

**Solicitation  
For Participation in  
Construction Services for Arlington Water Treatment Plant High Service Pump Replacement  
for**



**Jacksonville, FL**

**Solicitation Number 090-17**

**Mandatory Pre-Bid Meeting on May 10, 2017 at 1:00 p.m.**

**JEA Customer Center, 1<sup>st</sup> Floor, Room 002**

**21 W. Church Street, Jacksonville, FL 32202**

**And**

**A Mandatory Site Walk through will be held following the Pre-Bid Meeting on May 10, 2017 from 2:30pm to 3:30pm at the WTP. The WTP is located at 1425 Maitland Ave, Jacksonville, FL**

**Bids are due on May 30, 2017 at 12:00 p.m.**

**Direct delivery or mail to JEA Bid Office, Customer Center 1<sup>st</sup> Floor, Room 002**

**21 W. Church Street, Jacksonville, FL 32202**

**JEA will publicly open all bids received from qualified Bidders on May 30, 2017 at 2:00pm  
in the JEA Customer Center 1<sup>st</sup> Floor, Room 002, 21 W. Church Street, Jacksonville, FL**

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## Solicitation

### 1. SOLICITATION

#### 1.1. INVITATION

##### 1.1.1. SCOPE OF WORK

The purpose of this solicitation is to obtain a contractor for the construction services for Arlington Water Treatment Plant High Service Pump Replacement. The project will involve replacing four (4) high service pumps with those of a higher capacity with VFD's to control the motors of the new pumps. The project will involve some demolition work and installing a new chlorine analyzer, replacing pump suction and discharge piping, new sodium hypochlorite injection points with a valve box, new MCC gear and new HVAC and repairing asphalt road after construction is completed. All work is to be installed per the requirements set forth in the latest edition of the JEA Water and Sewer Standards. The following is a link to the JEA Water and Sewer Standards:

[https://www.jea.com/Engineering\\_and\\_Construction/Water\\_and\\_Wastewater\\_Standards/](https://www.jea.com/Engineering_and_Construction/Water_and_Wastewater_Standards/)

The duration of this work is 300 days from Notice to Proceed (NTP) to Substantial Completion, and 330 days from Notice to Proceed (NTP) to Final Completion.

A complete scope of work is located in Appendix A Technical Specifications.

##### 1.1.2. QUESTIONS

All questions must be submitted in writing to the JEA Buyer listed below at least five (5) business days prior to the opening date. Questions received within five (5) business days prior to the opening date will not be answered.

##### For Procurement Related Questions:

Buyer: NATHAN WOYAK

E-mail: [WOYANJ@JEA.COM](mailto:WOYANJ@JEA.COM)

##### For Technical Questions:

Contact: MINDY GRINNAN

E-mail: [GRINMH2@JEA.COM](mailto:GRINMH2@JEA.COM)

##### 1.1.3. INVITATION TO BID

You are invited to bid on the Solicitation noted below:

**JEA Solicitation Title:** Construction Services for Arlington Water Treatment Plant High Service Pump Replacement

**JEA Solicitation Number:** 090-17

To obtain more information about this Solicitation:

Download a copy of the Solicitation, PDF quality drawings (if applicable) and any required forms at [jea.com](http://jea.com).

**Bid Due Time:** 12:00 P.M. - ALL LATE BIDS WILL BE RETURNED UNOPENED

**Bid Due Date:** May 30, 2017



All Bids must reference the JEA Solicitation title and number noted above. All Bids must be made on the appropriate Bid forms as specified within this Solicitation, and placed in an envelope marked to identify the Solicitation and delivered or mailed to:

JEA Procurement Bid Office, Customer Center 1<sup>st</sup> Floor, Room 002, Jacksonville, FL 32202

The Bidder shall be solely responsible for delivery of its Bid to the JEA Bid Office. **Please note, JEA employs a third party courier service to deliver its mail from the local U.S. Postal Service (USPS) which could cause a delay of Bid delivery if mailed through the USPS.** Therefore, JEA recommends direct delivery to the JEA Bid Office. Reliance upon the USPS, the courier service employed by JEA to make pick-ups from the local USPS, or public carriers is at the Bidder's risk.

**Bids are due by the time and on the date listed above. ALL LATE BIDS FOR WHATEVER REASON WILL BE RETURNED UNOPENED.**

#### **1.1.4. MANDATORY PRE-BID MEETING AND MANDATORY SITE VISIT**

There will be a mandatory Pre-Bid and Site visit. All interested Bidders must attend both the Pre-Bid meeting and the Site visit. Each Bidder will be required to sign in at the beginning of the meeting. A Bidder shall only sign in representing one (1) company, unless otherwise specified by JEA. Bidders not attending the Pre-Bid and Site visit shall have their bids rejected returned unopened.

Bidders shall be on time to the Pre-Bid meeting and Site Visit, Bidders must be present at the starting time of the meetings. Bidders not arriving on time for the meeting or site visit will have their Bids rejected and returned unopened.

PLEASE BE AWARE DUE TO JEA SIGN IN AND/OR SECURITY PROCEDURES IT MAY TAKE UP TO FIFTEEN (15) MINUTES TO OBTAIN ACCESS TO A JEA FACILITY. PLEASE PLAN ACCORDINGLY SO AS TO ARRIVE TO THE PRE-BID MEETING ON TIME.

**Pre-Bid Meeting Time:** 1:00pm

**Pre-Bid Meeting Date:** May 10, 2017

**Pre-Bid Location:** JEA Bid Office, Customer Center 1st Floor, Room 002; 21 W. Church Street, Jacksonville, FL 32202

**A Mandatory Site Walk through will be held following the Pre-Bid Meeting on May 10, 2017 from 2:30pm to 3:30pm at the WTP. The WTP is located at 1425 Maitland Ave, Jacksonville, FL.**

#### **1.1.5. OPENING OF BIDS**

All Bids shall be publicly opened, read aloud and recorded at 2:00 PM on May 30, 2017 at the JEA Bid Office, 21 W. Church Street, Customer Center 1<sup>st</sup> Floor, Room 002, Jacksonville, FL 32202.

At the opening of Bids, a JEA Representative will publicly open and announce each Bid that was received on time. Bids that have been properly withdrawn will not be opened. JEA has the right to waive any irregularities or informalities in the Bid Document.

## **1.2. SPECIAL INSTRUCTIONS**

### **1.2.1. MINIMUM QUALIFICATIONS FOR SUBMISSION**

Bidder shall have the following Minimum Qualifications to be considered eligible to submit a Bid in response to this Solicitation.

- o The Bidder must be listed on JEA's Responsible Bidder's List (RBL) in the following category: **RBL WP2 - Water and Sewer Plant Systems Installation, Construction, Maintenance & Repair.**
- o The Bidders must have an active State of Florida General Contractor License. Enter number on Appendix B Bid Form.

For any questions regarding RBL qualification and current status, contact Melanie Green at: 904-665-6740 or at newtmi@jea.com.

It is the responsibility of the Bidder to ensure and certify that it meets the Minimum Qualifications stated above. A Bidder not meeting all of the following criteria will have their Bid rejected.

**Please note: any Bidder whose contract with JEA was terminated for default within the last two (2) years shall have their Bid rejected.**

### **1.2.2. EVALUATION METHODOLOGY**

#### **1.2.2.1. BASIS OF AWARD - LOWEST BID**

JEA will Award this Contract to the responsive and responsible Bidder whose Bid meets or exceeds the Minimum Qualifications set forth in this Solicitation, and the Bidder's price represents the lowest cost to JEA.

JEA will use the Bidder's Total Bid Price stated on the Bid Form when making price comparisons for Award purposes.

The Bidder shall include the price for travel, shipment of materials and equipment in its pricing shown on the Bid Form unless otherwise stated herein. The shipment of all materials shall be F.O.B. Destination.

#### **1.2.2.2. COMPETITIVE SEALED BIDDING (INVITATION FOR BIDS)**

The Bidder shall submit its sealed Bid in response to this Solicitation no later than the Bid due date and time indicated herein. At the public opening of the Bids, the Bids from all Bidders will be publicly announced. After the public opening, JEA will subsequently review Bids to determine if they meet the minimum qualifications as stated in this Solicitation. JEA will Award the Contract to the lowest responsive and responsible Bidder whose Bid meets or exceeds the minimum qualifications, and whose Bid Price represents the lowest cost to JEA.

**NO EXCEPTIONS ARE ALLOWED IN AN INVITATION TO BID. IF THE BIDDER OBJECTS IN ANY MANNER TO THE TERMS AND CONDITIONS OR TECHNICAL SPECIFICATIONS, THE OBJECTION MUST BE ADDRESSED IN WRITING FIVE (5) BUSINESS DAYS PRIOR TO THE BID OPENING DATE, AND THE OBJECTION MAY BE ADDRESSED IN AN ADDENDUM IF JEA BELIEVES THAT A CLARIFICATION OR CHANGE IS NECESSARY. ANY MODIFICATIONS, EXCEPTIONS OR OBJECTIONS STATED WITHIN THE BID DOCUMENTS SHALL SUBJECT THE BID TO BE REJECTED.**

### **1.2.3. NUMBER OF CONTRACTS TO BE AWARDED**

JEA intends to Award One (1) Contract(s) for the Work. JEA reserves the right to Award more than one Contract based on certain groupings of the Work items, or JEA may exclude certain Work items, if JEA determines that it is in its best interest to do so.

### **1.2.4. REQUIRED FORMS TO SUBMIT WITH BID**

To submit a Bid in response to this Solicitation, all of the forms listed below must be completed and submitted as part of the Bid. The Bidder must obtain the required forms, other than the forms provided in the solicitation, by downloading them from JEA.com. If the Bidder fails to complete or fails to submit one or more of the required forms, the Bid shall be rejected.

The following forms are required to be submitted at the time of Bid:

- o Bid Bond
- o Bid Form (including acknowledgements of all addenda) - This form can be found in Appendix B
- o List of JSEB Certified Firms
- o Florida Trench Safety Act Acknowledgment
- o Construction and Demolition Debris Disposal (if applicable)
- o Subcontractor Form - This form can be found in Appendix B
- The following Subcontractors must be listed on the subcontractor form if not being self-performed:**
  - a. Electrical,**
  - b. Pump Supplier**
  - c. Generator Supplier**
- o State of Florida license number- entered on the Bid Form

If the above listed forms are not submitted with the Bid by the Bid Due Time on the Bid Due Date, JEA shall reject the Bid.

JEA also requires the following documents to be submitted prior to execution of Contract. A Bid will not be rejected if these forms are not submitted at the Bid Due Time and Date. However, failure to submit these documents at the time of Contract execution could result in Bid rejection.

- o Conflict of Interest Certificate Form
- o Insurance Certificate
- o W-9
- o Evidence of active registration with the State of Florida Division of Corporations ([www.sunbiz.org](http://www.sunbiz.org))
- o Any technical submittals as required by the Technical Specifications.

### **1.2.5. SUBCONTRACTORS**

The Bidder shall list the names of the major Subcontractors that it intends to use for this Work, unless the Work will be self-performed by the Bidder. The Subcontractors shall be listed on the Subcontractors Form which is available at [jea.com](http://jea.com). Failure to submit this form with the Bid shall result in rejection of company's Bid. The Bidder shall not use Subcontractors other than those shown on the Subcontractor Form unless it shows good cause and obtains the JEA Representative's prior written consent.

If the Bidder plans to use Subcontractors to perform over 50% of the Work, the Bidder shall obtain JEA's approval at least five (5) days prior to the Bid Due Date. Failure to obtain JEA approval shall result in rejection of the company's Bid.

#### **1.2.6. JACKSONVILLE SMALL AND EMERGING BUSINESS (JSEB) PROGRAM REQUIREMENTS**

##### **1.2.6.1. JACKSONVILLE SMALL AND EMERGING BUSINESS (JSEB) GOAL (IFB)**

The specific JSEB participation goal for the Scope of work described in this Solicitation is: **Three percent (3%)**. This percentage is the percentage of the Bidder's total bid price that must be awarded or subcontracted to JSEB firms. Failure to fully comply with the JSEB requirements stated herein may disqualify the Bid.

Bidders are required to complete and submit with their Bid the JSEB form which can be found at [www.jea.com](http://www.jea.com). Bidders must specify on the JSEB form how they intend to comply with the JSEB goal stated herein. Bidders that do not submit a JSEB form with their Bid may have their Bids rejected, unless they are exempted under the good faith exception described below.

In no case shall the Bidder make changes to the JSEB firms listed in its Bid, revise the JSEB Scope of work or amount of Work as stated in its Bid without prior written notice to the JEA Contract Administrator, and without subsequent receipt of written approval from the JEA Contract Administrator.

JSEB firms that qualify for this Contract are those shown on the current City of Jacksonville JSEB directory appearing at [www.COJ.net](http://www.COJ.net). Certification of JSEB firms must come for the City of Jacksonville. No other agency or organization is recognized for purposes of this Contract.

If the Bid does not comply with the JSEB requirements established in this Solicitation, the Bidder must submit documentation as part of its Bid describing in detail its good faith efforts to comply with the JSEB requirements of the Solicitation. This documentation shall include at a minimum the following items:

A written and signed statement describing the level of effort for each of the requirements listed below. Include dates, times, people whom the Bidder contacted and phone numbers to enable JEA to confirm good faith efforts.

Copies of written solicitations of participation the Bidder sent to qualified JSEB firms, showing adequate response time was provided, defining the scope and nature of the work Bidder is asked to perform, Bidder contact information for questions and follow-up, and an offer to meet to review plans, specifications and scope.

A statement of the Bidder's efforts to negotiate a suitable agreement with JSEB firms including call logs showing participants, dates, times, topics discussed, and open issues.

A statement of the Bidder's efforts to help qualified firms that may require assistance in obtaining bonding, insurance, financing, technical support, procedural information, or other items necessary to compete for and perform the Work.

For each offer received from a qualified JSEB firm but rejected by Bidder, a statement explaining why such offer was not made part of the Bid.

For each qualified JSEB firm contacted but considered unqualified by the Bidder to perform a portion of the Work, a statement of the reasons Bidder considered firm to be unqualified.

The Bidder shall contact the JEA JSEB Office for assistance when all independent attempts (emails, phone calls, faxes and letters) to contact qualified JSEB firms have failed, and shall do so in adequate time for JSEB firms to be identified and to allow JSEB firms adequate time in which to respond. Failure by the Bidder to contact the JEA JSEB Office as required herein will be considered when determining if the Bidder has made a good faith effort.

The Bidder understands and agrees that receipt of a lower bid from a non-JSEB qualified firm, will not in and of itself, be sufficient reason to justify failing to meet the JSEB requirements of the Solicitation.

The determination as to whether the Bidder made a good faith effort in trying to achieve the JSEB requirements of this Solicitation will be made solely by JEA and prior to Award.

All questions and correspondence concerning the JSEB program should be addressed to the following contact:

G. Nadine Carswell  
JSEB Manager  
(904) 665-6257  
carsgs@jea.com

#### **1.2.7. INSURANCE REQUIREMENTS**

Prior to JEA issuing a Purchase Order to the Bidder to begin the Work or Services, the Bidder shall submit a certificate of insurance (COI) that is in compliance with amounts and requirements as indicated in the Section herein entitled "Insurance Requirements". **Note that the COI shall specifically indicate JEA (and Florida Power and Light Company ("FPL"), if applicable) as additional insured(s) on all required insurance except Worker's Compensation and Professional Liability (if applicable). Furthermore, waiver of subrogation shall be provided for all required insurance in favor of JEA, FPL (if applicable), including their board members, officers, employees, agents, successors, and assigns.**

#### **1.2.8. PAYMENT AND PERFORMANCE BOND REQUIREMENTS**

Once the Bidder is Awarded the Contract and upon receipt of the Contract Documents, the Bidder shall furnish a Payment and Performance Bond, or alternate form of security, in the amount indicated on the Bid Form, made out to JEA in forms and formats approved and provided by JEA, as security for the faithful performance of the Work or Services. No modifications to the JEA bond forms are allowed.

A fully executed Payment and Performance Bond must be recorded with the Clerk of Duval County Court and delivered to JEA before the JEA Purchase Order will be issued. JEA will send the approved bond forms to the Bidder for execution along with the Contract; however, in no case shall the date on the bond forms be prior to that of the executed Contract. The surety must be authorized and licensed to transact business in Florida. **Note that the Bidder is responsible for the costs associated with the required Payment and Performance Bonds; therefore, the costs should be included in the Bidder's total Bid Price.** If the Bidder fails or refuses to furnish or record the required bonds, JEA will retain the Bidder's bid bond as liquidated damages.

To be acceptable to JEA as surety for Performance and Payment Bonds, a surety company shall comply with the following provisions:

- o The Surety Company shall have a currently valid Certificate of Authority, issued by the State of Florida, Department of Insurance, authorizing it to write surety bonds in the State of Florida.

- o The Surety Company shall have a currently valid Certificate of Authority issued by the United States Department of Treasury under Sections 9304 to 9308 of Title 31 of the United States Codes.
- o The Surety Company shall be in full compliance with the provisions of the Florida Insurance Code.
- o The Surety Company shall have at least twice the minimum surplus and capital required by the Florida Insurance Code during the life of this agreement.
- o If the Contract Award Amount exceeds \$500,000, the Surety Company shall also comply with the following provisions:

The Surety Company shall have at least the following minimum ratings in the latest issue of A.M. Best's Key Rating Guide.

**POLICY HOLDER'S CONTRACT AMOUNT AND REQUIRED FINANCIAL RATING**

\$500,000 TO 1,000,000: A-CLASS IV

\$1,000,000 TO 2,500,000: A-CLASS V

\$2,500,000 TO 5,000,000: A-CLASS VI

\$5,000,000 TO 10,000,000: A-CLASS VII

\$10,000,000 TO 25,000,000: A- CLASS VIII

\$25,000,000 TO 50,000,000: A- CLASS IX

\$50,000,000 TO 75,000,000: A- CLASS X

The Surety Company shall not expose itself to any loss on any one risk in an amount exceeding ten percent (10%) of its surplus to policyholders, provided:

Any risk or portion of any risk being reinsured shall be deducted in determining the limitation of the risk as prescribed in this section. These minimum requirements shall apply to the reinsuring carrier providing authorization or approval by the State of Florida, Department of Insurance, to conduct business in this state has been met.

In the case of the surety insurance company, in addition to the deduction for reinsurance, the amount assumed by any co-surety, the value of any security deposited, pledged or held subject to the consent of the surety and for the protection of the surety shall be deducted.

### **1.2.9. LIQUIDATED DAMAGES IN CONTRACT**

The Contract issued pursuant to this Solicitation contains liquidated damages tied to project completion deadlines. The Bidder should review the specific time frames and liquidated damage amounts prior to submitting its Bid.

### **1.2.10. SAFETY QUALIFICATION REQUIREMENTS (IFB)**

Bidder shall be approved as JEA Safety Qualified within ten (10) business days of receiving written notice from the JEA Bid Office that it is the lowest responsive and responsible Bidder. If the Bidder fails to obtain JEA approval as a JEA Safety Qualified company by 4:00 p.m. Eastern time on the 10<sup>th</sup> business day, JEA will reject the company's Bid, and proceed to Award to the next lowest responsive and responsible Bidder.

JEA Safety Qualification information is available online at [jea.com](http://jea.com). Please note that it may take up to five (5) business days for a company to be approved as JEA Safety Qualified. It is the Bidder's responsibility to ensure it is JEA Safety Qualified. A list of the JEA's Safety Qualified vendors can be found on [jea.com](http://jea.com). For additional information, contact Jerry Fulop at (904) 665-5810.

### **1.2.11. TIME**

In computing any period of time prescribed or allowed by this solicitation, the day of the act, event, or default from which the designated period of time begins to run shall not be included. The last day of the period so computed shall be included unless it is a Saturday, Sunday, or JEA holiday, in which event the period shall run until the end of the next day which is neither a Saturday, Sunday, or JEA holiday.

#### **1.2.12. BID SECURITY/BID BOND**

All Bids shall be accompanied by a bid security in the amount stated on the Bid Form. The bid security must be furnished by the Bidder at or before the opening of Bids. The bid security shall either be issued by a surety company authorized to do business in the State of Florida, or Bidder shall furnish a certified check or cashier's check in the amount of **five percent (5%)** of the total Bid Amount shown on the Bid Form. The JEA Bid Bond form can be found at [jea.com](http://jea.com). Failure to furnish the required bid security will disqualify the Bid. If the Bidder is Awarded the Work and fails to execute the Contract within ten (10) days of postmarked date on the Contract Documents, JEA shall retain the Bid Bond or check as liquidated damages.

### **1.3. GENERAL INSTRUCTIONS**

#### **1.3.1. COMPLETING THE BID DOCUMENTS**

Bidders shall complete and submit all Bid Documents with responses typewritten or written in ink. ALL BIDS SUBMITTED LATE TO THE JEA BID OFFICE WILL BE REJECTED.

When a blank is marked "optional" on the bid form, the Bidder shall insert the words "No Bid" in the space provided if the Bidder does not choose to submit a price for that item. Failure to complete each blank with either a price or the words "No Bid" may disqualify the Bid. The Bidder, or its authorized agent or officer, shall sign the Bid Documents. Failure to sign the Bid Documents may disqualify the Bid. JEA approved erasures, interlineations or other corrections shall be authenticated by affixing in the margin, immediately opposite the correction, the handwritten signature of each person executing the Bid. Failure to authenticate changes may disqualify the Bid. JEA may disqualify any Bids that deviate from the requirements of this Solicitation, and those that include unapproved exceptions, amendments, or erasures.

#### **1.3.2. CALCULATION OF THE BID PRICE**

JEA will use the Bidder's Total Bid Price stated on the Bid Form when making price comparisons for Award purposes.

#### **1.3.3. SUBMITTING THE BID FORM**

The Bidder shall submit one (1) original of all the Bid Documents, two (2) duplicates and one (1) CD or thumb drive of the original Bid Documents.

JEA will not accept Bid Documents files transmitted via email. If electronic copies of the Bid Documents are submitted, they must be submitted on a CD with the hardcopies of the Bid Documents.

#### **1.3.4. MODIFICATION OR WITHDRAWAL OF BIDS**

The Bidder may modify or withdraw its Bid at any time prior to the Bid Due Date and Time by giving written notice to JEA's Chief Procurement Officer. JEA will not accept modifications submitted by telephone, telegraph, email, or facsimile, or those submitted after the Bid Due Date and Time. The Bidder shall not modify or withdraw its Bid from time of Bid opening and for a period of ninety (90) days following the opening of Bids.

#### **1.3.5. ADDENDA**

JEA may issue Addenda prior to the Bid opening date to revise, in whole or in part, or clarify the intent or requirements of the Solicitation. The Bidder shall be responsible for ensuring it has received all Addenda prior to submitting its Bid and shall acknowledge receipt of all Addenda by indicating where requested on the Bid Form. JEA will post all Addenda when issued online at [jea.com](http://jea.com). The Bidder must obtain Addenda from the JEA website. All Addenda will become part of the Solicitation and any resulting Contract Documents. It is the

responsibility of each Bidder to ensure it has received and incorporated all Addenda into its Bid. Failure to acknowledge receipt of Addenda may be grounds for rejection of a Bid.

#### **1.3.6. CONTRACT EXECUTION AND START OF WORK**

Within thirty (30) days from the date of Award, JEA will present the successful Bidder with the Contract Documents. Unless expressly waived by JEA, the successful Bidder shall execute a Contract for the Work or Services within ten (10) days after receiving the Contract from JEA. If the Bidder fails to execute the Contract or associated documents as required, or if it fails to act on a JEA-issued Purchase Order (PO), JEA may cancel the Award with no further liability to the Bidder, retain the bid security or bond (if applicable), and Award to the next-ranked company.

Upon JEA's receipt of the executed Contract, certificate of insurance, and recorded Payment and Performance bonds (if applicable), JEA will issue a PO, in writing and signed by an authorized JEA representative as acceptance of the Proposal or Bid and authorization for the company to proceed with the Work, unless otherwise stated in the Contract or PO.

For Construction Services: In the event that JEA intends to authorize the successful Bidder to proceed with administrative work only, or with only a portion of the Work, then the PO shall state the specific limitations of such authorization and JEA will issue a separate written Notice to Proceed to authorize the Bidder to begin Field Work, when applicable, or to perform the remainder of the Work, or any portion thereof. The Bidder shall ensure that it is prepared to begin Field Work upon receipt of Notice to Proceed. Any Work performed outside of this partial authorization shall be at the Bidder's risk and JEA shall have no obligation to pay for such Work.

#### **1.3.7. DEFINED TERMS**

Words and terms defined in the Section entitled "Definitions" of this document are hereby incorporated by reference into the entire document.

#### **1.3.8. EX PARTE COMMUNICATION**

Ex Parte Communication is strictly prohibited. Ex Parte Communication is defined as any inappropriate communication concerning a Solicitation between a firm submitting a Bid and a JEA representative during the time in which the Solicitation is being advertised through the time of Award. Examples of inappropriate communications include: private communications concerning the details of Solicitation in which a Bidder becomes privy to information not available to the other Bidders. Social contact between Bidders and JEA representatives should be kept to an absolute minimum during the solicitation process.

Failure to adhere to this policy will disqualify the noncompliant Company's Bid. Any questions or clarifications concerning a Solicitation must be sent in writing via email to the JEA Buyer at least five (5) business days prior to the opening date. If determined by JEA, that a question should be answered or an issue clarified, JEA will issue an addendum to all Bidders.

For more information on Ex Parte communications, see JEA Procurement Code, Article 1-110, which is available at [www.jea.com](http://www.jea.com).

#### **1.3.9. JEA PUBLICATIONS**

Applicable JEA publications are available at [jea.com](http://jea.com).



### **1.3.10. PROHIBITION AGAINST CONTINGENT FEES**

The Company warrants that it has not employed or retained any company or person, other than a bona fide employee working for the Company, or an independent sales representative under contract to the Company, to solicit or secure a contract with JEA, and that it has not paid or agreed to pay any person, company, corporation, individual or Company, other than a bona fide employee working solely for the Company, or an independent sales representative under contract to the Company, any fee, commission, percentage, gift, or any other consideration, contingent upon or resulting from the Award or making of the Contract. For a breach or violation of these provisions occurs, JEA shall have the right to terminate the Contract without liability, and at its discretion, to deduct from the Contract Price, or otherwise recover, the full amount of such fee, commission, percentage, gift or consideration.

### **1.3.11. RESERVATIONS OF RIGHTS TO JEA**

The Solicitation provides potential Companies with information to enable the submission of written offers. The Solicitation is not a contractual offer or commitment by JEA to purchase products or services.

Bids shall be good for a period of ninety (90) days following the opening of the Bids.

JEA reserves the right to reject any or all Bids, or any part thereof, and/or to waive informalities if such action is in its best interest. JEA may reject any Bids that it deems incomplete, obscure or irregular including, but not limited to, Bids that omit a price on any one or more items for which prices are required, Bids that omit Unit Prices if Unit Prices are required, Bids for which JEA determines that the Bid is unbalanced, Bids that offer equal items when the option to do so has not been stated, Bids that fail to include a Bid Bond, where one is required, and Bids from Companies who have previously failed to satisfactorily complete JEA contracts of any nature or who have been scored by JEA as "Unacceptable" and as a result, are temporarily barred from bidding additional work.

JEA reserves the right to cancel, postpone, modify, reissue and amend this Solicitation at its discretion.

JEA reserves the right to cancel or change the date and time announced for opening of Bids at any time prior to the time announced for the opening of Bids. JEA may Award the Contract in whole or in part. In such cases whenever JEA exercises any of these reservations, JEA will make a commercially reasonable effort to notify, in writing, all parties to whom Solicitations were issued. JEA may award multiple or split Contracts if it is deemed to be in JEA's best interest.

### **1.3.12. SUNSHINE LAW**

#### **General**

Article I, Section 24, Florida Constitution, guarantees every person access to all public records and Chapter 119, Florida Statutes, provide a broad definition of public records. JEA is a body politic and corporate and subject to these laws and related statutes ("Florida's Public Records Laws"). All responses to this Solicitation are public records and available for public inspection unless specifically exempt by law.

#### **Redacted Submissions**

If a Bidder believes that any portion of the documents, data or records submitted in response to this Solicitation are exempt from Florida's Public Records Law, Bidder must (1) clearly segregate and mark the specific sections of the document, data or records as "Confidential," (2) cite the specific Florida Statute or other legal authority for the asserted exemption, and (3) provide JEA with a separate redacted copy of its response (the "Redacted Copy"). The cover of the Redacted Copy shall contain JEA's title and number for this Solicitation and Bidder's name, and shall be clearly titled "Redacted Copy." Bidder should only redact those portions of records that Bidder claims are specifically exempt from disclosure under Florida's Public Records Laws. If Bidder fails to submit a redacted copy of information it claims is confidential, JEA is authorized to produce all documents, data and other records submitted to JEA in answer to a public records request for such information.

In the event of a request for public records to which documents that are marked as confidential are responsive, JEA will provide the Redacted Copy to the requestor. If a requestor asserts a right to any redacted information, JEA will notify Bidder that such an assertion has been made. It is Bidder's responsibility to respond to the requestor to assert that the information in question is exempt from disclosure under applicable law. If JEA becomes subject to a demand for discovery or disclosure of Bidder's redacted information under legal process, JEA shall give Bidder prompt notice of the demand prior to releasing the information (unless otherwise prohibited by applicable law.) Bidder shall be responsible for defending its determination that the redacted portions of its response are not subject to disclosure.

By submitting a response to this Solicitation, Bidder agrees to protect, defend and indemnify JEA from and against all claims, demands, actions, suits, damages, liabilities, losses, settlements, costs and expenses (including but not limited to reasonable attorney fees and costs) arising from or relating to Bidder's determination that the redacted portions of its response to this Solicitation are not subject to disclosure.

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

**JEA**

**Attn: Public Records**

**21 West Church Street**

**Jacksonville, Florida 32202**

**Ph: 904-665-8606**

**publicrecords@jea.com**

**1.3.13. ETHICS (IFB)**

By signing the Bid Form, the Bidder certifies this Bid is made without any previous understanding, agreement or connection with any other person, firm, or corporation submitting a Bid for the same Work other than as a Subcontractor or supplier, and that this Bid is made without outside control, collusion, fraud, or other illegal or unethical actions. The Bidder shall comply with all JEA and City of Jacksonville ordinances, policies and procedures regarding business ethics.

The Bidder shall submit only one (1) Bid in response to this Solicitation. If JEA has reasonable cause to believe the Bidder has submitted more than one (1) Bid for the same Work, other than as a Subcontractor or subsupplier, JEA shall disqualify the Bid and may pursue debarment actions.

The Bidder shall disclose the name(s) of any public officials who have any financial position, directly or indirectly, with this Bid by completing and submitting the Conflict of Interest Certificate Form available at jea.com. Failure to fully complete and submit the Conflict of Interest Certificate will disqualify the Bid. If JEA has reason to believe that collusion exists among the Bidders, JEA shall reject any and all Bids from the suspected Bidders and will proceed to debar Bidder from future JEA Awards in accordance with the JEA Purchasing Code.

JEA is prohibited by its Charter from awarding contracts to JEA officers or employees, or in which a JEA officer or employee has a financial interest. JEA shall reject any and all Bids from JEA officers or employees, as well as, any and all Bids in which a JEA officer or employee has a financial interest.

In accordance with Florida Statutes Sec. 287.133, JEA shall reject Bids from any persons or affiliates convicted of a public entity crime as listed on the Convicted Vendor list maintained by the Florida Department of Management Services. JEA shall not make an Award to any officer, director, executive, partner, shareholder, employee, member, or agent active in management of the Bidder listed on the Convicted Vendor list for any transaction exceeding \$35,000 for a period of thirty-six (36) months from the date of being placed on the Convicted Vendor list.

If the Bidder violates any requirement of this clause, the Bid may be rejected and JEA may debar offending companies and persons.

#### **1.3.14. FLORIDA TRENCH SAFETY ACT**

If required, the Bidder shall complete and submit with its Bid the Florida Trench Safety Act Acknowledgment form, in accordance with Florida Statutes when the Work includes trench excavations that exceed five (5) feet in depth and as written assurance that the Bidder shall comply with all applicable trench safety standards, laws, rules and regulations during performance of any Work awarded from this Solicitation.

#### **1.3.15. SHIPPING, FREIGHT AND TRAVEL- F.O.B. DESTINATION**

The bidder shall include the price for travel, shipment of materials and equipment in its pricing shown on the Bid Form or Bid workbook unless otherwise stated herein. The shipment of all materials shall be F.O.B. destination.

#### **1.3.16. MATHEMATICAL ERRORS**

In the event of a mathematical error in calculation of the prices entered on the Bid Form, the Unit Prices will prevail. The corrected Bid Price utilizing the Unit Prices will be used to determine if the Company is Awarded the Work or the Services. Subsequently, the Unit Prices will be used throughout the term of the Contract.

#### **1.3.17. AVAILABILITY OF BIDS AFTER BID OPENING**

In accordance with the Florida Public Records Law, Florida Statutes, Chapter 119, copies of all Bids are available for public inspection thirty (30) days after the opening of Bids or on the date of Award announcement, whichever is earlier. Bidders may review opened Bids once they are available for public inspection by contacting the designated Buyer or JEA's Public Records custodian whose contact information can be found at [jea.com](http://jea.com). JEA will post a summary of the Bid results immediately after the Bid opening.

#### **1.3.18. PROTEST OF BIDDING AND AWARD PROCESS**

Companies shall file any protests regarding this Solicitation in writing, in accordance with the JEA Procurement Code, as amended from time to time. The JEA Procurement Code is available online at [jea.com](http://jea.com).

#### **1.3.19. CERTIFICATION AND REPRESENTATIONS OF THE BIDDER**

By signing and submitting a Bid, the Bidder certifies and represents as follows:

- A. That it has carefully examined all available records and conditions, including sites if applicable, and the requirements and specifications of this Solicitation prior to submitting its Bid. Where the Bidder visits sites, no Work or other disturbance is to be performed while at the site without written permission by JEA in advance of the site visit. The Bidder shall comply with all safety requirements described in the Solicitation and shall be prepared to show proof of insurance

- B. That every aspect of its submitted Bid, including the Bid Price and the detailed schedule for the execution of the Work, are based on its own knowledge and judgment of the conditions and hazards involved, and not upon any representation of JEA. JEA assumes no responsibility for any understanding or representation made by any of its representatives during or prior to execution of the Contract unless such understandings or representations are expressly stated in the Contract and the Contract expressly provides that JEA assumes the responsibility.
- C. That the individual signing the Bid Documents is a duly authorized agent or officer of the firm. Bids submitted by a corporation must be executed in the corporate name by the President or Vice President. If an individual other than the President or Vice President signs the bid, satisfactory evidence of authority to sign may be requested by JEA. If the Bid is submitted by a partnership, the bid must be signed by a partner whose title must appear under the signature. If an individual other than a partner signs the bid, satisfactory evidence of authority to sign may be requested by JEA. The corporation or partnership must be in active status at the Florida Division of Corporations at the time of contract execution.
- D. That the firm maintains an active status and all licenses, permits, certifications, insurance, bonds and other credentials including, but not limited to, contractor's license and occupational licenses necessary to perform the Work. The Bidder also certifies that, upon the prospect of any change in the status of applicable licenses, permits, certifications, insurances, bonds or other credentials, the Bidder shall immediately notify JEA of status change.
- E. That Bidder has read, understands these instructions and will comply with the Section titled Ethics.

#### **1.3.20. CONFLICT OF INTEREST (CONSTRUCTION)**

This conflict of interest policy applies to all JEA construction projects ("Project"). Any company bidding the construction phase of a Project cannot at the time of Bid submittal, be affiliated with or have any direct or indirect ownership interest in the architect/engineer ("Designer") of record. The company will also be prohibited from bidding if the Designer has any direct or indirect ownership interest in the Contractor. Should JEA erroneously award a contract in violation of this policy, JEA may terminate the contract at any time with no liability to company, and company shall be liable to JEA for all damages, including but not limited to the costs to rebid the Project. The purpose of this policy is to encourage bidding and eliminate any actual or perceived advantage that one Bidder may have over another.

#### **1.3.21. CONSTRUCTION AND DEMOLITION DEBRIS**

The Bidder shall complete and submit the Construction and Demolition Debris Disposal form which is available at [www.jea.com](http://www.jea.com). The Bidder shall identify, by the Certificate of Necessity number and Public Works number, the sites to which it will remove for disposal debris resulting from the Work. A list of approved sites may be obtained from the JEA Office Section or [jea.com](http://jea.com).

#### **1.3.22. UNABLE TO SUBMIT BID FORMS**

If you elect not to submit a Bid in response to this Solicitation, please complete the Unable to Submit Bid Form, available for download at [www.jea.com](http://www.jea.com), or by obtaining a hardcopy from the JEA Bid Office, 21 West Church St., Customer Center 1<sup>st</sup> Floor, Room 002, Jacksonville, FL 32202. The Bidder may contact the Bid Office by phone at (904) 665-6740.

Send the completed Unable to Submit Bid Form to:

JEA Bid Office  
21 West Church St., CC-1, Room 002  
Jacksonville, FL 32202  
or fax the Unable to Submit Bid Form to: (904) 665-7095.

Do not return the entire Solicitation package; simply return the Unable to Submit Bid Form.

## **2. CONTRACT TERMS AND CONDITIONS**

### **2.1. CONTRACT DOCUMENT AND TERMS AND CONDITIONS**

Provided below are the Contract terms and conditions that will be incorporated by reference in the Contract Document executed by the Company and JEA. The Contract Document will incorporate by reference the terms contained in the Solicitation portion of this document provided in Section 1, the Contract Terms provided in Section 2; and the Technical Specifications provided in Section 3. An example of the Contract that the Company will be required to execute is available for review at [jea.com](http://jea.com).

### **2.2. DEFINITIONS**

#### **2.2.1. DEFINITIONS**

Words and terms defined in this section shall have the same meaning throughout all parts of this Solicitation and Contract Documents. Where intended to convey the meaning consistent with that set forth in its definition, a defined word or term is marked by initial capitalization. The "Technical Specifications" portion of this Solicitation may define additional words and terms where necessary to clarify the Work. Unless otherwise stated in this Solicitation and/or Contract Documents, definitions set forth in the "Technical Specifications" shall apply only within the "Technical Specifications."

#### **2.2.2. ACCEPTANCE**

JEA's written notice by the Contract Administrator to the Company that all Work as specified in the Contract has been completed to JEA's satisfaction. Approval or recognition of the Company meeting a Milestone or interim step does not constitute Acceptance of that portion of Work. Acceptance is only applicable to the entirety of Work as specified in the Contract. Acceptance does not in any way limit JEA's rights under the Contract or applicable laws, rules and regulations.

#### **2.2.3. ADDENDUM/ADDENDA**

A written change or changes to the Solicitation which is issued by JEA Procurement Services and is incorporated into the Solicitation as a modification, revision and/or further clarification of the intent of the Solicitation.

#### **2.2.4. ADMINISTRATIVE WORK**

Actions primarily performed in an office environment and associated with preparing to perform or administer the Work including, but not limited to, preparing Work schedules, obtaining bonds, executing Contracts, securing resources and other actions specified in the Solicitation, or otherwise prudent to ensure a timely, safe and otherwise compliant start and performance of Field Work. Administrative Work is not performed at the Work Location.

#### **2.2.5. APPLICATION FOR PAYMENT**

The form required for payment which shall include all items required pursuant to the contract for the payment to be processed by JEA. Such form shall require the Contractor expressly state that the Contractor has fulfilled all obligations for the previous payments issued to the Contractor, including payment for subcontractors and materials.

The Application for Payment includes all forms and supporting documentation as required by the Contract documents.

#### **2.2.6. APPROVED SCHEDULE**

A Critical Path Method Schedule or a Summary Schedule for the Work approved in writing by the Contract Administrator.

#### **2.2.7. AWARD**

The written approval of the JEA Awards Committee that the procurement process for the purchase of the Work was in accordance with the JEA Procurement Code and Florida Statutes. Once an Award is approved, JEA will either issue a Purchase Order or execute a Contract with the successful bidder or proposer.

#### **2.2.8. BID DOCUMENTS**

The forms required to be submitted to JEA as the Company's offer to perform the Work or Services described herein. The Bid Documents can include, but is not limited to, the Bid Form, certifications and/or other required submittals. The Bid Documents may also be referred to as the "Bid Form".

#### **2.2.9. BID OR PROPOSAL**

The document describing the Bidder's offer submitted in response to this Solicitation. Bid and Proposal shall be considered synonymous for the purpose of this Contract.

#### **2.2.10. BID PRICE**

The total dollar amount of the Bidder's offer to successfully perform the Work or Services in accordance with the Contract Documents.

#### **2.2.11. BIDDER OR PROPOSER**

The respondent to this Solicitation. Bidder and Proposer shall be considered synonymous for the purpose of this Solicitation.

#### **2.2.12. CHANGE ORDER**

A written order issued after execution of the Contract to the Company signed by the Contract Administrator, or his designated representative, authorizing an addition, deletion, or revision of the Work, or an adjustment in the Contract Price or the Contract Time. Change Orders do not authorize expenditures greater than the monies encumbered by JEA, which is shown on the associated Purchase Order(s). An executed Change Order resolves all issues related to price and time for the Work included in the Change Order. A Change Order that involves a material change to the Contract may result in a Contract Amendment.

#### **2.2.13. COMPANY**

The legal person, firm, corporation or any other entity or business relationship with whom JEA has executed the Contract. Where the word "Company" is used it shall also include permitted assigns. Prime Contractor, Contractor, Vendor, Supplier and Company shall be considered synonymous for the purpose of the Contract.

#### **2.2.14. COMPANY REPRESENTATIVE**

The individual responsible for representing the Company in all activities concerning the fulfillment and administration of the Contract.

#### **2.2.15. COMPANY SUPERVISOR**

The individual, employed or contracted by the Company, to manage the Work on a day-to-day basis and ensure the Work is performed according to the Contract. The Company Supervisor may be authorized by the Company Representative to act on Contract matters. Such authorization shall be in writing and delivered to the Contract Administrator and shall clearly state the limitations of any such authorization. In the event that the Company Supervisor and the Company Representative is the same person, the Company shall notify the Contract Administrator of such situation.

#### **2.2.16. CONTRACT**

An agreement between JEA and the Company, signed by both parties, which incorporates all the Contract Documents. The Contract shall not be altered without an Amendment to the Contract and executed by JEA and the Company, or a JEA issued Change Order.

#### **2.2.17. CONTRACT ADMINISTRATOR**

The individual assigned by JEA to have authority to administer the Contract, including the authority to negotiate all elements of the Contract with the Company, authorize Change Orders within the maximum amount awarded, terminate the Contract, seek remedies for nonperformance including termination, and otherwise act on behalf of JEA in all matters regarding the Contract. The Contract Administrator may authorize JEA Representative in writing to make minor changes to the Work with the intent of preventing Work disruption.

#### **2.2.18. CONTRACT DOCUMENTS**

Contract Documents, also referred to as the "Contract" means the executed Contract, all Solicitation documents and Bid Documents as further described in the Section of the Solicitation titled "Contract Documents", and any written Change Orders, amendments or Purchase Orders executed by JEA, and insurance and/or bonds as required by the Contract.

#### **2.2.19. CONTRACT PRICE**

The total amount payable to the Company during the initial Term of the Contract. However, this amount is not a guaranteed amount. Also referred to as the "Maximum Indebtedness" of JEA.

#### **2.2.20. CONTRACT TIME (CONSTRUCTION)**

The number of calendar days or the period of time from when the written Purchase Order is issued to the Company to Substantial Completion and Acceptance of the Work.

#### **2.2.21. CONTRACTOR**

The legal person, firm, corporation or any other entity or business relationship with whom JEA has executed the Contract. Where the word "Contractor" is used it shall also include permitted assigns. Contractor and Company shall be considered synonymous for the purpose of the Contract.

#### **2.2.22. CRITICAL PATH METHOD (CPM) SCHEDULE**

A schematic display of the sequential and logical relationship of all activities that comprise the Work. Using a combination of duration, early and late start dates, and early and late finish dates, a critical path is established as the path of interdependent activities that must be sequentially performed and that require a longer total time to perform than any other such series. CPM Schedules suitable for use on this Contract use GANNT Precedence formats.

#### **2.2.23. CUSTOMER SERVICE PLAN**

The Company's plan to achieve customer satisfaction requirements as determined by JEA and JEA Project Outreach, which shall include, as a minimum, the name and office phone number, cell phone number, email address, Nextel Direct Connect number, and fax number of Company's Customer Service Representative, a detailed flow chart on how the Company will handle customer concerns, preemptive customer satisfaction control measures (such as door hangers provided by JEA, and neighborhood meetings in conjunction with JEA staff) and a plan to reduce the number of customer concerns surrounding construction Work addressing, as a minimum, the construction practices that will eliminate damage to customers' property including, but not limited to, cracked driveways, tire ruts in customers' yards, blocking customers' access to driveways, cutting customers' services during tie-in, excessive noise from construction equipment, and elimination of dust during construction Work.

#### **2.2.24. DEFECT**

Work that fails to reach Acceptance, or Work that fails meet the requirements of any required test, inspection or approval, and any Work that meets the requirements of any test or approval, but nevertheless does not meet the requirements of the Contract Documents.

#### **2.2.25. ENVIRONMENTAL REGULATIONS**

All laws, ordinances, statutes, codes, rules, regulations, agreements, judgments, orders, and decrees, now or hereafter enacted, promulgated, or amended, of the United States, the states, the counties, the cities, or any other political subdivisions in which the Work Location is located, and any other political subdivision, agency or instrumentality exercising jurisdiction over JEA, the Work Location, or the use of the Work Location, relating to pollution, the protection or regulation of human health, natural resources, or the environment, or the emission, discharge, release or threatened release of pollutants, contaminants, chemicals, or industrial, toxic or hazardous substances or waste or Hazardous Materials (as defined in this Contract) into the environment (including, without limitation, ambient air, surface water, ground water or land or soil).

#### **2.2.26. EQUAL ITEM**

Item a Bidder chooses to offer in place of offering the brand name or manufacturer's item specified on the Bid Document when the Bid Document clearly states that the Bidder may offer such an item.

#### **2.2.27. FIELD WORK**

Actions associated with meeting the requirements of the Contract other than Administrative Work. Field Work is primarily performed at the Work Location.

#### **2.2.28. FINAL COMPLETION**

The point in time after JEA makes the determination that the Work is completed and there is Acceptance by JEA, and the Company has fulfilled all requirements of the Contract Documents.

#### **2.2.29. FINAL PAYMENT**

The Final Payment for all Work performed. Final Payment shall not be made until the Company has complied with all the Contract requirements, and provided as necessary close-out documents as contained in the Contract.

#### **2.2.30. HAZARDOUS MATERIALS**

Any substance which is or contains (i) any "hazardous substance" as now or hereafter defined in the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (42 U.S.C. '9601 et seq.) ("CERCLA") or any regulations promulgated under or pursuant to CERCLA; (ii) any "hazardous waste" as now or hereafter defined in the Resource Conservation and Recovery Act (42 U.S.C. '6901 et. seq.) ("RCRA") or



regulations promulgated under or pursuant to RCRA; (iii) any substance regulated by the Toxic Substances Control Act (15 U.S.C. '2601 et seq.); (iv) gasoline, diesel fuel, or other petroleum hydrocarbons; (v) asbestos and asbestos containing materials, in any form, whether friable or non-friable; (vi) polychlorinated biphenyls; (vii) radon gas; and (viii) any additional substances or materials which are now or hereafter classified or considered to be hazardous or toxic under Environmental Requirements (as hereinafter defined) or the common law, or any other applicable laws relating to the Licensed Property. Hazardous Materials shall include, without limitation, any substance, the presence of which on the Licensed Property, (A) requires reporting, investigation or remediation under Environmental Requirements; (B) causes or threatens to cause a nuisance on the Licensed Property or adjacent property or poses or threatens to pose a hazard to the health or safety of persons on the Licensed Property or adjacent property; or (C) which, if it emanated or migrated from the Licensed Property, could constitute a trespass.

#### **2.2.31. HOLIDAYS**

The following days: New Year's Day, Martin Luther King Jr. Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Day after Thanksgiving, Christmas Eve Day, and Christmas Day.

#### **2.2.32. INVOICE**

A document seeking payment to Company from JEA for all or a portion of the Work, in accordance with the Contract Documents, and including at a minimum the following items: the Company's name and address, a description of the product(s) or service(s) rendered, a valid JEA PO number, the amount payable, the Unit Price, the payee name and address, any associated JSEB forms and any other supporting documentation required by the Contract Documents.

#### **2.2.33. JEA**

JEA on its own behalf, and when the Work involves St. Johns River Power Park (SJRPP), as agent for Florida Power and Light Company (FPL). JEA and FPL are co-owners of SJRPP.

#### **2.2.34. JEA ENGINEER**

The individual assigned by JEA (either an employee or a third party) to provide licensing, engineering, design review, and/or construction management including, but not limited to, overseeing and resolving engineering/design issues, conveying JEA's instructions to the Company and enforcing the faithful performance of the Work. The JEA Engineer's authority includes interpreting the technical portion of the Contract Documents, deciding on matters relating to the execution and progress of the Work and evaluating the Company's performance. The JEA Engineer may stop the Work when deemed necessary by JEA. The JEA Engineer will receive and adjudicate any claim of ambiguity or error in the technical portion of the Contract Documents and shall reduce any determination to writing, and the decision shall be final and binding. The JEA Engineer is not a party to the Contract. The JEA Engineer has no authority to approve changes to the Work or Contract, or to commit JEA to any expenditure of money except as expressly designated in writing by the Contract Administrator.

#### **2.2.35. JEA INSPECTOR**

The individual(s) or company(ies) designated by the Contract Administrator to inspect and test the Company's performance and Contract compliance including materials, workmanship, safety, environmental compliance, JSEB compliance, project controls, administration and accounting, and other aspects of Contract compliance. The JEA Inspector has no authority to approve changes to the Work or Contract, or to commit JEA to any expenditure of money except as expressly designated in writing by the Contract Administrator.

#### **2.2.36. JEA REPRESENTATIVES**

The Contract Administrator, Contract Inspector, Contract Administrator's Representative, JEA Engineer, Field Engineer, Project Manager, and other persons designated by the Contract Administrator as JEA Representatives acting in a capacity related to the Work or Contract under the authority of the Contract Administrator.

#### **2.2.37. MILESTONE**

A point in time representing a key or important intermediate event in the Work. A Milestone is to be capable of validation by meeting all of the items prescribed in a defining checklist as agreed to in writing by JEA.

#### **2.2.38. NOTICE TO PROCEED**

The written notice, duly authorized and delivered by JEA, that authorizes the Company to begin the Work. The Notice to Proceed is normally issued in the form of a Purchase Order, unless otherwise specified in the Contract Documents.

#### **2.2.39. OVERTIME**

Work approved in writing by the Contract Administrator that is required to be performed beyond an employee's scheduled workday or work week, including Work performed on Holidays.

#### **2.2.40. PAYMENT AND PERFORMANCE BONDS**

The common-law Performance Bond and the statutory Payment Bond contemplated by Section 255.05, Florida Statutes in the form required by JEA.

#### **2.2.41. PRE-WORK MEETING**

A meeting conducted after Award and prior to the start of any Field Work between JEA and the Company. The purpose of the meeting may include, but is not limited to orientation, schedule, certification and permitting, and other preparatory or Work execution details.

#### **2.2.42. PERFORMANCE - ACCEPTABLE PERFORMANCE/PERFORMER**

The Company averages more than 2.80 and less than 4.0 across all performance scorecard evaluation metrics, and does not receive a score of less than 2.0 on any metric.

#### **2.2.43. PERFORMANCE - TOP PERFORMANCE/PERFORMER**

The Company averages 4.0 or more across all scorecard evaluation metrics and does not receive a score of less than 4.0 on any one metric.

#### **2.2.44. PERFORMANCE - UNACCEPTABLE PERFORMANCE/PERFORMER**

The Company averages less than 2.80 across all scorecard evaluation metrics, or scores a 1.0 on any one metric regardless of average, or receives a score of 2.0 on the same metric on two sequential performance evaluations.

#### **2.2.45. PURCHASE ORDER (PO)**

A commercial document issued by JEA, authorizing work, indicating types, quantities, and agreed prices for products or services the Company will provide to JEA. Sending a PO to a Company constitutes a legal offer to buy products or services. The words "Purchase Order" are clearly marked across the top; a PO number is used for reference and invoicing purposes, includes an authorized JEA signature, and states the dollar amount of the lawfully appropriated funds.

#### **2.2.46. QUALITY ASSURANCE**

Actions that JEA takes to assess the Company's performance under the Contract.

#### **2.2.47. QUALITY CONTROL**

Actions that the Company takes to ensure it successfully completes the Work in full accordance with the Contract Documents.

#### **2.2.48. SCHEDULE**

All documentation related to the planning and scheduling of the Work as described in these Terms and Conditions.

#### **2.2.49. SHOP DRAWINGS (DEFINITION)**

Drawings, electronic and hard copy, that detail the fabrication, erection, layout and setting drawings; manufacturer's standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; wiring and control diagrams; all other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and method of construction as may be required to show the JEA Engineer that the proposed materials, equipment or systems and the position thereof are in compliance with the requirements of the Contract Documents.

#### **2.2.50. SOLICITATION**

The documents (which may be electronic) issued by JEA's Procurement Department to solicit Bids from Bidders that includes, but is not limited to, the Bid Documents, samples of documents, contractual terms and conditions, the Technical Specifications, and associated Addenda.

#### **2.2.51. SUBCONTRACTOR**

A provider of services performing Work under contract for the Company.

#### **2.2.52. SUBSTANTIAL COMPLETION (DEFINITION)**

The time when JEA determines that the Work (or a specified part thereof) is substantially complete, in accordance with the Contract Documents. Additionally, all work other than incidental corrective and incidental punch list work items shall be completed. Substantial Completion shall not have been achieved if all systems and parts are not functional, if utilities are not connected and operating normally, if all required regulatory permits and approvals have not been issued, or if all vehicular and pedestrian traffic routes affected by the Work have not been restored. The date of Substantial Completion shall be established in writing by JEA. Recognition of the Work as Substantially Complete, as evidenced by issuance of a Certificate of Substantial Completion, does not represent JEA's Acceptance of the Work.

#### **2.2.53. SUMMARY SCHEDULE**

A diagram displaying the Milestones for the Work graphically positioned on a timeline, showing at a minimum the calendar dates on which each Milestone is scheduled to be completed for Acceptance.

#### **2.2.54. SUPPLEMENTAL WORK AUTHORIZATION (SWA)**

A written order, issued at the sole discretion of the JEA representative, which incorporates cost or schedule changes into the Contract. The SWA shall be used for increases or decreases in the Contract Price within the SWA amount set forth on the Bid Form, or to make changes in the schedule for performance of the Work, or to authorize the Company to perform changes in the Work.

#### **2.2.55. TASK ORDER**

A document that describes the Work or describes a series of tasks that the Company will perform in accordance with the Contract Documents. A Task Order may be issued as an attachment to a Purchase Order, but the Task Order is neither a Purchase Order, nor a Notice to Proceed.

#### **2.2.56. TERM**

The period of time during which the Contract is in force or until the Contract's Maximum Indebtedness is reached, whichever occurs first.

#### **2.2.57. UNIT PRICES**

The Bidder's charges to JEA for the performance of each respective unit of Work as defined on the Bid Documents, Bid, Bid Form or in the Contract Documents.

#### **2.2.58. WORK LOCATION (DEFINITION)**

The place or places where the Work is performed, excluding the properties of the Company and/or the Subcontractor(s).

#### **2.2.59. WORK OR SCOPE OF SERVICES**

Work includes as defined in the Contract Documents all actions, products, documentation, electronic programs, reports, testing, transport, administration, management, services, materials, tools, equipment, and responsibilities to be furnished or performed by the Company under the Contract, together with all other additional necessities that are not specifically recited in the Contract, but can be reasonably inferred as necessary to complete all obligations and fully satisfy the intent of the Contract.

### **2.3. CONTRACT DOCUMENTS**

#### **2.3.1. ORDER OF PRECEDENCE**

The Contract shall consist of JEA's Contract and/or Purchase Order together with the Solicitation including, but not limited to, the executed Bid Documents, which shall be collectively referred to as the Contract Documents. This Contract is the complete agreement between the parties. Parol or extrinsic evidence will not be used to vary or contradict the express terms of this Contract. The Contract Documents are complementary; what is called for by one is binding as if called for by all. The Company shall inform JEA in writing of any conflict, error or discrepancy in the Contract Documents upon discovery. Should the Company proceed with the Work prior to written resolution of the error or conflict by JEA, all Work performed is at the sole risk of the Company. JEA will generally consider this precedence of the Contract Documents in resolving any conflict, error, or discrepancy:

- o Executed Contract Amendments
- o Exhibits to Contract Documents
- o Executed Contract Documents
- o Purchase Order(s)
- o Addenda to JEA Solicitation
- o Drawings associated with this Solicitation
- o Exhibits and Attachments to this Solicitation
- o Technical Specifications associated with this Solicitation
- o This Solicitation
- o Bid Documents
- o References

The figure dimensions on drawings shall govern over scale dimensions. Contract and detailed drawings shall govern over general drawings. The Company shall perform any Work that may reasonably be inferred from the Contract as being required whether or not it is specifically called for. Work, materials or equipment described in words that, so applied, have a well-known technical or trade meaning shall be taken as referring to such recognized standards.

## **2.4. PRICE AND PAYMENTS**

### **2.4.1. PAYMENTS**

#### **2.4.1.1. PAYMENT METHOD - SCHEDULE OF VALUES**

The Company shall submit to JEA a monthly Application for Payment that details the Work completed during that month. The Company shall request payment in accordance with the amounts/percentages set forth on the Schedule of Values that the Company submitted prior to the start of the Work. The Schedule of Values is defined as an itemized list that establishes the value of each part of the Work for a stipulated price and for major lump sum items in a unit price contract. JEA will determine, either by measurement or approximation, the final quantities incorporated into the Work under items for which Unit Prices are established in the Contract Documents. JEA's determination as to the quantity of the Work successfully completed shall be final.

#### **2.4.1. INVOICING AND PAYMENT TERMS AND RETAINAGE**

Within sixty (60) days of completion of the Work, the Company shall submit all Invoices or Applications for Payment in accordance with the payment method agreed upon in these Contract Documents. All Invoices shall be submitted to the following address:

JEA Accounts Payable  
P.O. Box 4910  
Jacksonville, FL 32201-4910

JEA will pay the Company the amount requested less any holdbacks or retainage set forth in herein within thirty (30) calendar days after receipt of an Invoice from the Company subject to the provisions stated below.

JEA may reject any Invoice or Application for Payment within twenty (20) calendar days after receipt. JEA will return the Invoice or Application for Payment to the Company stating the reasons for rejection. Upon receipt of an acceptable revised Invoice or Application for Payment, JEA will pay the Company the revised amount within ten (10) days.

JEA may withhold payment if the Company is in violation of any conditions or terms of the Contract Documents.

As security for the proper performance of the Work, JEA may deduct ten percent (10%) retainage, or such other amount allowable pursuant to Florida law, from the amount stipulated in the Invoice or Application for Payment. In accordance with Florida Statutes, after completion of fifty percent (50%) of the Work, a maximum retainage of five percent (5%) may be deducted. For the purposes of this section, "completion of fifty percent (50%) of the Work" shall be defined as the point at which fifty percent (50%) of the total cost of the Work, as defined, and inclusive of authorized change orders, has been expended by JEA.

In the case of early termination of the Contract, all payments made by JEA against the Contract Price prior to notice of termination shall be credited to the amount, if any, due the Company. If the parties determine that the sum of all previous payments and credits exceeds the sum due the Company, the Company shall refund the excess amount to JEA within ten (10) days of determination or written notice.

#### **2.4.2. OFFSETS**

In case the Company is in violation of any requirement of the Contract, JEA may withhold payments that may be due the Company, and may offset existing balances with any JEA incurred costs against funds due the Company under this and any other Company Contract with JEA, as a result of the violation, or other damages as allowed by the Contract Documents and applicable law.

#### **2.4.3. DISCOUNT PRICING**

JEA offers any or all of the following option payment terms, one of which may be executed at the request of the Company by sending an email to the JEA Buyer listed in this Solicitation:

- o 1% 20, net 30
- o 2% 10, net 30

Company may request alternate payment terms for JEA's consideration, however, alternate payment terms are not effective until acceptance by JEA in writing. Please note, all payment dates are calculated from the date of the Invoice receipt by JEA's Accounts Payable.

#### **2.4.4. COST SAVINGS PLAN**

During the Term of this Contract, JEA and Company are encouraged to identify ways to reduce the total cost to JEA related to the Work provided by the Company ("Cost Savings Plan"). JEA and Company may negotiate Amendments to this Contract that support and allow such reductions in total costs including, but not limited to, the sharing of savings resulting from implementation of cost-reducing initiatives between JEA and Company. The decision to accept any cost savings plan shall be in the sole discretion of JEA, and JEA shall not be liable to Company for any cost that may be alleged to be related to a refusal to accept a Cost Savings Plan proposed by Company.

#### **2.4.5. TAXES**

JEA is authorized to self-accrue the Florida Sales and Use Tax and is exempt from Manufacturer's Federal Excise Tax when purchasing tangible personal property for its direct consumption.

#### **2.4.6. GENERAL CONDITIONS/SPECIAL CONDITIONS**

The line item shown on the Bid Form titled "General/Special Conditions Lump Sum Price" shall be used for general and special expenses which do not appear as separate line items on the Bid Form, including, but not limited to, costs and expenses related to the following:

- o The execution and recording of the Payment and Performance Bonds
- o Safety requirements
- o Quality Control
- o Preparation of daily reports
- o Maintenance of traffic
- o Attendance of meetings, project scheduling
- o Testing (if not included elsewhere)

Except as provided below for expenses related to Bonds and Surveying, JEA's payment for the General/Special Conditions line item shall be based upon the percentage of Work completed.

Bonds-Company will be permitted to invoice JEA, in its first payment application, for the costs associated with the execution and recording of the Payment and Performance Bonds. The amount paid by JEA for the Payment and Performance Bonds will be deducted from the General/Special Conditions line item total.

Surveying-Prior to construction, the Company will be permitted to invoice JEA for the costs associated with the survey of the existing roadway horizontal alignment. The amount paid by JEA for these costs will be deducted from the General/Special Conditions line item total.

SWA-In the event that JEA authorizes changes to the Work under a Supplemental Work Authorization (SWA), the amount of the Bid Form line item for SWA Allowance will not be increased unless the total value of all SWA Work exceeds the Original SWA Allowance provided on the Bid Form.

## **2.4.7. JSEB COMPLIANCE**

### **2.4.7.1. COMPLIANCE WITH JSEB REQUIREMENTS**

The Company shall achieve the JSEB participation requirements as set forth in the Solicitation, except as allowed under the good faith efforts exception as defined in the City of Jacksonville Ordinance. In no case shall the Company make changes to the JSEB firms listed in its Bid, revise the JSEB scope of Work or amount of Work as stated in its Bid without prior written notice to the Contract Administrator, and without subsequent receipt of written approval from the Contract Administrator.

The City of Jacksonville requirements as outlined in the City of Jacksonville Ordinance relating to JSEBs shall apply in their entirety to this Contract. Where the City of Jacksonville ordinance refers to "Chief", it shall be construed to mean, for purposes of this Contract, JEA's Chief Purchasing Officer. In a like manner, where it refers to "City", or "City of Jacksonville", it shall be construed to mean JEA.

Use of brokering, as defined in the City of Jacksonville Ordinance, or other techniques that do not provide a commercially useful function are strictly prohibited as means of achieving the JSEB requirements of the Contract. Only the amount of fees or commissions charged by a JSEB for providing a bona fide service such as professional, technical, consultant, or managerial services, or for providing bonds or insurance specifically required for the performance of a contract shall be counted towards a JSEB participation requirement, provided the fee is reasonable and not excessive as compared with fees customarily charged for similar services.

Payment terms for participating JSEB firms shall be the same or better than the payment terms the Company receives from JEA, except that in all cases JSEB firms shall be allowed to submit invoices to the Company at least bimonthly and the Company shall pay proper invoices no later than three (3) days after its receipt of JEA payment. The Company shall obtain written approval from the Contract Administrator prior to withholding any payment from JSEB firm.

If the Company uses a JSEB qualified firm for the performance of any part of this Work, the Company shall submit to JEA, with its Invoice, a listing of JSEB qualified firms that have participated in the Work. Such listing shall be made using the form "Monthly Report for COJ/JEA JSEB Participation" available at [www.jea.com](http://www.jea.com)

The Company agrees to let JEA audit its financial and operating records with one day of notice, and during normal business hours, at its corporate offices for the purpose of determining compliance with all JSEB requirements of the Contract Documents.

If the Company violates any provision regarding JSEB, including, but not limited to, program intent, the Company shall be subject to any or all of the following, plus any other remedies available to JEA under law:

- o Terminate the Contract for breach
- o Suspend the Company from bidding any JEA projects as follows:
  - o First offense: Six (6) months
  - o Second offense: One (1) year
  - o Third offense: Three (3) years
- o Revoke Company's JSEB certification if the Company itself is certified as a JSEB.

#### **2.4.7.2. JSEB - INVOICING AND PAYMENT**

If the Company utilizes JSEB certified firms, regardless of whether these Contract Documents require or encourage the use of such firms, the Company shall Invoice for and report the use of JSEB certified firms according to the format and guidelines established by the City of Jacksonville.

#### **2.4.8. PROMPT PAYMENT TO SUBCONTRACTORS, SUB-SUBCONTRACTORS AND SUPPLIERS**

When the Company receives payment from JEA for labor, services or materials furnished by Subcontractors and suppliers that are hired by the Company, the Company shall remit payment due (less proper retainage) to those Subcontractors and suppliers within ten (10) days after the Company's receipt of payment from JEA. Nothing herein shall prohibit the Company from disputing, pursuant to the terms hereof, all or any portion of a payment alleged to be due to its Subcontractors and suppliers. In the event of such dispute, the Company may withhold the disputed portion of any such payment only after the Company has provided written notice to JEA and to the Subcontractor and supplier whose payment is in dispute, stating the amount in dispute and specifically describing the actions required to cure the dispute. The Company shall deliver such notice to JEA and to the said Subcontractor or supplier within 10 days following the Company's receipt of payment from JEA. The Company shall pay all undisputed amounts due within the time frames specified herein.

The prompt payment requirements herein shall, in no way, create any contractual relationship or obligation between JEA and any Subcontractor, supplier, JSEB, or any third-party, nor create any JEA liability for the Company's failure to make timely payments as required. The Company's failure to comply with the prompt payment requirements, however, shall constitute a material breach of its contractual obligations to JEA. As a result of such breach, JEA, without waiving any other available remedy it may have against the Company, may issue joint checks and charge the Company a 0.2% daily late payment interest charge or charges as specified within the Florida Statutes, whichever is greater.

#### **2.4.1. SUBSTANTIAL COMPLETION, PUNCHLIST, & FINAL COMPLETION**

##### **2.4.1.1. SUBSTANTIAL COMPLETION**

The Company shall notify JEA in writing when a portion of the Work is Substantially Complete. The Company shall identify any deficiencies in the Work. JEA will inspect the Work and will give the Company written notice of either acceptance or rejection of the Work as Substantially Complete and provide a list of additional deficiencies. The Company shall correct all deficiencies prior to Final Completion of the Work by JEA.

Whenever any portion of the Work is Substantially Complete, JEA may use it. Such use shall not be held in any way as an Acceptance of the Work or as a waiver of any provisions of the Contract.

##### **2.4.1.2. PUNCH LIST: SECTION 218.735, FLORIDA STATUTES**

Within thirty (30) calendar days after reaching Substantial Completion, as defined herein, the parties shall jointly develop a final list of items required to render the Work complete, satisfactory, and acceptable (the "Punchlist"). If the parties cannot agree on the Punchlist, JEA will develop a Punchlist and deliver it to Company



within thirty-five (35) days after Substantial Completion. If the Work involves more than one building or structure or involves a multi-phased project, one Punchlist should be developed for each building, structure, or phase. Failure to include corrective work on the Punchlist does not relieve the Company from its responsibility to complete the Work required by the Contract.

Final Completion must be achieved within thirty (30) days after delivery of the Punchlist to Company. Notwithstanding anything in the Contract Documents to the contrary, damages may not be assessed against Company for failing to complete the Work unless Company fails to complete the Work within such thirty (30) day period.

#### **2.4.1.3. CERTIFICATE OF CONTRACT COMPLETION AND FINAL PAYMENT**

Company shall complete and submit to JEA the Certificate of Contract Completion, which can be found on [jea.com](http://jea.com), as notice that the Work, including the correction of all deficiencies outlined in the Punchlist, is complete.

By submitting the certificate, the Company certifies the following:

- o The Work, including all Punchlist items, has been satisfactorily completed; and
- o No liens have attached against the property and improvements of JEA; and
- o No notice of intention to claim liens are outstanding; and
- o No suits are pending by reason of the Work; and
- o All workers' compensation claims known to the Company have been reported to JEA; and
- o The surety provides a release; and
- o All warranties, equipment manuals and other documentation have been provided; and
- o No public liability claims are pending.

The Company shall submit its final Invoice with the completed Certificate of Contract Completion. JEA shall make Final Payment in accordance with the provisions contained herein. Final Payment includes payment of any retainage held.

#### **2.5. SCHEDULES, REPORTING REQUIREMENTS AND LIQUIDATED DAMAGES**

##### **2.5.1. LIQUIDATED DAMAGES UNTIL ACCEPTANCE**

If the Company fails to obtain Substantial Completion of the Work on or before 300 days after date of Notice to Proceed, the Company shall pay JEA the sum of \$1,000 per day for each and every calendar day, including Sundays and Holidays, starting on this day until the date the Work is Substantially Completed.

If the Company fails to obtain JEA's Acceptance and Final Completion of the Work on or before 330 days after date of Notice to Proceed, the Company shall pay JEA the sum of \$1,000.00 per day for each and every calendar day, including Sundays and Holidays, starting on the day the Work was deemed by JEA to be Substantially Complete until the date the Work is Accepted by JEA.

Liquidated Damages are capped at a maximum of ten percent (10%) of the Contract Price.

The Company understands and agrees that said daily sum is to be paid not as a penalty, but as compensation to JEA as a fixed and reasonable liquidated damages for losses that JEA will suffer because of such default, whether through increased administrative and engineering costs, interference with JEA's normal operations, other tangible and intangible costs, or otherwise, which costs will be impossible or impractical to measure or ascertain with any reasonable specificity.

Liquidated damages may, at JEA's sole discretion, be deducted from any monies held by JEA that are otherwise payable to Company.

The Company's responsibility for liquidated damages shall in no way relieve the Company of any other obligations under the Contract.

#### **2.5.2. REPORTING (CONSTRUCTION)**

The Company shall provide all reports as defined in the Contract Documents.

Where the reporting frequency is daily, reports shall be submitted by noon of the following workday. Where the reporting frequency is weekly, reports are due by Monday at noon, covering the prior workweek. Where Monday is a Holiday, the reports are due at noon on the next workday. Where reports are due monthly, reports are due by noon on the first business day of each month. Sample forms for reports may be included in the Contract Documents. Where they are included, they are to be used. Where they are not included, the Company shall provide a sample of its proposed report format for each report to the Contract Administrator at least one-week prior to its initial due date. The Contract Administrator will review and either approve or reject use of the report. Where proposed report is rejected, Company shall resubmit revised report formats, until Contract Administrator approves format. Reporting cycle shall begin upon the Purchase Order date, or, if used, the issuance date of the Notice to Proceed.

Where the Contract calls for reports to be submitted by Company, such reports shall be in both paper and electronic format, with the electronic version submitted electronically via email to the Contract Administrator.

#### **2.5.3. WORK SCHEDULES**

The Approved Schedule is referenced in the Technical Specifications attached to this Solicitation. If no schedule is provided, then the established schedule is based on working five (5) days per week, single shift, eight (8) hours per day or four (4) days per week, single shift, ten (10) hours per day. JEA may require the Company to base its schedule on an accelerated Work schedule or multiple shifts. The Company shall not schedule work on Holidays without obtaining prior written approval from JEA.

The Company shall, at no additional cost to JEA, increase or supplement its working force and equipment and perform the Work on an overtime or multiple shift basis when directed by JEA and upon notification that the Company is behind schedule. The Company shall submit a revised schedule in writing demonstrating the Company's schedule recovery plans.

The Company understands and agrees that the rate of progress set forth in the Approved Schedule already allows for ordinary delays incident to the Work. No extension of the Contract Term will be made for ordinary delays, inclement weather, or accidents and the occurrence of such events will not relieve the Company from requirement of meeting the approved schedule.

#### **2.5.2. CRITICAL PATH METHOD (CPM) SCHEDULING (UNDER \$5 MILLION)**

The Contractor shall use the Critical Path Method (CPM) to schedule and manage the Work. A qualified member of the Contractor's personnel shall do scheduling using CPM. If the Contractor does not have staff capable of preparing and managing CPM schedules, the Contractor shall obtain such qualified personnel on a subcontract basis for the purpose of supporting this Contract.

All CPM scheduling will be performed using CPM precedence diagramming method (PDM) scheduling software such as, Primavera P3, Primavera SureTrak (a low-cost CPM software for small businesses), Primavera P3e/c for construction, Primavera Contractor, Artemis Artviews, or a CPM scheduling software compatible with Primavera P3e import capabilities, integrated as part of a Contractor-wide ERP. The Contractor shall submit all schedules and

associated reports to the Contract Administrator in paper and/or electronic formats as described below in order to allow both complete analysis of the schedules and accurate record keeping.

#### CPM Schedule Terminology:

"Activity" means any single, continuous, identifiable task in the total Work. The project work scope is sub-divided into work tasks that are represented in the schedule software as activities. How finely the project scope is subdivided into tasks determines the "level of detail" within the schedule. JEA retains the right to reject a schedule for insufficient levels of activity detail.

"Milestone" or "Event" means the instant of time at which a significant task within the project is commencing or completing. A milestone or event is an activity in the scheduling software with an estimated duration of zero.

"Precedence relationships" means the logical relationships created in the scheduling software to sequence the performance of the work tasks identified by activities or milestones. Precedence relationships can be categorized in 4 groups - Finish-to-start, Start-to-Start, Finish-to-Finish, and Start-to-Finish. The interface between activities created by precedence relationships creates a PDM network logic. A PDM logic where estimated durations have not been assigned to the activities constitutes a network "Plan". Once activities are assigned estimated durations, the software interfaces durations and the network logic to calculate a "Schedule" based on the Plan.

"Initial Schedule" means the schedule that is proposed before any work has commenced against the project. The initial schedule differs from a current schedule only such that no activities have begun. Initial Schedules are usually the first schedules submitted for approval to the JEA representative. An Initial Schedule has no standing and is considered a working document or proposal.

"Current Schedule" means the schedule that has progress information (updates) reported against in-progress and completed activities. Update information is used to re-calculate / reforecast the most likely "early start" dates of the remaining incomplete activities as sequenced by the Plan. This calculation establishes to the earliest forecasted completion date of the project which allows project managers to determine if they are ahead, on, or behind schedule to meet the contractual completion date. A current schedule has no standing and is considered a working document to evaluate progress against an Approved Schedule.

"Original Schedule" is the first schedule that is approved by the JEA representative. In some extraordinary cases a Current Schedule may be accepted as the Original Schedule if no Initial Schedule is approved before work commences. The Original Schedule is the first schedule that is targeted as an Approved Schedule.

"Target Schedule" means a copy of the schedule where dates are frozen and those dates are not allowed to be modified by progress reporting, schedule changes, or further recalculations. Target Schedules take current schedule information which is dynamic and establishes static schedule data for comparison purposes. A project can have multiple Target Schedules (i.e. - copies of the schedule made at different times during project execution). The Original Schedule is usually the first Target Schedule to be generated within a project.

"Approved Schedule" is the Target Schedule that is approved by the JEA Representative. An Approved Schedule is the official schedule used to measure schedule performance against the Current Schedule. The first Approved Schedule is the Original Schedule and subsequent Approved Schedules are generated when the JEA representative agrees to revision(s) of the Approved Schedule. The Approved Schedule may be referred to as the Baseline Schedule or current Baseline Schedule.

"CPM Network" means a transferable electronic copy of project software data and files and includes, but is not limited to, activities, milestones, calendar definitions, precedence relationships including any relationship lag

periods, date constraints (e.g. start on or before, start on or after, finish on, finish on or before, finish on or after, as late as possible, zero free float, zero total float, etc.), target schedules, project and activity code definitions, resource definitions, resource assignments, project values (e.g. the data date/time now value, settings for project-activity processing options, etc.), and all information that can be generated from such data.

## Schedule Requirements

**General** - The Contractor is advised that its schedule and reports as specified herein will be an integral part of JEA's management program. The Contractor's schedules will be used by JEA to monitor project progress, plan the level of effort by its own forces and consultants, and as a critical decision making tool. Accordingly, the Contractor shall ensure that it complies fully with the requirements specified herein and that its schedules are both timely and accurate throughout the duration of the project.

**Duration Estimates** - The basic time unit for the duration estimate shall be in calendar days, except for plant outage work, which if requested by JEA, shall be measured at JEA's determination by work shifts or clock hours. For the purpose of scheduling, no schedule activity, outside of a plant outage, shall be estimated in duration units other than whole calendar days. The Contractor shall show each estimated duration on each Schedule (Initial or Current), indicating the best estimate of the activity's duration considering the scope of the Work and resources planned for the activity.

**Calendars** - The Contractor will specify the work pattern (calendar) to be used on the job (default) and the work pattern assigned to each activity - whether it is a four (4) day ten (10) hour/day week, five (5) day- eight (8) hour/day week.

**Holidays** - Holidays are to be observed and shall be identified as non-work days occurring during a regular work week pattern.

**Level of Schedule Detail** - JEA retains the right to reject an Initial or Current Schedule if insufficient level of detail in the schedule would inhibit meaningful schedule analysis or progress reporting used to evaluate progress of the project. Except for certain non-labor activities such as procurement or delivering of materials, activity durations "should" not exceed fourteen (14) days, nor be shown as less than one working day unless otherwise accepted by JEA. The "guideline" for activity durations not in excess of fourteen (14) days shall apply to all schedule submittals. JEA shall be the final authority regarding the appropriate level of schedule detail for all schedules submitted for approval.

**Activity and Project Codes** - The Contractor may use activity and project codes to support organization and displays of the schedule information if such information is transmitted to JEA with the Initial schedules. JEA shall be notified if additional codes are defined and utilized over the course of the project. At times, JEA may request that certain codes are applied to activities to facilitate the interface between the Contractor's schedule software and JEA's schedule software.

**PDM Network Quality** - Each project shall establish a "Start of Project" and "Project Completion/End of Project" milestone. All other activities within the schedule shall have precedence relationships that logically sequence both the start (predecessor) and finish (successor) of each activity. JEA will review the CPM Plan for excessive front loaded and back loaded work activity periods. Heavy front or back loaded schedules may indicate the lack of a well-designed Plan, poor network logic or poor utilization of available resources.

**Submittal Process for Establishing an Approved Schedule:**

Planning Session - Within three (3) days of Purchase Order issuance, and prior to submission of the Initial Schedule, the Contractor shall schedule and conduct a schedule planning session. During this session, the Contractor shall present its planned approach to the project including but not limited to: the planned construction sequence and phasing, planned crew sizes, summary of equipment types/sizes/numbers to be used, estimated durations of major work activities, the anticipated critical path of the project and a summary of the activities on the critical path, and a summary of the most difficult schedule challenges the Contractor is anticipating and how it plans to manage/control these challenges. This will be an interactive session with JEA. The Contractor's Initial Schedule shall incorporate the information discussed at this schedule planning session.

Initial Schedule - Within fourteen (14) days of the Planning Session, the Contractor shall submit a proposed CPM schedule consisting of Schedule deliverables as described herein. This schedule shall indicate project completion within the Contract Time. JEA shall contact a representative of the Contractor to review any discrepancies or items requiring clarification of the proposed Work schedule.

The Initial Schedule shall be reviewed and approved, or rejected by JEA within ten (10) days of submission. Failure to gain approval of the Initial Schedule within twenty-one (21) calendar days of submittal can result in Contract cancellation. The submitted CPM Network and schedule reports, when approved by JEA, shall constitute the Approved Schedule, until circumstances change and shall warrant the Contractor to request, and JEA to approve, a revised Approved Schedule.

#### Schedule Deliverables

The Contractor shall submit the following for the Initial Schedule and for each version of their Current schedule where they seek a revision to the Approved Schedule.

1. A tabular schedule report which includes:
  - Activity ID, activity description/name, activity calendar, original duration in calendar days, early start date, early finish date, total float, imposed date type, and imposed date (also known as "constrained date"), Approved Schedule Target Start Date, and Approved Schedule Target Finish Date
  - Sort criteria used on the report
  - Description of Grouping or sectioning criteria if used
  - No activities will be filtered, hidden, or removed from these reports.

If any of the above fields are too wide for a single tabular report, then the Contractor shall split some of the fields into a second report that also repeats activity ID and activity name, with the same sectioning, sorting and selection.

2. A second report (a Gantt chart) that includes the following:

Tabular fields: activity ID, activity name, remaining duration, early start date, early finish date, total float.

Graphic bars showing:

- i. Early date set: early start to early finish (including actual start to actual finish if the activity is completed). This bar must highlight activities, preferably in red, with total float values equal to 0 or less.
- ii. Late date set: late start to late finish (a separate, less prominent bar beneath early date set).

iii. Approved (Target) Schedule date set: a separate, less prominent bar beneath the late date set bar that highlights the original target dates. This bar is static, while the schedule bars for early and late dates will become dynamic during schedule execution.

iv. Milestone flags and constrained date flags: these are icons that show up as points in time (events). (Normally, they can share the same bar row as early date set).

#### Sort criteria

i. Grouping: sectioning appropriate to the scope of the project

ii. Sorting: sub grouping under each section by early start date (primary sort), by early finish date (secondary sort), total float (third-level sort), and by activity ID (final sort).

Selection: all activities

3. A document explaining the basis and purpose of any relationship lag values between activities in the CPM network.

4. An electronic copy of the Schedule data files from one of the Primavera schedule systems which will allow JEA to generate the products identified above based on the vendors schedule information/ raw data.

5. The Contractor shall also submit a list of project definitions including: calendar definitions indicating holidays, other non-work periods, normal planned work pattern (e.g. 8 hours per day, 5 days per week; 10 hours per day, 4 days per week), any activity code definitions if any of the items have been altered since the previous submission.

#### Schedule Acceptance

The JEA representative shall inform the Contractor when the Initial Schedule or a Current Schedule has been accepted as the Accepted Schedule. No changes reflected in an Approved Schedule will be construed as authorization to override the contractual completion date agreement. Changes to the contractual completion date must be amended outside the schedule review process.

#### Schedule Revisions

The Contractor shall modify any portions of the Current Schedule that become infeasible because of "activities or procurement behind schedule" or for any other valid reason. An activity that cannot be completed by its late finish date shall be deemed to be behind schedule. If the Contractor makes logic changes to the CPM network, adds, deletes, or modifies activities and wishes to establish a new Approved Schedule, it will be required to resubmit the same information that was originally submitted for the Approved Schedule. The submittal may be included as part of the update process with the Current Schedule, however none of the additions, deletions, or modifications to the schedule are approved until the JEA Contract Manager formally approves the changes as a revised Approved Schedule. JEA shall approve or reject an Initial or Current schedule submitted for the purpose of establishing an Approved Schedule within ten (10) calendar days of submittal and in any situation before the next periodic update is due. Schedule revisions shall be designed to document how the Contractor intends to accomplish the Work by the date stated for Final Completion.

#### Change Orders

Upon issuance of a Change Order, the Contractor shall indicate the approved change in the next submittal of the Current schedule by coding criteria and within the activity description so the JEA Representative may easily identify Change Order activities wherever they appear in the schedule.

#### Schedule Updates

The Contractor shall update the Current Schedule monthly or periodically as indicated in the Contract Documents, in order to show Work that is ahead of or behind the Approved Schedule. The Current schedule may indicate that an activity is ahead of or behind the targeted schedule and may show the Contractor's revised plan to meet the original dates by working overtime, weekends, or in drastic cases, revising the Work sequence/logic to recover time. Such reporting does not infer that changes to the schedule are authorized or agreed to by JEA.

The Contractor shall provide monthly schedule updates using a process which includes:

1. Determining a new data date (time now) value, against which the progress of all activities in the CPM network will be reported. Many activities may not be affected by the update because they remain planned, or were completed during a previous update cycle.
2. Based on the selected data date, review each activity for the following criteria:
  - If an activity has started and the actual start date has not been previously reported, record an actual start date.
  - If an activity has finished and the actual finish date has not been previously reported, record an actual finish date.
  - If the activity has started, but not finished, also report an expected finish date or report a remaining duration in days based on the activity work pattern (calendar).
3. When this data has been recorded analyze the PDM network to recalculate/ reforecast the Current Schedule dates based on progress reporting, remaining durations, relationships, and date constraints.
4. The Contractor shall review the schedule analysis results and determine if they are acceptable. If the results are not acceptable, the Contractor shall notify the JEA Representative such that the Contract Administrator may be aware that corrective action is needed by the Contractor to meet the schedule.
5. The Contractor shall publish and distribute the Current Schedule to show the impact of the progress reporting against the Approved Schedule.

The Contractor, after updating and issuing the Current Schedule, may choose to attempt to recover lost time through improved productivity, additional work hours or logic changes. They may submit their schedule changes to the JEA Contract Manager as a request for a revised Approved Schedule as described in the Schedule Revisions section.

The revised Approved Schedule grants permission to change the Target Schedule as the basis for measuring whether Work is ahead of schedule, on schedule or behind schedule. The documentation required for approval of a revised Approved Schedule will be the same as the documentation required for the initial Approved Schedule.

The current Progress Schedule Submittal should incorporate all proposed Activity, logic and restraint date revisions required to (a) implement changes in the Work, (b) detail all impacts on pre-existing Activities, sequences and restraint dates, (c) recover schedule, (d) reflect the Contractor's current approach for Work remaining, (e)

incorporate any Delays that are being negotiated between the JEA and Contractor, and (f) reflect "or equal" or substitution proposals.

#### Schedule Monitoring

The JEA representative has the right to withhold or delay approval of an Application for Payment based on failure to provide schedule updates or to exhibit project progress as shown on the Current Schedule when compared to the Approved Schedule. This section in no way limits or restricts Application for Payment standards set elsewhere in the contract. The Contractor agrees to and guarantees that they will not: misrepresent its scheduling or execution of the work; utilize schedules substantially different from those submitted to JEA for performance or coordination of the work; or submit schedules that do not accurately reflect the intent or reasonable expectations of the Contractor or its subcontractors.

#### Use of Float

Contract Float is not for the exclusive use or benefit of either JEA or the Contractor, but must be used in the best interest of completing the project within the Contract Time. If the Early Dates in any Progress Schedule Submittal forecast any slippage or overrun of the Contract Times, the Contractor shall indicate such slippage or overrun by reporting negative Contract Float.

The Contractor shall explain the rationale for use of any: (1) float suppression techniques in the Construction Schedule including but not limited to interim dates imposed by the Contractor other than Contract Time(s) and Contract Milestone(s), or (2) the inclusion of activities or constraints in a path or chain leading to a Contract Milestone which are unrelated to the Work as stated and specified in the Contract Documents, or (3) activity durations or sequences deemed by JEA to be unreasonable in whole or in part.

All Contract Time(s) and Milestones shall be imposed, coded and separately identified in all Progress Schedule Submittals in conformance with the Milestone(s) and Contract Times(s) set forth in the Contract Documents. The Contractor shall impose no other date restraints in the Construction Schedule, unless an explanation of their bases is provided and is acceptable to JEA. Contract Completion and Milestones incorporated in the Contractor's Construction Schedule shall be assigned duration of zero (0) days.

Extensions of time for performance of the Work required under the General Conditions pertaining to equitable time adjustment will be granted only to the extent that the equitable time adjustment for activities affected by any condition or event which entitles the Contractor to a time extension exceed the Contract Float along the path of the activities affected at the time of Notice to Proceed of a Contract Modification or commencement of any delay or condition for which an adjustment is warranted under the Contract Documents.

If the Contractor is delayed in performing the Work, the Contractor shall absorb any related delay, disruption, interference, hindrance, extension or acceleration costs, however caused until all Contract Float, if any, is consumed and performance or completion of the Work or specified part, necessarily extends beyond the corresponding Contract Times. The Contractor shall work cooperatively with JEA, adjacent Contractors, and third parties, to identify and implement to the maximum extent possible, no-cost measures to recover all schedule delays, regardless of the cause of the delays. One example of such measures is no-cost re-sequencing of Work Activities.

#### Delay Provisions

Review with JEA progress of work at the Construction Progress Meetings. Unless otherwise directed in writing by the JEA, whenever this review as determined by JEA indicates a late completion of the work or should activities shown on the Progress Schedule submittal slip by ten (10) or more days beyond any Contract Time or Milestones, a



recovery schedule shall be prepared and submitted. The Contractor shall work cooperatively with JEA's adjacent Contractors, and third parties, to identify and implement to the maximum extent possible, no-cost measures to recover all schedule delays, regardless of the cause of the delays. One example of such measures is no-cost re-sequencing of Work activities. The Contractor shall be required to, at no extra cost to JEA, prepare and submit a recovery schedule which displays how the Contractor intends to reschedule those activities, in order to regain compliance with the Contract Time or Milestones. The Contractor will also submit a narrative, which shall describe the cause of schedule slippage and actions taken to recover schedule within the shortest reasonable time (e.g., re-sequencing of Work activities, hiring of additional labor, use of additional construction equipment, expediting of deliveries, etc.).

Schedule recovery will be excused if the Contractor requests and demonstrates entitlement to an extension in Contract Time, in writing, due to delay(s) not within the control of the Contractor, and JEA concurs schedule recovery is not required at that time. Any Contractor request for adjustment in Contract Time and Contract Price will not be evaluated unless (a) the Contractor, using the procedures in this Section and the Contract, shows that conditions justifying adjustments in Contract Time and/or Contract Price have arisen, (b) the Contractor's analysis is verifiable through an independent review by JEA of the electronic disk files for the Progress Schedule Submittal provided by the Contractor, and (c) the Contractor provides adequate documentation (in the form of daily field reports, field records, correspondence, photos, videos, invoices, certified payrolls, narratives, U.S. Weather Bureau reports, etc.) to substantiate its position, to the satisfaction of JEA.

The Contractor shall include in the schedule a subnet demonstrating how the Contractor proposes to incorporate each Change Order into the most recently accepted Schedule. A subnet is defined as a sequence of new or revised activities that are proposed to be added to the Schedule.

The extension of Contract Time shall be considered only if the Contractor demonstrates via the timely submittal of a detailed schedule analysis that they are entitled to the time by using a methodology acceptable to JEA. The analysis shall include: a) a detailed narrative which clearly describes the events causing the delay and the resulting impacts to the critical path of the project schedule, b) documentation substantiating and supporting the delay, c) detailed CPM schedules (both electronic and hard copies) clearly delineating the delay, d) a matrix showing delays caused by JEA, delays caused by the Contractor, delays caused by any third party and any force majeure delays; e) any additional information reasonably requested by JEA, in order to enable JEA to perform a timely and informed analysis of the request for extension of Contract Time.

## **2.6. WARRANTIES AND REPRESENTATIONS**

### **2.6.1. WARRANTY (CONSTRUCTION)**

Unless otherwise stated herein, the Company unconditionally warrants to JEA for a period of not less than **one (1) year** from the date of issuance of the Certificate of Substantial Completion, that all Work furnished under the Contract, including but not limited to, materials, equipment, workmanship, and intellectual property, including derivative works will be:

- o Performed in a safe, professional and workman like manner; and
- o Free from Defects in design, material, and workmanship; and
- o Fit for the use and purpose specified or referred to in the Contract; and
- o Suitable for any other use or purpose as represented in writing by the Contractor; and
- o In conformance with the Contract Documents; and
- o Merchantable, new and of first-class quality.

The Company warrants that the Work shall conform to all applicable standards and regulations promulgated by federal, state, local laws and regulations, standards boards, organizations of the Department of State, and adopted industry association standards. If the Work fails to conform to such laws, rules, standards and regulations, JEA may return the Work for correction or replacement at the Company's expense, or return the Work at the Company's expense and terminate the Contract.

If the Company performs services that fail to conform to such standards and regulations or to the warranties set forth in the first paragraph of this Section, the Company shall make the necessary corrections at Company's expense. JEA may correct any services to comply with standards and regulations at the Company's expense if the Company fails to make the appropriate corrections within a reasonable time after notice of the Defect from JEA.

If Work includes items covered under a manufacturer's or Subcontractor's warranty that exceeds the requirements stated herein, Company shall transfer such warranty to JEA. Such warranties, do not in any way limit the warranty provided by the Company to JEA.

If, within the warranty period, JEA determines that any of the Work is defective or exhibit signs of excessive deterioration, the Company at its own expense, shall repair, adjust, or replace the defective Work to the complete satisfaction of JEA. The Company shall pay all costs of removal, transportation, reinstallation, repair, and all other associated costs incurred in connection with correcting such Defects in the Work. The Company shall correct any Defects only at times designated by JEA. The Company shall extend the warranty period an additional twelve (12) months for any portion of the Work that has undergone warranty repair or replacement, but in no case shall the maximum warranty period be extended beyond thirty-six (36) months.

JEA may repair or replace any defective Work at the Company's expense when the Company fails to correct the Defect within a reasonable time of receiving written notification of the Defect by JEA, when the Company is unable to respond in an emergency situation or when necessary to prevent JEA from substantial financial loss. Where JEA makes repairs or replaces defective Work, JEA will issue the Company a written accounting and invoice of all repair work required to correct the Defects.

Where spare parts may be needed, Company warrants that spare parts will be available to JEA for purchase for at least seventy-five percent (75%) of the stated useful life of the product.

The Company's warranty excludes any remedy for damage or Defect caused by abuse, improper or insufficient maintenance, improper operation, or wear and tear under normal usage.

Note that JEA intends to perform a warranty inspection prior to the expiration of the warranty period. JEA will notify the Company and the Company Representative shall attend the inspection. All discrepancies identified at said inspection shall be corrected by the Company within a reasonable timeframe.

#### **2.6.2. PERFORMANCE OF THE WORK**

The Company represents and warrants that it has the full corporate right, power and authority to enter into the Contract and to perform the acts required of it hereunder, and that the performance of its obligations and duties hereunder does not and will not violate any Contract to which the Company is a party or by which it is otherwise bound. The Company warrants that all items provided under the Contract shall be free from Defect and services shall be performed in a professional manner and with professional diligence and skill, consistent with the prevailing standards of the industry. The Company warrants that the Work will meet the functional and performance requirements defined in the Contract

## **2.7. INSURANCE, INDEMNITY AND RISK OF LOSS**

### **2.7.1. INSURANCE**

#### **INSURANCE REQUIREMENTS**

Before starting and until the Work by JEA, and without further limiting its liability under the Contract, Company shall procure and maintain at its sole expense, insurance of the types and in the minimum amounts stated below:

##### Workers' Compensation

Florida Statutory coverage and Employer's Liability (including appropriate Federal Acts); Insurance Limits: Statutory Limits (Workers' Compensation) \$500,000 each accident (Employer's Liability).

##### Commercial General Liability

Premises-Operations, Products-Completed Operations, Contractual Liability, Independent Contractors, Broad Form Property Damage, Explosion, Collapse and Underground, Hazards (XCU Coverage) as appropriate; Insurance Limits: \$1,000,000 each occurrence, \$2,000,000 annual aggregate for bodily injury and property damage, combined single limit.

##### Automobile Liability

All autos-owned, hired, or non-owned; Insurance Limits: \$1,000,000 each occurrence, combined single limit.

##### Excess or Umbrella Liability

**(This is additional coverage and limits above the following primary insurance: Employer's Liability, Commercial General Liability, and Automobile Liability);** Insurance Limits: \$4,000,000 each occurrence and annual aggregate.

Company's Commercial General Liability and Excess or Umbrella Liability policies shall be effective for two (2) years after Work is complete. The Indemnification provision provided herein is separate and is not limited by the type of insurance or insurance amounts stated above.

Company shall specify JEA as an additional insured for all coverage except Workers' Compensation and Employer's Liability. Such insurance shall be primary to any and all other insurance or self-insurance maintained by JEA. Company shall include a Waiver of Subrogation on all required insurance in favor of JEA, its board members, officers, employees, agents, successors and assigns.

Such insurance shall be written by a company or companies licensed to do business in the State of Florida and satisfactory to JEA. Prior to commencing any Work under this Contract, certificates evidencing the maintenance of the insurance shall be furnished to JEA for approval. Company's and its subcontractors' Certificates of Insurance shall be mailed to JEA (Attn. Procurement Services), Customer Care Center, 6<sup>th</sup> Floor, 21 West Church Street, Jacksonville, FL 32202-3139.

The insurance certificates shall provide that no material alteration or cancellation, including expiration and non-renewal, shall be effective until thirty (30) days after receipt of written notice by JEA.

Any subcontractors of Company shall procure and maintain the insurance required of Company hereunder during the life of the subcontracts. Subcontractors' insurance may be either by separate coverage or by endorsement under insurance provided by Company. Note: Any JSEB firms identified by Bidders for this Solicitation are considered "Subcontractors" under the direct supervision of the Prime or General Contractor (herein referred to as "Company"). Companies should show good faith efforts in providing assistance to JSEB firms in the securing of the Subcontractors' insurance requirements stated herein. Company shall submit subcontractors' certificates of insurance to JEA prior to allowing Subcontractors to perform Work on JEA's job sites.

#### Builder's Risk

During construction of the West Nassau Regional Water Treatment Plant (WNRWTP) Phase 1B – WTP and Wellhead Mechanical (hereinafter referred to as "Project"), JEA shall provide All Risk Builder's Risk insurance at its sole expense (insurance premiums and insurance deductibles unless otherwise specified in this Section 2.7.1) for itself, Company and its Subcontractors of all tiers while performing Work at JEA's Project site (Northwest Regional Water Treatment Plant (WTP) 1820 Owens Road, Jacksonville, FL 32218). The planned period of coverage for this Builder's Risk insurance is estimated to begin on or about September 1, 2016. JEA shall obtain a Waiver of Subrogation on this Builder's Risk insurance in favor of Company and its Subcontractors, including their employees, agents, successors and assigns. Certificates of Insurance shall be issued to Company and its Subcontractors on request to JEA's Director Risk Management Services at (904) 665-7781.

JEA's Builder's Risk insurance does not provide coverage for loss or damage for either: (a) Company's or its Subcontractors' tools, equipment, personal property, protective fencing, scaffolding, temporary structures, framework, forms and equipment owned, leased, rented or borrowed by Company and its Subcontractors or (b) materials, supplies and equipment in transit to JEA's Project site or located on JEA's Project site which does not become a permanent part of JEA's Northwest Regional Water Treatment Plant (WTP). JEA's Builder's Risk insurance shall be excess above any other property insurance or self-insurance maintained by vendors and suppliers who have agreed to be responsible for risk of loss for JEA's equipment, materials and supplies (F.O.B. destination: JEA's Project site).

Company and its Subcontractors shall be responsible to reimburse JEA for the first \$100,000 (each occurrence) of any property damage to the Work at JEA's Project site, caused by the negligence, error or omission of Company and its Subcontractors. This reimbursement requirement applies regardless if an insurance claim is submitted to Factory Mutual Insurance Company above JEA's Builder's Risk property insurance deductibles. All other insurance deductibles are the responsibility of JEA.

#### **2.7.2. TITLE AND RISK OF LOSS**

JEA will retain the title to equipment and materials removed from JEA sites for repairs, service or duplication.

The Company shall assume all risk of loss or damage to the Work until such time that JEA issues written notice of Final Acceptance, subject to JEA's Builder's Risk Insurance Section 2.7.1 of this Solicitation.

JEA's receipt or delivery of any equipment or other materials will not constitute JEA's Final Acceptance of any such items and will not constitute a waiver by JEA of any right, claim or remedy.

Ownership of the Work shall pass to JEA upon written notice of Final Acceptance.

#### **2.7.3. BOND AMOUNT**

The Company shall furnish a Payment Bond and Performance Bond in the amount of indicated on the Bid Form, made out to JEA in forms and formats approved and provided by JEA, as security for the faithful performance of the

Work of Contract. JEA will send the approved bond forms to the Company for execution along with the Contract, however, in no case shall the date on the bond forms be prior to that of the executed Contract. The surety must be authorized and licensed to transact business in Florida. A fully executed Payment Bond and Performance Bond must be recorded with the Clerk of Duval County Court and delivered to JEA before JEA will issue a Purchase Order to begin the Work. No Purchase Order shall be issued until the Payment and Performance Bonds are recorded and delivered to the JEA Procurement Department. If the Company fails or refuses to furnish or record the required bonds, JEA will retain the Company's Bid Bond as liquidated damages.

#### **2.7.4. ENVIRONMENTAL INDEMNIFICATION**

The Company shall hold harmless and indemnify JEA including without limitation, its officers, directors, members, representatives, affiliates, agents and employees, successors and assigns (the "Indemnified Parties") and will reimburse the Indemnified Parties from and against any and all claims, suits, demands, judgments, losses, costs, fines, penalties, damages, liabilities and expenses (including all costs of cleanup, containment or other remediation, and all costs for investigation and defense thereof including, but not limited to, court costs, reasonable expert witness fees and attorney fees) arising from or in connection with (a) the Company's, including, but not limited to, its agents, affiliates or assigns ("Parties"), actions or activities that result in a violation of any environmental law, ordinance, rule, or regulation or that leads to an environmental claim or citation or to damages due to the Company's or other Parties' activities, (b) any environmental, health and safety liabilities arising out of or relating to the operation or other activities performed in connection with this Contract by the Company or any Party at any time on or after the effective date of the Contract, or (c) any bodily injury (including illness, disability and death, regardless of when any such bodily injury occurred, was incurred or manifested itself), personal injury, property damage (including trespass, nuisance, wrongful eviction and deprivation of the use of real property) or other damage of or to any person in any way arising from or allegedly arising from any hazardous activity conducted by the Company or any Party. JEA will be entitled to control any remedial action, any proceeding relating to an environmental claim. This indemnification agreement is separate and apart from, and is in no way limited by, any insurance provided pursuant to this Contract or otherwise. This section relating to indemnification shall survive the Term of this Contract, and any holdover and/or Contract extensions thereto, whether such Term expires naturally by the passage of time or is terminated earlier pursuant to the provisions of this Contract.

#### **2.7.5. INDEMNIFICATION (JEA STANDARD)**

For ten dollars (\$10.00) acknowledged to be included and paid for in the contract price and other good and valuable considerations, the Company shall hold harmless and indemnify JEA against any claim, action, loss, damage, injury, liability, cost and expense of whatsoever kind or nature (including, but not by way of limitation, reasonable attorney's fees and court costs) arising out of injury (whether mental or corporeal) to persons, including death, or damage to property, arising out of or incidental to the negligence, recklessness or intentional wrongful misconduct of the Company and any person or entity used by Company in the performance of this Contract or Work performed thereunder. For purposes of this Indemnification, the term "JEA" shall mean JEA as a body politic and corporate and shall include its governing board, officers, employees, agents, successors and assigns. This indemnification shall survive the term of a Contract entered into pursuant to this solicitation, for events that occurred during the Contract term. This indemnification shall be separate and apart from, and in addition to, any other indemnification provisions set forth elsewhere in this Contract.

#### **2.7.6. NOTIFICATION OF SURETY**

The Company shall notify its surety of any changes affecting the general scope of the Work or altering the Contract Price. The amount of the applicable bonds shall be adjusted accordingly and the Company shall furnish proof of such adjustment to JEA within ten (10) days of date of Purchase Order.

## **2.8. ACCEPTANCE**

### **2.8.1. DELAY IN ACCEPTANCE OR DELIVERY**

JEA may delay delivery or acceptance of the Work in the event of any unforeseen event. The Company shall hold the Work pending JEA's direction, and JEA will be liable only for direct increased costs incurred by the Company by reason of JEA's instructions.

### **2.8.2. ACCEPTANCE OF WORK - RECEIPT, INSPECTION, USAGE AND TESTING**

The Contract Administrator will make the determination when Work is completed and there is Acceptance by JEA. Acceptance will be made by JEA only in writing, and after adequate time to ensure Work is performed in accordance with Contract Documents. JEA will reject any items delivered by Company that are not in accordance with the Contract, and shall not be deemed to have accepted any items until JEA has had reasonable time to inspect them following delivery or, if later, within a reasonable time after any latent defect in the items has become apparent. JEA may partially accept the Work items. If JEA elects to accept nonconforming items, it may in addition to other remedies, be entitled to deduct a reasonable amount from the price as compensation for the nonconformity. Any Acceptance by JEA, even if nonconditional, shall not be deemed a waiver, or settlement or acceptance of any Defect.

## **2.9. TERM AND TERMINATION**

### **2.9.1. TERM**

#### **2.9.1.1. TERM OF CONTRACT - THROUGH COMPLETION OF WORK**

The Contract shall be in force through completion of all Work, Acceptance and final payment, including resolution of all disputes, claims, or suits, if any. Certain provisions of this Contract may extend past termination including, but not limited to, Warranty and Indemnification provisions.

This Contract, after the initial year, shall be contingent upon the existence of lawfully appropriated funds for each subsequent year of the Contract.

#### **2.9.2. TERMINATION FOR CONVENIENCE**

JEA shall have the absolute right to terminate the Contract in whole or part, with or without cause, at any time after the Award effective date upon written notification of such termination.

In the event of termination for convenience, JEA will pay the Company for all disbursements and expenses that the Company has incurred, or has become obligated prior to receiving JEA's notice of termination.

Upon receipt of such notice of termination, the Company shall stop the performance of the Work hereunder except as may be necessary to carry out such termination and take any other action toward termination of the Work that JEA may reasonably request, including all reasonable efforts to provide for a prompt and efficient transition as directed by JEA.

JEA will have no liability to the Company for any cause whatsoever arising out of, or in connection with, termination including, but not limited to, lost profits, lost opportunities, resulting change in business condition, except as expressly stated within these Contract Documents.

### **2.9.3. SUSPENSION OF WORK**

JEA may suspend the performance of the Work by providing the Company with five days' written notice of such suspension. Schedules and compensation for performance of the Work shall be amended by mutual agreement to reflect such suspension. In the event of suspension of Work, the Company shall resume full performance of the Work when JEA gives written direction to do so. Suspension of Work for reasons other than the Company's negligence or failure to perform, shall not affect the Company's compensation as outlined in the Contract Documents.

### **2.9.4. TERMINATION FOR DEFAULT (WITH A BOND)**

JEA may give the Company written notice to discontinue all or part of the Work under the Contract or a Notice to Cure a material breach in the event that:

- o The Company assigns or subcontracts the Work without prior written permission;
- o Any petition is filed or any proceeding is commenced by or against the Company for relief under any bankruptcy or insolvency laws;
- o A receiver is appointed for the Company's properties or the Company commits any act of insolvency (however evidenced);
- o The Company makes an assignment for the benefit of creditors;
- o The Company suspends the operation of a substantial portion of its business;
- o The Company suspends the whole or any part of the Work to the extent that it impacts the Company's ability to meet the Work schedule, or the Company abandons the whole or any part of the Work;
- o The Company, at any time, violates any of the conditions or provisions of the Contract Documents, or the Company fails to perform as specified in the Contract Documents, or the Company is not complying with the Contract Documents;
- o The Company attempts to willfully impose upon JEA items or workmanship that are, in JEA's sole opinion, defective or of unacceptable quality;
- o The Company breaches any of the representations or warranties;
- o The Company is determined, in JEA's sole opinion, to have misrepresented the utilization of funds or misappropriate property belonging to JEA; or
- o There is an adverse material change in the financial or business condition of the Company.

If within thirty (30) days after service of such notice to discontinue or notice to cure upon the Company an arrangement satisfactory to JEA has not been made by the Company for continuance of the Work or the material breach has not been remedied, JEA may declare the Company to be in default and terminate the Contract.

Once Company is declared in default and the Contract has been terminated, JEA will notify the Surety in writing of the termination. The Surety shall, at JEA's sole option take one (1) of the following actions:

- (a) Within a reasonable time, but in no event later than thirty (30) days, from JEA's written notice of termination for default, arrange for Company with JEA's consent, which shall not be unreasonably withheld, to complete the Contract and the Surety shall pay JEA all losses, delay and disruption damages and all other damages, expenses, costs and statutory attorney's fees, including appellate proceedings, that JEA sustains because of a default by the Company under the Contract;
- (b) Within a reasonable time, but in no event longer than sixty (60) days after JEA's written notice of termination for default, award a contract to a completion contractor and issue notice to proceed or alternatively, JEA may elect, to have the Surety determine jointly with JEA the

- lowest responsible qualified bidder, to have the Surety arrange for a contract between such bidder and JEA, and for the Surety to make available as Work progresses sufficient funds to pay the cost of completion less the balance of the Contract price; or
- (c) Within a reasonable time, but in no event later than thirty (30) days from JEA's notice of termination for default, JEA may waive its right to complete or arrange for completion of the Contract and, within twenty-one (21) days thereafter, determine the amount for which the Surety may be liable to JEA and tender payment to JEA of any amount necessary in order for JEA to complete performance of the Contract in accordance with its terms and conditions less the balance of the Contract price.

JEA shall have the right to take possession of and use any of the materials, plant, tools, equipment, supplies and property of any kind provided by the Company for the purpose of this Work.

JEA will charge the expense of completing the Work to the Company and will deduct such expenses from monies due, or which at any time thereafter may become due, to the Company. If such expenses are more than the sum that would otherwise have been payable under the Contract, then the Company or Surety shall pay the amount of such excess to JEA upon notice of the expenses from JEA. JEA shall not be required to obtain the lowest price for completing the Work under the Contract, but may make such expenditures that, in its sole judgment, shall best accomplish such completion. JEA will, however, make reasonable efforts to mitigate the excess costs of completing the Work.

The Contract Documents shall in no way limit JEA's right to all remedies for nonperformance provided under law or in equity, except as specifically set forth herein. In the event of termination for nonperformance, the Company shall immediately surrender all Work records to JEA. In such a case, JEA may set off any money owed to the Company against any liabilities resulting from the Company's nonperformance.

JEA has no responsibility whatsoever to issue notices of any kind, including but not limited to deficient performance letters and scorecards, to the Company regarding its performance prior to default by Company for performance related issues.

JEA shall have no liability to the Company for termination costs arising out of the Contract, or any of the Company's subcontracts, as a result of termination for default.

Immediately upon termination or expiration of this Agreement, Company must return to JEA all materials, documents and things used by Company and belonging to JEA, including proposals, computer files, borrower files, building keys, and any other property or information regarding continued business compliance or goodwill, whether in electronic or hard-copy form. Furthermore, upon JEA's request, Company shall certify in writing that all of the foregoing documents or materials, including archival or backup copies, whether in electronic or hard-copy form, have been returned to JEA, deleted from any computer system, or otherwise destroyed.

Any other provision in this Agreement to the contrary notwithstanding the duration of this Agreement after the initial year, shall be contingent upon the existence of lawfully appropriated funds for each subsequent year of the term.

#### **2.9.5. UNAUTHORIZED WORK**

JEA will consider any Work done without lines and grades given, Work done beyond the lines and grades shown on the Contract or as given, or any extra Work done without written authority, as unauthorized Work and will not pay the Company for such Work. If so ordered by the Contract Administrator, the Company shall remove such Work and properly replace it at the Company's own expense.



## **2.10. PRELIMINARY MATTERS**

### **2.10.1. MAINTENANCE OF TRAFFIC**

The Company, when required by the governing agency such as the City of Jacksonville or the Florida Department of Transportation (FDOT), shall maintain traffic in accordance with an approved Maintenance of Traffic (MOT) plan ("MOT Plan") submitted by the Company, on streets, roads, private ways, and walks. The Company shall assume full responsibility for the adequacy and safety of provisions made. The Company shall be solely responsible for the placement, maintenance and removal of the minimum number of devices required by the MOT Plan, or specified by the FDOT, for the control of traffic at the Work Location including, but not limited to signs, cones, lights, barricades, concrete barrier walls, police officers, flaggers, etc. ("MOT Items").

Company shall be responsible for all costs associated with MOT. There will not be a separate line item for MOT on the Bid Form.

### **2.10.2. LIMITATION OF ACCURACY OF INFORMATIONAL MATERIALS**

For all drawings, test results, inspections, and other informational materials included as part of the Contract Documents, the Company understands and agrees that any existing facilities shown, including underground, overhead, and surface structures, and other delineations, and any other informational items provided as part of the Contract Documents are for reference only and are not to be used by the Company as the only indication of Work conditions. The Company understands and agrees that it is its sole responsibility to verify all Work conditions, measurements, dimensions, obstructions and other causes for existing or potential changes to the Work prior to initiating Work. In the event the Work must be changed due to the Company not fulfilling the above requirements, the Company understands and agrees that it will be responsible for all costs associated with the changed condition. Changes associated with conditions that are clearly unforeseen and that could not have been discovered by a reasonable verification of the above listed items, shall be covered as stated in Changes to Work.

### **2.10.3. COMPANY'S DOCUMENTS AT THE WORK LOCATION**

The Company shall maintain at the Work Location for JEA one record copy of all Contract Documents in good order and marked currently to record all Addenda and changes made during Contract Term. These shall be available to JEA Representatives and shall be delivered to the Contract Administrator upon completion of the Work and at the request of the Contract Administrator.

The Company shall also maintain detailed records of the Work for its own files. The Company shall make these records available to JEA for inspection upon request. The Company shall maintain such records for three (3) years after date of Final Completion.

### **2.10.4. COMPANY'S FIELD OFFICE**

The Company shall provide its own office facilities at the Work Location, as required. Unless specifically listed herein, JEA provides no Work Location facilities or Work Location area for the Company facilities of any kind such as field office and material storage. If the Company establishes a Work Location-based office, the Company shall provide and maintain adequate telephone facilities at this office during the full Term of the Contract. If the Company has a local business office, this office may serve as a Work Location office for this Contract, but the Company must maintain an operational cellular phone at the Work Location while performing Work.

### **2.10.5. PERMITS TO BE OBTAINED BY THE CONTRACTOR**

Unless otherwise specified in the Contract Documents, the Contractor shall secure, maintain, post as required, and pay for all building, plumbing, electrical, water, sewer, right-of-way, parking, roadway, railroad, shipping, freight, hazardous materials, and any other permits which may be required for performance of the Work in full compliance

with all applicable laws, rules and regulations. The Contractor shall perform all actions necessary to identify where permits are to be obtained and properly file for the permits, except those specifically listed in the Contract Documents as being provided by JEA.

The Contractor shall comply with all conditions of permits issued for the Work, either directly or indirectly, issued by federal, state, or local governmental agencies, which are hereby incorporated as part of these Contract Documents. The Contractor shall be solely responsible for resolving any issues and bearing all expenses including any damages suffered by JEA that result from a finding of noncompliance during performance of the Work by any of the respective regulatory agencies including, but not limited to, all costs for delays, litigation, fines, fees of any kind, and other costs.

#### **2.10.6. PRE-WORK MEETING AND PROGRESS MEETINGS (CONSTRUCTION)**

Before starting the Field Work, a Pre-Work or Pre-Construction meeting may be held to review procedures for the Work, review the Work schedule, establish procedures for invoicing, approving Invoices and making payments, and establish a working relationship between JEA and the Company.

The JEA Contract Administrator may, at his or her discretion, request Pre-Work Meetings to be held prior to start of any Field Work. Such meeting(s) shall be attended by, but not limited to, the Company Representative and Company Supervisor. The JEA Contract Administrator will notify the Company in writing of the meeting time and location at least two (2) days prior to the meeting date. In addition, construction progress meetings will be held at a frequency as determined by JEA. Such meeting(s) shall be attended by, but not limited to, the Company's Representative and Company's Supervisor.

#### **2.10.7. TEMPORARY CLOSURE OF ROADWAYS**

The Company shall not close or obstruct any portion of a street, road, or private way without first obtaining permits. If any street or private way is rendered unsafe by the Company's operations, the Company shall make such repairs or provide such temporary ways and guards necessary for the protection and safety of persons on the Work and the public and for the orderly maintenance of traffic. All costs associated with temporary closure of roadways shall be included in Bid Price.

The Company shall notify the police and fire departments in writing if it will be necessary to close a street. The Company shall copy JEA on all correspondence relating to street closure. The Company shall notify the police and fire departments prior to closure of the street. The Company shall be responsible for maintaining proper coordination with the proper authorities.

Temporary closure of business entrances must be approved in writing by and coordinated with JEA.

#### **2.10.8. TEMPORARY UTILITIES**

The Company shall furnish and install all temporary water, electricity and other utilities required to accomplish the Work. The Company shall obtain the water required for carrying out the Work from fire hydrants, existing water main connections, or new connections approved by JEA. The Company shall install a back flow preventer and water meter assembly if construction water is necessary. Upon Substantial Completion of Work, the Company shall remove all evidence of temporary connections and lines.

Prior to initiating any construction Work, the Company shall coordinate and schedule the provision of temporary utility service required during construction and arrange for the permanent installation and connection of utilities for the completed Work.

#### **2.10.9. WORK LOCATION**

Work shall be performed at the following location(s): WTP is located at 1425 Maitland Ave, Jacksonville, FL

#### **2.10.10. UNFORESEEN CONDITIONS**

The Company understands and agrees that it is its responsibility to conduct due diligence prior to the Work. Such due diligence includes, but is not limited to, verifying all Work conditions, measurements, dimensions and latent and patent obstructions, the accuracy of drawings, test results, inspections and other informational materials provided in the Contract Documents, and any other causes for existing or potential changes to the Work prior to initiating the Work. In the event that the Work must be changed due to the Company's failure to fulfill the above requirements, the Company understands and agrees that it will be responsible for all costs associated with the changed condition.

In the event, however, that the Company exercises the requisite due diligence and a change to the Work becomes necessary resulting from conditions that are clearly unforeseen and that could not have been discovered, the costs for adjusting the Work in response to such unforeseen conditions shall be addressed in a Change Order or an amendment to the Contract executed by JEA and Company. Any Work the Company performs prior to receipt of such Change Order or approved Contract amendment will be at the Company's sole risk.

#### **2.10.11. COMMERCIAL ACTIVITIES ON THE WORK LOCATION**

The Company shall not establish any commercial activities, or issue concessions or permits of any kind to third parties to establish commercial activities on lands owned or controlled by JEA, or within the boundaries of the Work Location. The Company shall not allow its employees to engage in any commercial activities on the Work Location.

#### **2.10.12. COMPLETION OF WORK**

The Company shall begin Work within ten (10) days after the date of written Notice to Proceed from JEA to begin Work, and shall complete the Work by the date set forth in the Contract Documents. The Company further understands and agrees that time is of essence and should the Company fail to complete the Work on or before the date established for Substantial Completion and Final Acceptance, the Company shall be solely responsible for additional costs as defined in the Contract.

#### **2.10.13. COMPANY LAYDOWN AREA**

In the event the Company decides to utilize public or private property as a laydown area, the Company shall enter into a written agreement with the entity who owns the property. JEA shall have access to all laydown areas. Upon submission of Company's first Invoice or application for payment to JEA, the Company shall provide to JEA a copy of such signed written agreement. The Company shall submit to JEA a letter of release from the entity in connection with Company's final Invoice or application for payment to JEA.

#### **2.10.14. COMPANY REPRESENTATIVE**

The Company shall provide JEA with the name and responsibilities of the Company Representative, in writing after Award of the Contract and before starting the Work under the Contract. Should the Company need to change the Company Representative, the Company shall promptly notify JEA in writing of the change.

#### **2.11. CONFIDENTIALITY AND OWNERSHIP OF DOCUMENTATION**

##### **2.11.1. PUBLIC RECORDS LAWS**

###### **Access to Public Records**

All Documents, data and other records received by JEA in connection with the Contract are public records and available for public inspection unless specifically exempt by law. The Company shall allow public access to all

documents, data and other records made or received by the Company in connection with the Contract unless the records are exempt from Section 249(a) of Article I of the Florida Constitution or subsection 119.07(1), Florida Statutes. JEA may unilaterally terminate the Contract if the Company refuses to allow public access as required under the Contract.

#### **Redacted copies of Confidential Information**

If the Company believes that any portion of any documents, data or other records submitted to JEA are exempt from disclosure under Chapter 119, Florida Statutes, the Florida Constitution and related laws ("Florida's Public Records Laws"), the Company must (1) clearly segregate and mark the specific sections of the document, data and records as "Confidential", (2) cite the specific Florida Statute or other legal authority for the asserted exemption, and (3) provide JEA with a separate redacted copy of the documents, data, or records (the "Redacted Copy"). The Redacted Copy shall contain JEA's contract name and number, and shall be clearly titled "Redacted Copy". Bidder should only redact those portions of records that Bidder claims are specifically exempt from disclosure under Florida's Public Records Laws. If the Company fails to submit a redacted copy of documents, data, or other records it claims is confidential, JEA is authorized to produce all documents, data, and other records submitted to JEA in answer to a public records request for these records.

#### **Request for Redacted Information**

In the event of a public records or other disclosure request under Florida's Public Records Laws or other authority to which the Company's documents, data or records are responsive, JEA will provide the Redacted Copy to the requestor. If a Requestor asserts a right to any redacted information, JEA will notify the Company that such an assertion has been made. It is the Company's responsibility to respond to the requestor to assert that the information in question is exempt from disclosure under applicable law. If JEA becomes subject to a demand for discovery or disclosure of the redacted information under legal process, JEA shall give the Company prompt notice of the demand prior to releasing the redacted information (unless otherwise prohibited by applicable law). The Company shall be responsible for defending its determination that the redacted portions of the information are not subject to disclosure.

#### **Indemnification for Redacted Information**

The Company shall protect, defend, and indemnify JEA from and against all claims, demands, actions, suits, damages, liabilities, losses, settlements, judgments, costs, and expenses (including but not limited to reasonable attorney's fees and costs) arising from or relating to the Company's assertion that all or any portion of its information is not subject to disclosure.

#### **Public Records Clause for Service Contracts**

If, under the Contract, the Company is providing services and is acting on behalf of JEA as contemplated by subsection 119.011(2), Florida Statutes, the Company shall:

- Keep and maintain public records that ordinarily and necessarily would be required by JEA in order to perform service;
- Provide the public with access to public records on the same terms and conditions that JEA would provide the records and at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes, or otherwise prohibited by law;
- Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law; and
- Meet all requirements for retaining public records and transfer, at no cost, to JEA all public records in possession of the Company upon termination of the contract and destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure

requirements. All records stored electronically shall be provided to JEA in a format that is compatible with the information technology systems of JEA.

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

**JEA**

**Attn: Public Records**

**21 West Church Street**

**Jacksonville, Florida 32202**

**Ph: 904-665-8606**

**publicrecords@jea.com**

**2.11.2. PROPRIETARY INFORMATION**

The Company shall not copy, reproduce, or disclose to third parties, except in connection with the Work, any information that JEA furnishes to the Company. The Company shall insert in any subcontract a restriction on the use of all information furnished by JEA. The Company shall not use this information on another project. All information furnished by JEA will be returned to JEA upon completion of the Work.

**2.11.3. PUBLICITY AND ADVERTISING**

The Company shall not take any photographs, make any announcements or release any information concerning the Contract or the Work to any member of the public, press or official body unless prior written consent is obtained from JEA.

**2.12. LABOR**

**2.12.1. NONDISCRIMINATION**

The Company represents that it has adopted and will maintain a policy of nondiscrimination against employees or applicants for employment on account of race, religion, sex, color, national origin, age or handicap, in all areas of employee relations, throughout the Term of this Contract. The Company agrees that on written request, it will allow JEA reasonable access to the Company's records of employment, employment advertisement, application forms and other pertinent data and records for the purpose of investigation to ascertain compliance with the nondiscrimination provisions of this Contract; provided however, the Company shall not be required to produce, for inspection, records covering periods of time more than one year from the effective date of this Contract.

The Company shall comply with the following executive orders, acts, and all rules and regulations implementing said orders or acts, which are by this reference incorporated herein as if set out in their entirety:

- o The provisions of Presidential Order 11246, as amended, and the portions of Executive Orders 11701 and 11758 as applicable to Equal Employment Opportunity;
- o The provisions of section 503 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA); and

- o The provisions of the Employment and Training of Veterans Act, 38 U.S.C. 4212 (formerly 2012).

The Company agrees that if any of the Work of this Contract will be performed by a Subcontractor, then the provisions of this subsection shall be incorporated into and become a part of the subcontract.

#### **2.12.2. JEA ACCESS BADGES**

If the scope of work described in this Contract requires a Company to access JEA facilities, each Company employee shall apply for a JEA access badge through JEA's Security Department. An appointment to obtain a JEA access badge can be made by contacting JEA Security at [securitybadge@jea.com](mailto:securitybadge@jea.com). Finally, JEA does not allow Company employees to share JEA access badges. A Company whose employees are found to be sharing JEA access badges, will result in the Contract being terminated immediately for default. Additionally, JEA shall be notified within six (6) hours of a lost or stolen JEA security badge or when an employee leaves the Company. Report badge termination notifications to JEA Security at (904) 665-8200.

#### **2.12.3. LEGAL WORKFORCE**

JEA shall consider the Company's employment of unauthorized aliens a violation of section 274A(e) of the Immigration and Nationalization Act. Such violation shall be cause for termination of the Contract for default upon thirty (30) days' prior written notice of such termination, notwithstanding any other provisions to the contrary in the Contract Documents.

#### **2.12.4. JEA WORKPLACE TOBACCO USE POLICY**

It is JEA's policy to maintain a healthy work environment and JEA's goal is to become a tobacco-free workplace. Therefore, JEA prohibits Company employees from using tobacco products while on JEA property or during the performance of JEA Work. JEA reserves the right to require Company to remove an employee who violates this policy from JEA property or JEA Work site upon notice from the JEA Representative.

#### **2.12.5. PROHIBITED FUTURE EMPLOYMENT**

It shall be unlawful and a class C offense for any person, who was an officer or employee of JEA, after his or her employment has ceased, to be employed by or enter into any contract for personal services, with a person or company who contracted with, or had a contractual relationship with JEA, while the contract is active or being completed, or within two years of the cessation, completion, or termination of the person's or company's contractual relationship with JEA, where (1) the contract with JEA had a value that exceeded \$250,000, and (2) the officer or employee had a substantial and decision-making role in securing or negotiating the contract or contractual relationship, or in the approval of financial submissions or draws in accordance with the terms of the contract; except that this prohibition shall not apply to an employee whose role is merely as a review signatory, or to contracts entered into prior to January 1, 2008, or to contracts that have been competitively procured. With respect to this subsection a contract is competitively procured if it has been obtained through a sealed low bid award. A "substantial and decision-making role" shall include duties and/or responsibilities that are collectively associated with: (i) approving solicitation or payment documents; (ii) evaluating formal bids and proposals; and (iii) approving and/or issuing award recommendations for JEA Awards Committee approval. The contract of any person or business entity who hires or contracts for services with any officer or employee prohibited from entering into said relationship shall be voidable at the pleasure of JEA. This prohibition shall not apply to any former officer or employee after two years from cessation from JEA employment.

#### **2.12.6. HIRING OF OTHER PARTY'S EMPLOYEES**

Each party recognizes that the other party has incurred or will incur significant expenses in training its own employees and agrees that it will not pursue or hire, without the other party's consent, the other party's employees or the employees of its subsidiaries for a period of two (2) years from the termination date of this Contract.

#### **2.12.7. MINIMUM QUALIFICATION OF COMPANY PERSONNEL**

At a minimum, all Company personnel shall be qualified for the tasks they are assigned. All Company personnel assigned to work at a JEA facility or job site shall be able to read, write, speak and understand English. All Company personnel shall act in a professional manner, with due sensitivity to other persons at the Work Location. If JEA, at its sole discretion, determines that a Company person is unqualified, unfit, or otherwise unsuitable for the tasks assigned, the Company shall immediately stop the person from performing the tasks, and replace the person with a qualified individual. The Company shall pay all costs associated with replacing the unqualified person including, but not limited to, termination, recruiting, training, and certification costs.

The Company personnel assigned supervisory roles, and those with increased authority shall be held to strict scrutiny of their qualifications and suitability for their positions. In addition to the other provisions of this Section, the Company shall provide written documentation as to experience, education, licenses, certifications, professional affiliations, and other qualifications of the individual, within one day of request from the Contract Administrator. Any changes to such personnel after approval shall require the written permission of the Contract Administrator.

#### **2.12.8. PAYMENT OF OVERTIME**

Any Overtime required for Company to complete the Work within the Contract Time shall be at the sole cost and expense of Company. However, if JEA requires the Company to perform Overtime Work in order to complete the Work prior to the Contract Time, the Company shall bill JEA for the Overtime such that only the actual costs incurred by the Company relating to the payment of Overtime premiums, in accordance with its labor policies and applicable laws. Such actual costs include Overtime wage premium, and additional taxes and insurance directly associated with the Overtime wage premium. The Company agrees that it will not charge for personnel paid a salary, or other form of compensation such that the Company incurs no direct costs as a result of the Overtime.

The Company shall total the direct Overtime charges, and add the agreed upon overhead rate, but in no case, shall such overhead rate exceed ten percent (10%) of the total overtime costs.

Overtime may only be charged to JEA if the Company was directed in writing by the Contract Administrator to incur the Overtime. Such authorization for Overtime shall be accompanied by a Change Order.

#### **2.12.9. SCHEDULING OF OVERTIME**

Whenever the Company schedules Work beyond eight (8) hours per day for a five (5) day week, beyond ten (10) hours per day for a four day week, beyond forty (40) hours per week, or on Saturdays, Sundays, or Holidays, then the Company shall arrange, in advance, for the JEA Representative to inspect the Work performed during Overtime. The Company shall not perform Overtime Work or after-hours Work without a JEA Representative at the Work Location or available to perform the inspections, as directed by the Contract Administrator. Except where JEA has requested the Company schedule Overtime to perform additional Work, the Company shall reimburse JEA for any additional costs associated with JEA Representatives' Overtime pay.

#### **2.12.10. SHOW-UP PAY**

In the event that inclement weather prevents the Company from performing Work, the Company may be obligated to pay its crew a show-up pay. The Company shall be solely responsible for providing this pay.

#### **2.12.11. COMPANY'S LABOR RELATIONS**

The Company shall negotiate and resolve any disputes between the Company and its employees, or anyone representing its employees. The Company shall immediately notify JEA of any actual or potential labor dispute that may affect the Work and shall inform JEA of all actions it is taking to resolve the dispute.

#### **2.13. COMPANY'S RESPONSIBILITIES AND PERFORMANCE OF THE CONTRACT**

##### **2.13.1. COMPANY REPRESENTATIVES**

The Company shall provide JEA with the name and responsibilities of the Company Representative, in writing after Award of the Contract and before starting the Work under the Contract. Should the Company need to change the Company Representative, the Company shall promptly notify JEA in writing of the change.

##### **2.13.2. COMPANY REVIEW OF PROJECT REQUIREMENTS**

The Company shall review the Work requirements and specifications prior to commencing Work. The Company shall immediately notify the Contract Administrator in writing of any conflict with applicable law, or any error, inconsistency or omission it may discover. JEA will promptly review the alleged conflicts, errors, inconsistencies or omissions, and issue a Change Order or Purchase Order as appropriate if JEA is in agreement with the alleged conflict, and issue revised specifications. Any Work the Company performs prior to receipt of approved Change Order will be at the Company's sole risk.

##### **2.13.3. LICENSES**

The Company shall comply with all licensing, registration and/or certification requirements pursuant to applicable laws, rules and regulations. The Company shall secure all licenses, registrations and certifications as required for the performance of the Work and shall pay all fees associated with securing them. The Company shall produce written evidence of licenses and other certifications immediately upon request from JEA.

##### **2.13.4. DAMAGED MATERIALS OR EQUIPMENT**

The Company shall report to the Contract Administrator any materials issued by JEA or delivered by the JEA material supplier and received by the Company that are later found to be faulty, damaged or discrepant in some manner. The Contract Administrator will obtain appropriate replacement materials upon written notification from the Contract Administrator. The Company shall not, under any circumstances, make a material replacement without written approval of the Contract Administrator.

The Company understands and agrees that damage to material and discrepancy of material is an expected part of performing the Work, and as such, the Company agrees it shall be solely responsible for any additional costs incurred as a result of damaged or discrepant materials, including, but not limited to, the costs to keep or get the Work on the Approved Schedule.

JEA will bill the Company for materials or equipment that are damaged while in the Company's custody. In such a case, the Company shall be charged the current JEA cost plus an inventory handling fee.

##### **2.13.5. DELIVERY LOCATION**

The delivery address for items provided under this Contract is: 1425 Maitland Avenue, Jacksonville, Florida.



#### **2.13.6. EMERGENCY PROCEDURES**

In emergencies affecting the safety of persons, the Work or property at the Work Location or any other area adjacent thereto, the Company, without special instructions or authorization from JEA Representatives, is obligated to act to its best ability to prevent threatened damage, injury or loss to the Work, any persons, or property. The Company shall give the Contract Administrator prompt written notice describing the emergency, its cause, actions taken, injuries and casualties, property damage, other damages, and impact on continued performance under this Contract.

#### **2.13.7. LAW ENFORCEMENT/SECURITY**

Onsite law enforcement shall be provided by the Company to ensure safe working conditions for site personnel. Any work activities performed at night shall have onsite law enforcement present. Company shall submit with corresponding pay application verification of the number of hours of law enforcement utilized during each pay period, including any associated fees. Company agrees to invoice JEA for law enforcement at its cost with no markup.

#### **2.13.8. ENCROACHMENTS ON RIGHTS OR PROPERTY**

The Company shall be solely responsible for any encroachments on public property or on the rights or property of adjoining property owners to the Work Location, and shall hold JEA harmless because of any encroachments that may result because of the Company's improper layout. In this regard, the Company shall, without extra cost to JEA, remove any Work or portion of any Work that encroaches on the property other than that of the Work Location, or that is built beyond legal building or setback limits. The Company shall rebuild the affected Work or portion of Work at the proper location and in full compliance with the Contract Documents.

#### **2.13.9. REMOVAL OF WORK**

The Company shall not sell, assign, mortgage, hypothecate or remove Work that has been delivered to or installed at the Work Location.

#### **2.13.10. FREE AND CLEAR TITLE**

The Company warrants that it has title to all equipment and materials furnished under the Contract where title will pass to JEA, and that the equipment and materials passed to JEA are free and clear of all liens, claims, security interests and encumbrances.

#### **2.13.11. INSPECTIONS AND TESTING**

JEA, or its designated representatives, will perform inspections at the Company facilities during normal business hours and in a manner that minimizes disruption to the normal day-to-day work activities of the Company. Company shall provide safe and proper facilities for inspection access and observation of the Work and also for any inspection or testing by others.

If the Company has covered or concealed any Work from inspection in any way that the JEA Representative has not specifically requested prior to the JEA Representative's inspection, or if the JEA Representative considers it necessary or advisable that covered Work be inspected or tested by others, the Company, at the JEA Representative's request, shall uncover, expose or otherwise make available the portion of the Work in question for observation, inspection or testing as the JEA Representative may require. The Company shall furnish all necessary labor, material and equipment to make such Work available.

If such Work is defective, the Company shall bear all expenses of uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, including, but not limited to, compensation for additional professional services required by JEA, and no change in Contract Time will be considered as a result of the foregoing.

If such Work is not defective, JEA will reimburse the Company for actual time, material, and equipment costs for uncovering and reconstruction of the portion of the Work in question. JEA may also, at its sole discretion, grant the Company an extension of the Contract Time directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction.

All materials and equipment used in the construction of the Contract shall be subject to adequate inspection and testing in accordance with accepted standards. The Company shall select the laboratory or inspection agency for making all tests required by the specifications, and shall pay for this laboratory service direct, as a part of this Contract.

The Company shall pay for all required testing of materials and equipment. Two (2) copies of each test showing certification of each test shall be furnished to the JEA Engineer immediately after such test has been made and with the exception of concrete, prior to delivery of the materials or equipment tested to the Work Location. JEA will not accept the materials or equipment until tests have been approved.

Materials of construction, particularly those upon which the strength and durability of the structure may depend, shall be subject to inspection and testing to establish conformance with specifications and suitability for uses intended. Test requirements for all materials are set out in the detailed specifications for that particular material. All materials and equipment prior to being incorporated in the Work, and required by the JEA Engineer to be tested, shall be tested for conformance with contractual requirements. Standard items of a uniform nature may be accepted on the manufacturer's certification. Where specific performance and/or quality is referred to, it is the Company's responsibility to have the necessary tests performed by qualified persons to show that the contractual requirements are being met except those tests named in the Contract Documents to be performed by JEA. Certified test results shall be submitted promptly in quadruplicate to the JEA Engineer for review. All tests shall be performed in accordance with referenced standards. Where no reference is made, tests shall be performed in accordance with the methods prescribed by the American Society for Testing and Materials or such other organization as would be applicable.

The Company shall pay for any retests resulting from its failure to provide Work that passes required tests.

The JEA Engineer may appoint JEA Inspectors to inspect any and all materials and Work. Such inspection may extend to any or all parts of the Work and to the preparation and manufacture of the materials to be used. The JEA Inspectors shall not be authorized to alter, revoke, enlarge or relax the provisions of the Contract, nor will they be authorized to approve or accept any portion of the completed Work, nor to issue instructions contrary to the Contract. The JEA Inspector shall inform the JEA Engineer of the progress of the Work and the manner in which it is being done, and notify the Company of any infringement upon the Contract Documents. The JEA Inspector will have the authority to reject defective materials or to suspend any Work that is being improperly done subject to the final decision of the JEA Engineer.

#### **2.13.12. INTERFERENCE WITH EXISTING UTILITIES**

The Company acknowledges and agrees that there is a possibility that existing JEA or other utility facilities may cross and/or lie parallel to excavations in the area where Work will occur. Although JEA may indicate recorded obstacles on the drawings, it does not warrant that other subsurface obstacles do not exist. The Company shall be responsible for verifying the data furnished by JEA and for fully investigating and locating additional obstructions including every type below, on or above the ground. The Company should regard these impediments as normal to construction. All costs for performing such work shall not be paid for separately, but shall be included in the Company's costs on the Bid Document.

The Company shall comply with all requirements of the Sunshine State One-Call program.

In the event the Company encounters an unidentified utility during performance of the Work, the Company shall promptly cease Work in the affected area and shall immediately notify the JEA Representative in writing. JEA will investigate the area and propose remedial actions in accordance with the provisions stated herein in "Changes to the Work".

The Company shall work in cooperation with JEA and representatives of existing utilities to plan and coordinate putting new Work into service so as not to interfere with the operation of the existing utilities. Such plans shall be adhered to unless deviations therefrom are expressly permitted in writing by the Contract Administrator.

The Company shall at all times conduct the Work in a manner that interferes as little as possible with the existing utilities. Any cables exposed during construction, whether energized or not, must be handled and protected as if they are energized. The Company shall so conduct its operations and maintain the Work in such condition that adequate drainage shall be in effect at all times. The Company shall not obstruct existing gutters, ditches and other runoff facilities. When working in the vicinity of overhead lines, the Company shall request line rubber protection from JEA at least ten (10) days in advance of performing the work.

The Company shall be solely responsible for any damages, interferences, and interruptions of service caused to any utility's assets and services including water, sewer, electric, telephone, gas, cable, and other utility services, that result from the Company's failure to fulfill the above stated requirements.

In the event the Company damages an existing utility, the Company shall immediately notify the property owner, the owner of the damaged utility and the JEA Representative. Should the damage cause an interruption of service, the Company shall be responsible for restoring service as soon as possible; however, the Company shall not make repairs, other than any required to restore safe conditions, without the approval of the property owner, or the owner of the damaged utility. The Company shall be responsible for coordinating any repair effort, and any associated costs should the utility owner or a licensed repair contractor be required to make the repair. JEA reserves the right to deduct any unsettled claim amount from Company's invoices until such time as the claim is satisfactorily resolved.

#### **2.13.13. INTERFERENCE WITH OTHER JEA WORK OR OTHER COMPANIES**

The Company shall perform the Work in a manner that minimizes the interference with other JEA work, City of Jacksonville work, or with work performed by other companies. The Company shall coordinate the Work with other persons and companies employed by JEA. If a difference of opinion regarding scheduling or coordination of the Work arises between the Company and another JEA contractor(s) performing work at the Work Location, JEA may arbitrate the matter. In such cases where JEA makes a decision regarding the scheduling or coordination of the work, the Company agrees to fully abide by JEA's decision. Unless otherwise agreed in writing by JEA, JEA will not be responsible for additional costs.

Any claims arising against the Company from damages to other companies' work, equipment, machinery, tools or other property shall be settled directly between the Company and the other companies involved. JEA will not, in any way, be a party to arbitrating or mediating any such disputes, nor shall JEA be responsible for any costs associated with such disputes.

#### **2.13.14. INTERFERENCE WITH RAILROADS**

The Company shall not build across, into, over or under, either temporarily or permanently, any portion of a railway or railway right-of-way without first obtaining all required permits. If the Company's operations render any railroad unsafe, the Company shall immediately notify the Contract Administrator and the railroad owner and take appropriate actions and such temporary safeguards as required to protect life, limb, and property, and to maintain orderly traffic.

The Company shall procure all railroad permits required for the Work beyond those procured by JEA and the costs for such permits shall be included in the Bid Documents. All costs associated with railroad fees for railroad flagmen, watchouts, inspectors, supervisors, any additional training of Company's employees that is required by applicable laws, rules and regulations when performing Work in association with railways, any certifications required for successful completion of the Work and all other associated costs shall be included in the Bid Document.

#### **2.13.15. COMPANY'S KNOWLEDGE OF THE WORK**

The Company represents that its total Bid Price and the detailed schedule for the execution of the Work are based on its own knowledge and judgment of the conditions and hazards involved, and not upon any representation of JEA. JEA assumes no responsibility for any understanding or representation made by any of its representatives during or prior to execution of the Contract unless such understandings or representations are expressly stated in the Contract and the Contract expressly provides that JEA assumes the responsibility.

#### **2.13.16. CONTRACTOR'S PLANS AND SPECIFICATIONS**

All plans and specifications that the Contractor provides for any building, structure, system or equipment where required by federal, state, local laws and regulation as part of the Work shall bear the seal of a professional engineer duly registered in the State of Florida at no cost to JEA.

#### **2.13.17. MATERIAL DELIVERED TO COMPANY SITES**

The Company shall be responsible for all unloading, handling and storage of Work-related materials at the Work Location. Where the Company is to use a JEA-designated supplier to deliver materials to the Work Location, JEA will provide the Company, upon request, with contact names and information, along with required material lead-times. The Company is solely responsible for taking into account required material lead-times when planning its performance of the Work and for communication and coordination of materials delivered to the Work Location by JEA suppliers. The Company shall be responsible for any additional delivery costs charged by the JEA material supplier for any Company delays.

If, for any reason, the Company is unable to receive, unload, handle or store materials it has ordered or caused to be ordered, the Company shall be responsible for any and all additional costs incurred by JEA for unloading, handling, storing, or additional shipping costs. In such cases where JEA is receiving items when the Company is unable to, such receipt does not indicate JEA's Acceptance of items.

#### **2.13.18. OBLIGATIONS OF THE COMPANY**

The Company shall provide everything necessary to successfully complete the Work except the materials and services specifically stated in the Contract to be provided by JEA. No payments, other than those shown in the Bid Documents, will be made to the Company for performance of any requirements of the Contract Documents. The Company shall perform all Work in accordance with the Contract Documents and the applicable JEA standards manuals, safety manuals, policies, accepted commercial work practices, local, state, and federal, rules regulations and laws which may be amended from time to time. The Company shall provide all permits, certifications, insurances, and bonds necessary or required by good practice, except where specifically stated in the Contract to be provided by JEA.

The Company's personnel shall perform all Work in a professional, efficient, and competent manner. The Company is obligated to provide personnel possessing the skills, certifications, licenses, training, tools, demeanor, motivation, and attitude to successfully complete the Work. The Company is obligated to remove individuals from performing Work under this Contract when the Company recognizes an individual to not be working in a manner consistent with the requirements of this Contract, or when JEA notifies the Company that JEA has determined an individual or

group of individuals to not be working in a manner consistent with the requirements of this Contract. The Company is obligated to ensure that their officers and executives interact with JEA, JEA customers, whether direct or indirect customers of JEA, with the utmost level of professionalism and integrity.

In the event the Contractor chooses to use Subcontractors, the Contractor is obligated to provide Subcontractors possessing the skills, certifications, licenses, training, tools, demeanor, motivation and attitude to successfully perform the work for which they are subcontracted. The Contractor is obligated to remove Subcontractors from performing Work under this Contract when the Contractor recognizes that a Subcontractor is failing to work in a manner consistent with the requirements of this Contract, or when JEA notifies the Contractor that JEA has determined a Subcontractor is failing to work in a manner consistent with the requirements of this Contract.

The Contractor is obligated to ensure that sufficient supervision of the Work is provided. This includes ensuring that the Contractor Supervisor is at the Work Location when Work is being performed.

The Contractor shall bear sole responsibility for the efficiency, adequacy and safety of the performance of the Work, including temporary Work and facilities, until Acceptance. The Contractor shall be solely responsible for any loss or damage to materials, tools, labor, and equipment used during the performance of, or in connection with, the Work. Any JEA comments or approval regarding the Contractor's performance, materials, working force, or equipment will not relieve the Contractor of any responsibility.

#### **2.13.19. PROTECTION OF COMPANY PROPERTY**

The Company shall bear sole responsibility for the efficiency, adequacy and safety of the performance of the Work, including temporary Work and facilities, until Final Completion. The Company shall be solely responsible for any loss or damage to materials, labor, and equipment used during the performance of, or in connection with, the Work. Any JEA comments or approval regarding the Company's performance, materials, working force, or equipment will not relieve the Company of any responsibility for such loss.

#### **2.13.20. PROTECTION OF EXISTING FACILITIES AND GROUNDS**

The Company shall be responsible for protecting all the existing facilities including, but not limited to, buildings, lawns, landscaping, sprinkler systems, and pavements, both public and private, that are encountered during the performance of the Work. At all times, the Company shall cooperate with the owners of such facilities by arranging and performing the Work in and around such facilities in a manner that facilitates their preservation, relocation, and/or reconstruction. The Company shall be responsible for the full restoration or replacement if the Company damages such facilities during or resulting from performance of the Work.

The Company shall verify the existing dimensions and clearances before laying out the Work. When the Work involves the laying of utility lines across landscaped areas and grassed areas, which may include, but is not limited to, irrigation systems, streets, sidewalks, and other paved areas, the Company shall protect and preserve all trees, shrubs, palms, landscaping, etc., and restore such areas and all paved areas to their original sound conditions using construction techniques and materials that are the same as existing including replacing plants and trees with those of similar size and age. In the case of planted areas, the Company shall maintain the restoration Work until positive growth has been acknowledged in writing by the Contract Administrator.

All costs for such restoration and replacement work shall be included in the associated lines on the Bid Documents.

The Company shall not (except upon written consent from the property owner and Contract Administrator) enter or occupy with workers, tools, equipment or vehicles any land outside the permitted easements, right-of-ways, JEA property or the City of Jacksonville property.

#### **2.13.21. QUALITY CONTROL AND QUALITY ASSURANCE**

The Company shall provide Quality Control to ensure the Work is performed in accordance with the Contract. Quality Control shall be appropriate for the nature of the Work, and shall be conducted in a manner consistent with sound quality management and industrial engineering principles. The Company shall have only personnel trained in Quality Control techniques and experienced with the nature of the Work perform the Quality Control function.

JEA may perform Quality Assurance activities. Such activities, whether performed or not, do not in any way limit or reduce the Company's requirements. JEA may become aware of quality related problems during its performance of Quality Assurance, but has no obligation to notify the Company of its findings. The Company shall provide access to all areas of Work, including the Company's facilities, for JEA Quality Assurance personnel and JEA Representatives. JEA will conduct Quality Assurance activities so as not to excessively interfere with the Work, however, where JEA Quality Assurance personnel request specific actions of the Company, the Company shall comply with the request and agrees that such compliance is included as part of its Contract Price.

#### **2.13.22. SAFETY AND PROTECTION PRECAUTIONS (CONSTRUCTION)**

The Company shall comply with all applicable federal, state and local laws, ordinances, all JEA procedures and policies including, but not limited to, JEA's Contractor Safety Management Process (available at JEA.com), and orders of any public body having jurisdiction for the safety of persons or protection of property. The Company understands and agrees that a violation of any provision of this Section e is grounds for an immediate termination of the Contract for default, with no requirement for JEA to provide Company with advanced notice and opportunity to cure. Additionally, the Company shall be responsible for all JEA damages associated with such termination.

The Company shall only use those Subcontractors who have met JEA Safety Prequalification requirements in the JEA Contractor Safety Management Process. The Company shall ensure that Subcontractors and their personnel have all the necessary personal protective equipment and training needed to perform the Work safely.

The Company understands and agrees that JEA Representatives may stop Work at any time that JEA, at its sole discretion, considers the Company's Work to be unsafe or a risk to person or property, and to direct the Company to, at a minimum, perform as directed in such a way as to render the Work environment safe. The Company understands and agrees that it is responsible for paying all costs associated with providing a safe work environment including, but not limited to, any costs associated with any JEA directed safety improvements. The Company also understands and agrees that it is solely responsible for the safety of personnel and property associated with the Work, and that any actions taken by JEA to prevent harm to persons or damage to equipment does not, in any way, relieve the Company of this responsibility.

The Company Representative, or alternatively, the Company Supervisor, shall be designated as the Company's representative responsible for the prevention of accidents.

If the nature of the Work requires, the Company shall notify the police and fire departments as to its Work Location in order to ensure prompt response in an emergency.

#### **2.13.23. SAFETY REPRESENTATION**

The Company represents and warrants to JEA that it has the capacity to train and supervise its employees, Subcontractors and suppliers to ensure the Work complies with all safety requirements of the Contract Documents. The Company shall be responsible for executing the necessary safety training and supervision of its employees and Subcontractors, and acknowledges that JEA is not responsible for training or supervising the Company's employees, except when noted for the purpose of enforcing compliance with these safety requirements.

#### **2.13.24. SALVAGE AND EXCESS MATERIALS AND EQUIPMENT PROVIDED BY JEA**

The Company shall protect salvaged or salvageable equipment and material from loss and damage. The Company shall protect excess materials and equipment provided by JEA to the Company for use in the Work from loss and damage. The Company shall inventory, sort and return salvage and excess materials, and shall weigh conductors. The Company shall return salvage and excess materials and equipment to the appropriate JEA Service Center accompanied by the Contractor Material Returns Form, in accordance with the JEA's inspector and the instructions and authorization of the JEA's storeroom foreman.

#### **2.13.25. SHIPPING - FOB DESTINATION**

Items are purchased F.O.B. destination. The Company shall ensure the following:

- o Pack and mark the shipment to comply with the Contract Documents; or in the absence of specifications in the Contract Documents, prepare the shipment in conformance with carrier requirements;
- o Prepare and distribute commercial bills of lading;
- o Deliver the shipment in good order and condition to the point of delivery specified in the Contract;
- o Be responsible for any loss of and/or damage to the goods occurring before receipt of the shipment by JEA Representative at the delivery point specified in the Contract;
- o Be responsible for obtaining any permits required for transportation to the installation site;
- o Furnish a delivery schedule and designate the mode of delivering carrier; and
- o Pay and bear all charges to the specified point of delivery.

#### **2.13.26. SHOP DRAWINGS**

The Company shall promptly submit all required Shop Drawings in accordance with the provisions provided herein. JEA will not grant an extension of Contract Time due to the Company's failure to submit Shop Drawings in ample time to allow for checking, revisions, reviews, and approval.

A letter of transmittal and four copies of each shop drawing shall accompany each submittal. Shop drawings shall be forwarded to the JEA Engineer. Each drawing shall be listed separately on the letter. The Company shall also note distinctively on the transmittal letter any deviations that the Shop Drawings may have from the requirements of the Contract Documents.

The JEA Engineer's approval of Shop Drawings shall not be construed as a complete check, nor shall it relieve the Company from responsibility for any deficiency that may exist, or from any departures or deviations from the requirements of the Contract unless the Company has, in writing, called the JEA Engineer's attention to such deviations at the time of submission and obtained written approval for the deviation. The JEA Engineer's approval shall not relieve the Company from the responsibility for errors of any sort in Shop Drawings or schedules, nor from responsibility for proper fitting of the Work, nor from the necessity of furnishing any Work, materials, equipment or tools, required by the Contract Documents that may not be indicated on Shop Drawings when approved. The Company shall be solely responsible for all quantities and dimensions shown on the Shop Drawings. The Company shall not execute any Work until the JEA Engineer approves the Shop Drawings and a copy stamped "Approved" is at the Work Location. The Company shall, at no extra cost to JEA, make all changes and alterations whatsoever in Work performed or in subcontracts or orders placed prior to the approval of any and all Shop Drawings.

The Company shall allow a minimum of fourteen (14) days for the review of Shop Drawings. This shall be the period for new Shop Drawings and Shop Drawings that are revised and resubmitted.

As used herein, the term "manufactured" applies to standard units usually mass produced, and "fabricated" means items specifically assembled or made out of selected materials to meet individual design requirements. Shop drawings shall establish the actual details of all manufactured or fabricated items; indicate proper relation to adjoining Work; amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure; and incorporate minor changes of design or construction to suit actual conditions.

Shop drawings shall be complete in every detail, properly identified with the Contract name, Contract and subsection number for identification of each item, and state the qualifications, departures or deviations from the Contract, if any. Shop drawings for each section of the Work shall be numbered consecutively and the numbering system shall be retained throughout all revisions. Each drawing shall have a clear space above the title block in the lower right-hand corner for the approval stamps of the Company and the JEA Engineer.

If the materials are not listed in JEA's Approved Materials Manual, then prior to purchase of material or fabrication, the Company shall forward to the JEA Engineer for review, five (5) sets of each shop drawing plus the number of prints it desires returned.

In checking the Shop Drawings, the Company shall verify all dimensions and field conditions and shall check and coordinate the Shop Drawings of any section or trade with the requirements of all other sections or trades whose Work is related thereto, as required for proper and complete installation of the Work. All rough-in and connections for utilities shall conform to approved equipment Shop Drawings.

The JEA Engineer will review the Shop Drawings and will return them to the Company stamped to indicate the action taken. The stamp will indicate that the shop drawing is "Approved", "Approved as Noted", "Returned for Correction", or "Disapproved". Only those Shop Drawings stamped "Returned for Correction" or "Disapproved" shall be resubmitted for subsequent review. Resubmittals shall be in the same form and number of copies as original submittals, with notation indicating a revised submittal. The Shop Drawings stamped "Approved" or "Approved as Noted" will be returned to the Company, who will be responsible for obtaining prints thereof and distributing them to the field and Subcontractors.

At the same time the JEA Engineer returns a reviewed submittal to the Company, it will forward two copies of each item stamped "Approved" or "Approved as Noted" together with any conditions of approval, to JEA for field and office use. The JEA Engineer may revoke approval of Shop Drawings, should field conditions so dictate.

#### **2.13.27. STORAGE**

With the approval of the JEA Engineer, a limited amount of temporary indoor storage space may be made available, but only for the equipment that must be protected from the weather. Equipment for which arrangements have been made for indoor storage shall be packed separately and the container clearly marked "For Indoor Storage." For equipment that will be stored indoors and that will require special storage precautions, the storage instructions shall be shown on the outside of each container, or in a durable envelope identified as containing storage instructions and attached to the container.

#### **2.13.28. STORAGE OF EQUIPMENT**

The Company shall be responsible for all storage of materials, equipment, vehicles, tools, and all other items associated with the Work. Such storage shall comply with applicable regulations appropriate for the items being stored to ensure suitable care for items and protection from theft, vandalism, or inappropriate use. The Company is solely responsible for the costs for such storage, unless otherwise indicated in the Contract Documents, and any costs associated with noncompliant storage including, but not limited to, loss and damage to items. In the event that JEA directs the Company to stop the Work, costs associated with storing equipment or materials will be



compensated in accordance with the Contract Documents. The Company shall ensure that JEA Representatives have access to Work-related storage on an as needed basis during regular work hours and Overtime.

#### **2.13.29. STORM PREPAREDNESS**

In the event of a Hurricane Warning, Tropical Storm Warning, or other large storm affecting the Work Location, the Company shall secure, or shall remove and store all equipment and materials at the Work Location including, but not limited to, cones, barricades, lights and signs. The Company shall begin taking such precautions as necessary to secure the Work Location upon official issuance of mandatory evacuation of the area of the Work Location and no later than twenty-four (24) hours prior to predicted arrival of tropical storm or hurricane force winds, or when notified by a JEA Representative to do so. These activities are considered a regular part of the Work; regardless of the frequency they are required.

#### **2.13.30. SUBSTITUTIONS**

Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular supplier, the naming of the item is intended to establish the type, function and quality required.

Materials or equipment of other suppliers may be accepted by the JEA Engineer if sufficient information is submitted by the Company to allow the JEA Engineer to determine that the material or equipment proposed is equivalent or equal to that named.

The Company shall make written application to the JEA Engineer for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified.

The application shall state that the evaluation and acceptance of the proposed substitute will not prejudice the Company's completion of the Work within the time prescribed by the Contract, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other Contract directly with JEA for Work on the Contract) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fees, royalties, permits or any other costs.

All variations of the proposed substitute from that specified shall be identified in the application and available maintenance, repair and replacement service shall be indicated.

The application shall also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other Companies affected by the resulting change, all of which shall be considered by the JEA Engineer in evaluating the proposed substitute.

Requests for review of substitute items of material and equipment will not be accepted by the JEA Engineer from anyone other than the Company.

The JEA Engineer may require the Company to furnish, at the Company's expense, additional data about the proposed substitute.

If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract, the Company may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to the JEA Engineer, if the Company submits sufficient information to allow the JEA Engineer to determine that the substitute proposed is equivalent to that indicated or required by the Contract.

The JEA Engineer will be allowed a reasonable time within which to evaluate each proposed substitute; such time shall not be deemed justification for an extension of the Company's time for completion of the Contract.

The JEA Engineer will be the sole judge of acceptability, and no substitute shall be ordered, installed or utilized without the JEA Engineer's prior written notice, which shall be evidenced by either a Change Order or an approved shop drawing.

JEA may require reimbursement for the costs associated with JEA's evaluation of substitutions.

JEA may require the Company to furnish, at the Company's expense, a special performance guarantee bonds or other surety with respect to any substitution.

#### **2.13.31. TOOLS AND EQUIPMENT**

All tools and equipment used in the performance of the Work shall be used as intended by the manufacturer and in accordance with manufacturer operating manuals and industry practices, whichever is more stringent. The Company shall ensure that all tools and equipment used in the performance of the Work shall be of the size and quality suitable for safe and efficient performance of the Work. If the Company-provided tools and equipment do not meet these requirements, or if in the sole opinion of JEA formed after considering relevant factors, the tools or equipment are inappropriate for performance of the Work, the Company agrees to remove the unacceptable tools and equipment and obtain tools and equipment JEA considers suitable. Such replacement shall be entirely at the Company's expense, and no change to time prescribed by the Contract will be allowed.

The Company is responsible for furnishing and the security of any and all tools and equipment required to perform the Work.

#### **2.13.32. CARE OF JEA CUSTOMERS**

The Company agrees to provide excellent customer service throughout the execution of the Work during both scheduled Work hours and Overtime in the manner, as a minimum, as set forth below:

##### **Customer Service Plan:**

The Company shall submit a Customer Service Plan prior to mobilization and designate an individual to assume the duties of the Company's Customer Service Representative (CSR) as described herein.

The Company shall provide an after-hours emergency phone number to JEA.

The Company shall provide contact numbers for those individuals assigned to concerns arising during non-business hours and in the event of emergencies. The designated person(s) shall provide a cellular phone number as the main contact number, and one (1) alternate number. The designated person(s) shall respond to JEA with proposed resolution within two (2) hours of receiving a call from a JEA representative or customer. If the Company fails to respond within the designated time and it is thereby necessary for JEA to provide assistance, the Company shall be responsible for all costs incurred by JEA as a result of resolving the concern.

Upon JEA approval, the Company shall deliver fliers and/or door hangers provided by Project Outreach to all customers in an affected work area at least three days prior to each construction activity including, but not limited to, locates, TV/cleaning, soil borings, mobilization, etc. Upon JEA's request, the contractor will install JEA provided signage at a location chosen by the JEA project team. These signs will be removed by the contractor at the end of the project.

The Company shall notify affected customers prior to any planned water/electric outages, line flushing, valve simulations and driveway/curb construction, paving and road closures. The notification will be produced by the Company (unless notifications are provided by JEA) and approved by JEA Project Outreach.

#### **Customer Concerns:**

The CSR shall contact the JEA customer who has a concern by the end of the business day of when the concern was received from JEA Project Outreach. The Company shall contact Project Outreach within two (2) business days to confirm that they have contacted the customer and assessed the concern.

The CSR shall provide JEA Project Outreach with concern evaluations, resolutions, and actions taken all within five (5) business days of when the concern was received.

The CSR shall notify Project Outreach immediately after a concern has been resolved with specific resolution actions or an update of the resolution. Project Outreach will contact the customer following notification of resolution to confirm the resolution before Project Outreach closes the concern and prior to notifying the Company, the CSR, JEA Representatives and inspectors of resolution of the concern.

Within one business day of receiving a concern from a JEA customer, the Company shall notify JEA Project Outreach in writing of each customer concern reported directly to the Company's personnel by any JEA customer. Such notification shall include, as a minimum: the Company's name, date and time the concern was communicated to the Company, the name, address and phone numbers for the customer, the nature of their concern and any action that was taken or any action currently underway to resolve the concern. The CSR shall follow the customer concern procedures stated above.

If the Company fails to meet the problem resolution deadlines stated in this document in a manner that meets acceptable quality standards, JEA may make repairs or take other necessary actions to resolve the issue, which shall be at the Company's sole expense.

#### **Duties of the Customer Service Representative (CSR)**

The Company shall provide a Customer Service Representative for the Term of the Contract. The CSR's primary responsibilities shall include, but are not limited to the following:

**Communication:** Serve as the primary point of contact for customer concerns and information requests; report customer concerns to the JEA Project Manager and Project Outreach or other internal JEA resources and assist in resolution of issues; and meet with customers on site as needed to assess their concerns.

**Planning:** Conduct bi-weekly progress meetings with JEA Project Manager; conduct progress meetings with Project Outreach regularly and as needed to review any outstanding complaints and provide a timeframe/action plan for resolving them; review customer satisfaction targets and goals, measurements, documentation and project definition and assist with making improvements; conduct periodic customer service reviews during the course of the Work to assess and identify any items considered to be at risk or vulnerable in relationship to meeting JEA goals and objectives; and notify Project Outreach, in a timely manner, of change in scope or schedule.

**Process Improvement:** Work with JEA to identify process improvement opportunities that increase customer service and satisfaction; make recommendations to JEA to enhance and assist with JEA goals and objectives for customer service; and conduct a customer service review at the completion of the construction phase of a project, but prior to the restoration, or "punch list" phase, to assess customers' satisfaction with the handling of concerns and customers' overall response to the project.

**Disruption of Utility Services:** If the Company disrupts any utility services (water, sewer or electric, etc.) during performance of the Work, the Company shall return them to operation as soon as possible. No disruption to any utility service disruption shall exceed the end of the Company's normal work shift. No disruption to the customer's utility services shall exceed any twelve (12) hour period. Should any of the customer's utility services be disrupted, for a period longer than twelve (12) hours, the Company shall provide alternative arrangements for the customer, as determined by JEA, with no additional cost to JEA for these arrangements unless otherwise specified in the documents. The CSR shall immediately notify JEA Project Outreach (telephone 665-7500) of any service disruptions.

**Restoration:** The Company shall restore, for no additional compensation, the landscaping of any properties affected by the Company's actions, directly or indirectly, (in the right-of-way not related to ongoing Work, or isolated Work in the right-of-way that would leave unrestored areas for undue periods of time subject to criticism) to its original state, within five (5) calendar days from the time the area was disrupted. All other restoration required within the right-of-way shall be scheduled in the customary method for such construction and in accordance with any permit conditions.

The Company shall, at its own expense (unless otherwise specified in the documents), repair any irrigation systems damaged by the Company's Work within one (1) day from the time the irrigation system was damaged. If this is not possible, the Company shall inform the customer of the damage and provide an estimated time for repair. In addition, the Company shall make adequate provisions for the customer to water and maintain his or her lawn.

The Company shall repair, at its own expense, any asphalt and concrete damaged by Company (in the right-of-way not related to ongoing Work, or isolated Work within the right-of-way that would leave unrestored areas for undue periods of time subject to residents/customer criticism) within five (5) calendar days from the time the damage occurred. All other restoration required within the right-of-way shall be scheduled in the customary method for such construction and in accordance with any permit conditions.

**Customer Concern Ratios:** Project Outreach's goal for customer concerns is to completely resolve all complaints within ten (10) business days of receiving a complaint. A formal customer concern shall be defined as a documented concern to JEA Project Outreach. The concern may be of a real or perceived problem that the customer has against the Company.

The JEA Project Manager or designee will notify the Company on a monthly basis of how many concerns were received by JEA's Project Outreach and the number of concerns yet to be resolved. JEA will immediately notify the Company when a concern has been opened and has not been a response to it within five (5) business days. The Company shall contact Project Outreach and provide a written correction plan within five (5) calendar days of receipt of the notice. If at any time the Company allows unresolved concerns to exceed the five (5) business days without prior notification to Project Outreach and the customer concern ratio reaches 3.0 percent, the Company shall be required to appear in front of the Company Performance Review Board to explain the circumstances leading to the unresolved concern. The Company Performance Review Board will notify the Chief Procurement Officer of the board's decision and any recommended actions, which may include, but are not limited to, additional remedial action, termination of the Contract and/or suspension from JEA's Responsible Bidder's List in all categories for a period not to exceed one (1) year.

If the Company fails to adhere to the customer service requirements stated herein, the Company's performance shall result in a required hearing before the Company Performance Review Board. The Company Performance Review Board will consist of three JEA directors. The hearing will evaluate the Company's remedial action plan and determine whether such plan will be effective. The Company Performance Review Board will present its recommendation to the Chief Procurement Officer and recommended actions that may include additional remedial

actions, termination of the Contract and/or suspension from JEA's Responsible Bidder's List in all categories for a period not to exceed one (1) year.

#### **2.13.33. VIDEO/DIGITAL RECORDS**

Prior to any alterations to the Work Location, the Company shall video record the entire Work Location. The Company shall provide original video recording to the Contract Administrator no later than fifteen (15) days after the date of the Notice to Proceed.

When required by the technical specifications, the Company shall provide a monthly video record (on DVD) of construction progress to the JEA Project Manager. If construction is being conducted in different localities, then video shall be taken at each Work Location. The JEA Project Manager reserves the right to select the views to be video recorded. DVD(s) shall be labeled with record of date taken, JEA's assigned project tracking number, and a brief description of times and activity covered in the video.

The Company shall take the progress video(s) between the 20<sup>th</sup> and 25<sup>th</sup> day of each month and submit the video(s) to the JEA Project Manager before the end of the 27<sup>th</sup> day of each month. If Company fails to submit the video(s) to the JEA Project Manager before the 28<sup>th</sup> day of each month, JEA reserves the right to have the video tape(s) taken by an independent Recording Company at the Company's expense.

In addition, the Company shall provide unedited video(s) with superimposed timer and vocal commentary of the preconstruction and post construction conditions. Video(s) shall be DVD format and include both sides of the right-of-way and record close attention to paved and unpaved driveways and walkways; conditions of lawns, shrubs, flowers, flower beds, and trees; conditions of pavement, fences, signs, planters and any other item within the area of the Work or adjacent right-of-way. The video(s) shall become a part of the Contract Administrator's and JEA Project Manager's permanent job records. The video(s) shall be indexed using the timer for locations by stationing and by street intersections.

The video(s) shall include each waterway crossing. An upstream and downstream view of each bank at the point of crossing shall be taken recording the inertial zone and/or mean high water level. Also, a view of the line route shall be taken from each bank of the crossing and elsewhere as the JEA Project Manager may direct. Construction shall not begin until video recordings are approved by the JEA Project Manager. The video(s) shall depict wet conditions of the Work Location and surrounding areas whenever possible.

#### **2.13.34. WEATHER PROTECTION**

The Company shall provide proper facilities, take all necessary precautions and assume the entire cost for protecting the Work against weather conditions and for handling all storm, flood and ground water, sewage, or other seepage, that may be encountered during the performance of the Contract. The Company shall provide for such contingencies and for carrying on the Work in freezing weather by methods that meet with the approval of the JEA Engineer. If the Company fails to provide such protection, or in the event of an emergency, JEA may provide such protection at the Company's expense.

#### **2.13.35. WORK INFORMATION**

In the event the Company requires additional information regarding the scope, technical specifications, Work Locations, personnel requirements, or other information pertinent to the Work or Contract, the Company shall request such information or clarifications from the Contract Administrator in writing. Within the bounds of the JEA Representative's authority, JEA Representatives may provide requested information to the Company.

#### **2.13.36. WORK LOCATION CLEANLINESS**

The Company shall, at all times, keep the Work Location free from an accumulation of waste materials or rubbish caused by its operations. At the completion of the Work, the Company shall remove all waste materials and any rubbish from and about the project, as well as any tools, construction equipment, machinery and surplus materials. If the Company fails to clean up at the completion of the Work, JEA may do so and charge the cost thereof to the Company.

#### **2.13.37. WORKMANSHIP**

The Company shall perform all Work in a safe and professional manner, so as to render a neat and uniform appearance. The Company shall handle all material in such a way as to preserve its finish and protective coatings from damage. General arrangement shall be in accordance with JEA Distribution Construction Standards and shall be satisfactory to the Contract Administrator.

#### **2.13.38. COMPETENT PERFORMANCE OF THE WORK**

The Company represents that it will conduct the Work in a manner and with sufficient labor, materials and equipment necessary to affect a diligent pursuance of the Work through Final Completion. If, in the sole opinion of JEA, the Company fails to perform the Work as represented, JEA may, at its sole discretion, take charge of the Work and furnish and provide the labor, materials, and equipment necessary to complete the Work as planned within the required time if JEA deems the organization of the Company or its management, or the manner in which Company is performing the Work, to be manifestly incompetent or inadequate to complete the Work as specified. The Company shall pay JEA for the cost of all such Work completed by JEA.

#### **2.13.39. COMPLIANCE WITH REFERENCED SPECIFICATIONS**

All Work, materials, systems or operations specified by reference to standard trade specifications or to manufacturer's published specifications shall comply with the requirements of the referenced specifications, except as modified by the requirements of the Contract Documents. The referenced specification used shall be the latest published edition that is in effect on the effective date of this Contract unless a particular edition is specified. In case of a conflict, the specifications that contain the more stringent requirements will govern.

### **2.14. STANDARD REQUIREMENTS FOR CONSTRUCTION**

#### **2.14.1. PROTECTION OF THE ENVIRONMENT**

The Company and its Subcontractors shall comply with all applicable laws, rules and regulations including, but not limited to, all Environmental Regulations.

##### **A. Asbestos, Lead, or Toxic Mold Notification:**

Asbestos, Lead, or Toxic Mold may be present at the Work Location. The Company shall notify the Contract Administrator immediately upon discovery of asbestos, lead, toxic mold. The Company shall not disturb or remove known or discovered asbestos, lead, or toxic mold unless directed by the JEA Representative.

##### **B. Hazardous Materials:**

The Company shall bear full responsibility including, but not limited to, payment and liability for the transportation, use, recycling, and disposal of any Hazardous Materials under the Company's control during the performance of the Work. Disposal or recycling of Hazardous Materials shall only be performed at JEA approved facilities. The Company shall provide JEA with appropriate documentation showing proper disposal or recycling of its Hazardous Materials.

The Company shall notify the Contract Administrator in writing of the type, quantity and disposal or recycling method of any hazardous material used during the performance of the Work. The Company shall be solely responsible for the use and disposal or recycling of any such materials. The Company shall submit cleanup procedures to the JEA Representative for review and written approval prior to the use of the hazardous material. In the event that a hazardous material escapes into the environment, the Company shall immediately notify the Contract Administrator in writing of the occurrence and the actions taken. In the event that the Company encounters hazardous materials in the course of construction, the Company shall immediately notify the Contract Administrator verbally, with a written notification to follow. The Contract Administrator shall arrange for disposal by JEA.

JEA has identified and labeled equipment known to contain PCBs. JEA will remove and transport any equipment so identified. The Company shall not remove or transport any equipment containing PCBs. The Company shall immediately notify the JEA Representative of any questionable or unmarked equipment, and the JEA Representative will arrange for testing and identification.

C. Waste Management:

The Company will be solely responsible for the proper management of all waste material, including but not limited to, paints, lubricants, fuels, solvents, drilling mud and materials, construction and demolition debris, used oil and oily waste, land clearing debris, universal waste (mercury containing lamps and devices, batteries, etc.) and other chemicals and hazardous materials used in connection with or generated during the Work, except as specified above. The Company will provide proper containers for waste materials and comply with all applicable laws, rules and regulations in their disposal or recycling. The Company will dispose of or recycle all empty containers off-site as soon as possible.

D. Wetlands:

The Company understands and agrees that the Work Location may include wetlands or other environmentally sensitive areas. The Company shall not enter these areas during the performance of its Work, unless specifically authorized by the Contract Administrator and appropriate state and federal permits have been obtained.

E. Wildlife:

The Company and/or Subcontractor's employees shall not endanger wildlife species or domestic animals of any kind.

F. Violation of Environmental Laws and Permits:

The Company shall immediately cease any activity that causes or results in a violation of JEA's or Company's environmental permits or federal, state and local laws and regulations. Such violation shall immediately be reported to the Contract Administrator verbally, with written notification to follow. All additional costs due to the Company's noncompliance with the applicable environmental permits or Environmental Regulations shall be paid by the Company.

**2.14.2. NPDES PERMIT CONFORMANCE**

The Company shall obtain all other applicable local, state, and federal permits. It is unlawful to have any discharges that are not composed entirely of stormwater (except discharges pursuant to a NPDES permit) to the municipal separate stormwater system (MS4). Only non-contaminated water/non-turbid water shall be transported through the MS4. Groundwater discharge (approved by JEA) from dewatering activities may be routed into the stormwater

system providing that erosion, and transportation of suspended solids to the system is prevented. If contaminated soil or contaminated groundwater is encountered, the dewatering activity shall cease immediately, and the Company shall contact the Florida Department of Environmental Protection and notify the appropriate department of the incident immediately.

#### **2.14.3. NPDES PERMIT CONFORMANCE - DEWATERING**

If Company encounters groundwater, the Company shall be responsible for obtaining; a *Generic Permit for Discharge of Produced Ground Water From any Non-Contaminated Site Activity* from the Florida Department of Environmental Protection (FDEP), and a *Noticed General Permit for Short-term Construction Dewatering* from the St. Johns River Water Management District (SJRWMD) before any dewatering activities can begin.

Company shall also be responsible for developing and utilizing a dewatering system(s) to remove water from the excavations. Prior to beginning any dewatering, the Company shall submit a dewatering plan to JEA for review. The Company shall comply with all sampling requirements listed in FDEP regulation (62-621.300(2) F.A.C.) before any dewatering can begin. The Company shall submit to JEA the sampling analysis results. In the event the sample analysis fails to meet FDEP water quality standards as established in applicable rule, the Company shall not proceed with further permitting or dewatering activities, shall notify JEA of any failure to meet applicable standards, requirements, or rules, and shall await instruction from JEA.

The dewatering plan developed by the Company shall further consider the dewatering volume as estimated using traditional and customary methods. The dewatering plan shall comply with the requirements of 40C-2 and 40C-22, F.A.C., and additional requirements as may be mandated or amended by SJRWMD. In the event the dewatering plan does not comply with those requirements applicable to the *Noticed General Permit for Short-term Construction Dewatering* the Company shall not proceed with further permitting or dewatering activities, shall notify JEA of any failure to meet applicable standards, requirements, or rules, and shall await instruction from JEA.

If the above requirements are not followed, the Company shall be held liable for any fines and/or violations incurred by JEA.

#### **2.14.4. NPDES PERMIT CONFORMANCE - STORMWATER POLLUTION PREVENTION**

The Company shall obtain as necessary a *Generic Permit for Stormwater Discharge from Large and Small Construction Activities (CGP)*, and shall develop a Stormwater Pollution Prevention Plan (SWPPP) compliant with local, state, and federal rules, laws, and ordinances. Company shall be responsible for implementing the SWPPP, installing and maintaining in a functional manner structural and nonstructural best management practices as described therein, evaluating the effectiveness of the best management practices, and employing additional performance based best management practices as may be deemed necessary by JEA. The Company, at its own expense, shall revise, or include as addendum to the SWPPP measures as maybe required by a local, state, or federal authority to remain compliant with local, state, and federal rules, laws, and ordinances.

**No additional payments shall be made to Company for revisions or addendums to the SWPPP, or for the actual implementation of those revisions on the Work site, including those made so as to achieve functional performance based best management practices.**

The Company shall obtain all other applicable local, state, and federal permits subsequent to notification of JEA of the need for such authorization(s). It is unlawful to have any discharges that are not composed entirely of stormwater (except discharges pursuant to a NPDES permit) to the Municipal Separate Stormwater System (MS4). Only non-contaminated water/non-turbid water shall be transported through the MS4. Groundwater discharge (approved by the FDEP pursuant to 62-621.300(2)) from dewatering activities may be routed into the stormwater system, drainage ditch, creek, river or wetland providing that erosion, and transportation of suspended



solids to the system is prevented. If contaminated soil or contaminated groundwater is encountered, the dewatering activity shall cease immediately, and the Company shall contact JEA's Environmental Coordinator, Andrew Sears at (904) 665-7719.

Upon approval to proceed to do so by the Owner, the Company shall complete a *Notice of Termination (NOT)* (DEP Doc. No. 62-621.300(6), F.A.C.), to terminate the CGP coverage within one (1) week of final site stabilization.

If the above requirements are not followed, the Company shall be held liable for any fines and/or violations incurred by JEA.

#### **2.14.5. PREVENTION, CONTROL AND ABATEMENT OF EROSION AND SILTATION**

The Company shall take steps and make suitable provisions to minimize siltation and erosion of waterways that may result from its operation during the course of construction.

The Company shall make suitable arrangements, which may require the temporary construction of flumes, boxes, or some other device(s), at the Work Location for the drainage and disposal of water. The Company shall be responsible for protecting adjacent property to the Work Location from damage by water resulting from its operations. The Work Location shall be returned to its original condition to the satisfaction of JEA.

The Company is cautioned that execution or maintenance that creates turbidity and that directly or indirectly affects the water quality of any waterway into which storm water is discharged in such a manner as to exceed the limitations prescribed in the Florida Administrative Code is a violation of the water quality standards of the State of Florida.

Turbidity shall not exceed 29 NTU's, above background level within 100' of the construction activity. Costs incurred by the Company for compliance to the restrictions outlined above shall be included in the cost of the items for which the turbidity control is required, unless a separate line item is included in the Bid Document for turbidity control. Silt barriers shall be used at all waterway crossings or at any time during construction that siltation or erosion may occur. The Company shall submit to the JEA Engineer, for written approval prior to construction, the method to be used to control the turbidity. The JEA Engineer's approval of the method to be used in no way relieves the Company of the liability in case of a citation against JEA.

#### **2.14.6. SILT FENCE ASSEMBLY**

The Company shall furnish and install silt fence assembly (including fabric, stakes, etc.) in accordance with the details shown on the Erosion Control Drawings and as required by the Storm Water Pollution Prevention Plan (SWPPP). Company will be responsible for all costs associated with silt fence assembly. There will not be a separate line item for silt fence assembly on the Bid Form.

#### **2.14.7. DRAINAGE ALONG RIGHTS-OF-WAY**

The Company shall so conduct its operations and maintain the Work in such condition that adequate drainage shall be in effect at all times. The Company shall not obstruct existing gutters, ditches and other runoff facilities.

#### **2.14.8. FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (FDEP) CERTIFICATION OF COMPLETION**

Following satisfactory bacteriological clearance, installation and testing of the piping systems or mains installed under the Contract, the Company shall submit to the Contract Administrator Company-certified, as-built drawings of sufficient detail and accuracy to allow application to FDEP in accordance with the provisions set herein for Certification of Completion. This Certification of Completion must be obtained prior to making final tie-ins and/or

service transfers or connections. The Company shall schedule its Work to allow sufficient time for processing the Certificate of Completion. The submittal of as-built drawings in order to obtain the FDEP Certificate of Completion does not relieve the Company of the requirement to submit final as-built drawings as specified in the Contract Documents.

#### **2.14.9. HAND DIGGING AROUND TREES, TREE TRIMMING, ARBORIST SERVICES AND TREE REMOVAL**

No separate measurement and payment shall be made for hand digging around trees, tree trimming, and provision of arborist services, but all cost shall be included in the associated item of work in the bid form. Hand digging, tree trimming, and arborist services shall include but not be limited to all labor, equipment and supervision required to successfully hand dig or trim tree branches where tree roots or branches may be destroyed or injured due to the Work. Item shall include services of a certified arborist as required by the City landscape architect to ensure minimal or no damage to tree canopy or root system. If the tree canopy or root system is damaged, the Company, at its own expense, shall repair, restore, or replace the tree at the direction of the arborist. The Company shall review the drawings and visit the Work area prior to the bid to satisfy itself as to the amount of tree removal and disposal to be performed to complete the Work, and the extent of tree trimming required to perform the work. All tree mitigation costs shall be borne by the City of Jacksonville. Trees identified on the drawings for removal shall not be paid for separately, but all associated cost for removal and disposal and subsequent compacted soil backfill replacement shall be included in the associated item of the work.

#### **2.14.10. APPLICABLE WATER AND SEWER STANDARDS, DETAILS AND MATERIALS**

All Work shall be done in accordance with the latest version JEA Water and Sewer Standards, Details and Materials. The JEA Water and Sewer Standards, Details and Materials manual may be obtained from [jea.com](http://jea.com).

#### **2.14.11. INTERRUPTION OF SERVICE**

The Company shall not operate any valves, nor otherwise interrupt water and/or sewer service, without first obtaining permission from the JEA Engineer. The JEA Representative shall be present during any interruption of service.

If the Company must shut down a main or portion of a main, thereby causing an interruption of water service, the Company shall provide the JEA Engineer with the following information, in writing, a minimum of four (4) days in advance of any anticipated interruption of service:

- o Date and time of outage.
- o Purpose of the outage.
- o Map of the area to be affected by the outage.
- o Letter stating all offices, businesses, and residents have been or will be notified by Company at least four (4) days in advance of the outage (unless JEA chooses to issue such notification).

The Company is not authorized to proceed with requested Work without prior written notice from JEA Engineer that such actions are approved.

In the event of a major emergency that endangers life or property, the Company may take immediate action before notifying JEA. In all cases, however, JEA shall be notified in writing at the earliest opportunity after addressing the emergency.

#### **2.14.12. MAILBOXES**

The Company shall carefully remove and relocate mailboxes affected by construction operations to allow for uninterrupted mail service. All temporarily relocated mailboxes shall be reinstalled permanently as soon as construction operations allow. The condition of the reinstalled mailboxes shall be at least equal to the original facility, as directed by JEA. Company shall be responsible for removal, relocation or reinstallation of mailboxes. There will not be a separate line item for Mailbox removal, relocation or reinstallation on the Bid Form.

#### **2.14.13. METERS**

The Company shall pay all fees and charges required for connections to utilities, concurrency management, parking meter rental/removal and any other assessments imposed on the Work or initial occupancy of the Contract, except those specifically listed herein as provided by JEA.

#### **2.14.14. SEWAGE SPILLS**

The Company shall minimize the amount of sewage released into excavations by notifying affected parties of the service interruption, predraining affected lines, insuring pump station (non-)operating status, etc. The Company shall notify JEA immediately verbally, with written notification to follow.

The Company shall take precautions to prevent sewage from contacting the ground. If sewage contacts the ground, the Company shall take appropriate measures to disinfect the area of the sewage release. If pooling sewage is observed, the Company shall vacuum remove the sewage, or remove the sewage by other means acceptable to the JEA Representative, and dispose of the sewage in accordance with environmental and public health regulations. The Company shall clear any sanitary systems found plugged due to this type of pumping activity at its own expense.

#### **2.14.15. SUBSURFACE INVESTIGATION**

A geotechnical exploration of existing conditions including soft digs where necessary in the general area of the proposed Work has been performed and a report of the findings and recommendations are attached

#### **2.14.16. SURVEYING**

Unless specifically stated in the Contract Documents as being provided by JEA, the Company shall be responsible for all surveying necessary to commence and perform this Work. The Company shall employ a land surveyor registered in the State of Florida to reference and restore all property corners and/or monuments that may have been disturbed and to ensure accurate horizontal and vertical control during the construction of this project and for staking locations for new structures. Height and spacing of stakes to be as specified elsewhere herein or as directed by JEA Engineer.

All Work shall be done to the lines, grades and elevations shown on the drawings. Any Work improperly located may be ordered removed and replaced at the Company's expense. The Company shall be responsible for making its own determination of water table variations and shall not assume that any water levels shown by the aforesaid boring data will necessarily be maintained at the level indicated. The Company shall investigate the conditions above or below the surface of the ground as it may deem necessary for the proper and timely performance of its Work including, but not limited to, the making of borings.

#### **2.14.17. TEMPORARY ROADWAYS**

If the Company's operations render any street or private way unsafe, the Company shall make such repairs or provide such temporary ways and guards necessary for the protection and safety of JEA's and the Company's employees and subcontractors, and the public, and for the orderly maintenance of traffic.

The Company shall always provide and maintain a hard-surfaced roadway for traffic. Where temporary detours of lanes are required, they shall be asphalt-paved by the Company. The Company may construct paving section(s) appropriate to support traffic, provided the surface is smooth and the profile reasonable, and as a minimum, consists of 1 inch of bituminous structural course over a six inch (6") limerock base that was inspected and approved by the JEA Engineer. Should any temporary pavement fail, the Company shall be responsible for repairing it, at its own cost, before close of Work on the day notification is given. Should the Company be unable to make such repair by close of Work, the Company shall notify the Contract Administrator and provide an estimated time when repairs can be made. No repair timeframes shall exceed 48 hours. Any damages, direct or indirect, resulting from such temporary pavement failures shall be the sole liability of the Company.

All limerock base material used for temporary pavement and constructed in proposed grassed areas shall be completely removed and disposed of by the Company prior to final restorative grassing operations. The area shall be backfilled with material stockpiled on the Work Location that is conducive to growth of the plant material. All costs associated with this work shall be included in the cost for the associated item of work.

#### **2.14.18. BYPASS PUMPING**

The Company shall provide all necessary labor, materials and equipment to maintain the uninterrupted sewer service of laterals, mains, trunks, force mains and pump stations at all times. The manner in which this is accomplished shall be left to the discretion of the Company, subject to the requirements of the Contract and the prior approval of the JEA Engineer. The JEA Engineer's approval in no way relieves the Company of any liabilities resulting from the bypass method chosen.

The Company shall not allow any sewage, at any time, to be pumped into any drainage structure or to spill, puddle, or run upon any street, construction trench, public or private property.

The responsibility for coordinating the need, length of time, method, and suction and discharge locations for bypass pumping shall be the responsibility of the Company subject to approval by the JEA Engineer.

#### **2.14.19. TRAFFIC SIGNAGE**

Costs incurred by the Company to provide new signage and pavement markers, or remove and replace existing signage as necessary to accomplish the work shall not be paid for separately but shall be merged with the cost of the associated item of work. Damaged signage shall be replaced with new signage. All signage and pavement markers in accordance with the drawings and City Traffic Engineer's requirements.

#### **2.14.20. TREE PROTECTION**

The Company shall protect all trees, in accordance with applicable city and county laws, from damage by vehicles, equipment and machinery, except those trees designated for removal on the construction drawings and for which the Company shall be responsible for obtaining all required approvals and permits. Removal of any tree not so designated nor permitted, shall be only upon specific approval by the JEA Engineer.

Excavated dirt shall not be piled around the base of any tree not designated for removal. The Company shall not bury or burn any refuse around or near the trees. The Company shall proceed with caution when excavating in the vicinity of root structure of any tree. Excavation shall be by hand if necessary.

Roots up to two inches (2") in diameter when severed do not require any pruning paint. Roots from two inches (2") to four inches (4") in diameter must be severed with a pruning saw and painted. Roots over four inches (4") shall not be severed except as directed by the JEA Engineer.

An ax or similar tool is not acceptable for pruning. The wood shall be treated with asphalt-type pruning paint as soon as possible after pruning.

Prior to any site disturbance, barriers shall be put up around each tree to be protected. These barriers shall be constructed of 2 x 4's or any other practical materials that will discourage disturbance near the tree. To conform to applicable city and county laws and codes, these barriers should be at least six feet (6') away from the trunk of the tree and protect an area that is at least fifty percent (50%) of the unpaved area covered by the crown spread of the tree. When conditions permit, barriers are to be placed in such a manner as to provide the largest undisturbed area possible.

Cutting tree roots shall be kept to a minimum and only allowed when absolutely necessary. In such instances the Company shall ensure that all cuts are made clean with a saw, free of all loose soil, and sealed with pruning paint or shellac. At no time shall roots be pulled, ripped or cut with a blade, backhoe or other mechanical device. Additional fill under the crown spread of trees shall be kept to a minimum. If additional fill is unavoidable, all fill material shall consist of clean, coarse sand or gravel, free of silt and clay to allow for free movement of air and water. Lowering the grade under the crown spread of trees will not be permitted.

Should branches require pruning to provide for roadway or other necessary clearance, they shall be cut back to a main stem or crotch of the tree. All cuts shall be made at the bench collar to allow the natural healing process of the tree to occur. To further promote the natural healing process, no pruning paint or other material shall be applied to pruning cuts.

If a tree is wounded during construction, all bark surrounding the wound shall be cut away and carefully removed. Care shall be taken to leave as much cambium as possible.

Any tree whose root system has been disturbed or damaged must be properly fertilized to aid in its recovery. The hole or punch-bar method shall be used for applying fertilizer. The holes should be approximately twelve inches (12") to eighteen inches (18") deep, one inch (1") to two inches (2") in diameter, two feet (2') apart, and extend two feet (2') past the drip line of the tree. The Company shall not apply fertilizer within one foot (1') of the trunk of a small tree (up to six inches (6") in diameter) or within three feet (3') of the trunk of a large tree (over six inches (6") in diameter). Injury to the root collar and trunk base may result. The type of fertilizer to be used shall be twenty-five percent (25%) organic 8-8-8 with minor elements included. Chemical analysis as follows: Total Nitrogen, not less than 8.00%, available Phosphoric Acid, not less than 8.00%, water soluble potash, not less than 8.00%. Fertilizer shall be applied at the following rates and shall be evenly distributed among the holes:

Hardwoods up to six inches (6") Dia. 2 lb. per inch of Dia.

Hardwoods over six inches (6") Dia. 4 lb. per inch of Dia.

Evergreens up to six inches (6") Dia. 1 lb. per inch of Dia.

Evergreens over six inches (6") Dia. 2 lb. per inch of Dia.

#### **2.14.21. CONSTRUCTION PARKING**

No Company employee vehicular parking will be allowed within the construction footprint. All parking will be offsite. Company shall be responsible for ferrying its employees to and from the Work Location. This will reduce the number of complaints associated with number of vehicles clogging roadways and ruts associated with offstreet parking, as well as provide additional ingress/egress corridor for required construction vehicles.

## **2.15. VENDOR PERFORMANCE EVALUATION**

### **2.15.1. VENDOR PERFORMANCE EVALUATION**

#### **Use of Vendor Performance Evaluation Scorecards**

JEA may evaluate the Company's performance using the evaluation criteria shown on the vendor scorecard available online at JEA.com.

Scores for all metrics shown on the evaluation range from a low of 1, meaning significantly deficient performance, to a high of 5, meaning exceptionally good performance. The Company's performance shall be classified as Top Performance, Acceptable Performance, or Unacceptable Performance, as defined herein. The evaluator will be a designated JEA employee. The evaluator's supervisor and the Chief Purchasing Officer will review deficient performance letters and Unacceptable Performance scorecards, as described below, prior to issuance. When evaluating the Company's performance, JEA will consider the performance of the Company's Subcontractors and suppliers, as part of the Company's performance.

#### **Frequency of Evaluations**

JEA may conduct performance evaluations and prepare scorecards in accordance with the procedures described herein at any time during performance of the Work or soon after the completion of the Work. JEA may conduct one or more evaluations determined solely at the discretion of JEA.

#### **Unacceptable Performance**

- o If at any time, JEA determines, using the criteria described on the scorecard, that the performance of the Company is Unacceptable, the Contract Administrator and Chief Procurement Officer or his designated alternate will notify the Company of such in a letter. The Company shall have ten (10) days to respond to the Contract Administrator. Such response shall include, and preferably be delivered in-person by an officer of the Company, the specific actions that the Company will take to bring the Company's performance up to at least Acceptable Performance.
- o Within 30 days from date of the first Unacceptable Performance letter, the Contract Administrator and Chief Purchasing Officer or his designated alternate will notify the Company by letter as to whether its performance, as determined solely by JEA, is meeting expectations, or is continuing to be Unacceptable. If the Company's performance is described in the letter as meeting expectations, no further remedial action is required by the Company, as long as Company's performance continues to be Acceptable.
- o If the Company's performance as described in the letter continues to be Unacceptable, or is inconsistently Acceptable, then the Company shall have fifteen (15) days from date of second letter to demonstrate solely through its performance of the Work, that it has achieved Acceptable Performance. At the end of the fifteen (15) day period, JEA will prepare a scorecard documenting the Company's performance from the start of Work, or date of most recent scorecard, whichever is latest, and giving due consideration to improvements the Company has made in its performance, or has failed to make. If the scorecard shows Company's performance is Acceptable, then no further remedial action is required by Company as long as Company's performance remains Acceptable. If the scorecard shows the Company's performance is Unacceptable, JEA will take such actions as it deems appropriate including, but not limited to, terminating the Contract for breach, suspending the Company from bidding on any JEA related solicitations, and other remedies available in the JEA Purchasing Code and in law. Such action does not relieve

the Company of its obligations under the Contract, nor does it preclude an earlier termination.

- o In the event that the Contract Term or the remaining Term of the Contract does not allow for the completion of the deficient performance notification cycles described above for those in danger of receiving an Unacceptable Performance scorecard, JEA may choose to accelerate these cycles at its sole discretion.
- o If the Company receives five (5) or more letters of deficiency within any twelve (12) month period, then JEA will prepare a scorecard describing the deficiencies and the Company's performance will be scored as Unacceptable.

### **Acceptable Performance**

JEA expects the Company's performance to be at a minimum Acceptable.

### **Disputes**

In the event that the Company wants to dispute the results of its scorecard performance evaluation, the Company must submit a letter to the Chief Procurement Officer supplying supplemental information that it believes JEA failed to take into account when preparing the scorecard. Such letter, along with supplemental information, must be submitted no later than ten (10) days following the Company's receipt of the scorecard. If the Chief Procurement Officer decides to change the scorecard, the Company will be notified and a revised scorecard will be prepared, with a copy issued to the Company. If the Chief Procurement Officer decides that no change is warranted, the decision of the Chief Procurement Officer is final. If the Company is to be suspended from consideration for future Award of any contracts, the Company may appeal to the Procurement Appeals Board as per JEA Procurement Code.

### **Public Records**

There can be no expectation of confidentiality of performance-related data in that all performance-related data is subject to disclosure pursuant to Florida Public Records Laws. All scorecards are the property of JEA.

## **2.16. JEA RESPONSIBILITIES**

### **2.16.1. DENSITY TEST ALLOWANCE**

JEA will provide funds as specified on the bid sheet to reimburse Company at cost for hiring one (1) or more testing laboratory(ies) to perform all sampling, field testing and laboratory testing as specified herein, or as directed by the JEA Engineer. All testing is to be performed under the direct supervision of a registered geotechnical engineer paid for with the allowance. The testing allowance is to be used for first tests only. Any retesting due to failed first tests shall be at Company's expense. Company shall clearly mark on its invoices costs associated with testing services identifying the cost to Company of the testing service. Company agrees to invoice JEA for testing services at its cost with no markup.

### **2.16.2. ACCESS TO THE WORK LOCATIONS**

JEA will provide, as indicated in the Contract Documents and no later than the date when needed by the Company, access to the Work Location, including rights-of-way or access thereto, and such other lands that are designated for the Company's use. JEA will secure easements for permanent structures or permanent changes in existing facilities, unless otherwise specified in the Contract Documents.

### **2.16.3. PERMITS TO BE OBTAINED BY JEA**

JEA will obtain the following permits, approvals and licenses: FDEP Application for Specific Permit to Construct PWS Components.

## **2.17. CHANGES IN THE WORK, CONTRACT TIME OR PRICE**

### **2.17.1. AMENDMENTS**

This Contract may not be altered or amended except in writing, signed by JEA Chief Procurement Officer, or designee and the Company Representative, or each of their duly authorized representatives.

### **2.17.2. FORCE MAJEURE**

No party shall be liable for any default or delay in the performance of its obligations under this Contract due to an act of God or other event to the extent that: (a) the non-performing party is without fault in causing such default or delay; (b) such default or delay could not have been prevented by reasonable precautions; and (c) such default or delay could not have been reasonably circumvented by the non-performing party through the use of alternate sources, work-around plans or other means. Such causes include, but are not limited to: act of civil or military authority (including but not limited to courts or administrative agencies); acts of God; war; terrorist attacks; riot; insurrection; inability of JEA to secure approval, validation or sale of bonds; inability of JEA or the Company to obtain any required permits, licenses or zoning; blockades; embargoes; sabotage; epidemics; fires; hurricanes, tornados, floods; or strikes.

In the event of any delay resulting from such causes, the time for performance of each of the parties hereunder (including the payment of monies if such event actually prevents payment) shall be extended for a period of time reasonably necessary to overcome the effect of such delay, except as provided for elsewhere in the Contract Documents.

In the event of any delay or nonperformance resulting from such causes, the party affected shall promptly notify the other in writing of the nature, cause, date of commencement and the anticipated impact of such delay or nonperformance. Such written notice, including Change Orders, shall indicate the extent, if any, to which it is anticipated that any delivery or completion dates will be thereby affected within seven (7) calendar days.

### **2.17.3. EFFECTIVENESS OF CHANGE ORDER**

Any change in the Contract resulting from the RFI will be incorporated into the Contract through the use of a Change Order, Supplemental Work Authorization or Purchase Order. Whether requested by the Company, claimed by the Company, or contemplated by JEA, no change shall be authorized and effective unless made through an approved Supplemental Work Authorization (SWA) or on a JEA Change Order signed by the Contract Administrator or through a formal written amendment to this Contract. All Work defined on Change Orders shall be subject to the conditions of the Contract, unless specifically noted on the Change Order.

### **2.17.4. INITIATION OF A CHANGE BY COMPANY**

To request any change in the Work including, but not limited to, changes in scope, quantities, price, or schedule, the Company shall submit a written request in the form of a Request for Information ("RFI") to the JEA Representative within ten (10) working days of the date that the event that prompted the change was discovered or should have been discovered. The RFI shall contain sufficient information regarding the nature of the requested change, including an itemized estimate of cost, either positive or negative, in relation to the change, and any effect on contract time which is related to the changed condition, and work descriptions and other information necessary to evaluate the merits of the change. The JEA Representative may reject RFI's which do not provide sufficient supporting information. Upon receipt of the Company's RFI, the JEA Representative will provide written direction as to the procedures that will be used to address the request. JEA shall have the right to approve or disapprove any RFI, request or claim for change as it deems necessary and in its best interests consistent with the other Contract requirements. Where JEA and the Company are unable to reach a mutually acceptable resolution for the RFI, JEA will make a commercially reasonable determination, made in accordance with JEA's Procurement Code, which shall be final.



#### **2.17.5. INITIATION OF A CHANGE BY JEA**

When it is in JEA's best interest, the JEA Representative may request that the Company provide pricing information to accommodate a requested change in the Work, including a change to the scope of Work, quantity, schedule or completion date. Upon the written request by JEA, the Company shall submit a cost estimate, including all pricing elements requested by JEA. The Company shall not proceed with any changes to the Work until such change is authorized in writing.

#### **2.17.6. NO DAMAGE FOR DELAY**

Damage, loss, expense or delay incurred or experienced by the Company in the prosecution of the Work by reason of unforeseen circumstances, unanticipated difficulties and obstructions, bad weather, or other mischances that are generally considered to be a part of the usual hazards associated with Work, shall be borne entirely by the Company and shall not be the subject of any claim for additional compensation or change in Approved Schedule.

The Company agrees that its sole remedy for any claims, damages or losses related to any delay, disruption or hindrance alleged to be caused by JEA or any of JEA's agents or other contractors, shall be an extension of the Contract completion date.

Any demand for equitable time adjustment must be served in writing to JEA within five days of the event giving rise to the delay, disruption or hindrance. Any request for an equitable time adjustment shall be accompanied by a logical time impact analysis, demonstrating the nature and magnitude of the event to the critical path.

Failure to strictly comply with these requirements shall be deemed a waiver of any right to seek equitable time adjustment.

In the event the "no damage for delay" clause is inapplicable, there shall be no recovery for home office overhead and any damages claimed shall be proven by discreet accounting of direct project costs and no theoretical formula or industry estimating reference manuals shall be permissible.

#### **2.17.7. QUANTITIES**

Where the total Bid Price was based on estimated quantities, prior to making final payment, JEA will determine actual quantities using sampling, surveying and other industry recognized means and prepare a Change Order adjusting the Contract Price to reflect actual volumes.

The Company shall immediately notify the JEA Contract Administrator in writing of any unauthorized change in the scope of the Work or significant change in the quantities of the Work that may increase the Contract Price, require an extension of Work schedule, or negatively impact permitting or other regulatory requirements.

#### **2.17.8. USE OF THE SUPPLEMENTAL WORK AUTHORIZATION (SWA)**

The JEA Representative will issue a written SWA to incorporate cost or schedule changes into the Contract. Issuance of an SWA is solely at the discretion of the JEA Representative. The SWA shall be used for increases or decreases in the Contract price, within the SWA amount set forth in the Bid, or to make changes in schedule for performance of the Work. An SWA shall authorize the Company to perform changes in the Work. The Company shall not start on SWA work until the Company receives a fully authorized, written SWA form, signed by the appropriate JEA personnel - the Company shall not consider verbal statements as authorization to proceed with the changes. The Company should not expect that any SWAs will be issued. JEA shall have no obligation to pay for SWA work unless the same is performed pursuant to a written SWA form signed before the SWA work is commenced.

#### **2.17.9. WHEN SWA EFFECTIVE**

The Company shall not start on SWA work until the Company receives a fully authorized, written SWA form, signed by the appropriate JEA personnel. The Company shall not consider verbal statements as authorization to proceed with the changes. An SWA shall authorize the Company to perform changes in the Work. JEA shall have no obligation to pay for SWA work unless the same is performed pursuant to a written SWA form signed before the SWA work is commenced.

In determining costs for Work associated with any Change Order or an SWA, the following methods may be used:

##### **1. Agreed Upon Lump Sum Method**

- a. The Company and the JEA Representative shall mutually agree to the pricing of a change order or an SWA. Any negotiated increase or decrease in the Contract Price shall be based on the Company's costs for labor, materials and supplies directly applicable to the increase or decrease plus 10% thereof for Company's supervision, overhead, bonds and profit. For any negotiated increase or decrease, the Company will provide a complete detailed breakdown for all labor, material, and equipment, etc. associated with the change. The detailed breakdown shall include applicable labor rates for all trades used, equipment rates, labor and equipment hours. A lump sum figure submitted with no breakdown will be returned to the Company without review.
- b. Where the work is covered by established Unit Prices contained in the Contract, and JEA agrees that the Unit Price in the Contract is a fair and reasonable price, the Unit Price will be applied to the quantity of work. In the event that JEA does not agree that the Unit Price in the Contract is a fair and reasonable price, a negotiated price will be applied to the quantity of work at the discretion of the JEA.

##### **2. Cost Reimbursable (Time and Materials) Method**

- a. Whenever the Company and the JEA are unable to agree on costs for an increase in the Work, JEA or JEA Representative shall order the Company to proceed with the Work on a cost reimbursable (time and material) basis. JEA will pay the Company for the SWA work in the manner hereinafter described, and the compensation thus provided shall constitute full payment for said work. JEA shall issue the SWA for the Company to perform the specific work with payment determined as follows:
- b. For materials purchased by the Company and used in the work, the Company shall be paid the actual cost of such materials, including sales taxes if required, and freight and delivery charges as shown by original receipted bills. A mark-up amount equal to ten percent (10%) of the sum thereof shall be added to this cost. JEA reserves the right to select and approve, or to reject the materials to be used and the sources of supply of any materials furnished by the Company.
- c. The Company will be paid the cost of wages for all labor that is engaged in the Work, plus the actual cost chargeable to the Work for workers compensation insurance, social security taxes, unemployment compensation insurance and such additional amounts as are paid by the Company. A total mark-up shall be added equal to ten percent (10%) of wages and other cost listed above. In evidence of the costs of labor the Company shall provide a certified statement of wages actually paid, together with copies of supporting payrolls.

Wage rates used in determining the amount of the payment will be the actual wage rates paid by the Company for Work under this Contract, except that no rate used shall exceed the rate of comparable labor currently employed on the project.

- d. Payment for the services of foremen in direct charge of the specific operation will be made. Payment for the service of superintendents, timekeepers or other overhead personnel will not be made nor will payment for the services of watchmen be made unless required specifically by the SWA Work. The actual function performed by an employee rather than its payroll title will be the criterion used in determining the eligibility of an employee's services for payment under this provision.
- e. The types and amounts of equipment and machinery used by the Company in carrying out its work under the SWA shall be made in keeping with normal practice for work of similar nature. JEA may, at its discretion, limit by specific instruction the types and amounts of equipment and machinery to be used. For all equipment and machinery used in the SWA work, JEA will pay the lowest of the following options to which no mark-up percentages will be added (note that these options apply to rented or contractor owned equipment):

80% of the rental value as set forth in the Blue Book value, or

Actual cost, or

Current local equipment rental company quote as produced by JEA.

In computing the hourly rental of such equipment, the following applies:

The lowest calculated hourly equipment rental rate shall be used based on the duration that the equipment is at the site and/or the actual cost the Company is paying. For example, if the equipment used has been on the project for more than one month, then the hourly rate used shall be derived/calculated from the monthly equipment rate.

Less than thirty (30) minutes shall be considered 1/2 hour except when the minimum rental time to be paid is one (1) hour.

Rental time will not be allowed while equipment is inoperative due to breakdowns. The rental time of equipment to be paid for shall be the time the equipment is in operation on the SWA work being performed. The Company shall be reimbursed for the time required to move the equipment to the Work, and return it to its original location, only if the Company is charged this cost by the renting agency. Excess rental time of equipment due to inefficient work practices will not be reimbursed. Actual costs must be supported by invoices or other similar documentation provided by the Company.

- f. No payment will be allowed for the use of small tools and minor items of equipment, which, as used herein, are defined as individual tools or pieces of equipment having a replacement value of \$500.00 or less.
- g. The Company and JEA Representative shall compare records of the Work performed on a Cost Reimbursable basis at the end of each day. These records shall be prepared by the Company and shall be signed by both JEA and the Company Representative. A copy of these records shall be submitted to JEA with the invoice for the work.

- h. Payment for cost reimbursable SWA work will be included in monthly progress payments.
- i. The Company's Subcontractors will be allowed a ten percent (10%) mark-up on Work performed by their own forces. The Company will be allowed a five percent (5%) mark-up on the Subcontractor's costs (i.e. labor and materials) only, no mark-up on the Subcontractor's profit.
- j. Subcontractor's costs in excess of fifty thousand dollars (\$50,000) shall be justified for competitiveness through the submission of at least three (3) Bids for the work, or other cost justification satisfactory to JEA.

#### **2.17.10. CHANGES IN THE WORK**

Changes in the Work, including changes to scope, quantities, price, schedule or completion date, may be authorized through Supplemental Work Authorizations or through a Change Order.

#### **2.17.11. CHANGES TO WORK SCHEDULE OR TIME**

The Work schedule and/or contract time may be changed by a Change Order, Purchase Order or SWA. The Company's request or claim for a Work schedule and/or contract time adjustment shall be in writing delivered to the Contract Administrator within ten (10) working days following the discovery of the event that prompted the claim or the date when the event should have been discovered. Where accepted by JEA, changes to Work schedule will only adjust for critical path impacts. Failure to include the necessary critical path analysis with the request shall be grounds for rejecting the claim. The critical path as used in this Section means the series of interdependent Work events that must be sequentially performed and that require a longer total time to perform than any other such series. Upon receipt of the Company's request for a change in the Work schedule, the Contract Administrator will provide any additional directions in writing detailing the procedures that will be used to resolve the request, including provision of time impact or manpower and equipment loading schedules. Where JEA and the Company are unable to reach a mutually acceptable resolution of request, JEA will make a commercially reasonable determination, made in accordance with JEA's Procurement Code, which shall be final.

### **2.18. MISCELLANEOUS PROVISIONS**

#### **2.18.1. AMBIGUOUS CONTRACT PROVISIONS**

The parties agree that this Contract has been the subject of meaningful analysis and/or discussions of the specifications, terms and conditions contained in this Contract. Therefore, doubtful or ambiguous provisions, if any, contained in this Contract will not be construed against the party who physically prepared this Contract.

#### **2.18.2. APPLICABLE STATE LAW; VENUE; SEVERABILITY**

The rights, obligations and remedies of the parties as specified under the Contract will be interpreted and governed in all respects exclusively by the laws of the State of Florida without giving effect to the principles of conflicts of laws thereof. Should any provision of the Contract be determined by the courts to be illegal or in conflict with any law of the State of Florida, the validity of the remaining provisions will not be impaired. Litigation involving this Contract or any provision thereof shall take place in the State or Federal Courts located exclusively in Jacksonville, Duval County, Florida.

### **2.18.3. CUMULATIVE REMEDIES**

Except as otherwise expressly provided in this Contract, all remedies provided for in this Contract shall be cumulative and in addition to and not in lieu of any other remedies available to either party at law, in equity or otherwise.

### **2.18.4. ENTIRE AGREEMENT**

This Contract constitutes the entire agreement between the parties. No statement, representation, writing, understanding, or agreement made by either party, or any representative of either party, which are not expressed herein shall be binding. All changes to, additions to, modifications of, or amendment to this Contract, or any of the terms, provisions and conditions hereof, shall be binding only when in writing and signed by the authorized officer, agent or representative of each of the parties hereto.

### **2.18.5. EXPANDED DEFINITIONS**

Unless otherwise specified, words importing the singular include the plural and vice versa and words importing gender include all genders. The term "including" means "including without limitation", and the terms "include", "includes" and "included" have similar meanings. Any reference in this Contract to any other agreement is deemed to include a reference to that other agreement, as amended, supplemented or restated from time to time. Any reference in the Contract to "all applicable laws, rules and regulations" means all federal, state and local laws, rules, regulations, ordinances, statutes, codes and practices.

### **2.18.6. HEADINGS**

Headings appearing herein are inserted for convenience or reference only and shall in no way be construed to be interpretations of text.

### **2.18.7. INDEPENDENT CONTRACTOR**

Company is performing this Contract as an independent contractor and nothing in this Contract will be deemed to constitute a partnership, joint venture, agency, or fiduciary relationship between JEA and Company. Neither Company nor JEA will be or become liable or bound by any representation, act, or omission of the other.

### **2.18.8. LANGUAGE AND MEASUREMENTS**

All communication between the Company and JEA, including all documents, notes on drawings, and submissions required under the Contract, will be in the English language. Unless otherwise specified in the Contract, the US System of Measurements shall be used for quantity measurement. All instrumentation and equipment will be calibrated in US System of Measures.

### **2.18.9. MEETINGS AND PUBLIC HEARINGS**

The Company will, upon request by JEA, attend all meetings and public hearings as required, in any capacity, as directed by JEA.

### **2.18.10. NEGOTIATED CONTRACT**

Except as otherwise expressly provided, all provisions of this Contract shall be binding upon and shall inure to the benefit of the parties, their legal representatives, successors and assigns. The parties agree that they have had meaningful discussion and negotiation of the provisions, terms and conditions contained in this Contract. Therefore, doubtful or ambiguous provisions, if any, contained in the Contract shall not be construed against the party who physically prepared this Contract.

#### **2.18.11. NONEXCLUSIVE**

Notwithstanding anything contained herein that may appear to be the contrary, this Contract is "non-exclusive" and JEA reserves the right, in its sole discretion, to retain other companies to perform the Work, and/or JEA may self-perform the Work itself.

#### **2.18.12. NONWAIVER**

Failure by either party to insist upon strict performance of any of the provisions of the Contract will not release either party from any of its obligations under the Contract.

#### **2.18.13. REFERENCES**

Unless otherwise specified, each reference to a statute, ordinance, law, policy, procedure, process, document, drawing, or other informational material is deemed to be a reference to that item, as amended or supplemented from time to time. All referenced items shall have the enforcement ability as if they are fully incorporated herein.

#### **2.18.14. SEVERABILITY**

In the event that any provision of this Contract is found to be unenforceable under applicable law, the parties agree to replace such provision with a substitute provision that most nearly reflects the original intentions of the parties and is enforceable under applicable law, and the remainder of this Contract shall continue in full force and effect. With regard to any provision in this agreement pertaining to damages, equitable or otherwise, it is the intent of the Parties that under no circumstances shall there be recovery for home office overhead. Any damages claimed shall be proven by discreet accounting of direct project costs and no theoretical formula or industry estimating reference manuals shall be permissible.

#### **2.18.15. SUBCONTRACTING OR ASSIGNING OF CONTRACT**

Each party agrees that it shall not subcontract, assign, delegate, or otherwise dispose of the Contract, the duties to be performed under the Contract, or the monies to become due under the Contract without the other party's prior written consent.

The assignment of the Contract will not relieve either of the parties of any of its obligations until such obligations have been assumed in writing by the assignee. If the Contract is assigned by either of the parties, it will be binding upon and will inure to the benefit of the permitted assignee. The Company shall be liable for all acts and omissions of its assignee or its Subcontractor.

In the event the Company obtains JEA approval to use Subcontractors, the Company is obligated to provide Subcontractors possessing the skills, certifications, registrations, licenses, training, tools, demeanor, motivation and attitude to successfully perform the work for which they are subcontracted. The Company is obligated to remove Subcontractors from performing Work under this Contract when the Company recognizes that a Subcontractor is failing to work in a manner consistent with the requirements of this Contract, or when JEA notifies the Company that JEA has determined a Subcontractor is failing to work in a manner consistent with the requirements of this Contract.

#### **2.18.16. SURVIVAL**

The obligations of JEA and the Company under this Contract that are not, by the express terms of this Contract, to be performed fully during the Term, shall survive the termination of this Contract.

#### **2.18.17. TIME AND DATE**

Unless otherwise specified, references to time of day or date mean the local time or date in Jacksonville, FL. If under this Contract any payment or calculation is to be made, or any other action is to be taken, on or as of a day that

is not a regular business day for JEA, that payment or calculation is to be made, and that other action is to be taken, as applicable, on or as of the next day that is a regular business day. Where reference is made to day or days, it means calendar days. Where reference is made to workday, workdays, business day, or business days, it means regular working days for JEA Procurement.

#### **2.18.18. TIME OF ESSENCE**

For every material requirement of this Contract, time is of the essence.

#### **2.18.19. TITLE TO MATERIALS FOUND**

JEA shall retain the title to water, mineral matter, timber and any other materials that the Company, or its Subcontractors, encounters during the excavation or other operations of the Work. The Company shall use or dispose of this material in accordance with the Contract or written instructions from the Contract Administrator. Any materials found in the excavation, or other operations of the Company, that are of archaeological or historical value shall be left in place. The Company shall immediately notify JEA of the find and shall take no further action until directed by JEA.

#### **2.18.20. USE OF JEA CONTRACTS BY THE CITY OF JACKSONVILLE**

Where the City of Jacksonville's or its other independent agencies' or political subdivisions' procurement codes all use of JEA contracts, the Company agrees to extend any pricing and other contractual terms to such entities.

#### **2.18.21. WAIVER OF CLAIMS**

A delay or omission by JEA to exercise any right or power under this Contract shall not be construed to be a waiver thereof. A waiver by JEA under this Contract shall not be effective unless it is in writing and signed by the party granting the waiver. A waiver by a party of a right under or breach of, this Contract shall not be construed to operate as a waiver of any other or successive rights under, or breaches of, this Contract.

The Company's obligations to perform and complete the Work in accordance with the Contract shall be absolute. None of the following will constitute a waiver of any of JEA's rights under the Contract: approval of payments, including final payment; Certificate of Contract Completion; any use of the Work by JEA; nor any correction of faulty or defective work by JEA.

#### **2.18.22. JEA PROJECT SECURITY PROGRAM**

The JEA Project Security Program establishes a coordinated security program and assigns specific security responsibilities for which the Company and/or its Subcontractors shall be responsible at while performing services at existing JEA facilities and upon the substantial completion of new facilities. The programs objectives are 1) to direct all project security activities toward a single goal--no breaches, thefts or vandalism, and 2) to ensure effective coordination and communication of all project security activities with JEA Security.

In general, the Company shall provide on-site JEA security personnel at any time a JEA facility's perimeter is unsecured, including but not limited to, alarms disabled, fences or gates down, traffic flows that require gates to be opened repeatedly and/or for more than one hour of the work day. The Company shall schedule security personnel through JEA Security. Where existing lighting is disabled or otherwise impacted by the Work, the Company shall provide temporary lighting equal to or exceeding that which exists.

Further, the Company shall be responsible for complying with all applicable provisions of Chapter 12 "Security Program" of the JEA Contractor Safety Management Process Safety Requirements, a copy of which may be obtained upon request.

### **3. TECHNICAL SPECIFICATIONS/DETAILED SCOPE OF WORK**

#### **3.1. TECHNICAL SPECIFICATIONS/DETAILED SCOPE OF WORK (APPENDIX A)**

Technical Specifications and a Detailed Scope of Work are located in Appendix A of this document.

### **4. FORMS**

#### **4.1. FORMS (APPENDIX B AND ADDITIONAL FORMS)**

Forms required to be submitted with this solicitation are provided in Appendix B or can be obtained on the JEA website at [www.jea.com](http://www.jea.com). Other Form included with this Solicitation are as follows:

- Appendix B – Bid Form
- Appendix B – List of Subcontractors Form
- Appendix C - Construction Drawings





# ARLINGTON WATER TREATMENT PLANT (WTP) HIGH SERVICE PUMP REPLACEMENT

## Technical Specifications

**FEBRUARY 2017**

Prepared By:



CPH, Inc.

5200 Belfort Road, Suite 220

Jacksonville, Florida 32256

Ph: 904-332-0999

CPH Project No. J6606

**INDEX TO PROJECT MANUAL  
JEA**

**ARLINGTON WATER TREATMENT PLANT (WTP) HIGH SERVICE PUMP REPLACEMENT**

**CPH Project No. J6606**

**February 2017**

**SOLICITATION DOCUMENTS**

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01 14 00	Construction Sequence
01 20 00	Measurement and Payment
01 31 19	Project Meetings
01 32 34	Preconstruction Video
01 33 00	Submittals
01 35 43	Stormwater Pollution Prevention / NPDES Requirements
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01 41 26	Permits and Fees
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01 78 25	Plant Testing, Startup and Commissioning

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**DIVISION 3 – CONCRETE**

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**DIVISION 5 – METALS**

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**DIVISION 7 – THERMAL AND MOISTURE PROTECTION**

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#### **APPENDIX A**

Permits

## **SECTION 01 11 00**

### **SUMMARY OF WORK**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

Summary of work, other contracts, work sequence, operation of existing facilities, use of premises, Owner furnished products and coordination.

##### **1.02 SUMMARY OF WORK**

- A. The work to be performed under this Contact consists of replacing aging equipment at the Arlington Water Treatment Plant.

Demolition work to be done in the existing High Service Pump Building and existing Electrical Building generally includes the following:

- Demolition of four (4) existing constant speed high service pumps.
- Demolition of concrete floor, walls, and pump bases as indicated on the construction drawings.
- Demolition of suction and discharge piping in pipe trenches, demolition of above grade suction and discharge piping, valves and appurtenances at each existing pump.
- Demolition of existing aluminum grating, excluding frames.
- Demolition of existing 30" piping below concrete floor inside the High Service Pump building, demolition of foundation wall and removal of 30" piping in existing concrete vault.
- Demolition of existing sodium hypochlorite injection points, including valves, piping, concrete vault, and aluminum checkerplate.
- Demolish existing wall mounted exhaust fan in High Service Pump building.
- Demolish existing chlorine analyzer and associated piping/valves.
- Demolish existing pressure indicator, transmitter, and associated piping.
- Existing portable generator to be turned over to JEA.
- Remove and salvage existing electrical gear to be turned over to JEA.
- Demolish existing asphalt road as shown on the construction drawings.

The following work in the existing High Service Pump Building and existing electrical building includes the following:

- Install four (4) new 125 hp centrifugal split case high service pumps with new Variable Frequency Drive (VFD) units.
- Construct four (4) new high service pump concrete equipment pads.
- Construct new piping and valves inside the HSP building and chlorine injection vault.
- Construct new section of concrete pipe trench with aluminum grating.
  - Construct new pipe supports on the suction and discharge piping.

- Construct new concrete vault with aluminum hatch.
  - Construct new sodium hypochlorite injection points.
  - Install new aluminum grating on existing pipe trenching.
  - Install new chlorine analyzer.
  - Install new pressure indicators/transmitters on the suction and discharge ends of each pump and one pressure indicator/transmitter on the combined discharge header.
  - Install new exhaust fan on the west wall of the HSP building.
  - Install new electrical MCC gear as necessary for new VFDs to be installed in the existing electrical building.
  - Install new electrical conduit and motor cables.
  - Install split air conditioning unit to serve the additional heat load added to the existing electrical building.
  - Install hose bibb and reduced pressure backflow preventer as shown on Drawing G-03.
  - Repair asphalt road in areas where removed or damaged.
- B. Furnish all materials, equipment, tools, and labor which is reasonably and properly inferable and necessary for the proper completion of the Work, whether specifically indicated in the Contract Documents or not.
- C. All fees and permits for the permanent construction, which are required by controlling agencies or authorities, including fees for the review of Contract Documents prior to construction, will be procured by the OWNER. Other licenses or permits for construction facilities of a temporary nature which are necessary for the prosecution of the work shall be secured and paid for by the CONTRACTOR.
- D. Repair, replace, or otherwise settle with the OWNER, if damage to property or existing facilities occurs, including damage to pavements, utilities, lawns, structures, etc.
- E. Construct the Project under a Lump Sum Price Contract.
- F. Contract Time: Contractor shall have no more than 330 calendar days to reach substantial completion including DEP clearance, as required, of the new WTP components. Upon acceptance of substantial completion by Owner and Engineer, the Contractor shall have 35 days of additional calendar days to reach final completion. Final completion shall be within 365 days of Notice to Proceed.

### **1.03 WORK UNDER OTHER CONTRACTS – NOT USED**

### **1.04 WORK SEQUENCE AND WORKING HOURS**

The CONTRACTOR's sequence of work may be of his choosing and shall be coordinated with the OWNER and ENGINEER. Normal working hours for the project shall be an eight (8) hour period between the hours of 7:00 a.m. – 7:00 p.m., Monday

through Friday. Should the Contractor request of JEA to approve work periods greater than 8 hours a day, he shall make such requests in writing a minimum of 24 hours prior to such work periods.

The Contractor may be required to perform certain work at select locations along the route of construction at times of the day or night when vehicular traffic and pedestrian traffic is at diminished levels and at times appropriate to other activities which are occurring in the area of the project. The Contractor shall comply with requirements to alter his schedule of work as requested or required by JEA without change to the contract price or time.

#### **1.05 OPERATION OF EXISTING FACILITIES**

The project area will be closed to the public during construction. The CONTRACTOR shall coordinate all construction activities with the OWNER.

#### **1.06 CONTRACTOR USE OF PREMISES**

Confine operations at the site to areas permitted by applicable laws, ordinances, permits, and by the Contract Documents. Do not unreasonably encumber the site with materials or equipment. Do not load structures with weight that will endanger the structure. The CONTRACTOR shall assume full responsibility for protection and safekeeping of products stored on the job site. The CONTRACTOR shall maintain access to all existing structures throughout construction.

#### **1.07 OWNER FURNISHED PRODUCTS - NOT USED**

#### **1.08 COORDINATION**

- A. The CONTRACTOR shall be fully responsible for the coordination of his work and the work of his employees, subcontractors, and suppliers and to assure compliance with schedules.
- B. The coordination requirements of this Section are in addition to the requirements in JEA's Solicitation Documents.
- C. It is the CONTRACTOR's responsibility to coordinate with all the utilities regarding locates, protection of existing facilities, testing, or relocations.

#### **1.09 DRAWINGS AND PROJECT MANUAL**

- A. The Work shall be performed in accordance with the Drawings and Specifications prepared by CPH, Inc.
- B. The Contractor shall verify all dimensions, quantities and details shown on the Drawings, Supplementary Drawings, Schedules, Specifications or other data received from the Engineer, and shall notify same, in writing, of all errors, omissions, conflicts and discrepancies found therein. Failure to discover or correct errors, conflicts or discrepancies shall not relieve the Contractor of full

responsibility for unsatisfactory Work, faulty construction or improper operation resulting therefrom, nor from rectifying such conditions at his own expense.

- C. All schedules are given for the convenience of the Engineer and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quantity of materials and equipment included in the Work to be done under this Contract.
- D. Intent
  - 1. All work called for in the Specifications applicable to this Contract, but not shown on the Drawings in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified in either the Drawings or in the Specifications, but involved in carrying out their implied intent, or in the complete and proper execution of the Work, is required and shall be performed by the Contractor as though it were specifically delineated or described.
  - 2. Items of material, equipment, machinery, and the like may be specified on the Drawings and not in the Specifications. Such items shall be provided by the Contractor in accordance with the specification on the Drawings.
  - 3. The apparent silence of the Specifications to any detail, or the apparent omission from them of a detailed description concerning any Work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these Specifications shall be made upon that basis.
  - 4. Order of Precedence: Refer to Section 2.3.1 of JEA's Solicitation Documents for this project.

## **1.10 WEATHER**

During inclement weather, all work which might be damaged or rendered inferior by such weather conditions shall be suspended. The orders and decisions of the Engineer as to suspensions shall be final and binding. During suspension of the Work from any cause, the Work shall be suitably covered and protected so as to preserve it from injury by the weather or otherwise; and, if the Engineer will so direct, the rubbish and surplus materials shall be removed. Also, refer to additional requirements in the Solicitation Documents.

## **1.11 PROTECTION AND RESTORATION**

- A. The Contractor shall be responsible for the preservation of all public and private Property, and shall use every means of protection 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. Also, refer to additional requirements in the Solicitation Documents.

## **1.12 DELIVERY AND STORAGE**

### **A. General**

1. The 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 thereof by the Owner.
2. All materials and equipment to be incorporated in the Work shall be handled and stored by the Contractor before, during and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft or damage or any kind whatsoever to the material or equipment.
3. All materials which, in the opinion of the Engineer, have become so damaged as to be unfit for the use intended or specified shall be promptly removed from the site of the Work, and the Contractor shall receive no compensation for the damaged material or its removal.
4. In the event any such material, equipment and supplies are lost, stolen, damaged or destroyed prior to final inspection and acceptance, the Contractor shall replace same without additional cost to the Owner.
5. Refer to additional requirements in the Solicitation Documents.

### **B. Delivery – The Contractor shall**

1. Deliver materials in ample quantities to insure the most speedy and uninterrupted progress of the Work so as to complete the Work within the allotted time.
2. Coordinate deliveries in order to avoid delay in, impediment of, the progress of the Work of any related Contractor.
3. Schedule deliveries to the site not more than one month prior to scheduled installation without written authorization from the Engineer.
4. Arrange deliveries of products in accordance with construction schedules coordinated to avoid conflict with work and conditions at the site.
5. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
6. Immediately on delivery, inspect shipments with the Owner's field representative to assure compliance with requirements of Contract Documents and approved submittals, and that products are properly protected and undamaged.

7. Provide equipment and personnel to handle products by methods recommended by the manufacturer to prevent soiling or damage to products or packaging.
8. Submit operation and maintenance data to the Engineer for review prior to shipment of equipment.

C. Storage

1. The Contractor shall be responsible for securing a location for on-site storage of all material and equipment necessary for completion of this project.
2. All material delivered to the job site shall be protected from dirt, dust, dampness, water and any other condition detrimental to the life of the material from the date of delivery to the time of installation of the material and acceptance by the Owner.
3. Store products in accord with manufacturer's instructions, with seals and labels intact and legible.
4. When required or recommended by the manufacturer, the Contractor shall furnish a covered, weather protected storage structure providing a clean, dry, non-corrosive environment for all mechanical equipment, valves, architectural items, electrical and instrumentation equipment, and special equipment to be incorporated into this project.
5. 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.
6. The Contractor shall carefully study manufacturer's storage instructions. These instructions shall be carefully followed and a written record of this kept by the Contractor.
7. Moving parts shall be rotated a minimum of once weekly to insure proper lubrication and to avoid metal-to-metal "welding".
8. Mechanical equipment to be used in the Work, if stored for longer than ninety (90) days, shall have the bearings cleaned, flushed and lubricated prior to testing and start-up, at no extra cost to the Owner.

D. Specific Material Storage Requirements

1. Loose Granular Materials: Store in a well-drained area on solid surfaces to prevent mixing with foreign matter.
2. Cement, Sand and Lime: Stored under a roof and off the ground and kept completely dry at all times.
3. Brick, Block and Similar Masonry Products: Handle and store in a manner to reduce breakage, chipping, cracking and spilling to a minimum.

4. All structural and miscellaneous steel, and reinforcing steel: Store off the ground or otherwise to prevent accumulations of dirt or grease, and in a position to prevent accumulations of standing water and to minimize rusting.

Should the Contractor fail to take proper action on storage and handling of equipment supplied under this Contract within seven days after written notice to do so has been given, the Owner retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from the Contractor's Contract. These costs may be comprised of expenditures for labor, equipment usage, administrative, clerical, and engineering and any other costs associated with making the necessary corrections. In any event, equipment and materials not properly stored will not be included in a payment estimate.

### **1.13 MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION**

- A. Comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to all parties involved in the installation, including two copies for the Engineer's use. Maintain one set of complete instructions at the job site during installation and until completion.
- B. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements. Should job conditions or specified requirements conflict with the manufacturer's instructions, consult with the Engineer for further instructions. Do not proceed with Work without clear instructions.
- C. Perform Work in strict accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.
- D. The Contractor shall have on hand sufficient proper equipment and machinery of ample capacity to facilitate the installation of the Work and to handle all emergencies normally encountered in Work of this character.
- E. Equipment shall be installed in a neat and workmanlike manner on the foundations at the locations and elevations shown on the Plans, unless directed otherwise by the Engineer during installation.
- F. All equipment shall be correctly aligned, leveled and adjusted for satisfactory operation and shall be installed so that proper and necessary connections can be made readily between the various units.
- G. The Contractor shall furnish, install and protect all necessary anchor and attachment bolts and all other appurtenances needed for the installation of the devices included in the equipment specified. Anchor bolts shall be as approved by the Engineer and made of ample size and strength for the purposes intended. The manufacturer shall furnish substantial templates and working drawings for installation.

## **1.14 CONSTRUCTION FIELD ENGINEERING**

- A. Registered Land Surveyor: The Contractor shall retain the services of a registered land surveyor licensed in the State of Florida for the following specific services as applicable to the Work:
  - a. Identify existing rights-of-ways and property lines along or adjacent to the Work;
  - b. Locate existing utilities and structures as may be affected by the Work;
  - c. Locate control points prior to starting the Work;
  - d. Replace control points or reference points which may be lost or destroyed.
  - e. Prepare a certified survey of the actually constructed facilities based on information concurrent with the construction progress.
- B. Contractor shall protect control points prior to starting the Work and shall preserve all permanent reference points during construction. The Contractor shall bear the cost of re-establishing project control points, and bear the entire expense of rectifying Work improperly installed due to not maintaining or protecting or to removing, without authorization, such established points, stakes, and marks.
- C. Submittals
  - a. Certificate signed by a Registered Surveyor certifying that elevations and locations of improvements are in conformance, or non-conformance, with Contract Documents.
  - b. Certified drawings showing locations of all structures, piping conduits and other improvements, including electronic files. These drawings are referenced as the Project Record Drawings and shall be included with the Project Record Documents.
  - c. Documentation to verify accuracy of field engineering work when requested by the Engineer.

## **1.15 UTILITIES**

- A. Utility Construction
  - 1. Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, house service connections, vaults, manholes and all other appurtenances and facilities pertaining thereto, whether owned or controlled by governmental bodies or privately owned by individuals, firms or corporations, used to serve the public with transportation, traffic control, gas, electricity, telephone, sewerage, drainage or water. Other public or private property which may be affected by the Work shall be deemed included hereunder.

2. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access to private property during construction shall be removed when no longer required.
3. The length of open trench will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the Owner. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Owner may require special construction procedures. As a minimum, the Contractor shall conform to the following restoration procedures:
  - a. Interim Restoration: All excavations shall be backfilled and compacted as specified by the end of each working day.

All pipe and fittings shall be neatly stored in a location which will cause the least disturbance to the public. All debris shall be removed and properly disposed of by the end of each working day.
  - b. Final Restoration: After completing all utility installations, and after testing of the pipe, final restoration shall be performed. In no event shall final restoration begin after substantial completion. Maintenance of all restored facilities shall be the Contractor's responsibility. This maintenance shall be performed on an on-going basis during the course of construction.

The Contractor's Progress Schedule shall reflect the above restoration requirements.

B. Existing Utilities

1. The locations of all existing underground piping, structures and utilities have been taken from information received from the respective owner. The locations are shown without express or implied representation, assurance, or guarantee that they are complete or correct or that they represent a true picture of underground piping to be encountered.
2. The Contractor shall, at all times in performance of the Work, employ approved methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage or destruction of existing public utility installations and structures; and shall, at all times in the performance of the Work, avoid unnecessary interference with, or interruption of, public utility services; and shall cooperate fully with the owners thereof to that end.
3. Pipelines shall be located substantially as indicated on the Drawings, but the Owner reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or

for other reasons. When the location of piping is dimensioned on the Drawings, it shall be installed in that location; when the location of piping is shown on a scaled drawing, without dimensions, the piping shall be installed in the scaled location unless the Owner approves an alternate location for the piping. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him from laying and jointing different or additional items where required. The Engineer may require detailed pipe laying drawings and schedules for project control.

4. The Contractor shall exercise care in any excavation to locate all existing piping and utilities. All utilities which do not interfere with the completed Work shall be carefully protected against damage. Any existing utilities damaged in any way by the Contractor shall be restored or replaced by the Contractor at his expense as directed by the Owner. Any existing facilities which require operation to facilitate repairs shall be performed only by the owner of the respective utility.
5. It is the responsibility of the Contractor to ensure that all utility or other poles, the stability of which may be endangered by the proximity of excavation, be temporarily stayed and/or shored in position while Work proceeds in the vicinity of the pole and that the utility or other companies concerned be given reasonable advance notice of any such excavation by the Contractor.

#### C. Notices

1. All governmental utility departments and other owners of public utilities which may be affected by the Work will be informed in writing by the Contractor within two weeks after the execution of the Contract or Contracts covering the Work. Such notice will be sent out in general, and directed to the attention of the governmental utility departments and other owners of public utilities for such installations and structures as may be affected by the Work.
2. The Contractor shall also comply with Florida Statute 553.851 regarding notification of existing gas and oil pipeline company owners. Evidence of such notice shall be furnished to the Owner within two weeks after the execution of the Contract.
3. It shall be the Contractor's responsibility to contact utility companies at least 48 hours in advance of breaking ground in any area or on any unit of the Work so maintenance personnel can locate and protect facilities, if required by the utility company.
4. 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 utility owner and make arrangements for the interruption which will be satisfactory to the utility owner.

#### D. Exploratory Excavations

Exploratory excavations shall be conducted by the Contractor for the purpose of locating underground pipelines or structures in advance of the construction. Test pits shall be excavated in areas of potential conflicts between existing and proposed facilities and at piping connections to existing facilities a minimum of 48 hours or 1000 feet in advance of Work. If there is a potential conflict, the Contractor is to notify the Engineer immediately. Information on the obstruction to be furnished by the Contractor shall include: Location, Elevation, Utility Type, Material and Size. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the Engineer.

E. Utility Crossings

It is intended that whatever existing utilities must be crossed, deflection of the pipe within specified limits and cover shall be used to satisfactorily clear the obstruction unless otherwise indicated on the Drawings. However, when in the opinion of the Owner this procedure is not feasible, he may direct the use of fittings for a utility crossing or conflict transition as detailed on the Drawings.

F. Relocations

1. Relocations shown on the Drawings – Public utility installations or structures, including but not limited to light poles, signs, fences, piping, conduits and drains that interfere with the positioning of the Work which are shown on the Drawings to be removed, relocated, replaced or rebuilt by the Contractor shall be considered as part of the general cost of doing the Work and shall be included in the prices bid for the various contract items. No separate payment shall be made therefore.
2. Relocation not shown on the Drawings
  - a. Where public utility installations or structures are encountered during the course of the Work, and are not indicated on the Drawings or in the Specifications, and when, in the opinion of the Owner, removal, relocation, replacement or rebuilding is necessary to complete the Work under this contract, such Work shall be accomplished by the utility having jurisdiction, or such Work may be ordered, in writing by the Owner, for the Contractor to accomplish.
  - b. If such Work is accomplished by the utility having jurisdiction, it will be carried out expeditiously and the Contractor shall give full cooperation to permit the utility to complete the removal, relocation, replacement or rebuilding as required. If such Work is accomplished by the Contractor, it will be paid for as a Change Order.
3. All existing utility castings, including valve boxes, junction boxes, manholes, hand holes, pull boxes, inlets and similar structures in the areas of construction that are to remain in service and in areas of trench

restoration and pavement replacement, shall be adjusted by the Contractor to bring them flush with the surface of the finished Work.

4. All existing utility systems which conflict with the construction of the Work herein which can be temporarily removed and replaced shall be accomplished at the expense of the Contractor. Work shall be done by the utility unless the utility approves in writing that the Work may be done by the Contractor.

**G. Lines and Grades**

1. All Work under this Contract shall be constructed in accordance with the line and grades shown on the Drawings, or as given by the Engineer. The full responsibility for keeping alignment and grade shall rest upon the Contractor.
2. The Contractor shall, at his own expense, establish all working or construction lines and grades as required from the project control points set by the Owner, and shall be solely responsible for the accuracy thereof.
3. Potable water main shall have 36-inches minimum, of cover over the top of the pipe. Cover shall vary to provide long uniform gradient or slope to pipe to minimize air pockets.
4. To insure a uniform gradient for gravity pipe and pressure pipe, all lines shall be installed using the following control techniques as a minimum:
  - a. Gravity Lines: continuous control, using laser beam technology.
  - b. Pressure Lines: control stakes set at 50 ft intervals using surveyors level instrument.

**PART 2 PRODUCTS - Not Used**

**PART 3 EXECUTION - Not Used**

**END OF SECTION**



## **SECTION 01 14 00**

### **CONSTRUCTION SEQUENCE**

#### **PART 1 GENERAL**

##### **1.01 GENERAL REQUIREMENTS**

- A. This project consists of work on property owned by JEA. The Arlington WTP must remain in continuous operation during construction of this project. Portions of the system can be taken out of service for short durations with prior approval from the OWNER. All coordination shall be in presence of the OWNER and ENGINEER and shall be confirmed in writing by the OWNER in order to be valid.
- B. The work shall be performed in such a manner as to minimize the disruption to the operation and staff of the existing Arlington WTP. Modifications that affect or may affect the operation of the facility shall not be made without written permission from the OWNER.
- C. The construction progress schedule required under Section 01 33 00 shall reflect the conditions presented in this section.
- D. Special precautions are necessary to ensure that no damage occurs to these facilities including piping, utilities, roads, interiors of structures and structures in general that are to remain in operation and are not to be modified or replaced. Any temporary facilities, materials, equipment, and labor required to ensure that no damage occurs shall be provided by the CONTRACTOR as part of the Work and at no additional cost to the OWNER.
- E. The OWNER reserves the right to postpone connections to existing utilities due to operational and/or weather related concerns.

##### **1.02 NOTIFICATION REQUIREMENTS**

- A. The CONTRACTOR shall give a minimum of 5 working days advance written notice to the ENGINEER of each component proposed for shutdown, tie-in, or disruption, all of which shall be subject to OWNER's approval and limitations. Shutdowns, tie-ins, or disruptions specifically mentioned in the Section must conform to this requirement and any others requested by the ENGINEER or OWNER.

### **1.03 SUBMITTAL REQUIREMENTS**

- A. CONTRACTOR shall submit shop drawings and working drawings in accordance with Section 01 33 00 to show schedules and details of all temporary services, bypasses, shutdowns, tie-ins and connections to existing systems.

### **1.04 SITE CONDITIONS**

- A. Several areas of construction under this contract will need to be coordinated with the Plant Operating Personnel and accomplished in a logical order to maintain the process flow through the water treatment plant and to allow construction to be completed within the time allowed by the Contract Documents. The CONTRACTOR shall coordinate the activities to allow for orderly and timely completion of all the work.
- B. When access through construction areas must be disrupted, the CONTRACTOR shall provide alternate acceptable access for the plant operators.
- C. The CONTRACTOR shall coordinate the activities in the interface or common areas with the plant operators. The CONTRACTOR shall submit to the ENGINEER and the OWNER a description and schedule as to how the common areas will be utilized, recognizing the required coordination with the plant operators. Access to existing process equipment must be provided to the Plant Operating Personnel at all times.
- D. Various interconnections within the plant may depend on the closure of various valves. The CONTRACTOR shall coordinate with the Plant Operation Personnel prior to attempting any such closure and provide any corrective measure of temporary facilities necessary to attain the shut-off needed to perform the work without interrupting the plant operation.
- E. Some interconnections within the plant may require temporary partial power shutdown. The CONTRACTOR shall make every effort necessary to minimize the shutdown time and coordinate with the Plant Operating Personnel and/or utility authorities prior to attempting any such power shutdown. Furthermore, the CONTRACTOR shall provide any corrective measure or temporary facilities

necessary to perform the work without interrupting the plant operation.

- F. During all Start-Up and Performance testing activities, the CONTRACTOR shall make available the manpower, equipment, and manufacturer's representatives required to make any necessary adjustments and training. The CONTRACTOR shall provide all disinfection chemicals of suitable quantity to test the operation of the new facilities.
- G. The existing plant will be in operation during the entire construction period and the CONTRACTOR shall conduct their operations so as to cause the least possible interference and/or inconvenience with the normal operations of the facility. Dust tight and noise dampening partitions or other methods approved by the ENGINEER to contain dust, debris, rain, noise, etc., from construction areas shall be provided. Protective covers for equipment, furnishings, and water filled basins shall be provided by the CONTRACTOR in areas of work within existing buildings and structures.

#### **1.05 CONSTRUCTION CONSTRAINTS**

- A. The CONTRACTOR shall meet the constraints below and shall consider these constraints when developing the overall plan of construction. The list is not intended to release the CONTRACTOR from the responsibility to coordinate Work in any manner which will ensure project completion within the time allowed. The following areas are not necessarily listed in their required sequence of construction. A suggested sequence within each area, where necessary, is included. However the overall general sequence outlining the critical items is outlined below. Should the CONTRACTOR wish to deviate from this overall sequence they shall obtain permission and approval prior to proceeding. Any facility that is required to be in service to operate the plant shall either remain in service or be temporarily relocated and reinstalled until the new system is approved and on-line.

1. The new electrical gear for HSP No. 5 and 6 to be installed.
2. Install four new VFDs.
3. Install new chlorine analyzer, test, and clear.

4. Demolish existing chlorine analyzer.
5. All work for the new conduits/cables and controls for the new high service pumps and other instruments/analyzers to be completed upfront.
6. Pumps HSP No. 5 and HSP No. 6 shall be installed (including 12" suction/discharge piping and valves) and all connections made to the new electrical building. Existing header pipes may be utilized if unable to replace initially, and temporary piping connections and reducers may be necessary.
  - a. Once the new facilities are on-line deemed ready for operation, disinfect and test the system as per requirements of Division 1, technical specifications, and drawings.
  - b. All factory witness testing of the new pumps, VFDs, controls and associated MCC gear shall be completed prior to putting pumps HSP No. 5 and 6 in service.
  - c. Once tested and disinfected, the pumps may be placed into service along with the VFDs, pressure indicators/transmitters, and electrical gear.
7. Remove and replace new HSP No. 3 and 4 MCC gear.
8. Install HSP No. 3 and 4 (including 12" suction/discharge piping and valves) and all connections made to the new electrical building. Existing header pipes may be utilized if unable to replace initially, and temporary piping connections and reducers may be necessary.
  - a. Once the new facilities are on-line deemed ready for operation, disinfect and test the system as per requirements of Division 1, technical specifications, and drawings.
  - b. All factory witness testing of the new pumps, VFDs, controls and associated MCC gear shall be completed prior to putting pumps HSP No. 3 and 4 in service.

- c. Once tested and disinfected, the pumps may be placed into service along with the VFDs, pressure indicators/transmitters, and electrical gear.
- 9. Demolish HSPs No. 1 and 2 and associated suction/discharge piping and valves.
- 10. Demolish floor slab above 30" suction piping.
- 11. Construct new floor, then walls for the new section of pipe trench.
- 12. Provide temporary piping supports and replace sections of suction and header pipes to accommodate a maximum shutdown duration of 12 hours per shut-down. Multiple shut-downs are anticipated. Provide disinfection and pressure testing for each segment of piping installed. Install final concrete pipe supports.

B. Sitework

- 1. Since work will be occurring around active existing pipes, the CONTRACTOR shall prepare working drawings of existing and proposed new work to scale and submitted to the ENGINEER in advance of excavation. This will require additional pot-holing and excavations to locate and determine pipe elevations. The ENGINEER has provided all known existing information as a starting point to the CONTRACTOR.
- 2. All site and underground pipe and structures installation work shall be organized and scheduled to accomplish the following:
  - a. The OWNER access to operating facilities shall be maintained at all times.
  - b. All underground work shall be performed concurrently to avoid subsequent trenching through the same areas to a reasonable extent.
  - c. Yard electrical work and piping work shall be shown on the same working drawings and fully coordinated horizontally and vertically.

d. Existing systems shall remain fully operational except for pre-planned, scheduled, and organized temporary outages.

3. New slabs or pavement shall not be installed until all piping, cables, conduits, and duct banks under the paved area have been installed. Roads shall be stabilized with crushed stone until that time. Any weak areas in base course or existing pavement shall be removed and replaced prior to the final surface course installation.

4. All connections to existing facilities shall be scheduled through the ENGINEER and the OWNER to minimize the impact on plant operations and construction progress.

C. High Service Pump Building Modifications

1. Demolition/Removal

a. The CONTRACTOR shall refer to the design drawings and Section 02 41 00 of the Contract Documents for demolition details and specific requirements.

b. Power and instrumentation connections shall be maintained at all times in order to allow the plant to remain online, except for short durations (up to 12 hours) that are scheduled in advance with JEA.

2. It is the intent that the WTP stay on-line and operational throughout the construction period, except for short durations (up to 12 hours) scheduled in advance with JEA.

3. All system connections for each pump installation shall be completed during low demand periods and shall be coordinated with JEA WTP plant staff prior to beginning.

D. Electrical

1. All existing ductbanks, instrumentation, and controls and conduits shall

remain in full service during construction. There shall be no demolition work or shutdowns of the electrical system without approval by the ENGINEER and OWNER. The CONTRACTOR shall plan in advance for modifications required in the existing pump building.

2. CONTRACTOR shall coordinate the location of any new conduits and hand dig areas to avoid other utilities in the area. Detailed locations of new underground electrical shall be coordinated by the CONTRACTOR and included in the CONTRACTOR's yard piping working drawings which also show other existing utilities, conduits, ductbanks and yard structures.

E. Final Piping Connections and Pressure Testing

1. Final connections will be required to existing pipes on the site. All connections shall be coordinated with the plant operating staff and scheduled a minimum of five days in advance with the OWNER. The CONTRACTOR shall pressure test all piping prior to making connections. The CONTRACTOR shall coordinate with the OWNER to complete all bacteriological testing on all new facilities.
2. Once the manufacturer has certified the system is ready for operation, the CONTRACTOR shall make all connections to the existing pipes feeding the high service pumps. This will require multiple site visits by the pump manufacturer to witness the installation and testing for their pumps on two (2) separate tie-ins. These connections will require a temporary plant shutdown. The CONTRACTOR shall schedule these connections at least 5 working days prior with the ENGINEER and OWNER. All connections to the existing system will remain in-tact until the system is performance tested and approved for final use.

F. Electrical and High Service Pump Building Testing

1. The CONTRACTOR shall submit a plan for testing operation of the building including all HVAC, pumps, VFDs, MCC, and all controls.
2. The CONTRACTOR shall test the pumps with potable water from the existing reservoir and certify that that the pumps met the operating

conditions outlined in Section 43 21 11.

3. After the connections are made the CONTRACTOR shall operate the system in automatic mode for five consecutive days without any interruption and perform performance testing requirements.

G. Testing

1. All facilities and systems shall be tested as a condition precedent to substantial completion. See Section 01 78 25 and equipment specifications for additional requirements. Start-up plans for the facility and equipment shall be submitted, reviewed, and approved by the ENGINEER.

**1.06 PERMITS**

- A. The CONTRACTOR shall arrange for all required inspections and shall close out all City of Jacksonville permits at the end of the Contract. The CONTRACTOR shall provide the ENGINEER the required documentation to close out the FDEP permit.

**PART 2 PRODUCTS - Not Used**

**PART 3 EXECUTION - Not Used**

**END OF SECTION**



## **SECTION 01 20 00**

### **MEASUREMENT AND PAYMENT - LUMP SUM CONTRACTS**

#### **PART 1 GENERAL**

##### **1.01 Section Includes**

Measurement and payment provisions, schedule of values

##### **1.02 General Measurement and Payment Provisions**

- A. Payment for all work done in compliance with the Contract Documents, inclusive of furnishing all manpower, equipment, materials, and performance of all operations relative to construction of this project, will be made as a lump sum which will be complete payment for all work called for or reasonably inferable from the Contract Documents and other work will be considered incidental to the Contract and no additional compensation will be allowed.
- B. The Owner reserves the right to alter the Drawings, modify incidental work as may be necessary, and increase or decrease the work to be performed to accord with such changes, including deductions or additions to the scope of work outlined in the Contract Documents. Changes in the work shall not be considered as a waiver of any conditions of the Contract nor invalidate any provisions thereof. Changes resulting in changes in the scope or quantities of Work or time or other conditions of work will be basis for consideration of a Change Order which is to be negotiated and executed before proceeding with the work. A supplemental agreement between the Contractor and the Owner will be required when such changes meet the conditions described in the Supplementary Conditions. Work which has not been authorized by a written Change Order will not be subsequently considered for additional payment.
- C. The Contractor shall take no advantage of any apparent error or omission in the Drawings or Specifications, and the Engineer shall be permitted to make corrections and interpretations as may be deemed necessary for fulfillment of the intent of the Contract Documents.
- D. If the Contractor makes a claim for an extra or additional cost and requests a Change Order be issued prior to performing the work, and the ENGINEER and/or OWNER renders a decision denying such request, the CONTRACTOR must notify the Engineer in writing within 3 days of the time that the CONTRACTOR is informed of the Engineer's decision. Otherwise the Owner will not consider any such difference as a claim for a Change Order or additional payment or time. Any, such written notice received by the Engineer from the Contractor within the 3 day period shall be just reason for the Engineer to re-evaluate his previous decision.
- E. Failure on the part of the Contractor to construct any item to plan or authorized dimensions within the specification tolerances shall result in: reconstruction to acceptable tolerances at no additional cost to the Owner; acceptance at no pay; or, acceptance at reduced price, all at the discretion of the Engineer.

- F. Work shall not be considered complete until all testing has been satisfactorily completed and the item of work has demonstrated compliance with plans and specifications.
- G. A preliminary monthly application for payment shall be submitted to the Owner/Engineer for review five (5) days prior to the submittal for approval of the Contractor's monthly payment request.

### **1.03 Payment Method – Schedule of Values**

- A. The Company shall submit to JEA a monthly Application for Payment that details the Work completed during that month. The Company shall request payment in accordance with the amounts/percentages set forth on the Schedule of Values that the Company submitted prior to the start of the Work. The Schedule of Values is defined as an itemized list that establishes the value of each part of the Work for a stipulated price and for major lump sum items in a unit price contract. JEA will determine, either by measurement or approximation, the final quantities incorporated into the Work under items for which Unit Prices are established in the Contract Documents. JEA's determination as to the quantity of the Work successfully completed shall be final.
- B. Refer to Section 01 37 00 for Schedule of Value requirements.

**PART 2 PRODUCTS - Not Used**

**PART 3 EXECUTION - Not Used**

**END OF SECTION**

## **SECTION 01 31 19**

### **PROJECT MEETINGS**

#### **PART 1 GENERAL**

##### **1.01 Description**

###### Work Specified Herein and Elsewhere

A. Work under this Section includes:

1. Preconstruction meeting.
2. Progress meetings.

##### **1.02 Requirements Included**

A. The ENGINEER shall schedule and administer preconstruction meeting, periodic progress meetings, and specially called meetings throughout the progress of the work.

1. Prepare agenda for meetings.
2. Make physical arrangements for meetings.
3. Preside at meetings.

B. Representatives of contractors, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

C. The CONTRACTOR shall attend meeting to ascertain that work is expedited consistent with Contract Documents and construction schedules.

##### **1.03 Preconstruction Meeting**

A. The ENGINEER will schedule a preconstruction meeting prior to beginning the work. This meeting shall be attended by the ENGINEER, the CONTRACTOR, and the OWNER. The purpose of the meeting shall be to review shop drawing procedures, construction methods, and to establish a construction schedule.

B. Location: A central site, convenient for all parties designated by the ENGINEER.

C. Attendance:

1. OWNER's Representative.
2. ENGINEER and his professional consultants.
3. Resident Project Representative.
4. CONTRACTOR's Superintendent.
5. Major Subcontractors.
6. Major Suppliers.
7. Utilities.
8. Others as appropriate.

D. Suggested Agenda:

1. Distribution and discussion of:
  - a. List of major subcontractors and suppliers.
  - b. Projected construction schedules.
2. Critical work sequencing.
3. Major equipment deliveries and priorities.
4. Project Coordination.
5. Designation of responsible personnel.
6. Procedures and processing of:
  - a. Field decisions.
  - b. Proposal requests.
  - c. Submittals.
  - d. Change Orders.
  - e. Applications for payment.
7. Adequacy of distribution of Contract Documents.
8. Procedures for maintaining record documents.
9. Use of Premises:
  - a. Office, work and storage areas.
  - b. OWNER's requirements.
10. Construction facilities, controls and construction aids.
11. Temporary utilities.
12. Housekeeping procedures.
13. Check of required Bond and Insurance certifications.
14. Liquidated Damages.
15. Request for a weekly job meeting for all involved.
16. Introduction of the plant superintendent and discussion of the need for continued levels of wastewater treatment through the construction period, accommodations for plant employees, and partial OWNER occupancy.
17. Equal Opportunity Requirements.
18. Laboratory testing of material requirements.
19. Inventory of material stored on-site provisions.
20. Posting of Government funding sign.

**1.04 Progress Meetings**

- A. Schedule regular periodic meetings. The progress meetings will be held at a frequency determined by JEA.
- B. Hold called meetings as required by progress of the work.
- C. Location of the meetings: Project field office of CONTRACTOR or ENGINEER.
- D. Attendance:
  1. ENGINEER and his professional consultants as needed.
  2. Subcontractors as appropriate to agenda.
  3. Suppliers as appropriate to the agenda.
  4. Others as appropriate.
- E. Suggested Agenda:

1. Review, approval of minutes of previous meeting.
  2. Review of work progress since previous meeting.
  3. Field observations, problems, conflicts.
  4. Problems which impede construction schedule.
  5. Review of off-site fabrication, delivery schedules.
  6. Corrective measures and procedures to regain projected schedule.
  7. Revisions to construction schedule.
  8. Progress, schedule during succeeding work period.
  9. Coordination of schedules.
  10. Review submittal schedules; expedite as required.
  11. Maintenance of quality standards.
  12. Pending changes and substitutions.
  13. Review proposed changes for:
    - a. Effect on construction schedule and on completion date.
    - b. Effect on other contracts of the Project.
    - c. Other business.
  14. Construction schedule.
  15. Critical/long lead times.
- F. The CONTRACTOR is to attend progress meetings and is to study previous meeting minutes and current agenda items, in order to be prepared to discuss pertinent topics such as deliveries of materials and equipment, progress of the work, etc.
- G. The CONTRACTOR is to provide a current submittal log at each progress meeting in accordance with Section 01 33 00.

**END OF SECTION**

## **SECTION 01 32 34**

### **PRECONSTRUCTION VIDEO**

#### **PART 1 GENERAL**

##### **1.01 DESCRIPTION**

- A. Provide all material, equipment, transportation, labor and incidentals to prepare a continuous, color audiovisual recording of the proposed project to serve as a record of pre-construction conditions.
- B. All recordings and written records shall become the property of Owner.
- C. Recordings shall be submitted in DVD format.
- D. Provide video recording no later than 15 days after Notice to Proceed.

##### **1.02 SCHEDULING**

- A. Make recordings within 30 days prior to commencement of construction. No construction shall begin prior to review by the OWNER of the recording covering the construction area.
- B. The OWNER'S shall have the authority to reject all or any portion of a recording not conforming to specifications and order that it be redone at no additional charge. The Contractor shall reschedule unacceptable coverage within five (5) days after being notified.

##### **1.03 PROFESSIONAL SERVICES**

- A. Engage the services of a professional known to be skilled and regularly engaged in the business of constructing color, audio-video documentation. The professional shall be prepared to serve as a consultant or witness for the Owner in any litigation, public hearing or other legal or administrative proceeding involving the project.
- B. Include the names and addresses of two references that the professional has performed color audio-video recording on projects of a similar nature, including one within the last six (6) months.
- C. Furnish to the OWNER a list of all equipment to be used for the recording, i.e., manufacturer's name, model number, specification and other pertinent information.

##### **1.04 SUBMITTALS**

- A. Submit shop drawings in accordance with Division 01 General Requirements, Section 01 33 00, and the General Conditions.
- B. Qualifications and references of the professional.

## **PART 2 PRODUCTS**

### **2.01 GENERAL**

- A. The total recording system and the procedures employed in its use shall be such as to produce a finished product that will be admissible as evidence in a legal or administrative proceeding involving the project. The video portion of the recording shall produce bright, sharp, clear pictures with accurate colors and shall be free from distortion or any other form of picture imperfection. The audio portion of the recording shall clearly produce the commentary of the camera operator and be free of distortion.
- B. All video recordings shall, by electronic means, display on the screen the time of day, the month, day and year of the recording and the horizontal location of the recording in relation to the project stationing (when applicable). This time and date information must be continuously and simultaneously generated with the actual recording.

## **PART 3 EXECUTION**

### **3.01 COVERAGE**

- A. The recordings shall contain coverage of all surface features within the construction zone of influence. These features shall include, but not be limited to, all roadways, pavement, retention ponds, driveways, sidewalks, culverts, headwalls, retaining walls, landscaping, trees, poles, signs, overhead projections and fences. Of particular concern shall be the existence or non-existence of any faults, fractures or defects. Significant detail of any pre-existing damages to physical features and improvements shall be provided.
- B. Panning, zoom-in and zoom-out rates shall be controlled to maintain a clear view of the object. The following features and improvements shall be clear and visible:
  - a. Cracks in wall.
  - b. Condition of fencing.
  - c. Condition of planted areas and type of vegetation.
  - d. Condition of sodded areas.
  - e. Conditions of sprinkler systems and associated controls and wiring.
  - f. Condition of signs.
  - g. Conditions of lighting and associated wires.

### **3.02 AUDIO CONTENT**

- A. Accompanying the video recording of each DVD shall be a corresponding and simultaneously recorded audio recording. This audio recording, exclusively containing the commentary of the camera operator, shall assist in viewer orientation and in the identification, or objective description of the features being shown in the video portion of the recording.
- B. The audio recording shall be free from any conversation between the camera operator and any other production technicians that is not pertinent to the project.

### **3.03 DVD INDEXING**

- A. DVD shall be permanently labeled and shall be properly identified by number and project title.
- B. Each DVD shall have a written log of that DVD's contents. The log shall describe the various segments of coverage contained on that VDV in terms of the names of the streets or easements, coverage beginning and end, directions of coverage, DVD unit counter numbers when possible, and the date of the recording.

### **3.04 CONDITIONS OF RECORDING**

- A. All recording shall be performed during times of good visibility. No recording shall be done during periods of significant precipitation, mist or fog. The recording shall only be done when sufficient sunlight is present to properly illuminate the subjects and to produce sharp, bright recordings of those subjects.

### **3.05 CONTINUITY OF COVERAGE**

- A. The recording shall be a single, continuous, unedited recording which begins at one end of a particular construction area.
- B. However, where coverage is required in areas not accessible by conventional wheeled vehicles and smooth transport of the recording system is not possible, such coverage shall consist of an organized interrelated sequence of recordings at various positions along that proposed construction area, i.e., wooded easement area. Such coverage shall be obtained by walking or by a special conveyance.

### **3.06 COVERAGE RATES**

- A. The average rate of travel during a particular segment of coverage shall be directly proportional to the number, size and significance of the surface features within that construction areas' zone of influence.

### **3.07 CAMERA OPERATION**

- A. 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 camera shall be mounted such that transport of the camera during the recording process will not cause an unsteady picture.
- B. Control camera functional controls, such as camera pan, tilt, zoom-in and zoom-out rates, such that recorded objects shall be clearly viewed during playback. In addition, all other camera and recording system controls, such as lens focus and aperture, video level, pedestal, chroma, white balance and electrical focus shall be controlled or adjusted to maximize picture quality.
- C. Maintain viewer orientation of the physical location of the audio and video portions of the recording. To this end, overall views of all visible house and business addresses shall be utilized.



- D. In areas where the proposed construction location will not be readily apparent to the video viewer, highly visible yellow flags shall be placed, by the Contractor, in such a fashion as to clearly indicate the proposed center line of construction.
- E. The horizontal location of the recording shall be documented by linear measurement, utilizing a "fifth wheel" measuring device, relating the recording to project stationing (when applicable).

### **3.08 TESTS**

- A. Submit the completed recordings to the OWNER for review.
- B. If any recording or parts of any recording are illegible or inaudible, they shall be re-recorded and edited into the sequence prior to commencement of construction.

**END OF SECTION**

## **SECTION 01 33 00**

### **SUBMITTALS**

#### **PART 1 GENERAL REQUIREMENTS**

##### **1.01 Description**

- A. This Section includes but is not limited to requirements for the following:
  - 1. Construction Schedules.
  - 2. Shop Drawings, Product Data, and Samples.
  - 3. Operation and Maintenance Manuals.
  - 4. As-Built/Record Documents.

#### **PART 2 SCHEDULES AND REPORTS**

##### **2.01 Schedule of Operations**

Submit a schedule of operations to the ENGINEER for approval prior to any construction operations. The construction operations shall be sequenced to provide a minimum of interruption to operation of the existing facilities. Inform the ENGINEER of any changes in the schedule and allow ample time for the OWNER to alter operations as required by the construction of the various components of the work. Approval of traffic control and schedules shall be obtained from the governmental entity having jurisdiction over the area of work.

#### **PART 3 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES**

##### **3.01 Shop Drawings**

- A. Shop Drawings are original drawings, prepared by the CONTRACTOR, a subcontractor, or distributor, which illustrate some portion of the work; showing fabrication, layout setting, or erection details.
- B. Shop drawings shall be prepared by a qualified detailer and shall be identified by reference to sheet and detail numbers on the Contract Documents. Reproductions for submittal shall be full size opaque diazo prints or other print acceptable to the ENGINEER. Reduced size prints will not be reviewed or approved.

##### **3.02 Product Data**

- A. Product data are manufacturer's standard schematic drawings and manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data.
- B. Standard drawings shall be modified to delete information which is not applicable to the project and supplemented to provide additional information applicable to the project.

- C. Catalog sheets, brochures, etc., shall be clearly marked to identify pertinent materials, products, or models.
- D. Shop drawings and operation and maintenance manuals shall list pertinent information for all spare parts provided:
  - 1. Manufacturer
  - 2. Model
  - 3. Material
  - 4. Part Number/Serial Number

### **3.03 Samples**

Samples are physical examples to illustrate materials, equipment, or workmanship and to establish standards by which work is to be evaluated.

### **3.04 CONTRACTOR's Responsibilities**

- A. Prior to submission, the CONTRACTOR shall thoroughly check shop drawings, product data, and samples for completeness and for compliance with the Contract Documents and shall verify all dimensions and field conditions and shall coordinate the shop drawings with the requirements for other related work.
- B. The CONTRACTOR's responsibility for errors and omissions in submittals is not relieved by the ENGINEER's review of submittals.
- C. The CONTRACTOR shall notify the ENGINEER, in writing, at the time of submission, of deviations in submittals from the requirements of the Contract Documents and is not relieved by the ENGINEER's review of submittals, unless the ENGINEER gives written acceptance of specific deviations.
- D. Begin no work which requires submittals until return of submittals with ENGINEER stamp and initials or signature indicating the submittal has been reviewed.

### **3.05 Submission Requirements and ENGINEER Review**

- A. Submit four (4) prints of each shop drawing plus additional number of copies that contractor requires. Submit at least four (4) copies of product data. Submit the number of samples indicated in the individual Specifications Section.
- B. Shop drawings, product data, samples and certifications shall be submitted by the CONTRACTOR to the ENGINEER. Submittals should be properly identified with the name of the project, dated, and each lot submitted shall be accompanied by a letter of transmittal referring to the name of the project and to the specification page number and/or Drawing number for identification of each item. Submittals for each type of work shall be numbered consecutively, and the numbering system shall be retained throughout all revisions.
- C. Submittals shall bear the CONTRACTOR's stamp of approval certifying that they

have been checked. Submittals without the CONTRACTOR's initialed or signed certification stamp and submittals which, in the ENGINEER's opinion, are incomplete, contain numerous errors or have not been properly checked, will be returned unchecked by the ENGINEER for resubmission. The CONTRACTOR shall mark his corrections in Green ink and the ENGINEER's comments shall be noted in Red.

- D. The CONTRACTOR shall allow a minimum of 14 days for review of shop drawings. The ENGINEER will review submittals with reasonable promptness. The ENGINEER's review of submittals shall not be construed as a complete check and shall not relieve the CONTRACTOR from responsibility for complete compliance with the Contract requirements. No corrections, changes or deviations indicated on submittals reviewed by the ENGINEER shall be considered as a change order.
- E. If submittal is acceptable, the ENGINEER will return 1 print to the CONTRACTOR. If the submittal is not satisfactory, one set of prints will be retained by the ENGINEER and the remaining prints returned to the CONTRACTOR for appropriate action.
- F. In the event a third submittal of shop drawings is required, due to previous submittals of incomplete or incorrect shop drawings not in accordance with the Drawings and Specifications, the CONTRACTOR will be charged one-half the cost incurred by the ENGINEER for the review of the third submittal. The CONTRACTOR shall bear the total cost incurred by the ENGINEER for all subsequent reviews. The ENGINEER costs charged to the CONTRACTOR will be at the cost plus rate generally charged by the ENGINEER and will be deducted by the OWNER from payments due the CONTRACTOR.
- G. Distribution of copies of acceptable submittals will be as mutually determined by the CONTRACTOR, OWNER and ENGINEER on an individual item basis during or following the preconstruction conference.

## **PART 4 OPERATION AND MAINTENANCE MANUALS**

### **4.01 Submittal Requirements**

- A. The CONTRACTOR shall be responsible for obtaining installation, operation, and maintenance manuals from the manufacturers and suppliers. Submit one (1) electronic pdf copy and four (4) hard copies of manuals (plus additional copies to be returned to the Contractor) to the ENGINEER within 30 days after approval of shop drawings, product data, and samples, and not later than the date of shipment of each item of equipment to the project site. All operation and maintenance manuals shall be submitted prior to the completion of 35% of the construction. These manuals will be retained by the ENGINEER for use in assembling a comprehensive operation and maintenance manual for the OWNER.

- B. Manuals shall be provided for each piece of equipment including individual components and subsystems of complete assemblies. The section of the manual on operation shall describe the function of each component and its relationship to the system of which it is a part. Where several models, options, or styles are described, the manual shall identify the items actually provided.
- C. The manual shall contain the following:
1. Table of contents/index
  2. Specific description of each system and components
  3. Manufacturer's identification, including order number, model, and serial number
  4. Name, address, telephone number(s) and e-mail address(es) of vendor(s) and local service representative(s)
  5. Specific on-site operating instructions (including starting and stopping procedures)
  6. Safety considerations
  7. Project specific operational procedures
  8. Project specific maintenance procedures
  9. MANUFACTURER's operating and maintenance instructions – specific to the project
  10. Copy of each wiring diagram
  11. Copy of CONTRACTOR's approved shop drawings
  12. List of spare parts and recommended quantities
  13. Product Data: Mark each sheet to clearly identify specific products and component parts and data applicable to installation. Delete inapplicable information.
  14. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams
  15. Provide logical sequence of instructions for each procedure, incorporating MANUFACTURER's instructions specified.
  16. Equipment attributes sheet for submittal of name plate data.
  17. Warranties and Bonds.
- D. Each manual shall be bound in a binder and labeled to identify the contents, specification section, and project to which it applies.
- E. Operation and maintenance manuals specified herein are in addition to any operation, maintenance, or installation instructions by the CONTRACTOR to install, test, and start up equipment.
- F. Manuals for Equipment and Systems - In addition to the requirements listed above, for each System, provide the following:
1. Overview of system and description of unit or system and component parts. Identify function, normal operating characteristics and limiting conditions. Include performance curves, with engineering data and tests and complete nomenclature and commercial number of replaceable parts.

2. Panelboard circuit directories including electrical service characteristics, controls and communications and color coded wiring diagrams as installed.
3. Operating procedures: include start-up, break-in and routine normal operating instructions and sequences; regulation, control, stopping, shut-down and emergency instructions; and summer, winter and any special operating instructions.
4. Maintenance Requirements:
  - a. Procedures and guides for trouble-shooting; disassembly, repair, and reassembly instructions
  - b. Alignment, adjusting, balancing and checking instructions
  - c. Servicing and lubrication schedule and list of recommended lubricants
  - d. MANUFACTURER's printed operation and maintenance instructions
  - e. Sequence of operation by instrumentation and controls manufacturer
  - f. Original MANUFACTURER's parts list, illustrations, assembly drawings and diagrams required for maintenance
5. Control diagrams by controls manufacturer as installed (as-built)
6. CONTRACTOR's coordination drawings, with color coded piping diagrams, as installed (as- built)
7. Charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams. Include equipment and instrument tag numbers on diagrams.
8. List of original MANUFACTURER's spare parts and recommended quantities to be maintained in storage
9. Test and balancing reports, as required
10. Additional Requirements as specified in individual product specification
11. Design data for systems engineered by the CONTRACTOR or its Suppliers
12. Equipment attribute Information  
Equipment Attribute Worksheets as presented at the end of this Section shall be provided for all equipment meeting the asset definition as follows:  
Asset Definition
  - Maintenance is recommended

- Assets have a value greater than \$1,000
- Assets are complete and usable, and perform a distinct function independently (i.e., they pump waste, remove solids, etc.)

- a. This asset definition is intended to give a general indication of which equipment must be included in the Equipment Attribute Worksheets. The ENGINEER will provide the specific list of equipment that the CONTRACTOR must provide information for.
- b. The information requirements are shown in detail in the table. The data requirements include nameplate data, manufacturer and supplier information, information specific to the type of equipment, and recommended preventative maintenance activities.
- c. An electronic copy of the Equipment Attribute Worksheets must be delivered in Excel format and submitted to the ENGINEER on CD-ROM and submitted with the O&M manuals. It is not necessary to submit printed copies of the Equipment Attribute Worksheets.

G. Manual for Materials and Finishes – In addition to the requirements listed above, for each material or finish, provide the following:

1. Building Products, Applied Materials and Finishes: Include product data, with catalog number, size, composition and color and texture designations. Provide information for re-ordering custom manufactured products.
2. Instructions for Care and Maintenance: Include MANUFACTURER's recommendations for cleaning agents and methods, precautions against detrimental agents and methods and recommended schedule for cleaning and maintenance.
3. Moisture Protection and Weather Exposed Products: Include product data listing, applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance and repair.

H. Quick Reference Sheets for Equipment

1. For each item of equipment provide the following:
  - a. A minimum of one 8 ½ x 11-inch laminated quick reference sheet. Sheets shall be three hole punched and may be double sided.

- b. Each quick reference sheet shall include the following minimum information:
  - 1) Safety Procedures:
    - a. Brief descriptions of each piece of equipment and components
    - b. Starting and stopping procedures
    - c. Special operating instruction
    - d. Routine maintenance procedures
    - e. Calibration procedures
    - f. Pump curves
    - g. Trouble shooting procedures
    - h. Name, address, and telephone numbers of local service representative
- c. Provide three copies of quick reference sheets for review by the ENGINEER.
- d. After quick reference sheets have been approved, provide four copies of laminated quick reference sheets to the ENGINEER in one commercial coiled three-ring binder with durable and cleanable plastic cover.

## **PART 5 RECORD DOCUMENTS**

### **5.01 General**

- A. Provide and maintain on the jobsite one complete set of prints of all drawings which form a part of the contract. Immediately after each portion of the work is installed, indicate all deviations from the original design shown in the drawings either by additional sketches or ink thereon.
- B. Maintain the field as-built drawings in as great detail (or better) than that shown in the Construction Drawings (i.e., related fittings where called out, show dimensions as frequently shown on drawings, etc.). Refer to Table 01 33 00-1 for Contractor's field responsibilities with regard to maintaining records during construction.
- C. Contractor shall employ a professional land surveyor licensed in the state of Florida to obtain the As-Built survey data required in Table 01 33 00-1.
- D. Upon completion of the work, Contractor shall deliver three (3) full-size sets of approved, certified as-builts to the Engineer plus a CD with an electronic file of the as-built drawings in the latest version of AUTOCAD format. Each completed set of "As-Built" drawings shall include on its face, a certified statement by the Contractor's Professional Land Surveyor that the set of "As-Built" drawings accurately depicts the actual work as constructed. The final As-Builts provided by the Contractor to the Engineer shall provide the level of detail as listed in Table 01 33 00-1 below and in 3.05 E and F.
- E. The as-built documents shall also show limits of road restoration, power pole replacement, driveways, new drain lines, new inlets.



- F. Mark on the Specifications the manufacturer, trade name, catalog, and supplier of each product actually installed, and mark changes made by change order or field order.
- G. At the completion of the Work, deliver the as-built documents to the Engineer, in good condition and free from any extraneous notations.

<b>TABLE 01 33 00 -1: WATER MAIN AS-BUILT INFORMATION</b>			
<b>Water System Feature</b>	<b>Contractor's Field Responsibilities</b> <i>(Provide Red Line marks on field set of the approved plans)</i>	<b>Contractor's Survey Responsibility by a Licensed Surveyor</b> <i>(Survey information to be included in Contractor's ACAD As-Built Drawings)</i>	<b>Contractor's ACAD As-Built Drawing Responsibilities</b> <i>(Include final ACAD deliverable of As-Built Drawings. Clearly identify on the As-Built Drawings (e.g. clouding) all changes from design drawings, which were marked on the field set of drawings.)</i>
Pipes and Fittings	1) Material, class, size, joint type, fittings. 2) Measure distance between fittings (center of tees, crosses, bends). 3) Depth of pipes during installation at every fitting and appurtenance. 4) Limits of pipe restraint. 5) Location and elevation of pipes at utility crossings.	1) Horizontal and vertical location of main (top of pipe): Measurements/ offset ties shall be referenced to permanent surface improvements at the point of connection, all changes in direction or elevation but not to exceed intervals of 50 feet or less along straight runs and at the pipe terminus. 2) Top and bottom of crossings (drainage, sewer, telephone, cable, TV, electric, etc.) for location and verification of pipe separation requirements.	1) Redraw pipe if location differs from approved plans. 2) Draw existing pipe locations on As-Built Drawings 3) Detail any connection to existing utilities and any horizontal and vertical pipe alignment change.
Valves: Gate Valves (GV); Butterfly Valves (BV);	Type and size	1) Horizontal locations of valve: Valve shall be referenced for future recovery from three permanent surface improvements. 2) Vertical locations of valve: Valve shall be measured to the center of the operating nut.	1) Redraw on drawings if location differs from approved plan.  3) Indicate new information on plans.

## Equipment Attribute Sheets

In order to facilitate the creation of asset records and their corresponding preventive maintenance schedules and activities in the Computerized Maintenance Management System (CMMS), information should be completed using the Excel template provided. Examples are provided in the Equipment Attribute Sheets template to help convey how the information should be completed. In addition, each worksheet in the Excel template is described below. The ENGINEER will provide the CONTRACTOR a copy of the Excel spreadsheet for use in distributing to vendors/manufacturers for completion. The spreadsheet will be pre-populated with the list of assets for which information is required and the specific attributes that need to be completed.

### Vendor-Manufacturer Worksheet

Information for the equipment Vendors and Manufacturers should be provided on the Vendor-Manufacturer worksheet. The information that is required is listed below.

<b>Vendor ID / Manufacturer ID</b>	A unique identifier for the Vendor or Manufacturer. If this is unknown enter an abbreviation for the Vendor / Manufacturer name.
<b>Vendor/Manufacturer Name</b>	The name of the Vendor or Manufacturer
<b>Address</b>	Company address
<b>City</b>	
<b>State or Country</b>	
<b>ZIP Code</b>	
<b>Phone</b>	Company phone number
<b>Fax</b>	Company fax number
<b>Contact Name</b>	Best contact person
<b>Contact Phone</b>	Contact information associated with the person identified in the Contact Name field
<b>Contact Fax</b>	
<b>Contact email</b>	

### Local Representative Worksheet

Information for the local representative should be provided on the Local Representative worksheet. The information that is required is listed below.

<b>Company Name</b>	The company name of the Local Representative
<b>Address</b>	Company address
<b>City</b>	
<b>State</b>	
<b>ZIP Code</b>	
<b>Contact Name</b>	Best contact person
<b>Contact Phone</b>	Contact information associated with the person identified in the Contact Name field
<b>Contact Fax</b>	
<b>Contact email</b>	

### Assets Worksheet

The following Asset information should be provided for all equipment. The equipment that should be included will be pre-populated.

<b>Asset ID</b>	Will be pre-populated
<b>Asset Description</b>	Will be pre-populated
<b>Tag Number</b>	Identifier from the P&ID
<b>Model Number</b>	Equipment Model Number
<b>Serial Number</b>	Serial Number that is specific to the piece of equipment
<b>Vendor ID</b>	Identifier for the Vendor associated with the piece of equipment. The Vendor ID should be defined on the Vendor-Manufacturer worksheet.
<b>Manufacturer ID</b>	Identifier for the Manufacturer associated with the piece of equipment. The Manufacturer ID should be defined on the Vendor-Manufacturer worksheet.
<b>Cost</b>	The installed cost of the equipment.
<b>Warranty Duration</b>	The length of the warranty on the equipment
<b>Anticipated Warranty Start Date</b>	The estimated date of substantial completion. Will help define when the warranty will expire.

In addition to the information above, additional asset-specific attributes must be completed. The additional fields that need to be completed will be defined for you on the Assets Worksheet for each different type of asset. See the Equipment Attribute Sheets template for examples.

### Spare Parts Worksheet

Spare parts or kits that are to be used in the performance of recommended preventive maintenance activities should be listed on the Spare Parts worksheet. This will enable JEA to keep an inventory of the items and enable preventive maintenance work orders to reference the spare part requirements.

<b>Spare Part or Kit ID</b>	A unique identifier for the Spare Part of Kit
<b>Spare Part / Kit Description</b>	A useful description to help users of the CMMS and/or maintenance crews identify what is needed to perform the preventive maintenance task.
<b>Vendor/Manufacturer ID</b>	The unique identifier for Vendor or Manufacturer of the item. The identifier should reference the Vendor-Manufacturer worksheet.
<b>Kit Contents</b>	If the item is actually a kit that contains multiple items, the quantity and a brief description of each item in the kit should be listed
<b>Asset ID(s)</b>	The list of Assets that the spare parts are applicable to. The Asset IDs are defined in the Assets worksheet.

## Preventive Maintenance Worksheet

All recommended preventive maintenance (PM) activities for the equipment provided must be compiled on the Preventive Maintenance worksheet. This will facilitate the creation of the necessary preventive maintenance schedules for the equipment in the CMMS. It will also help JEA identify the specific tasks and materials that are involved in completing future PM work orders. The Preventive Maintenance worksheet contains two sections. The general list of preventive maintenance activities and their frequencies should be entered in the Preventive Maintenance Header. The tasks that a maintenance worker would execute as part of each PM should be entered into the Preventive Maintenance Tasks.

### Preventive Maintenance Header

<b>PM ID</b>	Please specify a unique number for each recommended preventive maintenance (PM) activity. The first PM should have an ID of 1, and you should increment from there. The individual tasks that comprise the activity will be listed separately below and will reference this
<b>PM Description</b>	A useful description of the PM activity. It should also contain the frequency that the activity should be performed.
<b>Frequency - Calendar</b>	If the frequency is calendar based (every week, 2 weeks, month, etc) please enter the frequency.
<b>Frequency - Runtime</b>	If the PM should be scheduled based on equipment run-time, please enter the runtime interval at which the PM should be performed.
<b>Applicable Asset ID(s)</b>	In order to create the PM schedules in the CMMS, a list of the applicable Asset IDs are needed. If a PM is applicable to several assets that you are supplying, please list all those Asset IDs and create rows as necessary in Excel.

### Preventive Maintenance Tasks

<b>PM ID</b>	This is the identifier from the Preventive Maintenance Header
<b>Task Number</b>	A numeric identifier for each task listed under a scheduled PM. The first task should be "10" and each successive task should be incremented by 10.
<b>Task Description</b>	A useful description of the task. It is not necessary or desirable for this to be overly detailed. It is meant to be a checklist that a person could use in performing the recommended PM activities. The examples provided are an indicator of the desired level of detail.
<b>Spare Part / Kit ID</b>	If the task likely will require spare parts, the spare parts should be listed here. The ID that should be entered here should come from the Spare Parts worksheet.
<b>Spare Part / Kit Quantify</b>	The quantity of the specified parts that are likely to be necessary to complete the PM task
<b>Special Tools / Equipment Description</b>	If any special or unusual tools or equipment are necessary to perform the maintenance task, a description should be entered here.

**END OF SECTION**

## **SECTION 01 35 43**

### **STORMWATER POLLUTION PREVENTION / NPDES REQUIREMENTS**

#### **PART 1 GENERAL**

##### **1.01 Section Includes**

Stormwater Pollution Prevention Plan requirements and recommendations under the NPDES program for construction projects located in Florida.

##### **1.02 Purpose**

The purpose of this section is to outline minimum requirements for stormwater pollution prevention as required under the NPDES program. There may be more stringent local government or Owner requirements for Erosion and Sediment Control, which would be located in the Specifications or on the Drawings. The more stringent requirement governs.

##### **1.03 Abbreviations**

- A. NPDES - National Pollution Discharge Elimination System
- B. SWPPP - Stormwater Pollution Prevention Plan
- C. NOI - Notice of Intent
- D. NOT - Notice of Termination

##### **1.04 Definitions**

The term "NPDES Generic Permit" means the State of Florida Department of Environmental Protection (FDEP) Generic Permit For Stormwater Discharge from Large and Small Construction Activities.

##### **1.05 Construction Projects Requiring Compliance with NPDES Generic Permit**

- A. All projects 1 or more acres in size that discharge to offsite areas.
- B. Smaller projects that are in the same construction corridor as larger construction projects where the larger project is 1 or more acre in size and is required to comply with the NPDES Generic Permit. In this case, even if the smaller project is less than 1 acre in size, the smaller project must comply with the NPDES Generic Permit.

##### **1.06 General Requirements**

- A. Construction of this project is required to comply with the requirements of the National Pollutant Discharge Elimination System (NPDES) Generic Permit for Stormwater Discharge from Small and Large Construction Activities.

- B. In order to meet NPDES requirements, the Contractor is responsible for preparing a Stormwater Pollution Prevention Plan (SWPPP), implementing, inspecting, maintaining, and reporting on all elements of the SWPPP, completing and submitting the required Notice of Intent (NOI) and Notice of Termination (NOT) forms as the Operator, and paying all associated fees. Copies of the NPDES Generic Permit, NOI, and NOT forms, and permit application fee information are available for download at [dep.state.fl.us/water/stormwater/npdes/](http://dep.state.fl.us/water/stormwater/npdes/)
- C. The Contractor must include in the SWPPP the names and addresses of all subcontractors working on this project who will be involved with the major construction activities that disturb site soil or who implement a pollutant control measure. These subcontractors, in addition to the Contractor, shall comply with the requirements of the NPDES Generic Permit and any local governing agency having jurisdiction concerning erosion and sedimentation control, and shall sign a copy of the certification statement in the SWPPP.
- D. The SWPPP shall describe and ensure the implementation of best management practices which will be used to reduce the pollutants in stormwater discharge associated with construction activity and to assure compliance with the terms and conditions of the NPDES Generic Permit. The erosion and sediment control measures shown on these Drawings are the minimum required and are to be installed prior to construction. The Contractor is responsible for complying with all applicable rules, regulations and water quality standards and may need to install additional controls to meet these requirements.

#### **1.07 SWPPP Implementation and Submittal Requirements**

- A. The SWPPP shall be completed prior to submittal of the NOI and shall include the elements necessary to comply with the NPDES Generic Permit for construction activities administered by the FDEP and shall also include all local governing agency and Owner requirements. There may be more stringent local government or Owner requirements for Erosion and Sediment Control, which would be located in the Specifications or elsewhere on these Drawings.
- B. The Contractor must file the NOI with FDEP and the Owner at least two (2) business days prior to the start of construction. The Contractor shall also submit a copy of the NOI to the MS4 operator for all projects that discharge stormwater associated with construction activity to a municipal separate stormwater system (MS4). A copy of the NOI and a description of the project must be posted in a prominent place for public viewing at the construction site.
- C. The SWPPP must be implemented at the start of construction. A complete copy of the SWPPP, including copies of all inspection reports, plan revisions, etc., must be retained at the project site at all times during working hours and kept in the permanent project records for at least three years following submission of the NOT.
- D. Final Stabilization means that all soil disturbing activities at the site have been completed, and that a uniform perennial vegetative cover (evenly distributed, without large bare areas) with a density of at least 70% for all unpaved areas and areas not covered by permanent structures has been established or equivalent

permanent stabilization measures (such as geotextiles) have been employed. Once construction is completed and final stabilization has been achieved, the Contractor must file the NOT to FDEP, the Owner, and the MS4 operator within 14 days.

#### **1.08 Inspections**

- A. It is the responsibility of the Contractor to assure the adequacy of site pollutant discharge controls. Between the time the SWPPP is implemented and final site stabilization is achieved, all disturbed areas and pollutant controls must be inspected at least once every seven calendar days and within 24 hours following a rainfall of 0.5 inches or greater. The inspections are to be conducted by the Contractor's qualified designated representative.
- B. All inspections shall be documented in an inspection report that summarizes the scope of the inspection, the names and qualifications of personnel making the inspection; the date of the inspection; rainfall data; major observations relating to the implementation of the SWPPP, and actions taken in order to ensure compliance with NPDES requirements and the SWPPP. Such reports shall identify any incidents of non-compliance and actions taken to bring the project into compliance. Where a report does not identify any incidents of non-compliance, the report shall contain a certification that the facility is in compliance with the NPDES requirements and the SWPPP. Each inspection report shall be signed and certified by each inspector.

#### **1.09 Updating and Modifying the SWPPP**

- A. Based on inspection results, any modifications necessary to increase effectiveness of the SWPPP to an acceptable level must be made within seven calendar days of the inspection.
- B. The SWPPP must be updated each time there are significant modifications to the pollutant prevention system or a change of contractors working on the project who disturbs site soil. For construction activities where the operator changes, the new operator shall file an NOI for coverage under this permit at least two (2) days before assuming control of the project and the previous operator shall file an NOT to terminate permit coverage in accordance with the NPDES Generic Permit. Amendments to the plan shall be prepared, signed, dated, and kept as attachments to the original SWPPP.

#### **1.10 Minimum SWPPP Provisions**

- A. Each SWPPP shall provide a description of pollutant sources and other information including a description of the nature of the construction activity; the intended sequence of major activities which disturb soils for major portions of the site; estimates of the total area of the site and the total area of the site that is expected to be disturbed by excavation, grading, or other construction activities; existing data describing the soil or the quality of any discharge from the site and an estimate of the size of the drainage area for each discharge point; a site map indicating drainage patterns and approximate slopes anticipated after major grading activities, areas of soil disturbance, an outline of areas which may not be

disturbed, the location of major structural and nonstructural controls identified in the plan, the location of areas where stabilization practices are expected to occur, surface waters, wetlands, and locations where stormwater is discharged to a surface water or MS4; and the latitude and longitude of each discharge point and the name of the receiving water(s) for each discharge point.

#### **1.11 Minimum Erosion and Sediment Control Construction Requirements**

- A. Stabilize all construction site exits with coarse aggregate or other approved materials, in accordance with details on the Drawings. Other minimum construction requirements that need to be implemented in order to comply with the NPDES Generic permit include installation of sediment barriers down slope from construction activities that disturb site soil; constructing rock surface temporary parking areas; installation of sediment barriers down slope prior to clearing and grubbing; installation of sediment barriers on the down slope side of utility construction and soil stockpiles; and the installation of sediment barriers on the down slope side of grading activities.
- B. Stabilization measures shall be initiated as soon as practicable, but in no case more than 7 days, in portions of the site where construction activities have temporarily or permanently ceased.
- C. The Owner has the authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, trenching, borrow and embankment operations. The Owner also has authority to direct Contractor to provide immediate permanent or temporary erosion and sediment control measures.
- D. The Contractor shall respond to erosion and sediment control maintenance requirements or implement additional measures to control erosion ordered by Owner or governing authorities within 48 hours or sooner if required at no additional cost to the Owner.
- E. The Contractor shall incorporate permanent erosion control features into project at earliest practical time to minimize need for temporary controls.
- F. For drainage basins with 10 or more disturbed acres at one time, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage per acre drained, or equivalent control measures, shall be provided where attainable until final stabilization of the site. The 3,600 cubic feet of storage area per acre drained does not apply to flows from offsite areas and flows from onsite areas that are either undisturbed or have undergone final stabilization where such flows are diverted around both the disturbed area and the sediment basin. For drainage basins with 10 or more disturbed acres at one time and where a temporary sediment basin providing 3,600 cubic feet of storage per acre drained, or equivalent controls is not attainable, a combination of smaller sediment basins and/or sediment traps and other BMPs should be used. At a minimum, silt fences, or equivalent sediment controls are required for all sideslope and downslope boundaries of the construction area.



- G. Water trucks shall be used as needed during construction to reduce dust generated on the site. Dust control must be provided by the Contractor and shall be in compliance with applicable local and state dust control regulations.

## **1.12 Maintenance Requirements**

- A. Maintain all erosion and sediment control measures throughout construction. Repair or replace all damaged sediment barriers. Remove accumulated sediment along all silt fences where the height of the sediment exceeds one-third of the height of the silt fence. Inspect all temporary and permanent grassing areas and re-grass where there are bare spots, washouts, or unhealthy growth.
- B. At the completion of construction, once final stabilization has been achieved, clean all accumulated sediment from all storm structures, pipelines, and stormwater ponds. Remove all temporary sediment controls upon receipt of authorization to remove has been received from the Owner or Engineer. Note that this may not occur for some time after construction activities have been completed, in order to ensure their removal has not occurred until final stabilization has been achieved to the satisfaction of the Owner and Engineer.

## **1.13 Stormwater Discharge Provisions**

- A. Non-stormwater components of site discharge must be clean water. Water used for construction, which discharges from the site, must originate from a public water supply or private well approved by the governing local agency. Water used for construction that does not originate from an approved public supply must not discharge from the site. Allowable non-stormwater discharges include discharges from firefighting activities; Fire hydrant flushing; Water used to wash vehicles or control dust; Water flowing from potable sources and water line flushing; Irrigation drainage; and runoff from pavement wash down where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents have not been used, and noncontaminated ground water associated with dewatering activities.
- B. Solid materials, including building materials, are not allowed to be discharged from the site with stormwater. All solid waste, including disposable materials incidental to the major construction activities, must be collected and placed in containers. The containers shall be emptied periodically by a contract trash disposal service and hauled away from the site.
- C. Substances that have the potential for polluting surface and/or groundwater must be controlled by whatever means necessary in order to ensure that they do not discharge from the site. As an example, special care must be exercised during equipment fueling and servicing operations. If a spill occurs, it must be contained and disposed so that it will not flow from the site or enter groundwater, even if this requires removal, treatment, and disposal of soil in accordance with local and state regulations.
- D. All personnel involved with construction activities must comply with state and local sanitary or septic system regulations. Temporary sanitary facilities shall be

provided at the site throughout the construction phase for use by all construction personnel and shall be serviced by a commercial operator at least once a week.

- E. Discharges resulting from groundwater dewatering activities at construction sites are permitted provided the groundwater is free of sediments, is not contaminated, and dewatering occurs in accordance with state and local governing agency regulations.
- F. Chemicals, paints, solvents, fertilizers, and other toxic material must be stored in waterproof containers. Except during application, the contents must be kept in trucks or within storage facilities. Runoff containing such material must be collected, removed from the site, treated, and disposed at an approved solid waste or chemical disposal facility.
- G. The discharge of hazardous substances or oil in the stormwater discharge(s) from a facility or activity shall be prevented. This does not relieve the operator of the reporting requirements of 40 CFR part 117 and 40 CFR part 302. The operator shall submit within 14 calendar days of knowledge of the release a written description of: the release (including the type and estimate of the amount of material released), the date that such release occurred, the circumstances leading to the release, and remedial steps to be taken. The SWPPP must be modified within 14 calendar days of knowledge of the release to: provide a description of the release, the circumstances leading to the release, and the date of the release. In addition, the plan must be reviewed to identify measures to prevent the reoccurrence of such releases and to respond to such releases, and the plan must be modified where appropriate.

**END OF SECTION**

## **SECTION 01 37 00**

### **SCHEDULE OF VALUES**

#### **PART 1 GENERAL**

##### **1.01 PRELIMINARY SCHEDULE OF VALUES**

The apparent low bidder will prepare a preliminary schedule of values within the time frame referenced in the instructions to bidders. Each item in the schedule includes the complete structure; piping and valves (including pipe in the yard within 5 feet of the structure); equipment and local control panels furnished by equipment manufacturers. All electrical work will be included in the electrical item unless noted otherwise. All field instruments will be included in the instrumentation item. The preliminary schedule of values will include, but not limited to, the lump sums for the following items:

1. Mobilization
2. Demolition: This item includes all work related to demolition, removal, and abandonment of existing equipment, structures, piping and valves. Major items include the demolition of HSPs (including electrical components).
3. High Service Pumping: This items includes all work related to the installation of the new high service pumps, VFDs for the new pumps, concrete equipment pads, and associated piping, valves, and appurtenances.
4. Piping: This items includes all piping, valves and other in-ground facilities and above ground piping facilities not specifically included with any of the other items included in the schedule.
5. Structural: This item includes all concrete repair work, new pipe trench construction, new grating for existing pipe trench, new grating for new pipe trench, new pipe supports, new valve vault, and other miscellaneous structural items.
6. Site Work: This item includes demolition, mobilization, demobilization, concrete, asphalt, road base, start-up, asset management, grading, and site restoration.
7. Asset Management: This item includes contractor submission of completed Asset Management tables in accordance with JEA requirements.
8. Start-up: This item includes all testing and start up services.
9. O&M Manuals: This item includes submission of O&M Manuals, in compliance with the this technical specifications manual.

10. Contractor Redlines: This item includes submission of redlines to the construction documents highlighting any that has changed.

11. Demobilization

**B. Bid Breakdown**

1. Submit to the OWNER'S REPRESENTATIVE a breakdown of all lump-sum bid items into the major and minor portions of work and include material and equipment costs. The breakdown shall be by Process area and specification division within each Process area. The breakdown shall be done in accordance with a form established by the Contractor and acceptable to the Owner.

2. This breakdown shall be the basis of all progress payments. Fill in amounts or quantities where unit quantities are shown, i.e., L.F., C.Y., S.F. The Contractor may submit an alternate form, providing it is at least as detailed as the enclosed form.

3. Form:

Activity No.	PROCESS NO.	SPEC DIV	DESCRIPTION	CONTRACT			THIS MONTH		TO DATE	
				QTY	NIT PRICE	TOTAL COST OF ITEM	QTY	AMOUNT THIS MONTH	QTY	TOTAL COST OF ITEM

**1.02 FORM & CONTENT OF SCHEDULE OF ASSET VALUES**

A. The Table 01 37 00-1 includes the assets to be accounted for in the Schedule of Asset Values.

B. For each asset listed, provide a constructed cost which will include an allocation of construction activities including, but not limited to, demolition, sitework, specialties, materials, labor, general conditions, and overhead and profit associated with the construction of the asset.

C. The combined value of the assets will equal the bid price for the project, and will require adjustments as necessary due to change orders. The schedule of asset values will be updated on a monthly basis and will be included in the monthly pay request application for approval.

D. The OWNER reserves the right to edit this list prior to the first pay request application, and may add up to 10 percent more items than have been identified on the attached list.

Table 01370-1 Schedule of Assets	
<b>High Service Pumps</b>	
HSP No. 3 and Motor	
MCC No. 3	
VFD No. 3	
12" Suction Pipe Assembly, 12" Gate Valve	
12" Discharge Pipe Assembly, 12" Gate Valve, and 12" Check Valve with Limit Switch	
Pump No. 3 Pressure Indicators/Transmitters (Suction and Discharge)	
HSP No. 4 and Motor	
MCC No. 4	
VFD No. 4	
12" Suction Pipe Assembly, 12" Gate Valve	
12" Discharge Pipe Assembly, 12" Gate Valve, and 12" Check Valve with Limit Switch	
Pump No. 4 Pressure Indicators/Transmitters (Suction and Discharge)	
HSP No. 5 and Motor	
MCC No. 5	
VFD No. 5	
12" Suction Pipe Assembly, 12" Gate Valve	
12" Discharge Pipe Assembly, 12" Gate Valve, and 12" Check Valve with Limit Switch	
Pump No. 5 Pressure Indicators/Transmitters (Suction and Discharge)	
HSP No. 6 and Motor	
MCC No. 6	
VFD No.6	
12" Suction Pipe Assembly, 12" Gate Valve	
12" Discharge Pipe Assembly, 12" Gate Valve, and 12" Check Valve with Limit Switch	
Pump No. 6 Pressure Indicators/Transmitters (Suction and Discharge)	
Combined discharge pressure indicator/transmitter (discharge)	
<b>NaOCI</b>	
Injection Quill No. 1	
Injection Quill No. 2	
Precast Concrete Chemical Injection Vault with Aluminum Hatch	
Chlorine Analyzer	
<b>Piping and Valves</b>	
30" FW-1 suction piping	
12" FW-1 suction piping	
12" Gate Valve (12V-3A)	
12" Gate Valve (12V-3C)	
12" Gate Valve (12V-4A)	
12" Gate Valve (12V-4C)	

12" Gate Valve (12V-5A)
12" Gate Valve (12V-5C)
12" Gate Valve (12V-6A)
12" Gate Valve (12V-6C)
12" Check Valve (12V-3B)
12" Check Valve (12V-4B)
12" Check Valve (12V-5B)
12" Check Valve (12V-6B)
20" Butterfully Valve (20V-7)
20" Butterfully Valve (20V-8)
12" FW-1 Discharge Piping
20" FW-1 Discharge Piping

**END OF SECTION**

## **SECTION 01 41 26**

### **PERMITS AND FEES**

#### **1.0 GENERAL**

1. Obtain and pay for all permits and licenses as provided for in the General Conditions, except as otherwise provided herein.
2. Schedule all inspections and obtain all written approvals of the agencies required by the permits and licenses.
3. Comply with all conditions specified in each of the permits and licenses.
4. A copy of the permits obtained by the Owner will be furnished to the Contractor.

#### **2.0 PERMITS BY OWNER**

The Owner will apply for the following permits:

1. Apply and pay for - Florida Department of Environmental Protection (FDEP) Application for a Specific Permit to Construct PWS Components
2. Apply for - City of Jacksonville Building Permit

#### **3.0 PERMITS BY CONTRACTOR**

1. The Contractor will be required to obtain the final building permit from the City, pay the remaining permit fee and schedule and obtain final approval from the City inspectors. The Contractor will be responsible for City of Jacksonville subcontractor permits.
2. City of Jacksonville Site Work Permit/Horizontal Construction Permit

**END OF SECTION**

## **SECTION 01 45 00**

### **TESTING LABORATORY SERVICES**

#### **PART 1 - GENERAL**

##### **1.01 REQUIREMENTS**

- A. The Contractor will contract with, provide and pay for the services of an independent testing laboratory to perform certain specific testing as required by the Contract Documents, specified in the Specifications; or as specified here-in. This testing will include:

1. Field Density Tests, Concrete Test Cylinders, Grout Prisms, Mortar Cubes, Limerock Bearing Ratios, Grain Size Analysis, and Moisture-Density Relationships (Proctor).

This testing does not include tests required to prove satisfactory operation of equipment or materials, pressure leakage and infiltration/exfiltration tests, bacteriological tests, or any tests specified to be made by the Contractor. Testing of pipe material and pipe, proof of design tests, pressure tests and bacteriological testing are specified in other sections of the Specifications and are the responsibility of the Contractor. Any and all tests which have to be repeated because of the failure of the tested material to meet Specifications shall be paid for by the Contractor and the costs of any such retests shall be deducted from payments due the Contractor. JEA will be responsible for taking and analyzing water samples for bacteriological clearance. The Contractor shall be responsible for cleaning and chlorinating all components and providing a means for JEA to take water samples as required.

The results of all the testing reports shall be copied to the Contractor and the Owner.

##### **1.02 LABORATORY DUTIES: LIMITATIONS OF OWNER**

- A. The laboratory is not authorized to:
1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
  2. Approve or accept any portion of the work.

##### **1.03 CONTRACTOR'S RESPONSIBILITY**

- A. The Contractor shall:
1. Cooperate with laboratory personnel, and provide access to the Project.
  2. Secure and deliver to the laboratory adequate quantities of samples of materials that are representative of the whole of the material proposed to be used and which require testing.



3. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other materials mixes that require control by the testing laboratory.
4. Furnish incidental labor and facilities:
  - a. To provide access to Project to be tested.
  - b. To obtain and handle samples at the Project site or at the source of the product to be tested.
  - c. To facilitate inspections and tests.
  - d. For storage and curing of test samples.
- B. The Contractor shall notify in writing the Owner and the Testing Laboratory in advance of operations to allow for laboratory assignment of personnel and scheduling of tests. When tests or inspection cannot be performed after such notice, the Contractor shall reimburse the Owner for laboratory personnel and travel expenses incurred due to Contractor's failure to adequately provide such notice.
- C. The Contractor shall employ and pay for the services of the same or a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing required for the Contractor's convenience.
- D. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) to specifically be inspected, tested or approved, CONTRACTOR shall assume full responsibility therefore, pay all costs in connection therewith and furnish ENGINEER the required certificates of inspection, testing or approval.
- E. CONTRACTOR shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with OWNER's or ENGINEER's acceptance of a Supplier of materials or equipment proposed to be incorporated in the Work, or of materials or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work.
- F. All inspections, tests or approvals other than those required by Laws or Regulations of any public body having jurisdiction shall be performed by organizations acceptable to OWNER and CONTRACTOR.
- G. If any Work (including the work of others) that is to be inspected, tested or approved is covered without written concurrence of Owner's Representative, it must, if requested by ENGINEER, be uncovered for observation. Such uncovering shall be at CONTRACTOR's expense unless CONTRACTOR has given Owner's Representative timely notice of CONTRACTOR's intention to cover the same and Owner's Representative has not acted with reasonable promptness in response to such notice.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

**END OF SECTION**

## **SECTION 01 45 10**

### **QUALITY CONTROL**

#### **PART 1 GENERAL**

##### **1.01 Section Includes**

Quality control, quality assurance

##### **1.02 Quality Control**

- A. It is the Contractor's responsibility to perform all work to a degree and in a manner that satisfies and complies with the Project requirements. In order to fulfill this responsibility, the Contractor is required to have an approved Quality Control Program, including testing, as part of his Contract work in accordance with the Contract Documents and to submit details of his Program to the Engineer for review and approval prior to commencing any construction operations. The submittal shall include detailed information on locations and number of all tests, etc., that will be necessary for the Contractor to make his own determination that the work is being performed in compliance with the Project requirements.
- B. As part of the Contractor's Quality Control Program included as part of his work, the Contractor shall employ and pay for an independent, approved soils testing laboratory to perform testing services outlined in these Contract Documents.
- C. The Contractor's Quality Control Program shall include, but not be limited to, the following in addition to the type and frequency of tests as required by the technical specifications:
  - 1. Piping and structural excavation, bedding and backfill materials and density quality control testing.
  - 2. Determination of compactive effort needed for compliance with the density requirements.
  - 3. Portland cement concrete and asphalt paving quality control testing including design mix review, materials, field slump and air content, and field and lab cured strength samples and testing.
- D. In addition to Quality Control Testing, the Contractor shall be responsible for required testing or approvals for any work (or any part thereof) if laws or regulations of any public body having jurisdiction specifically require testing, inspections or approval. The Contractor shall pay all costs in connection therewith and shall furnish the Engineer the required certificates of inspection, testing or approval. The Contractor shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with Owner or Engineer acceptance of a supplier of materials or equipment proposed to be incorporated into the work.

- E. Any design or testing laboratory utilized by the CONTRACTOR shall be an independent laboratory acceptable to the OWNER and the ENGINEER, approved in writing, and complying with the latest edition of the "Recommended Requirements for Independent Laboratory Qualification", published by the American Council of Independent Laboratories.
- F. Testing laboratories, whether provided by the OWNER or the CONTRACTOR, shall promptly notify the ENGINEER and the CONTRACTOR of irregularities or deficiencies of work, which are observed during performance of services. Laboratories shall submit two (2) copies of all reports directly to the ENGINEER and two (2) copies to the CONTRACTOR.

### **1.03 Quality Assurance**

- A. In addition to the services provided by the laboratory paid for by the Contractor as a part of his work, the Owner, at his sole discretion, may employ an additional independent soils laboratory as part of Owner's Quality Assurance Program to verify that the work meets the requirements of the Contract Documents. The Owner furnished Quality Assurance testing may include the type and frequency of tests as required by the technical specifications. The Owner reserves the right to have additional tests made beyond those specified in the Contract Documents. The Contractor shall cooperate with the Owner and make the work and samples available for Owner testing at no additional cost in case the Owner chooses to have additional Owner furnished testing performed. It is the sole responsibility of the Contractor to see that his work meets all provisions of the Contract Documents.
- B. The CONTRACTOR shall cooperate with the soils laboratory personnel and provide access to the work to be tested. The CONTRACTOR shall notify the Engineer and Owner's testing laboratory sufficiently in advance of operations to allow scheduling of tests. The CONTRACTOR shall furnish casual labor and facilities to obtain and handle samples at the site and to store and cure test samples as required.

### **1.04 Testing of Materials**

- A. Unless otherwise specified, all materials shall be sampled and tested in accordance with the latest published standard methods of ASTM in effect at the time bids are received. If no ASTM Standards apply, applicable standard methods of the Federal Government or of other recognized agencies shall be used.
- B. Test of materials shall be made by a representative of the Contractor, unless otherwise provided. Testing of equipment shall be the responsibility of the CONTRACTOR or an authorized manufacturer's representative. All test results shall be furnished to the ENGINEER in writing. The CONTRACTOR shall provide facilities required to collect and forward samples. The CONTRACTOR shall furnish the required samples without charge.

- C. The CONTRACTOR shall not make use of or incorporate in the work, the materials represented by the sample until tests have been made and the material found to be in accordance with the requirements of the Specifications.
- D. Materials to be tested and the applicable test procedure shall be as outlined in the individual sections of these Specifications.

#### **1.05 Source and Quality of Materials and Equipment**

- A. The source of materials to be used shall be in accordance with the Contract Documents and as approved by the ENGINEER before delivery. The approval of the source of any material shall continue as long as the material conforms to the Specifications.
- B. All material not conforming to the requirements of the Specifications shall be considered as defective and shall be removed from the work. If in place, faulty materials shall be removed by the CONTRACTOR at his expense and replaced with acceptable material unless permitted otherwise by the OWNER. No defective materials which have been subsequently corrected shall be reused until approval has been given.
- C. Upon failure of the CONTRACTOR to comply immediately with any order of the ENGINEER to remove and replace defective material, the OWNER shall have authority to remove and replace defective materials, and to deduct the cost of removal and replacement from any monies due or to become due to the CONTRACTOR. Failure to reject any defective materials or work at the time of installation shall in no way prevent later rejection when such defects are discovered, nor obligate the OWNER to final acceptance.

#### **1.06 Additional Testing**

In addition to soils laboratory and materials testing, the Contractor shall perform other testing called for in the Contract Documents including but not limited to piping, pressure, leakage, infiltration and exfiltration, as appropriate. Bacteriological samples will be taken and tested by JEA, however the Contractor is required to clean and chlorinate and provide sample points.

#### **PART 2 PRODUCTS - Not Used**

#### **PART 3 EXECUTION - Not Used**

**END OF SECTION**

## **SECTION 01 51 00**

### **CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

#### **PART 1 GENERAL**

##### **1.01 Section Includes**

Construction facilities, controls, temporary utilities, project identification signs, field office and storage sheds, storage of materials and equipment

##### **1.02 Construction Facilities and Temporary Controls**

###### **A. Responsibility**

All construction facilities and temporary controls remain the property of the CONTRACTOR establishing them and shall be maintained in a safe and useful condition until removed from the construction site.

###### **B. Temporary Electric Service: CONTRACTOR shall coordinate with the OWNER and site operator for temporary service.**

###### **C. Temporary Heating (NOT USED)**

###### **D. Temporary Ventilation (NOT USED)**

###### **E. Temporary Telephone**

1. The CONTRACTOR shall provide the site superintendent with a mobile phone or radio so that he can be reached at all times.

###### **F. Temporary Water**

1. There is potable water facilities in the immediate area of proposed construction and the Contractor will coordinate with JEA to obtain a meter for any potable water needs during the project.
2. As may be necessary, the Contractor shall provide a water truck for all necessary water during construction.

###### **G. Temporary Sanitary Facilities**

Provide temporary toilet facilities as required. Maintain these during the entire period of construction under this Contract for the use of all construction personnel on the job. Enough chemical toilets shall be provided to conveniently serve the needs of all personnel. Chemical toilets and their maintenance shall meet the requirements of State and local health regulations and ordinances.

###### **H. Temporary Pumping and Site Drainage**

The CONTRACTOR shall keep the site free from water at all times to permit continuous access and to prevent damage to the work.

I. Material Hoists and Cranes

1. Provide material hoists required for normal use by all trades and employ skilled hoist operators. Provide all necessary guards, signals, safety devices, etc., required for safe hoist operation. The construction and operation of material hoists shall be in accordance with the applicable ANSI Standards, the "Manual Code of Accident Prevention in Construction" of the Associated General Contractors of America, OSHA, and of other Federal, State, and municipal codes or ordinances. The CONTRACTOR shall prohibit the use of hoists for transporting personnel. Hoists shall be located to avoid risk of damage to completed work.
2. Special rigging and hoisting facilities shall be provided by each trade requiring their use.

J. Temporary Runways, Scaffolding, and Ladders (NOT USED)

K. Temporary Chutes (NOT USED)

L. Security

Full time watchmen will not be specifically required as a part of the Contract, but the CONTRACTOR shall provide inspection of work area daily and shall take whatever measures are necessary to protect the safety of the public, workmen, and materials, and provide for the security of the site, both day and night.

M. Access Roads and Parking Areas

The CONTRACTOR shall maintain access to the plant and all facilities during construction.

N. Dust and Mud Control

Take all necessary precautions to control dust and mud associated with the work of this Contract, subject to the approval of the ENGINEER. In dry weather, spray dusty areas daily with water or weekly with oil in order to control dust. Take necessary steps to prevent the tracking of mud onto adjacent streets and highways.

O. Traffic Regulation (NOT USED)

P. Project Identification Signs

1. As soon as practicable after award of contract, furnish and erect two signs for the project, placed at locations determined by OWNER. Signs shall be erected when the work is started and shall be suitably supported, braced, and maintained, and shall be removed upon completion of the project or when directed by the OWNER.

2. The signs shall be identical and shall state the title of the project and the names of the OWNER, ENGINEER and the CONTRACTOR. Submit to the OWNER for approval the proposed sign lettering (fonts, size) and text prior to fabricating the signs.
3. The sign shall be 1" exterior grade plywood. All surfaces shall be painted with three coats of white exterior grade paint and neatly painted black letters.
4. No other signs will be permitted.

Q. CONTRACTOR's Field Office and Storage Sheds (NOT USED)

R. OWNER / ENGINEER Field Office (NOT USED)

S. Removal of Temporary Construction

Remove the various temporary facilities, services, and controls and legally dispose of them as soon as the ENGINEER deems permissible. Portions of the site used for temporary facilities shall be properly reconditioned and restored to a condition acceptable to the ENGINEER.

### **1.03 Materials and Equipment**

A. Transportation and Handling

1. Manufactured materials and products shall be delivered to the project site as needed for installation, undamaged, in original packages, containers, or bundles, as packaged by the manufacturer with manufacturer's name, brand, seals, and labels intact.
2. Materials other than those designated within the Specifications or approved by the ENGINEER shall not be delivered to the project site.

B. Storage and Protection

The CONTRACTOR shall be responsible for protection and preservation of all materials until final acceptance of the Project. Any damage to work prior to acceptance shall be remedied by the CONTRACTOR at no additional cost to the OWNER.

C. Protection of Completed Work

Provide temporary weather-tight enclosures to protect work from damage by the elements, and protect finished surfaces to prevent any damage resulting from the work of any trade.

### **1.04 Submittals**

- A. Prior to installation of construction facilities and temporary controls, submit the following items for review and approval:
  - 1. Project identification sign - provide proposed text, layout, and sizing of all required signs.

**PART 2 PRODUCTS - Not Used**

**PART 3 EXECUTION - Not Used**

**END OF SECTION**



## **SECTION 01 74 23**

### **CLEANING UP**

#### **PART 1 GENERAL**

##### **1.01 SUMMARY**

- A. Execute cleaning during progress of Work and at completion of Work.
- B. Refer to specification sections for specific cleaning for Products or Work.

##### **1.02 DISPOSAL REQUIREMENTS**

- A. Conduct cleaning and disposal operations to comply with local codes, ordinances, regulations, and anti-pollution laws. Do not burn or bury rubbish or waste materials on Project site. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains. Do not dispose of wastes into streams or waterways.

#### **PART 2 PRODUCTS**

##### **2.01 MATERIALS**

- A. Use only those cleaning materials which will not create hazards to property and persons or damage surfaces of material to be cleaned.
- B. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

#### **PART 3 EXECUTION**

##### **3.01 CLEANING DURING CONSTRUCTION**

- A. At all times maintain areas covered by the contract and adjacent properties and public access roads free from accumulations of waste, debris, and rubbish caused by construction operations.

- B. During execution of work, clean site, adjacent properties, and public access roads and dispose of waste materials, debris, and rubbish to assure that buildings, grounds, and public properties are maintained free from accumulations of waste materials and rubbish. Unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.
- C. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
- D. Cover or wet excavated material leaving and arriving at the site to prevent blowing dust. Clean the public access roads to the site of any material falling from the haul trucks.
- E. Where material or debris has washed or flowed into or been placed in existing watercourses, ditches, gutters, drains, pipes structures, work done under this contract, or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the work, and the ditches, channels, drains, pipes, structures, and work, etc., shall, upon completion of the work, be left in a clean and neat condition.
- F. On or before the completion of the work, the Contractor shall, unless otherwise especially directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools, and machinery or other construction equipment furnished by him; shall remove, acceptably disinfect, and cover all organic matter and material containing organic matter in, under, and around privies, houses, and other buildings used by him; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.
- G. Provide on-site containers for collection and removal of waste materials, debris, and rubbish in accordance with applicable regulations.

### **3.02 FINAL CLEANING**

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - g. Sweep concrete floors broom clean in unoccupied spaces.
    - h. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - i. Remove labels that are not permanent.

- j. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - k. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - l. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - m. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
  - n. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
  - o. Leave Project clean and ready for occupancy.
- C. Electrical Contractor shall touch-up paint or repaint damaged finishes on electrical items delivered to Project with finish coat of paint. Owner will make final determination of items to be repainted or touched-up.
- D. Prior to substantial completion or Owner occupancy, Contractor with Owner's Representative and Owner, shall conduct inspection of sight-exposed interior and exterior surfaces and work areas to verify Work and site is clean.

**END OF SECTION**

**SECTION 01 78 00**  
**CONTRACT CLOSEOUT**

**PART 1 GENERAL**

**1.01. Section Includes**

Substantial completion requirements, clean-up, final completion requirements, closeout submittals

**1.02. Clean-Up Operations**

- A. The entire project site shall be thoroughly cleaned at the completion of the work.
- B. The CONTRACTOR shall be responsible for the removal of excess dust and mud created by the construction project from all sidewalks, streets, and highways as directed by the OWNER. Equipment to clean these surfaces shall be subject to approval by the OWNER.

**1.03. Substantial Completion Requirements**

- A. Complete the following before requesting the inspection for certification of substantial completion.
  - 1. Submit as-built drawings.
  - 2. Deliver tools, spare parts, extra stocks of material and similar physical items to the Owner.
  - 3. Complete required cleaning and testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities and services from the project site, along with construction tools and facilities, mock-ups, and similar elements.
  - 4. Complete final cleaning up requirements, including touch-up painting of marred surfaces.
  - 5. Touch-up and otherwise repair and restore marred exposed finishes.
- B. Work is not substantially complete until regulatory agency letters of clearance for placing systems into service are received by the Owner.

**1.04. Closeout Submittals**

- A. Upon completion of the project, or portions thereof, the CONTRACTOR shall transfer to the OWNER all applicable items accumulated throughout construction. These include but are not limited to the following items:
  - 1. Service manuals, installation instructions, special tools, and specialties.

2. Spare parts ordered as part of this Contract.
3. Submittal of the Material and Workmanship Bond.
4. Submittal of manufacturers' guarantees, bonds, and letters of coverage extending beyond the time limitations of the CONTRACTORS' guarantee.
5. Delivery of any salvaged or borrowed materials or equipment to the OWNER.
6. Record documents of completed facilities.
7. All keys to all doors, gates, and equipment.
8. Checklist indicating satisfactory completion of all unfinished items from the final inspection.
9. Waivers of lien.
10. Completed Asset Tables.

**PART 2 PRODUCTS - Not Used**

**PART 3 EXECUTION - Not Used**

**END OF SECTION**

## **SECTION 01 78 25**

### **PLANT TESTING, STARTUP AND COMMISSIONING**

#### **PART 1 GENERAL**

##### **1.01 DESCRIPTION**

- A. Provide planning, and functional completion testing, as indicated and specified. Section includes:
  - 1. Plant Checkout Plan
  - 2. Functional Completion Testing including coordination with the Vendors for them to provide their services as contracted by the Owner.
- B. The Contractor shall be responsible for testing the functionality of each new component being furnished and installed by the Contractor. Contractor shall assist JEA with the overall plant startup.

##### **1.02 DEFINITIONS**

- A. The Plant Checkout Plan (the Plan) incorporates all aspects of functional completion testing, startup, commissioning, performance testing, training, and reliability tests to ensure the facility operates properly and meets design intent and performance.
- B. Functional Completion Testing is testing of the equipment and unit process systems to confirm that construction and installation has been completed in anticipation of initial startup of the equipment and unit process systems. Functional Completion Testing includes:
  - 1. Physical Checkout shall be defined as the process of physically inspecting products after they have been installed in the Work to determine if the Products have been properly and completely installed, and are ready for Field and/or Functional Testing. The requirements for Physical Checkout are contained in the pertinent technical specification(s) (if applicable).
  - 2. Field Testing shall be defined as testing that is performed by the Contractor, with Supplier assistance, on Products after they have been installed in the Work, and after the performance of physical checkout, for the purpose of proving that the tested Products meet the requirements of the pertinent technical specifications. Administrative and minimum technical requirements for field testing are specified in Paragraph herein, while additional technical requirements are contained throughout the technical specifications. The test criteria are specified herein.
- C. For the purposes of this specification, Startup shall be defined as the operation of equipment or unit process systems using clean water, air, or other fluids and gases as necessary to demonstrate the operation of the equipment or unit process systems with other equipment that is a part of, or a treatment process for the Facility. Administrative and minimum technical requirements for startup are specified herein. It is the Owner's

intent to conduct the Start-up of the project, however, this does not release the Contractor from responsibilities to have the equipment totally prepared for the start-up.

- D. For the purposes of this specification, Commissioning shall be defined as the operation of equipment or unit process systems using process liquids or process solids, plant support equipment, and plant utilities to demonstrate equipment or unit process systems are capable of processing water at specified flows and conditions for a sustained period of operation as required by this section or equipment or unit process systems specifications. Successful Commissioning shall determine that the equipment or unit process systems are ready to begin Performance Testing. Administrative and minimum technical requirements for Commissioning are specified herein, while additional technical requirements are contained throughout the technical specifications. It is the Owner's intent to conduct the Commissioning of the project; however, this does not release the Contractor from responsibilities to have the equipment totally prepared for the commissioning.
- E. Performance Testing is defined as a test to demonstrate the specified throughput of the equipment and unit process systems while maintaining regulatory compliance with Federal, State, and Local government regulations and minimum compliance with the equipment or unit process systems performance requirements and guarantees.
- F. The Testing and Checkout Coordinator shall be defined as the person provided by the Contractor to coordinate and oversee the total spectrum of testing and inspection activities required by the Contract Documents. The Testing and Checkout Coordinator shall have been in responsible charge of two similar Projects in the last four to six years.

#### **1.03 ROLES AND RESPONSIBILITIES:**

- A. The Contractor shall provide all outside services, materials, labor, supplies, test equipment and other items necessary to perform the Plant Testing, Startup and Commissioning as specified herein. In addition, the Contractor shall arrange for and provide the participation or assistance of survey crews, quality control technicians, and required governmental agency representatives.
- B. The Owner had contracted for certain Supplier's representative's activities to assist with installation, for vendor training and other services. This information will be provided to the General Contractor. Timing for the performance of these services is to be defined in the Contractors Checkout Plan, specified herein.
- C. The Owner will review and comment on the Contractor's deliverables, participate in the physical inspection activities, witness the shop and field testing, witness functional testing, maintain the permanent record of all testing results, and provide verification of conformance to the specifications. The Owner's right to perform inspections, witness tests or monitor or assess the Work and activities does not relieve the Contractor of its obligation to comply with the requirements of the Contract Documents nor does it imply completion of the Work.

#### **1.04 Submittals:**

- A. Submit the following shop drawings in accordance with Section 01 33 00.



1. Submit a Plant Checkout Plan.

**1.05 Plant checkout plan:**

- A. The Contractor shall be responsible for preparing, coordinating, and executing the Plan.
  1. The Contractor shall use the resources of the equipment and unit process systems suppliers in this work, particularly for specific equipment and unit process systems.
  2. An initial draft of the Plan shall be submitted as indicated here:
    - a. The initial draft Plan for the Facility shall be completed and submitted by the Contractor to the Owner for review as defined in Section 01 33 00.
    - b. The Contractor shall incorporate the Owner's comments into the revised Plan within 30 days of receiving comments, and reissue the Plan to the Owner.
    - c. The Contractor shall regularly schedule meetings with the Owner to review and coordinate activities required by the Plan.
- B. The Plan shall define:
  1. The logical and systematic performance of physical inspections, field and functional tests, including:
    - a. A chronological schedule of all testing and inspection activities.
    - b. A checklist of all inspection and testing activities broken down by location, discipline, system, and device or item.
    - c. All blank forms proposed by the Contractor for verification or recording of the functional completion testing.
    - d. An index which cross references the forms to their intended application(s).
    - e. A list of all supplier certifications, including those required by the applicable technical specifications. Provisions shall also be included for retesting, in the event it is required.
  2. A list of participants in functional completion testing, startup, commissioning, and performance testing.
  3. A list of special test equipment required for functional completion testing, startup, commissioning, and performance testing.
  4. Sources of the test media (water, power, air.) for functional completion testing.
  5. The proposed method of delivery of the media to the equipment to be tested during functional completion testing.

6. Temporary or interim connections for the sequencing of multiple units during functional completion testing.
  7. Ultimate disposal of the test media after functional completion testing,
- C. The plan shall be reviewed by the Owner, modified or revised as necessary by the Contractor, then re-reviewed by the Owner. The Contractor shall continue to update the Plan, working in conjunction with the Owner, prior to the start of the scheduled equipment checkout and functional testing activities as specified in Paragraph 1.08 herein. Each specific element of the plan must receive review or comment by the Owner, two weeks prior to the actual commencement of testing as defined herein.
- D. The Contractor shall designate, in the Plan, a Testing and Checkout Coordinator, to coordinate and manage the activities defined in the Plan.

#### **1.06 Functional completion testing:**

- A. Functional Completion Testing shall be completed as construction and installation of equipment is completed to demonstrate that the equipment is ready for equipment and unit process systems startup.
1. Functional Completion Testing shall be done in a coordinated manner based on the Plan prepared by the Contractor.
    - a. The Owner's operating and maintenance staff shall be allowed to observe and as necessary lead for the purposes of familiarization and training.
    - b. Additional witnesses, such as the Engineer, may be present to represent the Owner.
  2. Functional Completion Testing procedures and documentation forms shall be developed by the Contractor. The procedures shall include a listing of items inspected for Functional Completion Testing.
  3. If any equipment or unit process systems do not meet Functional Completion Testing requirements, it shall be the responsibility of the Contractor and/or equipment suppliers to make the necessary corrections or replacements and repeat the test.
  4. The equipment and unit process systems shall not be started up or put into service until the Functional Completion Testing is completed as evidenced by a completed Functional Completion Testing certificate for the equipment or subsystem.
  5. Modifications to the equipment and unit process systems required to meet Functional Completion Testing requirements shall be provided, and all retesting shall be performed at no additional cost to the Owner.
  6. A Functional Completion Testing Certificate shall be prepared by the Contractor for each piece of equipment or unit process and submitted to the Owner for review.

#### **1.07 Startup:**

- A. Startup activities for the Facility shall not be initiated until the requirements of Functional Completion Testing are completed for the equipment or unit process systems and have been documented by the General Contractor.
- B. The requirements of this section shall be satisfactorily completed prior to beginning Commissioning for equipment and unit process systems.
  - 1. It is intended that the Owner's operating and maintenance staff shall lead the startup activities and the Contractor's staff shall be available to assist for the purposes of familiarization and training.
  - 2. Additional witnesses, such as the Engineer, may be present to represent the Owner.
- C. For equipment or unit process systems that do not meet the specified Startup requirements, it shall be the responsibility of the Contractor and/or equipment or unit process systems suppliers to make the necessary corrections or replacements and repeat Startup at no additional cost to the Owner.
- D. Startup Reports for each piece of equipment or unit process shall be completed and submitted by the Contractor to the Owner for review as defined in Section 01 33 00.
- E. The Owner and the Contractor shall not begin Commissioning until Startup certificate is completed and is submitted.

#### **1.08 Commissioning:**

- A. Commissioning activities for the Facility shall not be initiated until the requirements of Startup are completed for the equipment or unit process systems.
- B. The requirements of this section shall be satisfactorily completed prior to beginning Performance Testing for equipment and unit process systems.
- C. Commissioning shall be used by the Owner and equipment or unit process suppliers to adjust, fine tune, modify and prepare the equipment or system for continuous operation and Performance Testing.
  - 1. Equipment shall not be operated without the guidance of qualified personnel having the knowledge and experience necessary to conduct proper operation thereof and obtain valid results.
  - 2. All required adjustments, tests, operation checks, and Startup and Commissioning activities shall be provided by qualified personnel.
  - 3. The Owner/Owner's operating and maintenance staff shall be responsible for coordinating the Startup and Commissioning of the equipment and unit process systems with the assistance of the Contractor and of equipment or unit process systems suppliers with the Owner in accordance with the Plan.

4. Additional witnesses, such as the Engineer, may be present to represent the Owner.
- D. For equipment or unit process systems that do not meet Commissioning requirements, it shall be the responsibility of the Contractor and/or equipment or unit process systems suppliers to make the necessary corrections or replacements and repeat Commissioning at no additional cost to the Owner.
- E. The equipment or unit process systems shall not be Performance Tested or otherwise placed into service until Commissioning is completed as evidenced by a completed Commissioning certificate for the equipment or unit process systems.
- F. Commissioning Certificates for each piece of equipment or unit process shall be completed and submitted by the Contractor to the Engineer and Owner for review as defined in Section 01 33 00, Table 01 33 00-1.

## **PART 2 PRODUCTS**

(Not Used)

## **PART 3 EXECUTION**

### **3.01 Plant Checkout plan:**

- A. The Plan shall include the following items as a minimum:
  1. Cover Sheet with Plant identification, title, date and other information as needed to properly identify the specific information for the Facility.
  2. Status and revisions sheet with appropriate dates and signatures spaces to document the development and status of the document.
  3. Table of Contents including Appendix.
  4. Equipment and systems descriptions with anticipated break down for individual startup activities. This section shall define the individual "packages" for startup activities for the equipment or unit process systems.
  5. Schedule of events for startup and other activities covered by the Plan.
    - a. The schedule shall define dates for completing activities for equipment and unit process systems.
    - b. The schedule shall be the Contractor's best estimate of time sequence at the time of issuance.
    - c. The Contractor shall submit monthly schedule updates to the Plan.
    - d. The schedule shall follow the required sequencing as specified herein.

6. Sign-off sheets consisting of certification forms or completion reports required by the specifications shall be included in the Plan. Standard forms shall be developed by the Contactor for this purpose.
  7. Reports, test results and other supporting data shall be collected by the Contractor for documentation of the specific details leading to the certification or completion.
- B. Following shall be the sequence for completing functional completion testing, and subsequent startup, commissioning and performance testing activities required by the Plan.
1. Controls
  2. High Service Pumps
- C. Any variation in the startup sequence deemed necessary by the Contractor shall be reviewed by the Owner prior to changing the sequencing.
- D. Prior to Functional Completion Testing the Contractor shall have performed the following preliminary matters.
1. Conduct (or have previously conducted, whichever is appropriate) all field inspections as defined in the individual sections of the Specifications, installation checks, hydrostatic tests, performance tests, and perform any corrections required.
  2. Demonstrate that individual components of the completed work have been properly installed and operate in accordance with the Contract Documents, and that they are ready to be utilized for their intended purposes.
  3. Remove all electrical jumpers, bypasses or other items connected to the equipment that are not intended to remain in the Facility and are not required by the Specifications.
  4. Confirm that all electrical circuits are energized in the manual position, that valves and gates are set to their normal position and that flow through the completed work is unobstructed.
  5. Install required temporary piping connections/facilities for supplying, circulating, and disposing of test water.

### **3.02 Functional completion testing:**

- A. Provide 30 days written notice to the Owner for each functional completion test so that the Owner may witness the functional completion tests. The Owner may witness the performance of any or all functional completion testing, at their option.
- B. Testing shall be conducted in accordance with the accepted Plan using applicable standard techniques reviewed by the Owner.

1. Local and remote instrumentation may be used to record test data where it is determined the devices have been calibrated and sufficient to obtain necessary data.
- C. The Contractor shall develop standard data sheets to document Functional Completion Testing requirements have been met for all equipment and unit process systems included in the Plan.
1. As equipment testing is completed the appropriate data sheet shall be completed and signed by the responsible party and submitted to the Owner for review and acceptance.
  2. Data values shall be stated in the engineering units noted in the equipment specifications.
- D. A detailed Functional Completion Test plan shall be prepared and submitted to the Owner for review and comment.
1. The plan shall be prepared by the Contractor in conjunction with the equipment or subsystem supplier and shall become a part of the overall Plan.
- E. In the event no reference to procedures is made, or no procedures for startup and commissioning are contained in a technical specification for the following test parameters, the following shall be the checkout requirements. Should these requirements conflict with the Supplier's recommendations or in any way be less stringent than the Supplier's requirements, they shall be superseded by the Supplier's requirements for checkout testing.
1. Measurement of wearing ring clearances for all pumps requiring assembly, so equipped:
    - a. Take two readings taken opposed to each other by 90 degrees.
    - b. All measured clearances shall be within Supplier's specifications for new installations. Replace and recheck rings found to be out of round or out of specified tolerance.
  2. Measurement of Impeller Bore for all pumps requiring assembly:
    - a. Take two readings opposed to each other by 90 degrees.
    - b. All measured clearances shall be within Supplier's specifications for new installations. Replace and recheck impellers found to be out of round or out of specified tolerance.
  3. Measurement of shaft runout for all rotating equipment requiring assembly:
    - a. Remove bearings from the shaft. Support shaft on pedestal rollers or in a lathe.
    - b. Check each shoulder on the shaft.

- c. Take two readings for each shoulder, opposed to each other by 90 degrees.
  - d. All measured clearances shall be within Supplier's specifications for new installations. Replace and recheck shafts found to be out of round or out of specified tolerance.
4. Vibration Measurements:
- a. Provide vibrational signature testing and documentation for each piece of direct drive or close coupled rotating equipment with a motor HP of 100 or above and a rated operating speed in excess of 1999 RPM.
  - b. Unless specified otherwise, the current edition of the Hydraulic Institute Standard, "Acceptable Field Vibration Limits" shall be the standard for vibrational testing.
  - c. Take all specified vibrational readings in three directions: vertical, horizontal, and axial.
  - d. Provide vibrational measurements in the following engineering units:
    - (1) Displacement in thousandths of an inch (mils), peak to peak.
    - (2) Velocity in inches per second (ips), peak to peak.
    - (3) Acceleration in feet per second per second ( $1g=32.3 \text{ ft/sec./sec.}$ ) zero to peak.
    - (4) Spike energy in g-SE.
    - (5) The vibrational readings shall be less than the device rotating frequency, and within the operating band specified by the Supplier.
    - (6) Amplitude Allowable Maximums:

<b>RPM</b>	<b>Amplitude inches peak to peak:</b>
3,000 and above	0.001
1,500 - 2,999	0.002
1,000 - 1,499	0.0025
999 and below	0.003

5. Belt Drives:
- a. All belts shall ride within the sheave and not slip to the bottom of the groove(s).
  - b. Belt tension shall be in accordance with Supplier's recommendations.
  - c. Pulley alignment shall be within Supplier's recommendations.

6. Gear Drives and Reducers:
  - a. Check gears for lash at no less than three points around the gear.
  - b. Rotate gears a full 360 degrees while checking alignment.
7. Coupling/Shaft Alignment:
  - a. Perform all final alignments and checks with a dial indicator or a laser device. Feeler gauges and straight edges are not acceptable.
  - b. Eliminate soft foot conditions prior to aligning.
  - c. When checking for final soft foot, any displacement in excess of 0.002" must be corrected.
  - d. When checking for pipe strain, any displacement in excess of 0.002" requires piping realignment.
  - e. Alignments will not be regarded as final until the grout is set and all piping has been attached. Demonstrate that alignment is not changed by attachment of piping.
  - f. Shim the driving element, never the driven element.
  - g. Take bracket sag corrections into account when using a dial indicator. Bracket sag shall be determined on a rigid pipe.
  - h. Mount a dial indicator to the driven element so that it can be rotated. Rotate both elements while aligning.
  - i. When aligning three coupled elements, align gear reduction elements with the driven element first, then align the driver to the gear reduction element.
  - j. Check all four alignments, i.e., angular alignment in the vertical and horizontal planes, and parallel alignment in the vertical and horizontal planes.
  - k. The acceptable alignment accuracy for flexible couplings is +0.005 inches, or the Supplier's specifications, whichever is more stringent.
  - l. The dial indicator must be perpendicular to the alignment surface.
  - m. Number hold down nuts prior to tightening. Loosen in reverse order. Tighten in ascending order.
  - n. Use only clean, deburred shims. Clean the machine base and feet from rust or burrs prior to alignment.
8. Measurement of Noise (dB):



- a. Eliminate noise sources generated by adjacent construction activity prior to testing.
- b. Establish a background noise level prior to testing.
- c. Perform noise level testing on each installed device as required by the technical specifications.
- d. The maximum noise level exposure is 75 dBA over eight hours continuous for office, shop, and other areas where the Owner's personnel will be performing their assigned duties.

9. Hydrostatic Testing:

- a. AWWA C600 standards latest edition are the standards for all hydrostatic testing.
- b. Visually inspect all welds prior to testing, for cracks, undercut on surface greater than 1/32-inches deep, lack of fusion on surface, reinforcement greater than Table 127.4.2 located in ANSI B31.1 Power Piping, and incomplete penetration (when accessible). Repair or rework as directed by the Owner's Representative.
- c. At no time during hydrostatic testing shall any part of the piping system be subjected to a stress greater than 90 percent of its yield strength at test temperature.
- d. After 10 minutes of full hydrostatic test pressures, make an examination for leakage of all joints, connections, and all regions of high stress, such as around openings and thickness transition sections.
- e. Unless otherwise specified, the minimum required hydrostatic test pressure shall be 1.5 times the design pressure as specified and as indicated.
- f. Pressure holding time shall be 10 minutes plus the time required to inspect for leakage.
- g. Maximum pressure shall not exceed the maximum rated pressure for any component in the system being tested.

10. Electrical Equipment:

- a. The testing standards for electrical components are those contained in Division 26 and the pertinent technical specification(s).

F. When contracted, the Owner will furnish an authorized, competent representative of the equipment or unit process supplier to supervise and coordinate the Functional Completion Testing program.

- 1. Instrument readings and other test data shall be tabulated by the Contractor.

G. It is the intent that as a result of this phase of Section 01 78 25 that the following has been accomplished:

1. All structures and pipelines have been filled.
2. Operational adjustments desired by the Owner have been made.
3. All chemical feed systems are capable of delivering their respective chemicals to their designated feed points, with the dosage rate manually and adjustable via SCADA.
4. All field devices are operational with control, indication, and alarm capability.
5. All electric valves can be operated.
6. Manufacturer's written certifications regarding equipment installation have been provided.
7. Manufacturer's training sessions have been conducted and video tape provided to the OWNER.
8. The system control and monitoring signals are properly received or transmitted from/to the interface terminal blocks as shown on the drawings.
9. Graphical display screens are functioning properly (by others)
10. Adjustments desired by the Owner have been made.
11. All functions of the automatic control system have been demonstrated and are fully operational.
12. Release/approvals have been received from JEA to place the Facility into operation.

H. Documentation Requirements:

1. Certificates are required for all Functional Completion Testing for equipment and unit process systems. Four copies of the completed certificates shall be supplied for review by the Owner. Contents of the certificate shall be at a minimum:
  - a. Equipment Suppliers Review Comments and Approval Page. This page shall include Certification by the equipment or unit process systems suppliers that the equipment or unit process systems are properly installed and suitable for startup.
  - b. Owner Review Comments and Approval Page.
  - c. Test Descriptions/Procedures
    - (1) Equipment or unit process systems tested.
    - (2) Test dates.

- (3) Electrical Inspection and Tests
  - (4) Test results.
  - (5) Any repairs or corrections required to obtain acceptable test results.
  - (6) Calibration sheet for instrumentation or devices used for testing but not part of plant installation.
  - (7) Copies of calibration records for plant installed instrumentation
- d. Certify Mechanics and Installation. Inspection and certification to be conducted by equipment representative. Inspect and certify that each piece of equipment meets the following requirements:
- (1) Not damaged in transportation or installation.
  - (2) Properly installed with no undue force imposed from piping or supports.
  - (3) Is properly lubricated.
  - (4) Motor rotation is correct.
  - (5) Free of overheating.
  - (6) Free of vibration.
  - (7) Free of noise.
  - (8) Functions without overloading.
  - (9) Piping and other connections are completed.
  - (10) No leaks at equipment connections (static pressure testing).
- e. Inspection and certification to be conducted by Contractor.
- f. Instrumentation and Control Inspection and Tests
- g. Inspect and certify instrumentation and control circuits for the following:
- (1) Loop checks have been completed for all signal and control circuits.
  - (2) All instruments have been calibrated.
  - (3) All instrumentation tubing has been pressure tested and any leaks repaired.
  - (4) Manual modes function as intended.

- (5) Protective interlocks function as intended.
- (6) Remote modes function as intended.
- (7) Automatic modes function as intended.

h. Instrumentation tests include the following:

- (1) Complete loop checks for all signals and controls. Control panel operates process properly in automatic mode.
- (2) Tests certificates shall be submitted no later than 30 calendar days, after testing ends. The Owner's Representative and Owner shall have no more than 30 calendar days to complete a review and return with any exceptions noted.

### **3.03 STARTUP & COMMISSIONING:**

- A. Startup and commissioning shall be led by the Owner.

**END OF SECTION**

## **SECTION 02 41 00**

### **EQUIPMENT, PIPING, AND MATERIALS DEMOLITION**

#### **PART 1 GENERAL**

##### **1.01 DESCRIPTION:**

- A. This section describes demolition and removal, replacement, abandonment, and relocation of existing process and mechanical and electrical equipment and piping.

#### **PART 2 - MATERIALS**

- A. Refer to other sections of these specifications for material to be used in removing, replacing, and/or abandoning in place equipment.

#### **PART 3 EXECUTION**

##### **3.01 GENERAL:**

- A. Perform removal, replacement, abandonment, relocation, and demolition work specified and indicated in the drawings. Prepare remaining surfaces to receive new scheduled and specified materials and finishes or finish to match adjacent surfaces if no additional work is scheduled or indicated.
- B. Removal
  - 1. Remove equipment indicated in the drawings.
- C. Replacement
  - 1. Replace equipment indicated in the drawings or listed herein. Unload the removed equipment and store it in the location designated by the Owner. Install the new equipment in locations as indicated in the drawings and as summarized below:

Existing Equipment Description	New Equipment	
	Description	Spec. Section
HSP's No. 1, 2, 3, 4	Horizontal Split Case Centrifugal Pumps 3, 4, 5, and 6 (2,083 gpm @ 70 psi, 125 hp)	43 21 11
MCC Gear No. 1, 2, 3, and 4	MCC Gear 3, 4, 5, 6	
Chlorine Analyzer	Depolox 3 Plus	None

**D. Abandon**

1. Abandon in place equipment indicated in the drawing. Piping located beneath structures, driveways, or other obstructions that are not assigned to be demolished can be abandoned in place. Grout fill existing piping that is abandoned in place.

**E. Relocate (NOT USED)**

**F. Salvage**

1. Equipment salvaged from the premises is the property of the Owner, unless specifically noted on the drawing or in this specification. Carefully remove and handle the equipment. Unload the equipment and store it on-site in the location designated by the Owner. Leave the property free of debris and material. The following items are to be turned back over to JEA's Investment Recovery Group:
  - Chlorine analyzer
  - Pressure Gauge and Transmitter
  - Four High Service Pumps
  - MCC Gear Pumps 1, 2, 3, and 4
  - Portable generator
2. Contractor shall be responsible for salvaging (recycling) the existing ductile/cast iron items to be demolished as listed below:
  - Existing suction and discharge piping and valves shown to be demolished on the construction drawings

The Contractor's bid shall reflect the gross salvaged costs of these items.

**G. Existing Piping and Electrical Utilities**

1. Shut off or disconnect utilities affecting demolition work. Schedule shutdowns with the Owner; notify the Owner three working days in advance of any shutdown that is required to perform the work. The Owner will open/close valves on piping, slide and sluice gates in channels, and electrical disconnects required for the shutdowns.

**H. Plugging Abandoned Piping**

1. Plug all pipes to be abandoned.

2. Plug and grout fill all pipes to be abandoned under structures.
3. Plug by placing a 3-foot-long concrete plug in the open ends or by pipe plugs.

I. Removal or Relocation of Electrical Materials and Equipment

1. Unless otherwise noted, remove existing electrical materials and equipment from areas indicated for demolition or where equipment is to be relocated. Disconnect circuits at their source. Remove materials no longer used, such as studs, straps, and conduits. Remove or cut off concealed or embedded conduit, boxes, or other materials and equipment to a point at least 3/4 inch below the final finished surface. Remove existing unused wires.
2. Repair affected surfaces to conform to the type, quality, and finish of the surrounding surface.

J. Ballasts

1. Electrical discharge lighting ballasts manufactured before 1974 that will be removed under this contract contain polychlorinated biphenyls (PCBs).
2. Electrical discharge lighting ballasts manufactured after 1973 may contain PCBs.
3. It is the Contractor's responsibility to identify the presence of PCBs and to dispose of them in compliance with all local, state, and federal laws, regulations, and ordinances.

K. Transformers and Other Electrical Apparatus

1. Transformers, switches, capacitors, resistors, and/or other liquid-filled electrical apparatus that will be removed under this contract may contain PCBs. It is the Contractor's responsibility to identify the presence of PCBs and to dispose of them in compliance with all local, state, and federal laws, regulations, and ordinances.

L. Patching

1. Patching shall mean the restoration of a surface or item to a condition as near as practicable to match the existing adjoining surfaces unless otherwise noted, detailed, or specified.
2. When patching involves painting, special coating, vinyl fabric, or other applied finish, refinish the entire surface plane (i.e., wall or ceiling), unless complete refinishing of the entire space is scheduled or specified.
3. Patching includes cleaning of soiled surfaces.

M. Demolition

1. Existing buildings, structures, boxes, pipes, pavements, curbs, and other items are to be removed, altered, salvaged, and disposed of as specified herein or indicated in the drawings. Remove and dispose of all portions of these items that interfere with project construction.

2. Remove and dispose offsite facilities to be demolished in their entirety including below ground footings, foundations, and other associated appurtenances, as shown in the drawings or as specified herein. Backfill and compact all site areas disturbed by demolition work with earth backfill material
3. Perform the work in a manner that will not damage parts of the structure not intended to be removed or to be salvaged for the Owner. If, in the opinion of the Owner's Representative, the method of demolition used may endanger or damage parts of the structure or affect the satisfactory operation of the facilities, promptly change the method when so notified by the Owner's Representative. No blasting will be permitted.
4. Equipment, material, and piping, except as specified to be salvaged for the Owner, or removed by others, within the limits of the demolition, excavations, and backfills, will become the property of the Contractor and shall be removed from the project site. The salvage value of this equipment, materials, and piping shall be reflected in the contract price of the demolition work.
5. Do not reuse material salvaged from demolition work on this project, except as specifically shown.

N. Schedule

Certain items cannot be removed, replaced, abandoned, or demolished until certain other work has been accomplished.

**END OF SECTION**



## **SECTION 03 11 00**

### **CONCRETE FORMWORK**

#### **PART 1 - GENERAL**

##### **1.01 REFERENCE:**

- A. General Provisions of the Contract, including General, Special and Supplementary Conditions and Division One General Requirements, apply to work specified in this Section.

##### **1.02 WORK INCLUDES:**

- A. All formwork for concrete as described in this section, indicated on the drawings or required by other sections of these specifications. Openings for other affected work. Form accessories and stripping forms.

##### **1.03 QUALITY ASSURANCE:**

- A. Codes and Standards
  - 1. Formwork shall comply with the provisions of ACI 347 "Recommended Practice for Concrete Formwork".
  - 2. ACI "Formwork for Concrete" and Specifications for Structural Concrete for Buildings.
  - 3. PSI - "Construction and Industrial Plywood".
- B. The Contractor is solely responsible for the design, construction and performance of the formwork. The engineer's examination of formwork plans and shoring operations shall in no way relieve the contractor of this responsibility.

##### **1.04 SUBMITTALS:**

- A. Submit to the Engineer shop drawings prepared and designed by an engineer registered in the state of Florida, for record purposes showing layout of shoring, sections and unusual details in accordance with the General Conditions of the Contract for construction. Submit sufficient information for full description of capacity.

#### **PART 2 - PRODUCTS**

##### **2.01 MATERIALS:**

- A. Forms
  - 1. Wood

- a. For concrete below grade, use standard grade or better boards or planks; or use 3/4" minimum thickness exterior type plywood, Grade B/B, Class I, PS-1.
- b. For exposed concrete surfaces use 3/4" minimum thickness exterior type plywood, Grade B/B, Class I, sanded both sides, PS-1.

2. Steel

- a. Steel forms shall be of such thickness that they shall remain true to shape. Metal forms, which do not present a smooth surface or do not properly align shall not be used.

B. Form Oil

1. The inside of the forms shall be coated with a non-staining form oil, such as:
  - a. Magic-Kote by Symons Manufacturing Company, Des Plaines, Illinois;
  - b. Form-coat by Concrete Service Company, Philadelphia, Pennsylvania.
  - c. Eucoslip by Euclid Chemical Company.

C. Form Ties

1. Form ties shall be snap-in form tie with a 1 inch minimum break off depth from the face of the concrete.
2. Ties shall be removed after forms are removed and holes shall then be filled with mortar that matches the adjacent surfaces.
3. Provide stainless steel form ties for all exterior surfaces exposed to view.
4. Approved Manufacturers
  - a. Dayton "Sure-Grip"
  - b. Hechman "Snapties"
  - c. Richmond "Snap-Tys"

D. Anchors

1. Zinc-coated dovetail slots (oriented vertically) shall be located at 3 feet - 0 inches on center horizontally wherever concrete surfaces adjoin masonry. Where concrete masonry (CMU) abuts columns, provide dovetail slot at centerline of adjoining CMU.
2. Approved Manufacturers

- a. Hechman Number 100 Standard, 24 gauge
  - b. Hohman & Barnard, Inc., Number 305
  - c. Wire Products Company, Number F-17
  - d. DAS-STD by Gateway Building Products
- E. Vapor Barrier: 0.006-inch thick, natural Visqueen polyethylene film, as manufactured by the Visking Company or equal.

## **PART 3 - EXECUTION**

### **3.01 GENERAL:**

- A. Forms, bracing, and supports shall be designed and constructed to withstand the pressure of freshly placed concrete. Temperatures of the concrete at time of placing, effect of vibration, speed of placement, the height of plastic concrete and similar factors shall be considered in the design. Concrete surfaces that are to be exposed shall be free of misalignment, unsightly bulges, offsets or ledges.
- B. Forms shall conform to the shape, lines, grades and dimensions of the concrete as called for on the drawings. Joints in forms shall be horizontal and vertical and shall be tightly fitted to prevent leakage of mortar. All vertical surfaces shall be formed.
- C. Removable sections shall be provided at sufficient intervals at the base of walls and columns to allow cleaning and inspection before concrete is placed. All open joints, holes or other blemishes shall be filled to provide a blemish free surface.
- D. Forms for concrete floor slabs shall have sufficient strength and stiffness to prevent sagging or deflection while subjected to the usual construction loads. Walking on forms will not be permitted. Planks (2 in. thick) shall be distributed over the forms to prevent abuse. Wheeling of concrete or other materials directly over the forms will not be permitted. Runways above the top of the finished concrete shall be required throughout the construction period. Runways shall not rest on the reinforcing steel.
- E. Embedded structural steel shapes meant to provide support for other structural elements shall be bolted to the formwork to maintain accurate positioning. Wiring or nailing will not be permitted.
- F. 3/4 inch by 3/4" chamfer strips shall be placed in the corners of forms to produce beveled edges on all permanently exposed surfaces. Corners, which abut masonry walls, shall not be chamfered.
- G. Forms shall be checked just prior to placing concrete and tightened as required to produce flush surfaces.
- H. Provisions shall be made for chases, offsets, openings, depressions, curbs and bulkheads.

- I. Camber formwork to compensate for anticipated deflections in the formwork due to weight of forms and wet concrete, and/or any additional camber as shown on the drawings.
- J. Floors have not been designed to carry the construction loads of the floor above. Contractor must design and furnish necessary shoring and reshoring to support the loads.
- K. The shores and supports for the formwork shall have ample strength to support all applied loads without settlement. Provide positive means of adjustment (wedges or jacks) for shores to take up any settlement during placement.
- L. Sills, if any, shall rest on solid ground, free from frost. Studs, walls, and bracing shall be dimension stock of sizes as required by form design. Dimensions of centering, bracing, etc. shall be in accordance with "ACI Recommended Practices for Concrete Formwork" (ACI 347).
- M. Sleeves, Reglets, Inserts and Conduits: After forms are erected and before reinforcement is placed, all sleeves, reglets and inserts for mechanical trades must be set in place by the trade involved. Other sleeves, anchors, inserts, anchor bolts, specialties and similar items embedded in the concrete shall be furnished, accurately located as shown and set by the Contractor. In general, electric conduits shall be placed within the middle one-third of the thickness of the concrete in which it is embedded.
- N. Before placing reinforcement or concrete the surface of the form shall be coated with approved non-staining form oil to prevent bond with the concrete surface.
- O. Reinforcements shall be adjusted to fit the sleeves, inserts, and openings, using additional bars where required around openings.

### **3.02 BULKHEADS:**

- A. Place bulkheads where end of days work requires a joint in a wall, beam or slab. Reinforcing steel shall extend through the bulkhead. All joints shall be keyed for 2 of the member thickness unless directed otherwise by the Architect/Engineer. Location of bulkhead must be approved by the Architect/Engineer.

### **3.03 REMOVAL OF FORMS:**

- A. Forms shall not be removed from concrete surfaces until the following minimum requirements are met.
  - 1. Formwork for concrete slabs and beams shall remain in place for a minimum of 48 hours, and until the concrete has achieved 75% of its design strength. Strength shall be determined by tests on cylinders site-cured under the same conditions as the work in question.
  - 2. Column and wall formwork can be removed in 48 hours provided curing compound is applied immediately. If Contractor elects not to provide curing compound, forms must remain in place 7 days minimum.

### **3.04     RESHORING:**

- A. When reshoring is permitted or required, the operations shall be planned in advance and shall be subject to approval. While reshoring is under way, no live load shall be permitted on the new construction.
- B. In no case during reshoring shall concrete in beam, slab, column or any other structural member be subjected to combined dead and construction loads in excess of the loads permitted by the Architect/Engineer for the developed concrete strength at the time of reshoring. Reshores shall be placed as soon as practicable after stripping operations are complete but in no case later than the end of the working day on which stripping occurs. Reshores shall be tightened to carry their required loads without over stressing the construction. Reshores shall remain in place until tests representative of the concrete being supported have reached the specified strength or the strength specified in the contract documents for removal of reshores.
- C. Floors supporting shores under newly placed concrete shall have their original supporting shores left in place or shall be reshored. The reshoring system shall have a capacity sufficient to resist the anticipated loads and in all cases shall have a capacity equal to at least one half of the capacity of the shoring system above. The reshores shall be located directly under a shore position above unless other locations are acceptable.

### **3.05     REUSE OF FORMS:**

- A. Clean and repair surfaces of forms to be re-used in the work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound to concrete contact form surfaces as specified for new formwork.
- B. When forms are intended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, unless as acceptable to Architect/Engineer.

### **3.06     VAPOR BARRIER:**

- A. Before laying of sheet, subgrade must be smoothed eliminating any protrusions that may cause damage or rupturing of film.
- B. Use widest practical widths; lapping where required shall be a Z-lock not less than 6 inches wide with top lap placed in the direction of the spreading of the concrete and underneath the reinforcing mesh prior to pouring.

**END OF SECTION**

## **SECTION 03 21 00**

### **CONCRETE REINFORCEMENT**

#### **PART 1 - GENERAL**

##### **1.01 REFERENCE:**

- A. General Provisions of the Contract, including General, Special and Supplementary Conditions and Division One General Requirements, apply to work specified in this Section.

##### **1.02 WORK INCLUDES:**

- A. Provide concrete, concrete masonry unit and precast concrete reinforcement as shown on the drawings, required by these specifications or necessary for proper completion of the work.

##### **1.03 SUBMITTALS:**

- A. Shop drawings showing all bar sizes, supports, fabrication dimensions and location for placing of the reinforcing in accordance with the General Conditions of the Contract for construction shall be submitted for approval. Approval shall be obtained prior to fabrication.
- B. Comply with the ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, diagrams of bent bars, and arrangements of concrete reinforcement.

##### **1.04 QUALITY ASSURANCE:**

- A. Codes and Standards: Comply with the provisions of the most recent edition of the following codes, specifications and standards, except as otherwise shown or specified.
  - 1. ACI 301 - Guidelines for Structural Concrete for Building.
  - 2. ACI 315 - Details and Detailing of Concrete Reinforcement.
  - 3. ANSI/ASTM A83 - Cold Drawn Steel Wire for Concrete Reinforcement.
  - 4. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
  - 5. ANSI/ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
  - 6. ANSI/AWS D1.4 - Structural Welding Code Reinforcing Steel.

7. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
8. ASTM A616 - Rail-Steel Deformed and Plain Bars for Concrete Reinforcement.
9. ASTM A617 - Axle-Steel Deformed and Plain Bars for Concrete Reinforcement.
10. CRSI - Manual of Practice.
11. CRSI 63 - Recommended Practice for Placing Reinforcing Bars.
12. CRSI 65 - Recommended Practice for Placing Bar Supports, Guidelines and Nomenclature.
13. No foreign steel shall be used.

## **PART 2 - PRODUCTS**

### **2.01 MATERIAL:**

- A. Reinforcing Bars shall be rolled from new billet steel, Grade 60 and deformed in accordance with ASTM A615, for bars numbers 3 to number 18 and shall be epoxy coated conforming to ASTM A776 81 for piles and grade beams only.
- B. Welded wire fabric shall be ASTM A185, welded steel wire fabric. The yield strength of the steel wire shall not be less than 60,000 pounds per square inch and shall be epoxy coated conforming to ASTM A776 81.
- C. Bar Supports and Spacers
  1. For unexposed concrete, bar supports and spacers shall be manufactured of standard brights basic wire upturned legs.
  2. For concrete which will be exposed to view from the underside upon completion of the structures, use plastic capped bar supports and spacers.
  3. For slabs on grade, use bolsters with runners where base will not support chair legs.
  4. Do not use wood, brick or other non-specified material.
- D. Tie wire: Federal specifications QQ-W-461 Annealed Steel, 16 ga. minimum for use on epoxy coated steel reinforcement.
- E. Welded electrodes: AWS A5.1, Low Hydrogen, E70 Series.

- F. Welded Inserts: Provide wedge inserts for the support of brick ledger angles. Wedge inserts shall be placed at 4'-0" o.c. unless drawings indicate a more restrictive spacing. Provide the F-7 wedge insert and 3/4" diameter askew bolt, nut and washers as manufactured by Dayton Superior, 10101 C General Drive, Orlando, Florida, or equal.

Wedge inserts and 3/4" diameter bolts to be deemed equal shall submit test information documenting an ultimate capacity of at least 8,500 pounds when the shelf angle is loaded 2-1/4" from the face of concrete, with the bottom of the insert 1-1/2" clear from the beam bottom, for concrete strength of 4,000 psi.

## **PART 3 - EXECUTION**

### **3.01 GENERAL:**

- A. Cleaning and storage reinforcement: Steel reinforcement at the time concrete is placed shall be free from heavy rust, scale or other coating that will destroy or reduce the bond.
- B. All reinforcing steel shall be stored in neat piles at the site clear of the ground in such a manner that all bars can be readily identified when required.
- C. Excessive form oil on the reinforcing shall be removed by washing the reinforcing with kerosene. Exercise due care that no smoking or welding is permitted in the area of cleaning. Provide fire extinguisher at cleaning site.
- D. Supports for reinforcing steel: All reinforcing steel shall be rigidly supported, accurately located and held in position by the use of proper reinforcing steel supports, spacers and accessories before the concrete placement begins.
- E. The legs of all reinforcing supports shall be bent to form a foot so that the side and not the end of leg rods bears on the form.
- F. Metal reinforcement shall be protected by the thickness of the concrete indicated on the drawings. Where not otherwise shown, the concrete cover shall be not less than the following:
1. 3 inches for footings and other principal structural members poured directly against the ground.
  2. 2 inches for bars larger than number 5, and 1-1/2 inches for number 5 bars and smaller where concrete will be exposed to the ground or weather after removal of forms.
  3. 1-1/2 inches in all beams, girders and columns.
  4. 3/4 inches for all slabs and walls not exposed to the ground or weather.
  5. In any event, there shall be not less than 3/4" of concrete protection over all reinforcing bars.



- G. Do not use bar supports or reinforcing as support for concrete runways or construction loads.
- H. Placing tolerances: Clear distance to formed surfaces:  $\pm 1/4$  inch. Minimum spacing between bars:  $-1/4$  inch:
  - 1. Top Bars in Slabs or Beams:
    - Members 8" or less in depth:  $\pm 1/4$  inch
    - Members 8" to 24" in depth:  $\pm 1/4$  inch
    - Members 24" or greater in depth:  $\pm 1/2$  inch
  - 2. Crosswire of Slabs or Beams: Spaced evenly within 2 inches.
  - 3. Lengthwise of Member:  $\pm 2$  inches
- I. Bending details: Typical bending and placing diagrams are shown on the drawings. For parts not shown, bending details and lengths shall conform to the requirements of the ACI Building Code 318 and "Manual of Standard Practice for Detailing Reinforced Concrete Structures" ACI 315.
- J. Bends for stirrups and ties shall be made around a pin having the diameter no less than 1-1/2 inches for number 3, and 2 inches for number 4.
- K. Bends for other bars shall be made around a pin having a diameter not less than six bar diameters for number 3 to number 6, 8 bar diameters for number 9, number 10 and number 11, 10 bar diameters for number 14 and number 18.
- L. All bars shall be bent cold. Heating of bars will not be allowed.

### **3.02 SPECIAL REINFORCING REQUIREMENTS:**

- A. Where walls or other items are shown as built integrally with other section, but are placed as separate pours, key and dowels must be provided. Dowels shall be the same size and at the same spacing as reinforcing.
- B. Main reinforcing bars shall not be spliced unless so noted on the drawings or approved by the Architect/Engineer.
- C. Provide 6 X 6 - W1.4 X W1.4 electrically welded wire fabric, ASTM A-185 reinforcing in all concrete slabs on ground unless shown otherwise.
- D. Provide corner bars of same size and spacing as main reinforcement at all intersections and corners.
- E. Where openings occur in walls, or slabs, provide two number 5 bars at all sides and extending at least two feet beyond the corners and two number 5 bars at least three feet long diagonally across each re-entrant corner.
- F. Unless permitted by an Inspector employed by the owner reinforcement shall not be bent after being embedded in hardened concrete.

### **3.03 INSPECTION OF REINFORCEMENT:**

- A. Reinforcing placement must be checked by an Inspector employed by the owner before any concrete is placed. Any corrections shall be made before concrete is placed.
- B. Placement of reinforcing shall occur in such sequence that the Inspector has sufficient time to inspect the correctness of the reinforcing within the placement area and retains the right to require necessary revisions be made before concrete is placed.
- C. The Contractor shall notify the Inspector at least 24 hours in advance of concrete placement for a particular portion of the building.
- D. Galvanized wire ties of double loop and tightly fastened to secure the proper spacing of rods and ties are required.

### **3.04 LAP SPLICING:**

- A. Welded wire fabric shall be overlapped wherever successive mats or rolls are continuous such that the overlap measured between outermost cross wires is not less than one wire spacing plus 2 inches.
- B. Longitudinal (continuous) footing reinforcing: Class B.
- C. Beam Reinforcing: Class B.
- D. Column Reinforcing: Class B Offset lap splices.
- E. Column/footing dowels: Class B
- F. Masonry vertical reinforcing: Class B.
- G. Splices not included above: Class B.

**END OF SECTION**

## **SECTION 03 30 00**

### **CAST-IN-PLACE CONCRETE**

#### **PART 1 - GENERAL**

##### **1.01 REFERENCE:**

- A. General Provisions of the Contract, including General, Special and Supplementary Conditions and Division One General Requirements, apply to work specified in this Section.
  - 1. 03 11 00 - Concrete Formwork
  - 2. 03 21 00 - Concrete Reinforcement

##### **1.02 WORK INCLUDES:**

- A. All labor and materials required for cast-in-place concrete shown on the drawings or specified herein. Concrete bases and pads for mechanical and electrical equipment. Coordinates with respective contractors. Concrete for grouting of concrete unit masonry.

##### **1.03 QUALITY ASSURANCE:**

- A. Codes and Standards
  - 1. Comply with the provisions of the most recent edition of the following codes, specifications and standards, except as otherwise shown or specified.
    - a. ACI 318 "Building Code Requirements for Reinforced Concrete."
    - b. ACI 301, "Specifications for Structural Concrete for Buildings."
    - d. ACI 302, "Recommended Practice for Concrete Floor or Slab Construction."
    - e. ACI 304 "Recommended Practice for Measuring Mixing, Transporting and Placing Concrete."
    - f. ACI 305 "Recommended Practice for Hot Weather Concreting."
    - g. ACI 307 "Recommended Practice for Cold Weather Concreting."
    - h. ACI 309 "Recommended Practice for Consolidation of Concrete."
    - I. CRSI Manual of Standard Practice.

- j. CRSI Placing Reinforcing Bars.
- k. ASTM C476, "Standard Specification for Grout for Reinforced or Non-Reinforced Masonry."
- l. ASTM C-31, Making and Curing Concrete Compression and Flexure Strength Test Specimens in Field.
- m. ASTM C-33, Concrete Aggregates.
- n. ASTM C-39, Compressive Strength of Molded Concrete Cylinders.
- o. ASTM C-42, Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
- p. ASTM C-94, Ready-Mixed Concrete.
- q. ASTM C-143, Slump of Portland Cement Concrete.
- r. ASTM C-150, Portland Cement
- s. ASTM C-172, Sampling Fresh Concrete.

#### **1.04 QUALITY CONTROL:**

- A. Do not commence placement of concrete until mix designs have been approved by the Architect/Engineer.
- B. Any concrete work which does not conform to the specified requirements, including strength, tolerance and finishes shall be corrected by the Contractor at his expense and as directed by the Architect/Engineer.

#### **1.05 DIMENSIONAL TOLERANCES FOR FORMED SURFACES:**

- A. Variation from plumb:
  - 1. In the lines and surfaces of columns, piers, walls and in arises:
    - In any 10 ft. of length.....1/4 in.
    - Maximum for the entire length  
(length greater than 40'-0").....1 in.
  - 2. Exposed corner columns, control-joint grooves, and other conspicuous lines:
    - In any 20 ft. of length.....1/4 in.
    - Maximum for the entire length.....1/2 in.
- B. Variation from the level or from the grades specified in the contract documents:

1. In slab soffits, ceilings, beam soffits and in arises, measured before removal of supporting shores

In any 10 ft. of length.....1/4 in.  
In any bay or in any 20 ft. of length.....3/8 in.  
Maximum for the entire length.....3/4 in.

2. In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines:

In any bay or in 20 ft. length.....1/4 in.  
Maximum for the entire length.....1/2 in.

- C. Variation of the linear building lines from established position in plan and related position of columns, walls, and partitions:

In any bay.....1/2 in.  
In any 20 ft. of length.....1/2 in.  
Maximum for the entire length.....1 in.

- D. Variation in the sizes and location of sleeves, floor openings, and wall openings.....+1/4 in.

- E. Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls:

Minus.....1/4 in.  
Plus.....1/2 in.

- F. Footings\*

1. Variations in dimensions in plan:

Minus.....1/4 in.  
Plus.....1/2 in.

2. Misplacement or eccentricity:

2 percent of the footing width in the direction of misplacement but not more than.....2 in.

3. Thickness:

Decrease in specified thickness.....5%  
Increase in specified thickness.....No limit

- G. Variation in steps:

1. In a flight of stairs:

Rise..... $\pm 1/8$  in.

Tread..... $\pm 1/4$  in.

2. In consecutive steps:

Rise..... $\pm 1/16$  in.

Tread..... $\pm 1/8$  in.

\* Tolerances apply to concrete dimensions only, not to positioning of vertical reinforcing steel, dowels, or embedded items.

#### **1.06 SUBMITTALS:**

A. Concrete Mix Report

1. For each proposed concrete mix, submit two copies of the test mix report. Submit report at least 15 days prior to start of concrete pouring.

B. Material Certificates

1. Provide material certificates signed by material manufacturer, certifying that each material complies with the specified requirements.

C. Test Reports

1. Submit results of all compression, slump and air content tests performed during mix design and throughout the duration of the project as required by the Specifications.
2. Submit sieve analysis of coarse and fine aggregate intended for use in the project.
3. Submit a copy of State Certification that the concrete batching and weighing equipment has been inspected and approved.
4. Submit letters from the cement and aggregate suppliers certifying that furnished materials meet appropriate ASTM Standards.

#### **1.07 TESTING:**

- A. Concrete shall be sampled and tested for Quality Control during placement of concrete.

- B. Failure to detect defective work or material shall not in any way prevent later rejection when such defect is discovered nor shall it obligate Architect/Engineer for final acceptance.
- C. Required Sampling and Testing
  - 1. Samples, for strength tests of each concrete mix shall be taken not less than once a day nor less than once for each 50 cu. yd. of concrete.
- D. If the total volume of concrete is such that the frequency of testing required above would provide less than five strength tests for a given mix, tests shall be made from at least five randomly selected batches.
  - 1. Secure composite samples in accordance with ASTM C172.
  - 2. Mold and cure five specimens from each sample in accordance with ASTM C31.
    - a. Samples for test shall be taken at the 1/4 and 3/4 points of the load mixer.
    - b. Cure specimens under laboratory conditions except as follows:
      - 1. When in the opinion of the Architect/Engineer there is a possibility of the surrounding air temperature falling below 40 degrees F, he may require additional specimens to be cured under job conditions.
      - 2. In hot weather or periods of low humidity the Architect/Engineer may require additional specimens to be cured under job conditions
        - a. Test specimens in accordance with ASTM C39.
          - 1. Test one specimen at 3 days.
          - 2. Test one specimen at 7 days.
          - 3. Test two specimens at 28 days for acceptance. This test of two specimens constitutes one strength test. The results of the strength test shall be the average of the strengths of the two specimens tested.
        - b. Hold one specimen for future use if test does not comply at 28 days.

- c. Determine slump of the concrete sample for each strength test and whenever consistency appears to vary, using ASTM C143.
- d. Determine air content for each strength test in accordance with either ASTM C231, ASTM C173, or ASTM C138.
- e. Determine temperature of concrete sample for each strength test.

E. Evaluation of Test Results

- 1. For evaluation each specified concrete mix shall be represented by at least five strength tests.

F. The strength level of the concrete will be considered satisfactory if both of the following requirements are met.

- 1. The average of all sets of three consecutive strength tests (average of two cylinders) exceeds specified strength.
- 2. No individual strength test (average of two cylinders) falls below the specified strength by 500 psi.

G. If the strength level does not meet the above requirements, the Architect/Engineer shall consider the concrete to be deficient and shall have the right to reject the work or require load tests on the structure in the areas the tests represent at no cost to the Owner.

H. Report tests results in writing to the Architect/Engineer and the Contractor on the same day that tests are made. Reports of compressive strength tests shall contain:

- 1. Project identification name and number
- 2. Date of concrete placement
- 3. Name of Contractor
- 4. Name of Concrete Supplier and Truck Number
- 5. Name of Concrete Testing Service
- 6. Concrete type and class
- 7. Location of concrete batch in the structure
- 8. Design compressive strength at 28 days
- 9. Slump
- 10. Air Content
- 11. Concrete temperature
- 12. Concrete mix identification number
- 13. Compressive breaking strength



14. Type of break for both 7-day tests and 28-day tests.

#### **1.08 TESTING SERVICES:**

- A. The Owner will employ an independent testing laboratory meeting the requirements of ASTM E329 and approved by the Architect/Engineer to perform the following services:
  1. Sample concrete at placement and make slump, air content, temperature and compression tests as described above.
  2. Report tests results to the Architect/Engineer.
- B. Contractor Responsibilities
  1. Pay for additional testing and inspection of materials or concrete occasioned by their failure by test or inspection to meet specification requirements.
  2. Provide the necessary testing services for the qualification of proposed materials and the establishment of mix designs; and for any other testing services required by the Contractor.
  3. Furnish any necessary labor to assist the designated testing agency in obtaining and handling samples.
  4. Advise the testing agency sufficiently in advance of operations to allow for completion of tests.
  5. Provide and maintain for the sole use of the testing agency adequate facilities for safe storage and proper curing of concrete test specimens as required by ASTM C31.
  6. The use of Testing Services shall in no way relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the Contract Documents.

### **PART 2 - PRODUCTS**

#### **2.01 MATERIAL:**

- A. Portland Cement
  1. ASTM C150, Type I (Normal)
- B. Aggregate

1. ASTM C 33, and as herein specified. Provide aggregates from a single source for all exposed concrete.
  - a. Fine Aggregate: Clean, sharp sand, free from loam, clay, lumps or other deleterious substance.
2. Coarse Aggregate For Normal Weight Concrete: Comply with ASTM C33 size #57. Clean, uncoated, processed aggregate of crushed stone or washed gravel containing no clay, mud, loam or foreign matter. Use of pit or bank run gravel is not permitted. Aggregate shall meet ASTM C33 Size No. 56 or 57.
3. Where contractor elects to place concrete by pumping he shall provide a pump with sufficient capacity to place this size of aggregate.
4. ASTM C404 for masonry grout. Maximum aggregate size shall be 3/8".

C. Water:

1. Water shall be fresh and potable. Water shall be obtained from city water system. The Contractor shall pay for the quantity of water used during construction and also furnish, install and maintain a water meter if required by the Water Department.
2. Air-Entraining Admixtures - ASTM C260
  - a. "Darex" by W.R. Grace
  - b. "SikaAer" by Sika Chemical Co.
  - c. "MBVR" by Master Builders
  - d. "Air-Mix" by Euclid
  - e. "Sealtight" by W.R. Meadows

D. Water Reducing Admixture - ASTM C494 Type A

1. "Pozzolith 300 Series" by Master Builders
2. "WRDA/HYCOL" by Grace
3. "Plastocrete 161" by Sika
4. "Eucon-WR-75" by Euclid

E. High Range Water Reducing Admixture (Superplasticizer)

1. Admixtures shall meet the requirements of ASTM C494 Type F and shall contain no chloride ions.
  2. Acceptable Products
    - a. "Melmet" by American Admixtures
    - b. "WRDA 19" by W.R. Grace Co.
    - c. "Sikament" by Sika Chemical Co.
  3. Dosage and use of any mix containing this admixture shall be in strict accordance with the manufacturers direction and only with the written permission of the Engineer.
  4. A representative of the admixture manufacturer shall be present to observe the products use and to assure that it is being used in accordance with the manufacturers directions.
- F. Water Reducing, Retarding Admixture
1. Shall comply with ASTM C494 Type D.
  2. Acceptable Products
    - a. "Daratard 17" by W.R. Grace & Company
    - b. "Pozzolith 100XR" by Master Builders, Inc.
    - c. "Lubricon R" by American Admixture
    - d. "Plastocrete 161R" by Sika Chemical Co.
- G. Calcium Chloride
1. Do not use calcium chloride in any concrete.
- H. Concrete Color Admixtures
1. Carblack by Euclid Chemical Company
  2. Integral Colors by Davis Colors
  3. Chromix by L.M. Scofield
- I. Integral Concrete Waterproofing: Shall be Anti-Hydro by Anti-Hydro Company or approved equal.

## **2.02 RELATED MATERIALS**

### **A. Vapor Barrier:**

1. Provide water-vapor cover over sub-grade materials as shown on the drawings. Use only materials which are resistant to decay when tested in accordance with ASTM E154.

B. Preformed Joint Fillers:

1. Provide preformed strips, non-staining, non-extruding and resilient bituminous type complying with ASTM D1751.
2. Thickness to be as indicated on drawings. If no thickness is indicated use 1/2".

C. Waterproof Sheet for Curing:

1. Conform to ASTM C171.
2. Polyethylene film thickness shall be at least 4 mils.

D. Membrane Curing Compound:

1. Conform to ASTM C171, Class B, Clear 100% resin type.
2. Do not use on any surface which will later receive paint, sealer, hardener, carpeting, tile or other bonded covering.
3. Acceptable Products:
  - a. Sealtight AR-30 W.R. Meadows
  - b. Kurez Euclid Chemical
  - c. Horncure W.R. Grace
  - d. Hydrocide Resin Sonneborn

E. Curing/ Sealing Compound:

1. Sodium Silicate Sealer
  - a. Acceptable Products
    - 1) Cure Hard Meadows
    - 2) Eucosil Euclid Chemical
    - 3) WB-309 Grace
    - 4) Sonosil Sonneborn
    - 5) Acurion Anti-Hydro Waterproofing
2. Verify compatibility of finish with curing/sealing compounds.

F. Bonding Agent (Epoxy Type) ASTM C881:

- |                   |                 |
|-------------------|-----------------|
| 1. Sikadur Hi-Mod | Sika Chemical   |
| 2. Thiopoxy       | W.R. Grace      |
| 3. Epoxy #452     | Euclid Chemical |

G. Non-shrink, Non-metallic grout:

- |                   |                 |
|-------------------|-----------------|
| 1. Five Star      | U.S. Grout      |
| 2. Euco NS        | Euclid Chemical |
| 3. Masterflow 713 | Master Builders |

H. Water Stop:

1. Provide rubber or PVC flat, center build type water stops as shown on drawings.

## **PART 3 - EXECUTION**

### **3.01. GENERAL**

A. Proportioning

1. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on the project for each class of concrete required, complying with the latest edition of ACI 211.1.
2. Contractor shall provide all testing services for approval of mixes.
3. The Contractor shall furnish the Architect/Engineer for approval a mix design for each class of concrete at least 15 days prior to start of work.

B. Report to Include

1. Total weight of water, cement, coarse aggregate fine aggregate and admixtures to be used.
2. Slump.
3. Percent of Air.
4. Results of Compression Test for 6 cylinders cast and broken 7, 14 and 28 days.
5. Grain size curves for both aggregates.

C. Do not begin production until mixes have been approved by Architect/Engineer.

- D. When field experience methods are used to select concrete proportions, establish proportions as specified in ACI 301-72. Strength data for establishing standard deviation will be considered suitable if the concrete production facility has certified records consisting of at least 30 consecutive tests in one group or the statistical average for 2 groups totaling 30 or more tests, representing similar materials and project conditions.
- E. The proper proportions of cement, aggregate and water to obtain the required strength shall be determined from ACI 211.1 "Recommended Practice for Selection Proportions for Normal and Heavy Weight Concrete".
1. Strength requirements shall be 4000 and 3000 pounds per square inch.
  2. In all cases, not more than 6 gallons of water per each sack of cement will be allowed.
  3. The minimum weight of cement per yard for various strengths are listed below:
    - a. 4,000 pounds per square inch concrete - 587 pounds of cement per yard minimum.
    - b. 3,000 pounds per square inch concrete - 517 pounds of cement per yard minimum.
  4. Unit weight for normal weight concrete shall be 150 pcf  $\pm$  5%.
  5. Air content for mixes requiring air entrainment shall be 3.5%  $\pm$  1.5%.
  6. Slump at the point of placement shall be not less than 4" and not more than 6".
  7. Water/cement ratio not to exceed 0.4.
- F. Concrete containing a high range water-reducing admixture (superplasticizer) shall have an initial slump or 1-1/2 to 2 inches and a final slump not to exceed 8 inches after addition of the admixture.
- G. Mix design adjustments may be requested by the Contractor when characteristics of material, job conditions, weather, test results, or other circumstances warrant, at no additional cost to Owner and as approved by the Architect/Engineer. Laboratory test data for revised mix and designs and strength results must be submitted to and accepted by the Architect/Engineer before using it in the work.
- H. Ready-Mix Concrete shall be mixed and delivered in accordance with ASTM C94, "Specifications for Ready-Mix Concrete" and shall meet other applicable requirements of this Section.

### **3.02 AIR-ENTRAINING ADMIXTURE:**

- A. Use air-entraining admixture in all concrete exposed directly to the elements, such as foundation and retaining walls, exterior slabs-on-grade, concrete canopies and walkways.
- B. Add air-entraining admixture in accordance with manufacturer's recommendations.

### **3.03 WATER REDUCING ADMIXTURE**

- A. Use water-reducing admixtures in all concrete and in strict compliance with the manufacturer's directions.
- B. Admixture to increase cement dispersion, or provide increased workability for low-slump concrete, any be used at the Contractor's option subject to the Architect/Engineer's acceptance.
- C. The reduced water content shall be taken into account when proportioning mixes.

### **3.04 MIXING**

- A. Unless otherwise approved by the Architect/Engineer use ready mix concrete conforming to ASTM C494.
- B. Place concrete no more than 90 minutes after initial mixing.
- C. Tempering: All concrete shall be placed within 1-1/2 hours after introduction of water to the mix. Under no conditions may additional water be added that will exceed the quantity of water called for in the design mix. Submit time stamped batching tickets on delivery of concrete to job site. All concrete where the quantity of water has exceeded the design mix will be removed and replaced with proper concrete at no cost to the Owner.
- D. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required.
  - 1. When the air temperature is between 85 degrees Fahrenheit and 90 degrees Fahrenheit reduce the mixing and delivery time from 1-1/2 hours to 75 minutes, and when the air temperature is over 90 degrees Fahrenheit, reduce the mixing and delivery time to 60 minutes.

### **3.05 PLACING CONCRETE**

- A. Pre-Placement Inspection

1. Before placing concrete, inspect and complete the formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts and contractors to permit the installation of their work; cooperate with other trades in setting such work, as required.
2. The Contractor shall notify the Inspector at least 24 hours in advance of concrete placement for a particular portion of the building. Placement of reinforcing shall occur in such sequence that the Inspector has sufficient time to inspect the correctness of the reinforcing within placement area & retains the right to require necessary revisions be made before concrete is placed.

B. PLACEMENT

1. Clean out all chips, saw dust, dirt and other foreign matter from forms and assure that inside of forms are free of frost. Remove any dirt, debris, and water from trenches and other excavations. Remove any dirt, debris and mud from tops of footings or pile caps before pouring walls.
2. Deposit concrete in forms in horizontal layers not deeper than 18 inches and in a manner to avoid inclined construction joints.
3. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as herein specified.
4. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing.
5. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use vibrators designed to operate with vibratory element submerged in concrete.
6. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Do not insert vibrators into lower layers of concrete that have begun to set. Limit the duration of vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix.
7. Dropping the concrete a distance of more than 6 feet or depositing a large quantity at any point and running or working it along the forms will not be permitted. An "elephant trunk" shall be used for all wall pours, which are over 6 feet high.



C. Cold Weather Placing

1. Protect concrete work from physical damage or reduced strength, which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.
2. When air temperature has fallen to or is expected to fall below 40 degrees Fahrenheit, uniformly heat all water and aggregates before mixing as required to obtain a concrete mixture temperature of not less than 55 degrees Fahrenheit, and not more than 80 degrees Fahrenheit at point of placement.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
5. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators.

D. Hot Weather Placing

1. When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
2. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees Fahrenheit. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature, provided the water equivalent of the ice is calculated to the total amount of mixing water.
3. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperatures immediately before embedment in concrete.
4. Wet forms thoroughly before placing concrete.
5. Do not use retarding admixtures without the written approval of the Architect/Engineer.
6. Place concrete in column forms before beam and slab steel is in place. Place column concrete in not more than 36 inch lifts before vibrating.
7. Slabs and Beams: Thoroughly clean beam and slab forms after placing column concrete. Do not place concrete in roof or wall beams or slabs until concrete in columns have been in place at least 4 hours.

Place concrete for slabs and beams continuously in layers not over 12 inches deep. Arrange the work so that the joints will be located at points indicated.

8. Place slabs on fill carefully to avoid damage to vapor barrier.

E. Compaction

1. Compact concrete in layers by internal vibrating equipment, supplemented by hand rodding and tamping as required. Do not use vibrators to move the concrete laterally inside the forms.
2. Internal vibrators should maintain a speed of at least 5,000 impulses per minute when submerged in concrete (at least one spare vibrator in working condition should be maintained at the site at all times).
3. Limit duration of vibration to the time necessary to produce satisfactory consolidation without causing segregation, but in no case more than 15 seconds per square foot of exposed surface. Move vibrator constantly and place in each specific spot only once.

F. Placing Concrete Slabs

1. Deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is completed.
2. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Bring slab surfaces to the correct level with a straight-edge and strike-off. Use bull floats and darbies to smooth the surface, leaving it free of humps or hollows.
4. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.
5. Concrete to be placed on grade shall be placed over 10 mil polyethylene film.
  - a. This film shall be laid continuously and in as large of pieces as possible.
  - b. Any holes or perforations caused by pipes, conduits, ducts and general construction activity shall be securely taped to make the film vapor tight.

6. Floor slabs shall be level or pitched to drains as required.
7. All top of slab elevations shall be determined by the use of preset runners supported at the proper elevation.

G. Joints

1. Construction Joints

- a. Construction joints not shown on the drawings shall be located so as not to impair the strength and appearance of the structure, and at locations approved by the Architect/ Engineer.
- b. Provide keyways at least 1-1/2 inches deep in all construction joints in walls and slabs. Accepted bulkheads designed for this purpose may be used in slabs.
- c. Place construction joints perpendicular to main reinforcement.
- d. Roughened construction joints where indicated on the drawings shall be clean, free of laitance and intentionally roughened to a full amplitude of 1/4 inch by raking. Remove laitance entirely by high pressure water blasting.
- e. Continue all reinforcement across construction joints. Welded wire fabric in slabs on grade may stop at those joints, which are shown on the drawings.

2. Isolation Joints in Slabs-on-Grade

- a. Locate where indicated or detailed on Drawings to points of contact between the slabs on ground and vertical surfaces, such as foundations, curbs, etc.
- b. Install preformed joint filler according to manufacturer's recommendations. Filler shall be closely fitted to wall faces and to slab edges.
- c. Reinforcement shall not extend through isolation joints.

3. Weakened-Plane (Control) Joints

- a. Locate where required and as indicated on the drawings.

b. Form weakened-plane joints in fresh concrete by grooving top portion with a recommended jointing tool and finishing edges with an edger.

c. If joints are saw-cut cutting shall be started as soon as the concrete has hardened sufficiently to prevent aggregates from being dislodged by the saw; and cutting shall be completed before shrinkage stresses become sufficient to project cracking.

d. Form or cut joints to a depth of 1/3 of slab or wall thickness.

H. Expansion Joints

1. Locate as shown on drawings.
2. Joints in on-grade walkways maximum at 20 feet o.c., at every change in thickness, direction and at center line of drives. Score and tool between expansion joints in equal bays at not over 5 feet o.c.
3. Joints shall be straight and smooth. They shall have hardened before fresh concrete is deposited against them.

I. Other Embedded Items

1. All sleeves, inserts, anchors, and embedded items required for adjoining work shall be placed prior to concreting.
2. All Contractors whose work is related to the concrete or must be supported by it shall be given ample notice and opportunity to introduce and/or furnish embedded items before the concrete is placed.

### 3.06 FINISHES

A. Formed Surfaced

1. Patching: Immediately after stripping forms, patch all defective areas with mortar similar to the concrete mix; coarse aggregate should be omitted. Bulges, minor honeycomb and other minor defects, as designated by the Architect, shall be patched only where exposed to view. Clean, dampen and fill tie holes with patching mortar.

a. Defective Areas as judged by the Architect and Engineer, including those resulting from leakage of forms,

excessive honeycomb, large bulges and large offsets at form joints shall be chipped away to a depth of at least 1/4 inch, and the surfaces that are to be patched shall be coated with an epoxy polysulfide adhesive. The patching mortar shall be pressed in for a complete bond and finished to match adjacent areas, or where defective areas impair the strength of the member in question (as judged by the Architect), the member should be removed or gunited as determined by the Architect and Engineer.

2. Finishes:

a. Rough or Board Finish: For all concrete surfaces not exposed to public view, including concrete in utility spaces.

b. Plywood Finish: For all other exposed exterior overhead surfaces.

c. Grout Cleaned Surfaces: For all other exposed exterior surfaces and exposed vertical interior surfaces.

1). Rough or board finish, reasonably true to line and plane. Tie holes and defects patched and ins exceeding 1/4 inch rubbed down; otherwise, surfaced may be left with texture imparted by forms.

2). Plywood Finish: Same as board finish except forms should be constructed of 5/8 inch minimum thickness plywood in as large size as practicable, arranged in an orderly and symmetrical manner. Sheets showing torn grain, worn edges, holes or similar defects shall not be used. Remove all fins.

3). Grout Cleaned Finish: After concrete, still freshly hardened, had been predampened, a slurry consistency of 1 part cement and 1-1/2 parts sand passing No. 16 sieve by dry loose volume shall be spread over the surface with burlap pads or rubber floats. Surplus shall be removed by scraping and then rubbing with clean burlap. Cure in an approved manner. (All work will conform with ACI Standard 301-72).

B. Unformed Surfaced - Flatwork (Interior)

1. Grade and screen the surfaces to the exact elevation or slope shown or required. Make proper allowances for setting beds for ceramic tile. After screening, tamp mixture thoroughly to drive the coarse aggregate down from the surfaces and apply the applicable finish indicated hereinafter. Always slope exterior walks away from the building a minimum of 1/4 inch

per foot unless noted otherwise on the drawings. Covered walks between buildings always slope to drain to the exterior and away from the buildings. At cross sections of the walks, warp the surfaces to drain water from the walls. Provide control joints as indicated on drawings.

2. Scratch Finish: For surfaces to receive thickset bonded continuous applications, i.e., ceramic tile, etc., refer to drawings for locations of depressed areas.
3. Float Finish: For surfaces to receive roofing waterproofing membranes.
4. Trowel Finish: For all interior floor surfaces intended as smooth waling surfaces or for receipt of floor coverings except as noted in paragraph 2 above.
5. Wood Float Finish: For exterior play courts.
6. Non-Slip Finish: Where indicated on drawings.
7. Definition of Finish Types:
  - a. Scratch Finish: After concrete has been placed, struck off, consolidate and leveled to a Class C tolerance, surface shall be roughened with stiff brush, rakes or metal lather roller before final set.
  - b. Float Finish: After concrete has been placed, struck off and consolidated and leveled, concrete shall not be worked further until water sheen has disappeared and/or when mix has stiffened sufficiently to permit proper operations or a power-driven float. Consolidated with power drive float, check trueness of surface, fill low spots and cut down high spots to achieve Class B tolerance. Refloat to uniform, smooth, granular texture.
  - c. Trowel Finish: Finish same as above for floated finish and in addition, steel trowel the surface to produce a smooth, glassy, impervious surface free of trowel marks to a Class A tolerance. On surfaces intended to support floor coverings, defects of sufficient magnitude to show through the floor covering shall be removed by grinding.
  - d. Broom Finish: Finish same as above for float finish to a Class B tolerance and then draw a broom or burlap belt across surface transversely.
8. Tolerances: Finishes as indicated above should be as follows:

- a. Class A - true planes within 1/8 inch to 10 feet.
  - b. Class B - true planes within 1/4 inch to 10 feet.
  - c. Class C - true planes within 1/4 inch to 2 feet.
  - d. Tolerances should be measured by placing a 10-foot straightedge anywhere in any direction.
9. Sealer: Apply 2 coats Thompson's Waterseal (or equal) after concrete has cured as follows:
- a. Where indicated on the finish schedule.
  - b. To floor slabs receiving ceramic tile (except shower rooms scheduled to receive waterproofing barrier membrane), application of sealer shall be made no more than 48 hours prior to installation of tile Contractors to coordinate.
10. It shall be the Contractors responsibility to provide the proper substrate to receive floor finishes as required by manufacturers thereof.

### **3.07 Concrete Curing and Protection**

#### **A. General**

- 1. Protect freshly placed concrete from premature drying and excessive cold or heat, and maintain without drying at a relatively constant temperature for a period of time necessary for hydration of cement and proper hardening.
- 2. For concrete not in contact with forms, one of the following curing methods shall be applied immediately after completion of placement and finishing. Floors to receive hardener or mortar bonded topping shall be cured in accordance with #3 listed below under Curing Methods.
- 3. Curing shall be continued for at least seven days. Curing may be terminated in less than seven days if cylinder tests show that the concrete has reached 2/3 of the specified design strength.
- 4. For concrete surfaces placed against forms the concrete shall be cured by one of the following methods after form removal until the end of the time period specified above.

#### **B. Curing Methods**

- 1. Membrane Curing Compound: To be used on all exterior flatwork.

a. May not be used on surfaces to receive paint, sealer, hardener, carpeting, tile, or other bonded coating.

b. Spray or roll apply material as specified and in accordance with manufacturers directions immediately after any water sheen which may develop after finishing has disappeared from the concrete surface.

c. The compound shall form a uniform, continuous fill that will not check, crack or peel.

d. It is the Contractors responsibility to determine that the curing compound used will not leave discoloration on concrete exposed to view.

e. Recoat areas which are subject to heavy rainfall within 3 hours after initial application; maintain continuity of coating and repair damage during curing period.

## 2. Curing/Sealing Compound

a. All interior concrete floors and slabs except those to receive hardener or mortar bonded topping, shall be cured/sealed in this manner. Spray or roll apply the specified materials in accordance with the manufacturers directions immediately after any water sheen which may develop after finishing has disappeared from the concrete surface.

b. The compound shall form a uniform continuous film that will not check, crack or peel.

c. It is the Contractors responsibility to determine that the curing/sealing compound uses is compatible with any carpet, tile or specific brand of paint to be used.

## 3. Waterproof Sheet Material

a. Cover concrete surfaces with waterproof sheet material conforming to ASTM C171, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed with waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

## 4. Application of burlap mats kept continuously wet.

### 3.08 FLOOR HARDENER



- A. Those areas noted to receive floor hardener shall be treated with materials as specified and in accordance with manufacturers directions.
- B. Concrete shall be cured using waterproof sheet material or continuously wet burlap as described above. No curing or sealing compound may be applied to areas to receive hardener.

### **3.09 PATCHING CONCRETE**

- A. Any concrete work not formed as shown on the drawings or which for any reason is out of alignment or level, or shows defective surfaces, shall be considered as not conforming with the intent of the specifications and shall be removed unless the Architect/Engineer grant permission to patch a defective area.
- B. Immediately after removing the forms, all concrete surfaces shall be inspected. Any pockets showing unsolidified materials, or any other defective areas permitted by the Architect/Engineer to be patched, and all holes and honeycombed areas shall be patched before the concrete is thoroughly dry. The patching shall be made of the same material and of the same proportions as used for the concrete, except that the coarse aggregate shall be omitted and white cement shall be substituted for a part of the dry Portland cement to match color of surrounding concrete.
- C. The mortar shall be thoroughly compacted into place and screened off so as to leave the patch slightly higher than the surrounding surface. It shall be left undisturbed for a period of one to two hours to permit shrinkage before being finally finished. Patches shall be finished in such a manner and texture as to match the adjoining surface.
- D. Patches shall be bonded with a re-wettable bonding agent.

### **3.10 EPOXY MORTAR REPAIR**

- A. The areas to be patched shall have all loose, unsound concrete removed and then cleaned by sandblasting, vacuumed and/or blown clean with oil-free compressed air. The sound concrete remaining shall then be scrubbed with the epoxy binder only (without aggregate) just prior to the placement of the epoxy mortar.
- B. The epoxy mortar shall be mixed and placed in accordance with the manufacturer's printed instructions. Such instructions shall be supplied to the Contractor by the supplier of the epoxy system.
- C. Do not apply mortar in layers greater than 1" thick. Maximum thickness for outdoor applications is 1/2".

### **3.11 EPOXY GROUTING OF BOLT AND REINFORCING BARS**

- A. Drill holes in concrete 1/4" larger than the diameter of the bolt or bar and to the depth required. Holes to be blown free of dust and to be dry prior to placing epoxy grout.
- B. Use epoxy grout in accordance with these specifications and the manufacturers directions.
- C. Fill hole 1/3 with epoxy grout, insert bolt or bar and move up and down several times while filling hole.
- D. No load shall be applied to the bar or bolt for at least 24 hours.

### **3.12 MISCELLANEOUS CONCRETE ITEMS**

- A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in place construction. Provide other miscellaneous concrete filling shown or required to complete the work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.
- C. Equipment Bases and Foundation: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment with a template at correct elevations, complying with certified diagrams or templates of the manufacturer furnishing machines and equipment.

### **3.13 MINIMUM REQUIREMENTS FOR SIDEWALKS**

- A. Where the drawings do not specify thickness, reinforcement, or jointing, the following minimum requirements shall be met:
  - 1. Minimum thickness shall be 4 (four) inches.
  - 2. Minimum reinforcement shall be woven wired fabric 6 x 6 - W1.4 x W1.4 placed at slab mid-depth.
- B. Sidewalks shall be formed or sawn into squares.
  - 1. For sidewalks less than ten feet in width longitudinal spacing of formed or sawn joints shall be equal to sidewalk width.

2. For sidewalks greater than ten feet in width spacing of formed or sawn joints shall not exceed ten feet in either direction.
  3. Sawn joint depth shall be one and one-half inches in depth.
  4. Formed joints shall be keyed together. Key shall be at slab mid-depth and be 1-1/2" x 1-1/2" at mid-depth of slab.
  5. Expansion joints shall be installed at no greater than fifty (50') foot intervals or at any change in direction or width of walk, at locations where walk abuts other concrete or masonry construction. An expansion joint is defined as wood or metal formed at one side, the two surfaces separated by a 1/2" preformed expansion joint filler.
- C. Sidewalk concrete shall have a minimum 28-day compressive strength of 4,000 pounds per square inch.

**END OF SECTION**

**SECTION 03 35 00**  
**CONCRETE FINISHING**

**PART 1 - GENERAL**

**1.01 DESCRIPTION:**

- A. Work included: Provide finishes on cast-in-place concrete as called for on the Drawings, specified herein, as needed for a complete and proper installation.

**1.02 QUALITY ASSURANCE:**

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Except as may be modified herein or otherwise directed by the Architect, comply with ACI 301, "Specifications for Structural Concrete for Buildings."

**1.03 SUBMITTALS:**

- A. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
  - 1. Materials list of items proposed to be provided under this Section;
  - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
  - 3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

**PART 2 - PRODUCTS**

**2.01 MATERIALS:**

- A. General:
  - 1. Carefully study the Drawings and these Specifications, and determine the location, extent, and type of required concrete finishes.
  - 2. As required for the Work, provide the following materials, or equals approved in advance by the Architect.
- B. Concrete materials: Comply with pertinent provisions of Section 03300, except as

may be modified herein.

- C. Liquid bonding agent: "Weld-Crete," manufactured by the Larsen Products Corporation.
- D. Curing and protection paper:
  - 1. Approved products:
    - a. "Sisalkraft, Orange Label";
    - b. Equal products complying with ASTM C171.
  - 2. Where concrete will be exposed and will be subjected to abrasion, such as floor slabs, use non-staining paper such as "Sisalkraft, Seekure 896," or equal paper faced with polyethylene film.
- E. Liquid curing agents:
  - 1. Where application of specified finish materials will be inhibited by use of curing agents, cure the surface by water only; do not use chemical cure.
  - 2. For curing other areas, use "Hunt TLF" manufactured by Hunt Process Company, Inc.
- F. Floor sealer: Acceptable products:
  - 1. "Superkote Special Clear Sealer" manufactured by Ven-Chem Company, Inc., P.O. Box 3186, Santa Barbara, California 93105 (213) 342-1195.
  - 2. "Supershield" manufactured by James Darcey Company, Inc., 19712 Merrydy Street, Chatsworth, California 91311 (213) 349-3705.
- G. Slip-resistant abrasive aggregate:
  - 1. Provide aluminum oxide, 14/36 grading.
  - 2. Acceptable manufacturers:
    - a. Carborundum Company;
    - b. Norton Company;
    - c. L. M. Scofield Company.

## **2.02 OTHER MATERIALS**

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

## **PART 3 - EXECUTION**

### **3.01 SURFACE CONDITIONS**

- A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

### **3.02 FINISHING OF FORMED SURFACES**

- A. General:
  - 1. After removal of forms, give the concrete surfaces one or more of the finishes specified below where so indicated on the Drawings.
  - 2. Revise the finishes as needed to secure the approval of the Architect.
- B. As-cast finish:
  - 1. Rough form finish:
    - a. Leave surfaces with the texture imparted by forms, except patch tie holes and defects.
    - b. Remove fins exceeding 1/4" in height.
  - 2. Smooth form finish:
    - a. Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces, with number of seams kept to a practical minimum and in a uniform and orderly pattern.
    - b. Patch tie holes and defects.
    - c. Remove fins completely.
- C. Rubbed finishes:
  - 1. Provide these finishes only where specifically called for, and then only on a "smooth form finish" base as described above.
  - 2. Smooth rubbed finish:
    - a. Produce on newly hardened concrete no later than the day following form removal.
    - b. Wet the surfaces, and rub with carborundum brick or other abrasive until uniform color and texture are produced.
    - c. Do not use a cement grout other than the cement paste drawn from the concrete itself by the rubbing process.

3. Grout cleaned finish:
  - a. Do not start cleaning operations until all contiguous surfaces to be cleaned are completed and accessible.
  - b. Do not permit cleaning as the work progresses.
  - c. Mix one part portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint.
  - d. Substitute white portland cement for part of the gray portland cement as required to produce a color matching the color of surrounding concrete, as determined by a trial patch.
  - e. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout, and apply the grout uniformly with brushes or spray gun.
  - f. Immediately after applying the grout, scrub the surface vigorously with a cork float or stone to coat the surface and fill all air bubbles and holes.
  - g. While the grout is still plastic, remove all excess grout by working the surface with a rubber float, sack, or other means.
  - h. After the surface whites from drying (about 30 minutes at normal temperatures), rub vigorously with clean burlap.
  - i. Keep the surface damp for at least 36 hours after final rubbing.
- D. Unspecified finish: If the finish of formed surfaces is not specifically called out elsewhere in the Contract Documents, provide the following finishes as applicable:
  1. Rough form finish:
    - a. For all concrete surfaces not exposed to public view.
  2. Smooth form finish:
    - a. For all concrete surfaces exposed to public view.

### **3.03 FINISHING SLABS**

- A. Definition of finishing tolerances:
  1. "Class A": True plane within 1/8" in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction.

2. "Class B": True plane within 1/4" in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction.
  3. "Class C": True plane within 1/4" in two feet as determined by a two foot straightedge placed anywhere on the slab in any direction.
- B. Scratched finish: After the concrete has been placed, consolidated, struck off, and leveled to a Class C tolerance, roughen the surface with stiff brushes or rakes before the final set.
- C. Floated finish:
1. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further until ready for floating.
  2. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.
  3. During or after the first floating, check the planeness of the surface with a ten-foot straightedge applied at not less than two different angles.
  4. Cut down high spots and fill low spots, and produce a surface with a Class B tolerance throughout.
  5. Refloat the slab immediately to a uniform sandy texture.
- D. Troweled finish:
1. Provide a floated finish as described above, followed by a power troweling and then a hand troweling.
    - a. Produce an initial surface which is relatively free from defects, but which still may show some trowel marks.
    - b. Provide hand troweling when a ringing sound is produced as the trowel is moved over the surface.
    - c. Thoroughly consolidate the surface by hand troweling.
  2. Provide a finished surface essentially free from trowel marks, uniform in texture and appearance, and in a plane of Class A tolerance.
    - a. For concrete on metal deck, Class B plane tolerance is acceptable.
    - b. On surfaces intended to support floor coverings, use grinding or other means as necessary and remove all defects of such magnitude as would show through the floor covering.
- E. Broom finish:



1. Provide a floated finish as described above.
  2. While the surface is still plastic, provide a textured finish by drawing a fiber bristle broom uniformly over the surface.
  3. Unless otherwise directed by the Architect, provide the texturing in one direction only. Provide "light," "medium," or "coarse" texturing as directed by the Architect or otherwise called for on the Drawings,
  4. Provide "light," "medium," or "coarse" texturing as directed by the Architect or otherwise called for on the Drawings.
- F. Unspecified finish: If the finish of slab surfaces is not specifically called for elsewhere in the Contract Documents, provide the following finishes as applicable:
1. Scratched finish:
    - a. For surfaces scheduled to receive bond-applied cementitious applications.
  2. Floated finish:
    - a. For surfaces intended to receive roofing.
  3. Troweled finish:
    - a. For floors intended as walking surfaces;
    - b. Floors scheduled to receive floor coverings or waterproof membrane;
  4. Broom finish:
    - a. Exterior pedestrian ramps.
  5. Non-slip finish:
    - a. Platforms, steps, and landings;
    - b. Exterior pedestrian ramps.

### **3.04 CURING AND PROTECTION**

- A. Beginning immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures, and mechanical injury.
- B. Preservation of moisture:
  1. Unless otherwise directed by the Architect, apply one of the following procedures to concrete not in contact with forms, immediately after completion of placement and finishing.

- a. Ponding or continuous sprinkling;
  - b. Application of absorptive mats or fabric kept continuously wet;
  - c. Application of sand kept continuously wet;
  - d. Continuous application of steam (not exceeding 150 degrees F) or mist spray;
  - e. Application of waterproof sheet materials specified in Part 2 of this Section;
  - f. Application of other moisture-retaining covering as approved by the Architect;
  - g. Application of the curing agent specified in Part 2 of this Section or elsewhere in the Contract Documents.
- 2. Where forms are exposed to the sun, minimize moisture loss by keeping the forms wet until they can be removed safely.
  - 3. Cure concrete by preserving moisture as specified above for at least seven days.

C. Temperature, wind, and humidity:

1. Cold weather:

- a. When the mean daily temperature outdoors is less than 40 degrees F, maintain the temperature of the concrete ☐ between 50 degrees F and 70 degrees F for the required curing Period.
- b. When necessary, provide proper and adequate heating system capable of maintaining the required heat without injury due to concentration of heat.
- c. Do not use combustion heaters during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases, which contain carbon dioxide.

- 2. Hot weather: When necessary, provide wind breaks, fog spraying, shading, sprinkling, ponding, or wet covering with a light colored material, applying as quickly as concrete hardening and finishing operations will allow.

3. Rate of temperature change: Keep the temperature of the air immediately adjacent to the concrete during and immediately following the curing period as uniform as possible and not exceeding a change of 5 degrees F in any one hour period, or 50 degrees F in any 24 hour period ☐

D. Protection from mechanical injury:

1. During the curing period, protect the concrete from damaging mechanical disturbances such as heavy shock, load stresses, and excessive vibration.
2. Protect finished concrete surfaces from damage from construction equipment, materials, and methods, by application of curing procedures, and by rain and running water.
3. Do not load self-supporting structures in such a way as to overstress the concrete.

**END OF SECTION**

## **SECTION 05 05 20**

### **METAL MATERIALS, METHODS AND FASTENING**

#### **PART 1 GENERAL**

##### **1.01 DESCRIPTION**

###### Work Specified Herein and Elsewhere

- A. This Section includes the basic materials and methods required for the work of Division 5, Metals.
- B. Related Work Specified Elsewhere - Painting - Section 09 90 00

#### **PART 2 PRODUCTS**

##### **2.01 STEEL**

- A. Steel shall comply with ASTM A36, unless otherwise specified.
- B. Structural steel tubing shall comply with ASTM A500, Grade B or ASTM A501.
- C. Steel pipe shall comply with ASTM A53, Grade B.

##### **2.02 STAINLESS STEEL**

- A. Stainless steel shall comply with ASTM A167, type 316.

##### **2.03 ALUMINUM**

- A. Aluminum for structural and rolled shapes shall be Aluminum Association alloy 6061-T6.
- B. Aluminum for extruded shapes shall be Aluminum Association alloy 6063-T6.
- C. Aluminum for pipe shall be Aluminum Association alloy 6063-T6.
- D. Aluminum for castings shall be Aluminum Association alloy F-514, or approved equal.

##### **2.04 CAST IRON**

- A. Gray iron for castings shall comply with ASTM A48, Class 30 or approved equal.
- B. Malleable iron castings shall be made of high grade white iron, fully annealed, of uniform ductile strength and shall comply with ASTM A197.

##### **2.05 BOLTS**

- A. High strength bolts shall comply with ASTM A325 with suitable nuts and washers, complying with ASTM A354, Grade BC.
- B. Anchor bolts and connection bolts for steel assemblies shall comply with ASTM A307.
- C. Anchor bolts and connection bolts for aluminum shall be stainless steel.

## **2.06 WELDING ELECTRODES**

Filler metal for welding shall comply with AWS D1.1, Structural Welding Code.

## **2.07 GROUT**

Grout for bedding and grouting structural steel shall be non-shrink grout as specified in Section 03 30 00.

## **2.08 FABRICATION**

### **A. General**

1. Fabricate all metal parts to comply with the design indicated on the Drawings. Make field measurements and prepare templates as required to ensure proper fit. Assemblies shall be fitted together in the shop and delivered to the site complete and ready for installation.
2. Form metal shapes with sharp lines and angles, and finish with smooth surfaces. Shearings and punchings shall be clean and true. In general, holes for bolts shall be drilled or reamed 1/16\_inch larger than the diameter of the bolt. Holes for anchor bolts shall be 1-1/3 times the anchor bolt diameter.
3. Metal thicknesses, assembly details, and supports shall provide ample strength and stiffness. Joints shall be designed to prevent trapping of moisture.

### **B. Shop Coatings**

1. Prepare and shop prime ferrous metal in compliance with Section 09900. Do not shop prime stainless steel, aluminum, galvanized or plated metals, bronze, or machined bearing surfaces.
2. Anchors, sleeves, and metal parts built into masonry or concrete shall be galvanized or coated with a bituminous paint.
3. Castings for exterior exposure shall be cleaned and coated with coal-tar-pitch varnish.
4. Hot-dip galvanizing for products fabricated from steel shapes, plates, bars, and strips shall comply with ASTM A123. Hot-dip galvanizing for

assembled steel products shall comply with ASTM A386. Except for bolts and nuts for field assembly, galvanize all subassemblies immediately after fabrication. Hardware shall be galvanized in compliance with ASTM A153.

5. Aluminum in direct contact with dissimilar metals, concrete, or masonry shall be coated with a heavy-bodied bituminous paint or covered with non-absorptive insulating tape or gasket.

#### **C. Fasteners and Connections**

1. Provide fastening devices as required and in compliance with the Drawings and shop drawings. Provide welded shop connections or concealed fastenings wherever practicable.
2. Power-driven fasteners shall be of the types and sizes recommended by the manufacturer for the particular application. Power-driven fasteners that will be exposed to view shall be set through a steel finishing disc. When set in concrete or masonry, the minimum penetration of power-driven fasteners shall be six times the diameter of the shank.
3. Structural joints made using high strength bolts, hardened washers, and nuts tightened to a high bolt tension shall comply with the "Specification for Structural Joints Using ASTM A325 or A490 Bolts", issued by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
4. Welded joints shall comply with AWS D1.1, Structural Welding Code, and AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings". All welds shall be made by operators who have been previously qualified as prescribed by AWS B3.0, Welding Procedure and Performance Qualification. All welds exposed to view shall be dressed smooth.
5. Anchor holes in concrete or masonry for grouted bolts shall be a minimum of 1-1/2 times the bolt shank diameter. Anchor holes in concrete and masonry for expansion type anchor bolts shall comply with the bolt manufacturer's recommendations.
6. Screw heads shall be countersunk. Bolt threads shall be nicked to prevent nut loosening.

### **2.09 TEMPLATES, LEVELING PLATES, AND APPURTENANCES**

Provide all templates, leveling plates, and appurtenances required for the installation of metal work.

**END OF SECTION**

## **SECTION 05 12 10**

### **MISCELLANEOUS METAL ASSEMBLIES**

#### **PART 1 GENERAL**

##### **1.01 DESCRIPTION**

Work Specified Herein and Elsewhere

A. Work under this Section includes:

1. Plates, and miscellaneous angles.
2. Equipment supports.

##### **1.02 SUBMITTALS**

Submit shop drawings and product data for the work of this Section in compliance with Section 01 33 00.

#### **PART 2 PRODUCTS**

##### **2.01 PLATES, AND MISCELLANEOUS ANGLES**

Provide plates, and miscellaneous angles as required. Install plates and angles as indicated on the Drawings. Where bolts and straps are shown attached to plates, angles, and lintels, provide a 1  $\frac{3}{4}$  -inch diameter by 15-inch long anchor bolt or 2  $\frac{1}{4}$  -inch by 1-inch by 8-inch long strap anchor at each end, unless otherwise indicated on the Drawings. Properly embed fasteners into concrete or masonry.

##### **2.02 EQUIPMENT SUPPORTS**

Provide equipment supports as required to support and anchor mechanical equipment

#### **PART 3 – EXECUTION – Not Used**

**END OF SECTION**

## **SECTION 05 53 00**

### **GRATING, COVER PLATES, AND ACCESS HATCHES**

#### **PART 1 GENERAL**

##### **1.01 DESCRIPTION**

- A. This section describes materials, fabrication, and installation of steel and aluminum grating, checkerplates, and access hatches.

##### **1.02 DESIGN CRITERIA**

- A. Grating, Floor Plates, and Miscellaneous Cover Plates: Design live load of 100 psf unless otherwise stated on drawings, maximum deflection of 1/240 of span.

##### **1.03 SUBMITTALS**

- A. Submit drawings of grating, cover plates, and access hatches. Show dimensions and reference materials of construction by ASTM designation and grade. Show design criteria.
- B. Submit placing or erection drawings that indicate locations of fabricated items. Reproductions of contract documents will not be accepted for this purpose.

#### **PART 2 MATERIALS**

##### **2.01 DESIGN OF GRATING, FLOOR PLATES, AND MISCELLANEOUS COVER PLATES**

- A. Grating, floor plates, and miscellaneous cover plates shall be as detailed in the drawings or, if not detailed, shall be designed per subsection on "Design Criteria" in Part 1. No single piece of grating, floor plate, or miscellaneous cover plate shall weigh more than



80 pounds. Length of individual pieces shall not exceed one and one-half times the width, unless limited by the installation.

- B. Field measure grating and cover plates for proper cutouts and size.
- C. Grating shall be completely banded. For pipe and conduits (including electrical conduit) larger than 1 inch in diameter penetrating grating, cut and band grating.

## **2.02 STAINLESS STEEL PLATE AND MEMBERS**

- A. Except where otherwise specified, stainless steel plate and members shall be Type 316 or 316L, ASTM A240 or A666.

## **2.03 ALUMINUM SHEET**

- A. Aluminum sheet shall conform to ASTM B209, Alloy 3003, H 14 temper.

## **2.04 ALUMINUM ACCESS HATCHES**

- A. Access hatches shall be Bilco or Halliday of the size and configuration shown in the drawings. Aluminum doors shall be anodized. Latch and lifting mechanism assemblies, hold-open arms and guides, and brackets, hinges, pins, and fasteners shall be Type 316 stainless steel.
- B. Locking and Latching Devices:
  - 1. Lugs welded to the exterior door surface to receive a padlock.
  - 2. Hinged hasp on exterior door surface.
  - 3. Recessed hasp covered by a hinged lid flush with the exterior surface.

## **2.05 GRATING**

- A. Grating shall be aluminum (Alloy 6061 or 6063, Temper T6) as indicated in the drawings. Main bars shall be of the thickness and of the depth indicated in the drawings.

## **2.06 FRAMES AND SUPPORTS FOR GRATING**

- A. Fabricated frames and supports for grating shall be as indicated in the drawings. Corners of embedded angle frames shall be mitered and welded with the welds ground smooth.

## **2.07 WELDING ELECTRODES**

- A. Welding electrodes for structural steel shall conform to AWS A5.5. Use electrodes in the E-70 series.
- B. Welding electrode for aluminum shall be ER4043 filler metal.
- C. Welding electrodes for stainless steel shall conform to AWS A5.4. Use electrodes as follows:

Stainless Steel Material	Welding Electrode Material
Type 304	E 308
Type 304L	E 347
Type 316	E 316
Type 316L	E 318

## **PART 3 EXECUTION**

### **3.01 STORAGE OF MATERIALS**

- A. Store structural material, either plain or fabricated, above ground on platforms, skids, or other supports. Keep material free from dirt, grease, and other foreign matter and protect from corrosion.

### **3.02 INSTALLATION AND ERECTION**

- A. Clean the surfaces of metalwork to be in contact with concrete of rust, dirt, grease, and other foreign substances before placing concrete.
- B. Set grating seats and frames and checkered plate frames and supports accurately in position when concrete is placed and support it rigidly to prevent displacement or undue vibration during or after the placement of concrete. Unless otherwise specified, where metalwork is to be installed in recesses in formed concrete, said recesses shall be made, metalwork installed, and recesses filled with dry-pack mortar (minimum compressive strength of 3,000 psi).
- C. Set seat angles for grating so that the grating will be flush with the floor. Maintain the grating and floor as indicated in the drawings.

### **3.03 FASTENING**

- A. Fasten grating panels to supporting members as indicated in the drawings. Saddle clips shall be the same material as the grating.

### **3.04 GALVANIZING**

- A. Zinc coating for plates, bolts, anchor bolts, and threaded parts shall be in accordance with ASTM A153 and F2329.

### **3.05 WELDING**

- A. Perform welding on steel by the SMAW process. Welding shall conform to AWS D1.1-2006, except as modified in AISC Section J2.
- B. Perform welding on aluminum by the gas metal arc (MIG) or gas tungsten arc (TIG) process. Welding shall conform to AWS D1.2-2003.
- C. Perform welding on stainless steel by the gas tungsten arc (TIG) process. Welds shall be full penetration and smooth. Provide inert gas on the inside of pipe during welding to reduce oxidation.
- D. Provide a minimum of two passes for metal in excess of 5/16-inch thickness.
- E. Produce weld uniform in width and size throughout its length with each layer of weldment smooth; free of slag, cracks, pinholes, and undercuttings; and completely fused to the adjacent weld beads and base metal. Avoid irregular surface, nonuniform bead pattern, and high crown. Form fillet welds of the indicated size of uniform height and fully penetrating. Accomplish repair, chipping, and grinding of welds in manner that will not gouge, groove, or reduce the base metal thickness.

### **3.06 CORROSION PROTECTION OF ALUMINUM SURFACES**

- A. Coat aluminum surfaces to be embedded or which will be in contact with concrete or masonry per with a coal tar bitumastic coating before installation. Allow the coating to dry before the aluminum is placed in contact with the concrete.
- B. Where aluminum surfaces come in contact with dissimilar metals, keep the dissimilar metallic surfaces from direct contact by use of neoprene gaskets or washers.

### **3.07 PAINTING AND COATING OF STRUCTURAL STEEL**

- A. Coat nongalvanized structural steel surfaces per Section 099000, System No. 7. Apply prime coat in the shop prior to shipping to the site. Apply intermediate and finish coats after erection, except surfaces that will be inaccessible for coating after erection or

assembly shall be finish coated prior to erection or assembly. Color of finish coat shall be selected by Owner. Faying surfaces of connections that are not specified to be slip critical may be primed and need not be further painted.

**END OF SECTION**

## **SECTION 07 90 00**

### **JOINT SEALERS**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Sealants and joint backing.

##### **1.02 REFERENCES**

- A. ASTM C 919 - Standard Practice for Use of Sealants in Acoustical Applications; 2008.
- B. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 2010.
- C. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2009.

##### **1.03 SUBMITTALS**

- A. Product Data: Provide data indicating sealant chemical characteristics.
- B. Manufacturer's Installation Instructions: Indicate special procedures.

##### **1.05 QUALITY ASSURANCE**

- A. Maintain one copy of each referenced document covering installation requirements on site.
- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum 3 years experience.

##### **1.06 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

##### **1.07 COORDINATION**

- A. Coordinate the work with all sections referencing this section.

##### **1.08 WARRANTY**

- A. Correct defective work within a five year period after Date of Substantial Completion.
- B. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

#### **PART 2 PRODUCTS**

##### **2.01 MANUFACTURERS**

- A. Polyurethane Sealants:
  - 1. Bostik, Inc: [www.bostik-us.com](http://www.bostik-us.com).
  - 2. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
  - 3. BASF Construction Chemicals, Inc: [www.chemrex.com](http://www.chemrex.com).
- B. Polysulfide Sealants:
  - 1. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
  - 2. BASF Construction Chemicals, Inc: [www.chemrex.com](http://www.chemrex.com).
- C. Acrylic Sealants:

1. Tremco, Inc: [www.tremcosealants.com](http://www.tremcosealants.com).

## **2.02 SEALANTS**

- A. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
- B. Type 2 - General Purpose Exterior Sealant for joints in vertical and sloping surfaces; Polyurethane and Polysulfide; single component.
  1. Color: Standard colors matching finishing surfaces.
- C. Type 1; self-leveling - General Purpose Exterior Sealant for joints on horizontal surfaces; Polyurethane and Polysulfide; single component.
  1. Color: Standard colors matching finished surfaces.

## **2.03 ACCESSORIES**

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 25 to 50 percent larger than joint width.
- C. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

### **3.02 PREPARATION**

- A. Remove loose materials and foreign matter which might impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C 1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

### **3.03 INSTALLATION**

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C 1193.
- C. Perform acoustical sealant application work in accordance with ASTM C 919.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

### **3.04 CLEANING**

- A. Clean adjacent soiled surfaces.

### **3.05 PROTECTION OF FINISHED WORK**

- A. Protect sealants until cured.

**END OF SECTION**



## **SECTION 09 90 00**

### **PAINTING**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Painting of plaster, wood, metal, masonry, and other surfaces designated to be painted except factory-applied finishes.

##### **1.02 RELATED SECTIONS**

- A. Section 07 90 00 - Joint Sealant

##### **1.03 REFERENCES**

- A. American Water Works Association, Inc. (AWWA) latest edition:
  - 1. AWWA D100 - Welded Steel Tanks For Water Storage
  - 2. AWWA D102 - Coating Steel Water Storage Tanks
- B. Steel Structures Painting Council (SSPC) latest edition Specifications:
  - 1. SSPC-SP 1 - Solvent Cleaning
  - 2. SSPC-SP 2 - Hand Tool Cleaning
  - 3. SSPC-SP 3 - Power Tool Cleaning
  - 4. SSPC-SP 5 - White Metal Blast Cleaning
  - 5. SSPC-SP 6 - Commercial Blast Cleaning
  - 6. SSPC-SP 7 - Brush Off Blast Cleaning
  - 7. SSPC-SP10 - Near White Blast Cleaning

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### C. OSHA

1. 1926 Subpart C – General Safety and Health Provisions
2. 1926 Subpart D – Occupational Health and Environmental Controls
3. 1926 Subpart E – Personal Protective and Life Saving Equipment
4. 1926 Subpart F – Fire Protection and Prevention
5. 1926 Subpart H – Material Handling, Storage, Use, and Disposal
6. 1926 Subpart Z – Toxic and Hazardous Substances

### 1.04 DEFINITIONS

- A. Coating = emulsions, enamels, paints, stains, varnishes, sealers, and other coatings, whether used as prime, intermediate, or finish coats.
- B. DFT = abbreviation for Dry Film Thickness.

### 1.05 SYSTEM DESCRIPTION

- A. A schedule of coating colors will be provided by the E/A after award. The Contractor shall base his bid on ceilings of a color different than walls and an average of two wall colors per room or area. Colors other than those shown in the manufacturer's standard color charts may be required for building finishes. Strong colors may be selected for doors, piping, equipment, and miscellaneous features. Exterior building or structure colors will be limited to two plus trim.

### 1.06 SUBMITTALS

- A. Within 30 days after award of the Contract, the Contractor shall notify the E/A, in writing, the name of the paint manufacturer for the Project.
- B. Prior to submitting shop drawings for any item requiring shop or field applied primer or finish coatings, submit to the E/A a Painting Schedule, indicating major items to be

painted, preparation, paint manufacturer, product designation, and dry mill thickness. This submittal shall include the manufacturer's written recommendation of the type paint for each item to be painted.

- C. Upon request submit three 8-1/2 inch x 11-inch samples of requested colors for approval by the E/A.

#### **1.07 QUALITY ASSURANCE**

- A. Unless otherwise specified, all work and materials for the preparation and coating of all metal surfaces shall conform to the applicable requirements specified in the Steel Structures Painting Manual, Volume 2, Systems and Specifications Revised, latest edition, published by the Steel Structures Painting Council.
- B. It is the intent of this Specification that the Contractor use one paint manufacturer throughout, unless otherwise approved by the E/A. Products shall be manufactured by one of the following:
  - 1. Tnemec - Tnemec Co., Inc., North Kansas City, Missouri.
  - 2. Substitutions not permitted
- C. Manufacturers other than the above shall submit product data for all products specified in this Section to the E/A for approval. No request for substitution will be considered which decreases the dry film thickness and/or the number of coats to be applied, or which offers a change from the generic type of coating specified. Bidders desiring to use paints other than those specified shall submit their proposal based on the specified materials, together with the information noted above, and indicate the sum which will be added to or deducted from the base bid, should the alternate materials be acceptable.

#### **1.08 PAINTING CONFERENCE**

- A. At the request of the Owner/Engineer the Contractor shall schedule a conference of the painter, Owner, a technical representative of the paint supplier, and the E/A to discuss painting requirements and finalize color selections before painting is started.
- B. Prior to painting any surface the Contractor shall schedule a meeting with the painter and

an Owners/Engineers representative to inspect the surface preparation and verify that the surface is ready for painting. Failure to inspect a surface prior to coating could result in the rejection of the coating.

#### **1.09 SAMPLES**

- A. Paint colors will be selected by the Engineer with final approval by the Owner. Compliance with all other requirements is the exclusive responsibility of the Contractor.
- B. Samples of each finish and color shall be submitted to the Engineer for approval before any work is started.
- C. Samples shall be prepared so that an area of each sample indicates the appearance of the various coats, For example, where three coat work is special, the sample shall be divided into three areas: one showing application of one coat only, one showing the application of two coats, and the third showing the application of three coats.
- D. Such samples when approved in writing shall constitute a standard, as to color and finish only, of acceptance or rejection of the finish work.
- E. For piping, valves, equipment, and miscellaneous metal work, provide sample chips or color charts of all paint selected showing color, finish and the general characteristics.
- F. Rejected samples shall be resubmitted until approved.
- G. Before proceeding with room painting, the Contractor shall finish paint one complete room. After approval, this sample room shall serve as a standard for texture and workmanship throughout the project.

#### **1.10 DELIVERY AND STORAGE**

- A. All materials shall be delivered to the job in original sealed and labeled containers of the paint manufacturer, and shall be subject to inspection by the E/A. Labels shall show name of manufacturer, type of coating, formulation, color and instructions for reducing.
- B. Storage areas outside of the structures being constructed will be submitted by the Contractor for the E/A to review for the storage and mixing of all painting materials.

Materials shall be in full compliance with the requirements of pertinent codes and fire regulations. The Contractor shall take all safety precautions in accordance with Section 7 of AWWA D102, NFPA Bulletin No. 101 and all federal, state and local regulations. Proper containers outside of the buildings/structures shall be provided and used by the Contractor for painting wastes.

- C. Exercise every precaution in the storing of paints, solvents, cleaning fluids, rags, and similar materials as to eliminate the risk of spontaneous combustion or other hazardous conditions.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. All materials used in the work except oils, thinners and driers, shall be of the brands and qualities specified.
- B. All cleaners, thinners, driers and other additives and surface pretreatment materials shall only be those approved for use by the manufacturer of the coatings.
- C. Do not dilute paints except as recommended by the paint manufacturer.
- D. Paint containing lead or chromate is not allowed.
- E. Protective coatings for surfaces which will be in contact with potable water shall be listed by NSF International as approved for potable water contact in accordance with ANSI/NSF Std. 61, Section 5 Protective (Barrier) Materials.
- F. Emulsion and alkyd paint shall contain a mildewcide and both the paint and mildewcide shall conform to OSHA and Federal requirements, including Federal Specification TT-P-19.

### **2.02 PAINT SYSTEMS GUIDE**

- A. The following table illustrates the general features of the standard coating systems and is provided as a general guideline, and may be superseded by specific coating requirements outlined within this specification or on the Drawings:

<b>System No.</b>	<b>Generic Type</b>	<b>Surface Material</b>	<b>Finish</b>	<b>Typical Function</b>
1	Epoxy / Polyurethane	Ferrous Metal, Non-galvanized	Gloss	Exterior metals not subject to immersion or frequent splashing
2	Polyurethane	Ferrous Metal, galvanized	Gloss	Exterior metals not subject to immersion or frequent splashing
3	Epoxy	Ferrous Metal, Non-galvanized	Semi-gloss	Interior metals not subject to immersion or frequent splashing or condensation
4	Alkyd	Ferrous Metal, galvanized	Semi-gloss	Interior metals not subject to immersion or frequent splashing or condensation
5	Epoxy	Ferrous Metal, Non-galvanized	Semi-gloss	Interior metals subject to condensation
6	Epoxy	Ferrous Metal, galvanized	Semi-gloss	Interior metals subject to condensation
7	Epoxy	Ferrous Metal, Non-galvanized	Semi-gloss	Metals subject to immersion or frequent splashing
8	Epoxy	Ferrous Metal, galvanized	Semi-gloss	Metals subject to immersion or frequent splashing

<b>System No.</b>	<b>Generic Type</b>	<b>Surface Material</b>	<b>Finish</b>	<b>Typical Function</b>
9	Epoxy	Concrete	Semi-gloss	Interior
10	Epoxy	Concrete	Tile-like gloss	Interior walls of washrooms
11	Acrylic	Concrete	Low sheen	Precast concrete ceilings, beams, columns
12	Elastomeric	Concrete	Low sheen	Exterior concrete
13	Epoxy	Masonry	Semi-gloss	Interior masonry
14	Epoxy	Masonry	Tile-like gloss	Interior walls of washrooms
15	Elastomeric	Masonry	Low sheen	Exterior masonry
16	Acrylic	Masonry	Low sheen	Interior masonry
17	Acrylic	Drywall, plaster	Low sheen	Interior drywall, plaster
18	Acrylic	Plaster, stucco	Low sheen	Exterior plaster, stucco
19	Alkyd	Wood	Gloss	Exterior wood

<b>System No.</b>	<b>Generic Type</b>	<b>Surface Material</b>	<b>Finish</b>	<b>Typical Function</b>
20	Alkyd	Wood	Semi-gloss	Exterior wood
21	Alkyd	Wood	Gloss	Interior wood
22	Alkyd	Wood	Semi-gloss	Interior wood
23	Acrylic	Wood	Low sheen	Interior wood
24	Acrylic	Canvas wrapped insulation	Semi-gloss	Canvas wrapped insulated piping
25	Coal Tar Epoxy	Ferrous Metal	Semi-gloss	Metals submerged in non-potable water
26	Coal Tar Epoxy	Concrete	Semi-gloss	Concrete in non-potable water or below grade
27	Epoxy	Ferrous Metal	Semi-gloss	Metals submerged in potable water
28	Epoxy	Concrete	Semi-gloss	Concrete submerged in potable water
29	Sealer, Hardener	Concrete	Semi-gloss	Concrete Floors

## 2.03 COATING SYSTEMS

### A. System No. 1



1. System No. 1 shall be used for exterior non-galvanized ferrous metals that are not subject to immersion or frequent splashing of water or wastewater, including but not limited to the following:
  - a. Exposed exterior piping, valves and fittings.
  - b. Exterior mechanical equipment, control panels, miscellaneous metal, etc. without a factory-applied final finish.
2. System No. 1 surface preparation shall be SP 6.
3. System No. 1 shop primer shall be one coat of one of the following, or equal:
  - a. Tnemec Series 1 Omnithane @ 2.5-3.5 mils DFT.
4. System No. 1 field touch-up shall be the same material as Shop Primer.
5. System No. 1 intermediate coats shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series N69 @ 4.0-6.0 mils DFT
6. System No. 1 finish shall be one full coat of High Gloss aliphatic polyurethane, of one of the following, or equal:
  - a. Tnemec Series 72 Endra-Shield (gloss) @ 2.5-4.0 mils DFT

B. System No. 2

1. System No. 2 shall be used for exterior galvanized ferrous metals which are not subject to immersion or frequent splashing of water or wastewater, including but not limited to the following:
  - a. Exposed galvanized piping and fittings.
  - b. Exposed galvanized conduit, equipment, miscellaneous metal, etc. without a factory-applied final finish.
2. System No. 2 surface preparation shall be SSPC-SP1 Followed by Hand or Power Tool Cleaning to scarify.
3. System No. 2 primer shall be one coat of one of the following, or equal:

- a. Tnemec Series N69 @ 3.0-5.0 mils DFT
- 4. System No. 2 finish shall be two 1 coat of one of the following or equal:
  - a. Tnemec Series 72 Endrua-Shield @ 2.0-3.0 mils DFT .
- C. System No. 3
  - 1. System No. 3 shall be used for interior, non-galvanized, ferrous metals not subject to immersion, frequent splashing or condensation, including but not limited to the following:
    - a. Interior piping, valves and fittings, except piping subject to condensation.
    - b. Exposed structural steel.
    - c. Steel stairs and railings.
    - d. Interior cranes and hoists.
    - e. Steel doors and frames.
    - f. Interior equipment, control panels, miscellaneous metal, etc. without a factory-applied final finish.
  - 2. System No. 3 surface preparation shall be SSPC-SP6 Commercial Blast Cleaning.
  - 3. System No. 3 shop primer shall be one coat of one of the following, or equal:
    - a. Tnemec Series 1 Omni-Thane @ 2.5-3.5 mils DFT
  - 4. System No. 3 field touch-up shall be the same material as the shop primer.
  - 5. System No. 3 finish shall be two (2) coats of one of the following, or equal:
    - a. Tnemec Series 23 Enduratone at 2.0 mils DFT per coat.
- D. System No. 4
  - 1. System No. 4 shall be used for interior, galvanized, ferrous metals not subject to immersion, frequent splashing or condensation, including but not limited to the

following:

- a. Interior galvanized piping, except piping subject to condensation.
  - b. Interior galvanized conduit, mechanical equipment, control panels, miscellaneous metal, etc. without a factory-applied final finish.
  - c. Metal decking
2. System No. 4 surface preparation shall be SSPC-SP:1
  3. System No. 4 primer shall be one coat of one of the following, or equal:
    - a. Tnemec Series 115 Uni-Bond DF @ 2.0-4.0 mils DFT
  4. System No. 4 finish coat shall be two (2) coats of one of the following, or equal:
    - a. Tnemec Series 23 Enduratone at 2.0 mils DFT per coat.

E. System No. 5

1. System No. 5 shall be used for interior, non-galvanized ferrous metals subject to condensation, including but not limited to the following:
  - a. Interior liquid process and water piping.
  - b. Chemical piping.
  - c. Air intake piping.
2. System No. 5 surface preparation shall be SSPC-SP6 Commercial Blast Cleaning
3. System No. 5 shop primer shall be one coat of one of the following, or equal:
  - a. Tnemec 37-77 Chem-Prime Universal Primer at 2.0 mils DFT. Series 1 Omnithane @ 2.5-3.5 mils DFT.
4. System No. 5 field touch-up shall be the same material as the shop primer.
5. System No. 5 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series N69 Epoxoline II @ 3.0-5.0 mils DFT per coat.

F. System No. 6

1. System No. 6 shall be used for interior, galvanized, ferrous metals subject to

condensation, including but not limited to interior galvanized liquid process and water piping.

2. System No. 6 surface preparation shall be SP M1 or SP 7.
3. System No. 6 primer shall be one coat of one of the following, or equal:
  - a. Tnemec: Series N69 @ 2.5-3.5 mils DFT
4. System No. 6 finish shall be two (1) coat of one of the following, or equal:
  - a. Tnemec Series N69 @ 2.5-3.5 mils DFT (Maximum DFT for galvanized steel should be 7.0 mils.

G. System No. 7

1. System No. 7 shall be used for non-galvanized, ferrous metals subject to immersion or frequent splashing, including but not limited to the following:
  - a. Submerged piping and piping subject to splashing.
  - b. Submersible pumps.
  - c. Submerged miscellaneous metal, equipment, etc. without a factory-applied final finish.
2. System No. 7 surface preparation shall be SSPC-SP10.
3. System No. 7 shop primer shall be one coat of one of the following, or equal:
  - a. Tnemec Series 1 Omnithane @ 2.5-3.5 mils DFT
4. Field touch-up shall be the same material as shop primer.
5. Finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series 446 Perma-Thane @ 5.0-7.0

H. System No. 8

1. System No. 8 shall be used for galvanized, ferrous metals subject to immersion or frequent splashing, including but not limited to the following:
  - a. Submerged galvanized piping and piping subject to splashing.
  - b. Submerged galvanized conduit, miscellaneous metal, equipment, etc. without a factory-applied final finish.
2. System No. 8 surface preparation shall be SP M1 and SP 7.
3. System No. 8 primer shall be one coat of one of the following, or equal:
  - a. Tnemec: Series N69 @ 2.5-3.5 mils DFT
4. System No. 8 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series N69 @ 2.5-3.5 mils DFT

I. System No. 9

1. System No. 9 shall be used for interior, exterior, , except concrete requiring a tile-like

epoxy finish, including but not limited to the following:

- a. Interior cast-in-place concrete walls, except washroom walls.
- b. Pipe gallery walls and ceiling.
2. System No. 9 surface preparation shall be SP C2 or SP C3 (horizontal surfaces only).
3. System No. 9 filler shall be one coat of one of the following, or equal (May be deleted if concrete has rubbed finish. Delete filler for all submerged concrete):
  - a. Tnemec 54-561 Modified Epoxy Masonry Filler at 80 square feet per gallon.
4. System No. 9 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series 66 Epoxoline at 5.0 mils DFT per coat.
5. System 9A: Submerged Concrete in Wastewater or Concrete Exposed to Wastewater Splash or Wastewater Fumes (moderate environment).
6. System 9A Surface Preparation: Abrasive Blast to remove laitance, fines, curing compounds, form release oils, and establish a surface profile equal to ICRI CSP 5 (minimum). Fill all voids and bugholes, and resurface all concrete using Tnemec Series 218 MortarClad at an average of 1/16". Fill deep voids (greater than 3/8" and up to 4") with Tnemec Series 217 MortarCrete
7. System 9A Finish System:
  - a. 1st Coat: Tnemec Series 446 @ 5.0-7.0 mils DFT
  - b. 2nd Coat: Tnemec Series 446 @ 5.0-7.0 mils DFT
8. System 9B: Submerged Concrete in Wastewater or Concrete Exposed to Wastewater Splash or Wastewater Fumes (severe environment such as headworks, digesters, influent structures, grit chambers, lift stations, etc).
9. System 9B Surface Preparation: Abrasive Blast to remove laitance, fines, curing compounds, form release oils, and establish a surface profile equal to ICRI CSP 5 (minimum). Fill all voids and bugholes, and resurface all concrete using Tnemec Series 218 at an average of 1/16". Fill deep voids (greater than 3/8" and up to 4") with Tnemec Series 217 MortarCrete.
10. System 9B Finish System:
  - a. 1st Coat: Tnemec Series 434 Perma-Shield @ 1/8"
  - b. 2nd Coat: Tnemec Series 435 Perma-Glaze @ 18.0-20.0 mils DFT

J. System No. 10

1. System No. 10 shall be used for interior concrete and CMU requiring a tile-like epoxy finish, including but not limited to interior washroom walls.
2. System No. 10 surface preparation: Allow new Concrete to cure for 28 days. All

surfaces must be clean and dry.

3. System No. 10 filler shall be one coat of one of the following, or equal (May be deleted if concrete has rubbed finish):
  - a. Tnemec Series 1254 Epoxoblock WB @ 100-125 SF / GL (CMU Only)
4. System No. 10 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series 84 Ceramlon ENV at 4.0-6.0 mils DFT per coat.

K. System No. 11

1. System No. 11 shall be used for interior concrete and Concrete Masonry requiring a matte finish, including but not limited to precast concrete ceilings, CMU walls, beams and columns.
2. System No. 11 surface preparation shall be SP C2.
3. System No. 11 filler shall be one coat of one of the following, or equal:
  - a. Tnemec Series 1254 Epoxoblock WB @ 100-125 SF / GL square feet per gallon.
4. System No. 11 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series 6 Tneme-Cryl at 2.5 mils DFT per coat.

L. System No. 12

1. System No. 12 shall be used for exterior concrete and CMU requiring a matte finish.
2. System No. 12 surface preparation shall be SP C2.
3. System No. 12 filler shall be one coat of one of the following, or equal (May be deleted if concrete has rubbed finish):
  - a. Tnemec Series 1254 Epoxoblock @ 100-125 square feet per gallon.
4. System No. 12 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series 6 Tneme-Cryl at 2.5 mils DFT per coat.

M. System No. 13

1. System No. 13 shall be used for interior masonry, including but not limited to masonry walls, except washroom walls.
2. System No. 13 surface preparation shall be SP C1.
3. System No. 13 filler shall be one coat of one of the following, or equal:
  - a. Tnemec Series 1254 Epoxoblock @ 100-125 square feet per gallon, CMU only
4. System No. 13 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series 66 Epoxoline at 4.0-6.0 mils DFT per coat.

N. System No. 14

1. System No. 14 shall be used for masonry walls requiring a tile-like epoxy finish, including but not limited to interior washroom walls.

2. System No. 14 surface preparation shall be SP C1.
3. System No. 14 filler shall be one coat of one of the following, or equal:
  - a. Tnemec Series 1254 Epoxoblock @ 100-125 square feet per gallon
4. System No. 14 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series 84 Ceramlon at 4.0-6.0 mils DFT per coat.

O. System No. 15

1. System No. 15 shall be used for exterior masonry requiring a matte finish.
2. System No. 15 surface preparation shall be SP C2.
3. System No. 15 filler shall be one coat of one of the following, or equal:
  - a. Tnemec Series 1254 Epoxoblock @ 100-125 square feet per gallon
4. System No. 15 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series 6 Tneme-Cryl at 2.0-3.0 mils DFT per coat.

P. System No. 16

1. System No. 16 shall be used for interior masonry requiring a matte finish.
2. System No. 16 surface preparation shall be SP C2.
3. System No. 16 filler shall be one coat of one of the following, or equal:
  - a. Tnemec Series 1254 Epoxoblock @ 100-125 square feet per gallon
4. System No. 16 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series 6 Tneme-Cryl at 2.0-3.0 mils DFT per coat.

Q. System No. 17

1. System No. 17 shall be used for the following interior surfaces:
  - a. Drywall
  - b. Plaster
  - c. Stucco
2. System No. 17 surface preparation shall be SP P1 (Drywall) or SP P2 (Plaster and Stucco).
3. System No. 17 primer shall be one coat of one of the following, or equal:
  - a. Tnemec 51PVA Sealer at 1.5 mils DFT.
4. System No. 17 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series 6 Tneme-Cryl at 2.0-3.0 mils DFT per coat.

R. System No. 18

1. System No. 18 shall be used for the following exterior surfaces:
  - a. Concrete columns and beams
  - b. Stucco

2. System No. 18 surface preparation shall be SP C2.
3. System No. 18 filler shall be one coat of one of the following, or equal:
  - a. Tnemec 54-561 Modified Epoxy Masonry Surfacer at 80 square feet per gallon.
4. System No. 18 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series 6 Tneme-Cryl at 2.5 mils DFT per coat.

S. System No. 20

1. System No. 20 shall be used for exterior wood surfaces requiring a semi-gloss finish.
2. System No. 20 surface preparation shall be SP W1.
3. System No. 20 primer shall be one coat of one of the following, or equal:
  - a. Tnemec 10-1009 Tnemec Primer at 2.0-3.0 mils DFT.
4. System No. 20 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series 1029 Enduratone at 2.0-3.0 mils DFT per coat.

T. System No. 21

1. System No. 21 shall be used for interior wood surfaces requiring a gloss finish.
2. System No. 21 surface preparation shall be SP W1.
3. System No. 21 primer shall be one coat of one of the following, or equal:
  - a. Tnemec 10-1009 Tnemec Primer at 2.0-3.0 mils DFT.
4. System No. 21 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series 1028 Endruatone Gloss @ 2.0-3.0 mils DFT per coat.

U. System No. 22

1. System No. 22 shall be used for interior wood surfaces requiring a semi-gloss finish.
2. System No. 22 surface preparation shall be SP W1.
3. System No. 22 primer shall be one coat of one of the following, or equal:
  - a. Tnemec 10-1009 Tnemec Primer at 2.0-3.0 mils DFT.
4. System No. 22 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series 1029 Enduratone at 2.0-3.0 mils DFT per coat.

V. System No. 23

1. System No. 23 shall be used for interior wood surfaces requiring a low-sheen finish.
2. System No. 23 surface preparation shall be SP W1.
3. System No. 23 primer shall be one coat of one of the following, or equal:
  - a. Tnemec 10-1009 Tnemec Primer at 2.0-3.0 mils DFT.
  - b. Tnemec Series 6 Tneme-Cryl at 2.0-3.0 mils DFT per coat.

W. System No. 24

1. System No. 24 shall be used for insulated and canvas-wrapped piping.



2. System No. 24 surface preparation shall be general cleaning.
3. System No. 24 primer shall be one coat of one of the following, or equal:
  - a. Tnemec 51-792 PVA Sealer at 1.5 mils DFT.
4. System No. 24 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series 23 Enduratone at 2.0 mils DFT per coat.

X. System No. 25

1. System No. 25 shall be used for metal surfaces.
2. System No. 25 surface preparation shall be SP 10.
3. System No. 25 shop primer shall be one coat of one of the following, or equal:
  - a. Tnemec Series 1 Omnithane @ 2.5-3.5 mils DFT
4. System No. 25 field touch-up shall be one of the following, or equal:
  - a. Tnemec Series 1 Omnithane @ 2.5-3.5 mils DFT
5. System No. 25 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec Series 446 Perma-Thane @ 5.0-7.0 mils DFT per coat; apply second coat within 96 hours of first coat.

Y. System No. 26

1. System No. 26 shall be used for concrete surfaces.
2. System No. 26 surface preparation shall be SP C1.
3. System No. 26 finish shall be two (2) coats of one of the following, or equal:
  - a. Tnemec 46H-413 Tneme-Tar at 8.0-10.0 mils DFT per coat; apply second coat within 96 hours of first coat.

Z. System No. 27

1. System No. 27 shall be used for steel surfaces in potable water immersion.
2. System No. 27 surface preparation shall be SSPC-SP 10 Near White Metal Blast.
3. System No. 27 shop primer shall be one coat of the following system or equal:
  - a. Tnemec Series 1 Omnithane @ 2.5-3.5 mils DFT
  - b. Stripe coat welds and seams using Tnemec Series N140-1255 Beige Pota-Pox Plus @ 3.0-5.0 mils DFT
  - c. Intermediate Coat: Tnemec Series N140-15BL Tank White Pota-Pox Plus @ 4.0-6.0 mils DFT
  - d. Finish Coat: Tnemec Series N140-00WH White @ 4.0-6.0 mils DFT.

AA. System No. 28

1. System No. 28 shall be used for concrete surfaces in potable water immersion.
2. System No. 28 surface preparation: Abrasive Blast to remove laitance, fines, curing

compounds, form release oils, and establish a surface profile equal to ICRI CSP 5 (minimum). Fill all voids and bugholes, and resurface all concrete using Tnemec Series 218 MortarClad at an average of 1/16". .

3. System No. 28 shop primer shall be one coat of the following system or equal: Coating System:
  - a. Primer: Tnemec Series N140-1255 Beige Pota-Pox Plus @ 3.0-5.0 mils DFT
  - b. Intermediate Coat: Tnemec Series N140-15BL Tank White Pota-Pox Plus @ 4.0-6.0 mils DFT
  - c. Finish Coat: Tnemec Series N140-00WH White @ 4.0-6.0 mils DFT.

BB. System No. 29

1. System No. 29 shall be used for all non-painted, exposed concrete flooring surfaces.
2. System No. 29 surface preparation shall be SP C1
3. System No. 29 shall be three coats of Sonneborn "Kure-N-Seal", Euclid Chemical Co. "Surfhard", or Lambert Corp. "Solidus" applied per the manufacturer's installation instructions, or an approved equal.

CC. System No. 30

1. System No. 30 shall be used for Aluminum Insulation from Concrete and Carbon Steel.
2. System No. 30 shall be bituminous paint having a minimum volume solids of 68% coaltar pitch based.
3. Contractor to coat areas of aluminum grating, stairs, structural members or aluminum fabrications, in contact with concrete or carbon steel with this system.
4. Surface Preparation: Solvent or Steam Cleaning per SSPC SP-1; do not use alkali cleaning. Then dust blast.
5. No primer required for Tnemec.
6. Finish Coat: Tnemec 46-465. Apply two coats to a minimum dry-film thickness of 12 mils each.

## **PART 3 EXECUTION**

### **3.01 GENERAL**

- A. All painting shall be done in strict accordance with the recommendations of the manufacturer and shall be performed in a manner satisfactory to the Owner/Engineer.
  - 1. All recommendations of the paint manufacture in regard to mixing, applying, thinning and curing as well as the health and safety of the workers shall be followed.
  - 2. Dry film thickness for masonry is approximate for application to a smooth surface.
  - 3. Sequence painting to ensure work area is dust free.

### **3.02 MIXING**

- A. Exercise care to keep fire hazards to a minimum. Provide an approved hand fire extinguisher near each paint storage and mixing area. No oily waste, rags, or painting equipment shall be left scattered throughout the premises.
- B. Mix coatings in accordance with manufacturer's instructions. Colors shall be thoroughly mixed with no streaks or separation of color. Do not add thinners, driers or other additives except as recommended by the coating manufacturer. Do not incorporate in the coating any thinners or solvents used for cleaning brushes or equipment.
- C. Protect all adjacent areas against damage and leave storage and mixing areas clean at the completion of painting.

### **3.03 ACCEPTANCE OF SURFACES**

- A. Inspect all surfaces and adjoining work and report to the E/A in writing any existing unsatisfactory conditions. No painting work shall be started until the unsatisfactory conditions are remedied.
- B. Commencement of surface preparation and painting shall constitute the acceptance of existing conditions and any defects appearing in the painting work thereafter shall be by the Contractor at no additional cost.

### **3.04 PROTECTION OF ADJACENT SURFACES**

- A. Provide necessary protection for completed work and all adjoining surfaces. Provide

temporary closures as required to prevent circulation of dust from adjacent areas where other work is in progress. Where it is necessary to remove existing protection of work of others, such protection shall be fully replaced.

- B. Locate and protect all existing utilities, structures, or appurtenances.

### **3.05 VENTILATION**

- A. Provide adequate ventilation for safe application and for proper drying of coatings on interior surfaces. Ensure solvent vapors are released during and after application of coatings. Remove vapors by exhausting air from the lowest portions of tanks or enclosed spaces and keep tops open and clear. During coating application in enclosed areas the capacity of ventilating fans shall be at least 300cfm per gallon of coating applied per hour. Provide continuous forced ventilation at a rate of at least one complete air change per 4 hours for at least 7 days after coating application is completed.

### **3.06 GENERAL SURFACE PREPARATION REQUIREMENTS**

- A. Prepare all surfaces in accordance with the coating manufacturer's instructions and as specified. Surfaces shall be uniform texture, dry, and free from dust, grit, oil, grease, or any material which will adversely affect adhesion or appearance of the coating. Rough edges of metal, weld seams and sharp edges from scaffold lugs shall be ground to a curve.
- B. Surfaces that have been cleaned, pretreated, and/or otherwise prepared for painting shall be given a coat of the first-coat material as soon as practicable prior to any deterioration of the prepared surface.
- C. Hardware, accessories, plates, fixtures, and similar items in contact with coated surfaces shall be removed, masked, or otherwise protected prior to surface preparation and painting operations.
- D. Exposed nails and other ferrous metals on surfaces to be coated shall be spot- primed with a metal primer compatible with the finish.

### **3.07 SURFACE PREPARATION**

- A. Surface Preparation SP 3 - Power Tool Cleaning
  - 1. Remove all oil and grease from surface. Power tool clean the surface removing all loose mill scale, loose rust, loose paint and other detrimental foreign matter by the

methods outlined in the SSPC SP 3. Feather out edges of chipped or abraded areas to prevent flaws from showing through finish coats.

2. The cleaned surface shall be primed as soon as possible and before any rusting of the surface occurs.

B. Surface Preparation SP 6 - Commercial Blast Cleaning

1. Remove all oil and grease from the surface. Blast clean surface to a Commercial Finish, removing mill scale, dirt, rust, and foreign matter by the methods outlined in SSPC SP 6. Two thirds of each square inch of surface area shall be free of all visible residues.
2. Blasting shall be done with centrifugal wheel or compressed air blast using either steel grit or flint silica sand. Abrasive should provide a profile depth of 1.0 to 2.0 mils. Steel Grit #G-80 or flint silica sand 20-50 mesh is recommended to obtain proper profile depth. Remove all dust and sand by vacuuming.
3. The blast cleaned surface shall be primed as soon as possible and before any rusting of the surface occurs.

C. Surface Preparation SP 7 - Brush-Off Blast: Prepare metal as outlined in SSPC SP 7 to provide for proper adhesion of coating.

D. Surface Preparation SP 10 - White Blast Cleaning

1. Steel surfaces shall be dry and clean. Remove all grease, oils and contaminants with rags soaked in toluol or xylol. Solvent Clean all surfaces per SSPC-SP 1 Solvent Cleaning.
2. Remove all weld spatter. Grind all rough welds and sharp edges to a smooth rounded contour. Blast clean the surface to a Near White Metal finish, removing nearly all mill scale, rust, rust-scale, paint or foreign matter by the recommended methods outlined in SSPC SP 10. At least 95 percent of each square inch shall be free of all visible residues and staining.
3. Blasting shall be done with centrifugal wheel or compressed air blast nozzles using either steel grit or flint silica sand. Abrasive should provide profile depth of 1.0 to 2.0

mils. Steel Grit #G-80 or flint silica sand 20-50 mesh is recommended to obtain proper profile depth. Remove all dust and sand by vacuuming.

4. The blast cleaned surface should be primed as soon as possible and before any rusting of the surface occurs.

E. Surface Preparation SP C1 - General Cleaning: Allow concrete and masonry to cure in place for 28 days. Remove all dirt, dust, form oil, curing compounds, grease stains, or efflorescence from surfaces and roughen as required to provide good adhesion of coatings. If washing of the surface is required, use tri-sodium phosphate solution followed by a clean water rinse. Fill all minor holes to produce uniform surface textures.

F. Surface Preparation SP C2 - Sweep Sand Blasting

1. Concrete surfaces must be clean, dry and free of existing coatings. Cure new concrete a minimum of 28 days. Fill and seal structural cracks and defects.
2. Concrete shall be cleaned and etched by sweep sandblasting (brush-off blast) so the surface is grainy to the touch. All dust or foreign matter shall be removed by vacuuming.

G. Surface Preparation SP C3 - Acid Etching (Horizontal Surfaces Only)

1. Concrete surfaces must be clean and dry. Cure new concrete a minimum of 28 days. Remove all dirt, dust, grease, oil and other contaminants from surface.
2. Etch concrete surface with 15 to 20 percent muriatic acid. Thoroughly coat the concrete with solution applied with a mop or brush. When foaming stops, thoroughly neutralize with clear water to remove soluble salts. Test the rinse water with litmus paper to verify the neutralization.
3. After etching, the surface shall be "grainy" to the touch; if not, repeat the treatment.
4. Permit surface to thoroughly dry a minimum of 72 hours before coating, while maintaining the cleanliness of the surface.

H. Surface Preparation SP M1 - Solvent Cleaning: Non-ferrous and galvanized ferrous surfaces scheduled to receive paint shall be solvent cleaned to remove all oils, salts, and

contaminants prior to application of pretreatments or primers.

- I. Surface Preparation SP P1 – Drywall: Fill all surface irregularities with spackling compound and sand to a smooth level surface prior to applying finish. Care shall be exercised to avoid raising nap on the paper.
- J. Surface Preparation SP P2 - Plaster and Stucco: Rake cracks, scratches and abrasions deeply. Soak with water and fill with patching plaster or spackling compound. Treat with aqueous solution of zinc sulphate, 4 lbs. to 1 gallon of water. Add to solution enough phenolphthalein to act as a color warning of alkali. Allow to dry for 3 days. Remove loose crystals before coating.
- K. Surface Preparation SP W1 – Wood: Sandpaper to a smooth even surface and vacuum or dust off. Treat all knots and sap spots with mineral spirits and, when dry, touch up with an approved sealer. Subsequent to priming and staining, thoroughly fill holes and cracks with plastic wood filler for transparent finishes and putty for painted wood. Unless otherwise approved, paint only when the moisture content of the wood is below 12 percent. Do not apply primer or sealer to wood in areas where cement, mortar, or plaster is not thoroughly dry.

### **3.08 APPLICATION**

- A. All work shall be performed by skilled painters. Surfaces shall be free of drops, ridges, waves, laps and brush marks. Edges of paint adjoining other colors or materials shall be sharp and true.
- B. Do not apply coatings in temperatures below 50 degrees F except where the manufacturer specifically allows for lower temperatures. No exterior painting shall be done during inclement weather when relative humidity exceeds 85%, the ambient temperature is within 5 degrees F of the Dew Point or under conditions identified by the manufacturer as unsuitable.
- C. The average rate of application shall not exceed the theoretical rate of coverage recommended by the coating manufacturer for the type of surface involved, less an allowance for losses. Average DFT shall not be less than thickness set forth under Painting Systems. Not more than 10-20% of points inspected may be less than 90% of the specified thickness. Deficiencies shall be corrected by application of additional coating.
- D. Each coat shall be uniform in coverage and color. Successive coats shall perceptibly vary in color. Each coat shall be carefully examined and faulty material, poor workmanship, holidays, damaged areas and other imperfections shall be touched up prior to applying

succeeding coats. Comply with coating manufacturer's recommendations for drying time between coats.

- E. Bottoms, sides and edges of doors shall receive same finish as faces of doors. If refitting of wood doors is done prior to final acceptance, refinish at no extra cost.
- F. Incidental niches, recesses, passages, closets, etc., shall be finished to match similar or adjacent spaces. Access doors, panels, convectors, grilles and similar items shall be coated the same color as adjacent work, except for non-ferrous metal or where otherwise directed by the E/A. Primed hardware shall be coated to match adjacent work to which they are attached.
- G. In the event that the finished surfaces are not acceptable, completely refinish entire unit areas or sections as necessary in order to eliminate visible laps or other indications of repairs.
- H. Mixing, thinning, pot life, application procedure, equipment, coverage, curing, re-coating, storage and number of coats shall be in accordance with coating manufacturer's instructions.
- I. Avoid degradation and contamination of blasted surfaces, and avoid between coat contamination. Surfaces contaminated shall be cleaned before applying next coat. Method of cleaning contaminated surface shall be approved by the Engineer or owner's representative.
- J. Each application of material shall be worked into corners, crevices, joints, etc., and distributed evenly over flat surfaces. Spraying techniques that result in a uniform wet pattern shall be used and dry spraying should be avoided. Dry spray shall be removed prior to coating being applied.
- K. All bolts, welds, sharp edges, and difficult access areas shall receive a primer brush coat or spray coat prior to primer spray application.

### **3.09 PIPE COLOR CODING**

- A. Coat all exposed piping, conduit and appurtenances to conform to a color code as approved by the E/A.
- B. Submit for the E/A to approve a coating schedule for the color coding of exposed piping, conduit and appurtenances.

### **3.10 CLEAN-UP**

- A. At completion of the painting work, clean off all paint spots and other paint materials from



surfaces where they are not intended to be. Remove from the premises all rubbish and accumulated material and leave the work in clean orderly condition, acceptable to the E/A. All cloths and waste that might constitute a fire hazard shall be placed in closed metal containers or destroyed at the end of each day. Upon completion of the work, all staging, scaffolding, and containers shall be removed from the site and/or destroyed in an approved and legal manner.

### **3.11 EXTRA STOCK**

- A. Upon completion of painting work, the Owner shall be furnished at no additional cost, one gallon of each type and color of finish paint for touching up. Paint container labels shall be complete with the manufacturer's name, generic type, number, color and location in which the paint is applied.

### **3.12 DAMAGED COATINGS**

- A. Damaged coatings, pinholes, and holidays shall have edges feathered and repaired in accordance with the recommendations of the manufacturer, as approved by the Engineer.
- B. All finish coats, including touch up and damage-repair coats shall be applied in a manner which will present a uniform texture and color-match appearance.

### **3.13 UNSATISFACTORY APPLICATION**

- A. If the item has an improper finish, color, or insufficient dry film thickness, the surface shall be cleaned and top coated with the specified material to obtain the specified color and coverage. Specific surface preparation information to be secured from the coatings manufacturer and the Engineer.
- B. All visible areas of chipped, peeled, or abraded paint shall be hand or power-sanded, feathering the edges. The areas shall then be primed and finish coated in accordance with the specifications.
- C. Work shall be free of runs, bridges, shiners, laps, or other imperfections. Evidence of these conditions shall be cause for rejection.
- D. Any defects in the coating system shall be repaired by the Contractor per written recommendations of the coating manufacturer.
- E. Any repairs made on steel surfaces for immersion service shall be holiday detected in accordance with ASTM G 62 low voltage holiday detection. Areas found to have holidays shall be marked and repaired in accordance with the paint manufacturer's instructions.

The Engineer shall be notified of time of testing so that he might be present to witness testing.

#### **3.14 GUARANTEE AND ANNIVERSARY INSPECTION**

- A. All work shall be warranted for a period of one year from date of acceptance of the project.
- B. The Owner will notify the Contractor at least 30 days prior to the anniversary date and shall establish a date for the inspection. Any defects in the coating system shall be repaired by the Contractor at no additional cost to the Owner. Should a failure occur to 25% of the painted surface, either interior or exterior, the entire surface shall be cleaned and painted in accordance with these specifications.

**END OF SECTION**

## **SECTION 09 97 61**

### **FUSION-BONDED EPOXY LININGS AND COATINGS**

#### **PART 1 GENERAL**

##### **1.01 DESCRIPTION**

- A. This section includes materials, application, and testing of one-part, fusion-bonded, heat-cured, thermosetting, 100% solids epoxy linings and coatings on steel, cast-iron, and ductile-iron equipment, such as valves, flexible pipe couplings, and steel and ductile iron pipe. All coatings in contact with potable water, raw water, or aerated water are to be coated with an NSF 61 approved coating.

##### **1.02 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01 33 00 and the following:
- B. Submit manufacturer's catalog literature and product data sheets, describing the physical and chemical properties of the epoxy coating. Describe application and curing procedure.
- C. Submit coating application test records for measuring coating thickness and holiday detection for each item or pipe section and fitting. Describe repair procedures used.
- D. Submit NSF 61 certification for coatings that come into contact with potable water, raw water, or aerated water.

#### **PART 2 MATERIALS**

##### **2.01 PIPING AND EQUIPMENT SURFACES**

- A. The Contractor shall require the equipment suppliers to provide equipment that is free of salts, oil, and grease to the coating applicator.
- B. The Contractor shall require pipe suppliers to provide bare pipe that is free of salts, oil, and grease to the coating applicator.

##### **2.02 SHOP-APPLIED EPOXY LINING AND COATING**

- A. Lining and coating shall be a 100% solids, thermosetting, fusion-bonded, dry powder epoxy resin: Scotchkote 134 or 206N, Valspar "Pipeclad 1500 Red," or equal. Epoxy lining and coating shall meet or exceed the following requirements:

Hardness (minimum)	Barcol 17 (ASTM D2583) Rockwell 50 ("M" scale)
Abrasion resistance (maximum value)	1,000 cycles: 0.05 gram removed
	5,000 cycles: 0.115 gram removed
	ASTM D1044, Tabor CS 17 wheel, 1,000-gram weight
Adhesion (minimum)	3,000 psi (Elcometer)
Tensile strength	7,300 psi (ASTM D2370)
Penetration	0 mil (ASTM G17)
Adhesion overlap shear, 1/8-inch steel panel, 0.010 glue line	4,300 psi, ASTM D1002
Impact (minimum value)	100 inch-pounds (Gardner 5/8-inch diameter tup)

### **2.03 FIELD-APPLIED EPOXY COATING FOR PATCHING**

- A. Use a minimum 80% solids liquid epoxy resin, such as Scotchkote 306 or 323.

### **2.04 PAINTING AND COATING OF GROOVED-END AND FLEXIBLE PIPE COUPLINGS**

- A. Line and coat couplings the same as the pipe. Color shall match the color of the pipe fusion epoxy coating.

## **PART 3 EXECUTION**

### **3.01 SHOP APPLICATION OF FUSION-BONDED EPOXY LINING AND COATING-GENERAL**

- A. Grind surface irregularities, welds, and weld spatter smooth before applying the epoxy. The allowable grind area shall not exceed 0.25 square foot per location, and the maximum total grind area shall not exceed 1 square foot per item or piece of equipment. Do not use any item, pipe, or piece of equipment in which these requirements cannot be met.
- B. Remove surface imperfections, such as slivers, scales, burrs, weld spatter, and gouges. Grind outside sharp corners, such as the outside edges of flanges, to a minimum radius of 1/4 inch.
- C. Uniformly preheat the pipe, item, or piece of equipment prior to blast cleaning to remove moisture from the surface. The preheat shall be sufficient to ensure that the surface temperature is at least 5°F above the dew point temperature during blast cleaning and inspection.
- D. Sandblast surfaces per SSPC SP-5. Protect beveled pipe ends from the abrasive blast cleaning.

- E. After cleaning and surface preparation, test the surface for residual chloride concentration. If the residual chloride concentration exceeds  $5 \mu\text{g}/\text{cm}^2$ , then apply a phosphoric acid wash to the surface after sandblasting. The average temperature, measured at three different locations, shall be 80°F to 130°F during the acid wash procedure. The acid wash shall be a 5% by weight phosphoric acid solution. The duration in which the acid is in contact with the surface shall be determined by using the average temperature as tabulated below:

Surface Temperature (°F)	Contact Time (seconds)
80	52
85	45
90	36
95	33
100	28
105	24
110	21
130	10

After the acid wash has been completed, remove the acid with demineralized water having a maximum conductivity of 5 micromhos/cm at a minimum nozzle pressure of 2,500 psi.

- F. Apply lining and coating by the electrostatic spray or fluidized bed process. Minimum thickness of lining or coating shall be 15 mils. Heat and cure per the epoxy manufacturer's recommendations. The heat source shall not leave a residue or contaminant on the metal surface. Do not allow oxidation of surfaces to occur prior to coating. Do not permit surfaces to flash rust before coating.

### **3.02 SHOP APPLICATION OF FUSION-BONDED EPOXY LINING AND COATING TO PIPE--ADDITIONAL REQUIREMENTS**

- A. Apply lining and coating per AWWA C213 except as modified herein.
- B. Grind 0.020 inch (minimum) off the weld caps on the pipe weld seams before beginning the surface preparation and heating of the pipe.

### **3.03 SHOP APPLICATION OF FUSION-BONDED EPOXY LINING AND COATING TO JOINT AREAS OF DUCTILE-IRON AND CAST-IRON FITTINGS—ADDITIONAL REQUIREMENTS**

- A. Limit the protective coating thickness in the joints of ductile-iron and cast-iron fittings to maintain a leak-proof joint. However, the coating thickness in the joint area shall not be less than 4 mils.

### **3.04 QUALITY OF LINING AND COATING APPLICATIONS**

- A. The cured lining or coating shall be smooth and glossy, with no graininess or roughness. The lining or coating shall have no blisters, cracks, bubbles, underfilm voids, mechanical damage, discontinuities, or holidays.

### **3.05 FACTORY TESTING OF COATING--GENERAL**

- A. Test linings and coatings with a low-voltage wet sponge holiday detector. Test pipe linings and coatings per AWWA C213, Section 5.3.3. If the number of holidays or pinholes is fewer than one per 20 square feet of coating surface, repair the holidays and pinholes by applying the coating manufacturer's recommended patching compound to each holiday or pinhole and retest. If the number of pinholes and holidays exceeds one per 20 square feet of coating surface, remove the entire lining or coating and recoat the item or pipe.
- B. Measure the coating thickness at three locations on each item or piece of equipment or pipe section using a coating thickness gauge calibrated at least once per eight-hour shift. Record each measured thickness value. Where individual measured thickness values are less than the specified minimum thickness, measure the coating thickness at three additional points around the defective area. The average of these measurements shall exceed the specified minimum thickness value, and no individual thickness value shall be more than 2 mils below or 3 mils above the specified minimum value. If a section of the pipe, item, or piece of equipment does not meet these criteria, remove the entire lining or coating and recoat the entire item or piece of equipment.

### **3.06 FACTORY INSPECTION OF LINING AND COATING OF PIPE—ADDITIONAL REQUIREMENTS**

- A. Check for coating defects on the weld seam centerlines. There shall be no porous blisters, craters, or pimples lying along the peak of the weld crown.

### **3.07 SHIPPING, STORAGE, AND HANDLING**

- A. When loading piping, fittings, couplings, or other coated items for shipment to the project site, use spacers and other protective devices to separate pipes or other coated items to prevent damaging the coated surfaces during transit and unloading. If wood spacers are used, remove wood splinters and particles from the coated surfaces after separation. Use padded chains or ribbon binders to secure the loaded pipe or other coated items and minimize damage.
- B. Do not load or unload pipe, fittings, couplings, or other coated items by inserting forklift tines or lifting chains inside the pipe or item. Use nonmetallic slings, padded chains, or padded forklift tines to lift pipe or other coated items.
- C. Cover piping or other coated items 100% with protective coverings or tarpaulins to prevent deposition of road salts, fuel residue, and other contaminants in transit.
- D. Provide stulls, braces, and supports for piping during shipping and storage such that out-of-roundness or deflection does not exceed 0.5% of the pipe diameter.
- E. Handle piping and other coated items with care during the unloading, installation, and erection operations to minimize damage. Do not place or store pipe or other coated items on the ground or on top of other work unless ground or work is covered with a protective covering or tarpaulin. Place pipe or other coated items above the ground upon platforms, skids, or other supports.

- F. Store piping or other coated items at the site on pallets to prevent direct contact with ground or floor. Cover pipe or coated items during storage with protective coverings or tarpaulins to prevent deposition of rainwater, salt air, dirt, dust, and other contaminants.
- G. Do not allow piping or other coated items to contact metal, concrete, or other surfaces during storage, handling, or installation and erection at the site that could damage or scratch the coating.

### **3.08 FIELD REPAIRS**

- A. Patch scratches and damaged areas incurred while installing fusion-bonded epoxy coated items with a two-component, 80% solids (minimum), liquid epoxy resin. Wire brush or sandblast the damaged areas per SSPC SP-10. Lightly abrade or sandblast the coating or lining on the sides of the damaged area before applying the liquid epoxy coating. Apply an epoxy coating to defective linings and coatings to areas smaller than 20 square inches. Patched areas shall overlap the parent or base coating a minimum of 0.5 inch. If a defective area exceeds 20 square inches, remove the entire lining and coating and recoat the entire item or piece of equipment. Apply the liquid epoxy coating to a minimum dry-film thickness of 15 mils. Measure the dry film thickness coating thickness at three locations at each repair site using a coating thickness gauge calibrated at least once per eight-hour shift. Record each measured thickness value. All measurements shall meet the minimum thickness. If dry film thickness is not observed on any reading, re-patch per the previous direction and re-test.

**END OF SECTION**

**SECTION 23 07 13**  
**DUCT INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Duct insulation.
- B. Duct Liner.
- C. Insulation jackets.

**1.02 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

**1.03 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

**1.04 FIELD CONDITIONS**

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

**PART 2 PRODUCTS**

**2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

**2.02 GLASS FIBER, FLEXIBLE**

- A. Manufacturer:
  - 1. Knauf Insulation: [www.knaufusa.com](http://www.knaufusa.com).
  - 2. Johns Manville Corporation: [www.jm.com](http://www.jm.com).
  - 3. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).
  - 4. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
  - 5. Approved Equal.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
  - 1. 'K' ('Ksi') value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 1200 degrees F (649 degrees C).
  - 3. Maximum Water Vapor Sorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
  - 3. Secure with pressure sensitive tape.
- D. Vapor Barrier Tape:
  - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- E. Outdoor Vapor Barrier Mastic:



- F. Tie Wire: Annealed steel, 16 gage (1.5 mm).

### **2.03 GLASS FIBER, RIGID**

- A. Manufacturer:
1. Knauf Insulation: [www.knaufusa.com](http://www.knaufusa.com).
  2. Johns Manville Corporation: [www.jm.com](http://www.jm.com).
  3. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).
  4. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
  5. Approved Equal.
- B. Insulation: ASTM C612; rigid, noncombustible blanket.
1. 'K' ('Ksi') value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C518.
  2. Maximum service temperature: 450 degrees F (232 degrees C).
  3. Maximum Water Vapor Sorption: 5.0 percent.
  4. Maximum Density: 8.0 lb/cu ft (128 kg/cu m).
- C. Vapor Barrier Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
  3. Secure with pressure sensitive tape.
- D. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- E. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight, glass fabric.
  2. Vinyl emulsion type acrylic, compatible with insulation, black color.

### **2.04 JACKETS**

- A. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
1. Lagging Adhesive:
    - a. Compatible with insulation.
- B. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square (2.45 kg/sq m).
- C. Aluminum Jacket: ASTM B209 (ASTM B209M).
1. Thickness: 0.016 inch (0.40 mm) sheet.
  2. Finish: Smooth.
  3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
  4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.
  5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.
  6. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.010 inch (0.25 mm) thick stainless steel.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated ducts conveying air below ambient temperature:
1. Provide insulation with vapor barrier jackets.

2. Finish with tape and vapor barrier jacket.
  3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- D. Insulated ducts conveying air above ambient temperature:
1. Provide with or without standard vapor barrier jacket.
  2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet (3 meters) above finished floor): Finish with canvas jacket sized for finish painting.
- F. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with with calked aluminum jacket with seams located on bottom side of horizontal duct section.
- G. External Duct Insulation Application:
1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
  2. Secure insulation without vapor barrier with staples, tape, or wires.
  3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
  4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
  5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- H. Duct and Plenum Liner Application:
1. Adhere insulation with adhesive for 100 percent coverage.
  2. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards for spacing.
  3. Seal and smooth joints. Seal and coat transverse joints.
  4. Seal liner surface penetrations with adhesive.
  5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

### **3.03 SCHEDULES**

- A. Combustion Air Duct:
1. Flexible Glass Fiber Duct Insulation: 1 inches thick.
  2. Rigid Glass Fiber Duct Insulation: 1 inches thick.
  3. Flexible Glass Fiber Duct Liner Insulation: 1 inches thick.
  4. Rigid Glass Fiber Duct Liner Insulation: 1 inches thick.
- B. Evaporative Condenser Intake and Exhaust:
- C. Exhaust Ducts Within 10 ft (3 m) of Exterior Openings:
- D. Exhaust Ducts Exposed to Outdoor Air:
- E. Outside Air Intake Ducts:
- F. Plenums:
- G. Plenums (Cooling System):
- H. Ventilation Equipment Casings:
- I. Supply Ducts:
- J. Supply Ducts From Fans to Vertical Ducts in Shafts (Cooling System):
- K. Supply Ducts in Vertical Shafts (Cooling Systems):
- L. Supply ducts After Terminal Boxes:
- M. Return and Relief Ducts in Mechanical Rooms:

N. Ducts Exposed to Outdoors:

**END OF SECTION**

**SECTION 23 08 00**  
**COMMISSIONING OF HVAC**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This section covers the Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.
- B. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.
- C. The entire HVAC system is to be commissioned, including commissioning activities for the following specific items:
  - 1. Control system.
  - 2. Major and minor equipment items.
  - 3. Piping systems and equipment.
  - 4. Ductwork and accessories.
  - 5. Sound control devices.
  - 6. Vibration control devices.
  - 7. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.
- D. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.
- E. Upon completion of the TAB (Testing, adjusting, and balancing) report one copy shall be provided to the owner.

**1.02 REFERENCE STANDARDS**

- A. ASHRAE Guideline 1.1 - The HVAC Commissioning Process; 2012

**1.03 SUBMITTALS**

- A. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.
- B. DRAFT Prefunctional Checklists and Functional Test Procedures for Control System: Detailed written plan indicating the procedures to be followed to test, checkout and adjust the control system prior to full system Functional Testing; include at least the following for each type of equipment controlled:
  - 1. System name.
  - 2. List of devices.
  - 3. Step-by-step procedures for testing each controller after installation, including:
    - a. Process of verifying proper hardware and wiring installation.
    - b. Process of downloading programs to local controllers and verifying that they are addressed correctly.
    - c. Process of performing operational checks of each controlled component.
    - d. Plan and process for calibrating valve and damper actuators and all sensors.
    - e. Description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
  - 4. Copy of proposed log and field checkout sheets to be used to document the process; include space for initial and final read values during calibration of each point and space to specifically indicate when a sensor or controller has "passed" and is operating within the contract parameters.
  - 5. Description of the instrumentation required for testing.

6. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the Commissioning Authority and TAB contractor for this determination.
- C. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.
- D. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:
1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
  2. Full as-built set of control drawings.
  3. Full as-built sequence of operations for each piece of equipment.
  4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
    - a. Floor.
    - b. Room number.
    - c. Room name.
    - d. Air handler unit ID.
    - e. Reference drawing number.
    - f. Air terminal unit tag ID.
    - g. Heating and/or cooling valve tag ID.
    - h. Minimum air flow rate.
    - i. Maximum air flow rate.
  5. Full print out of all schedules and set points after testing and acceptance of the system.
  6. Full as-built print out of software program.
  7. Electronic copy on disk of the entire program for this facility.
  8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
  9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
  10. Control equipment component submittals, parts lists, etc.
  11. Warranty requirements.
  12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
  13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
    - a. Sequences of operation.
    - b. Control drawings.
    - c. Points lists.
    - d. Controller and/or module data.
    - e. Thermostats and timers.
    - f. Sensors and DP switches.
    - g. Valves and valve actuators.
    - h. Dampers and damper actuators.
    - i. Program setups (software program printouts).
- E. Project Record Documents: See Section 01720 for additional requirements.
1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
  2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.
- F. Draft Training Plan: In addition to requirements specified in Section 01820, include:
1. Follow the recommendations of ASHRAE Guideline 1.

2. Control system manufacturer's recommended training.
  3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.
- G. Training Manuals: See Section 01820 for additional requirements.
1. Provide one copy of the controls training manuals in a separate manual from the O&M manuals.

## **PART 2 PRODUCTS**

### **2.01 TEST EQUIPMENT**

- A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Cooperate with the Commissioning Authority in development of the Prefunctional Checklists and Functional Test Procedures.
- B. Furnish additional information requested by the Commissioning Authority.
- C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.
- D. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.
- E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.
  1. Include cost of sheaves and belts that may be required for testing, adjusting, and balancing.
- F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.
- G. Provide temperature and pressure taps in accordance with the contract documents.
  1. Provide a pressure/temperature plug at each water sensor that is an input point to the control system.

### **3.02 INSPECTING AND TESTING - GENERAL**

- A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.
- B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.
- C. Provide two-way radios for use during the testing.
- D. Valve/Damper Stroke Setup and Check:
  1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
  2. Set pump/fan to normal operating mode.

3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
  4. Command valve/damper open; verify position is full open and adjust output signal as required.
  5. Command valve/damper to a few intermediate positions.
  6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- E. Coil Valve Leak Check:
1. Method 1 - Water Temperature With 2-Way Valve:
    - a. Calibrate water temperature sensors on each side of coil to be within 0.2 degree F of each other.
    - b. Turn off air handler fans, close outside air dampers. Keep pump running. Make sure appropriate coil dampers are open.
    - c. Normally closed valves will close.
    - d. Override normally open valves to the closed position.
    - e. After 10 minutes observe water delta T across coil. If it is greater than 2 degrees F, leakage is probably occurring.
    - f. Reset valve stroke to close tighter.
    - g. Repeat test until compliance is achieved.
  2. Method 2 - Air Temperature With 2 or 3-Way Valve: Water leak-by less than 10 percent will likely not be detected with this method.
    - a. Calibrate air temperature sensors on each side of coil to be within 0.2 degree F of each other.
    - b. Air handler fans should be on.
    - c. Change mixed or discharge air setpoint, override values or bleed or squeeze bulb pneumatic controller to cause the valve to close.
    - d. After 5 minutes observe air delta T across coil. If it is greater than one degree F, leakage is probably occurring.
    - e. Reset valve stroke to close tighter.
    - f. Repeat test until compliance is achieved.
  3. Method 3 - Coil Drain Down: Not for 3-way valves.
    - a. Put systems in normal mode.
    - b. If cooling coil valve, remove all call for cooling; if heating coil valve, put system in full cooling.
    - c. Close isolation valve on supply side of coil, open air bleed cap, open drain-down cock and drain water from coil.
    - d. If water does not stop draining, there may be a leak through the control valve.
    - e. Return all to normal when done.
- F. Isolation Valve or System Valve Leak Check: For valves not by coils.
1. With full pressure in the system, command valve closed.
  2. Use an ultra-sonic flow meter to detect flow or leakage.
- G. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

### **3.03 TAB COORDINATION**

- A. TAB: Testing, adjusting, and balancing of HVAC.
- B. Coordinate commissioning schedule with TAB schedule.
- C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.
- D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.

- E. Have all required Prefunctional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the Commissioning Authority prior to starting TAB.
- F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

#### **3.04 CONTROL SYSTEM FUNCTIONAL TESTING**

- A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the requirements of the Contract Documents and the detailed Sequences of Operation documentation submittal.
- B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with the contract documents.
- C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the Commissioning Authority.
- D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.
  - 1. The scope of trend logging is partially specified; trend log up to 50 percent more points than specified at no extra cost to Owner.
  - 2. Perform all trend logging specified in Prefunctional Checklists and Functional Test procedures.
- E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.
- F. Demonstrate the following to the Commissioning Authority during testing of controlled equipment; coordinate with commissioning of equipment.
  - 1. Setpoint changing features and functions.
  - 2. Sensor calibrations.
- G. Demonstrate to the Commissioning Authority:
  - 1. That all specified functions and features are set up, debugged and fully operable.
  - 2. That scheduling features are fully functional and setup, including holidays.
  - 3. That all graphic screens and value readouts are completed.
  - 4. Correct date and time setting in central computer.
  - 5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner.
  - 6. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner.
  - 7. Power failure and battery backup and power-up restart functions.
  - 8. Global commands features.
  - 9. Security and access codes.
  - 10. Occupant over-rides (manual, telephone, key, keypad, etc.).
  - 11. O&M schedules and alarms.
  - 12. Occupancy sensors and controls.
  - 13. "After hours" use tracking and billing.
  - 14. Communications to remote sites.
  - 15. Fire alarm interlocks and response.
  - 16. Fire protection and suppression systems interfaces.
  - 17. Security system interlocks.



18. That points that are monitored only, having no control function, are reporting properly to the control system.
  19. All control strategies and sequences not tested during controlled equipment testing.
  20. Trend logging and graphing features that are specified.
  21. Other integrated tests specified in the contract documents
  22. That control system features that are included but not specified to be setup are actually installed.
- H. Perform and submit trend logging on the following using the control system, for minimum period of 5 days including one weekend, if the control points are monitored by the control system:
1. Duty cycling, if specified.
  2. Demand limiting, including over-ride of limiting.
  3. Sequential staging ON of equipment; optionally demonstrate manually.
  4. Optimum start-stop functions.
  5. Miscellaneous equipment current or status for duty cycling and demand limiting.
  6. Equipment or building kW or current for demand limiting.
  7. Equipment optimum start/stop functions.
- I. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

### **3.05 OPERATION AND MAINTENANCE MANUALS**

- A. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.
- B. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.
- C. Commissioning Authority will add commissioning records to manuals after submission to Owner.

### **3.06 DEMONSTRATION AND TRAINING**

- A. Demonstrate operation and maintenance of HVAC system to Owner' personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.
- B. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to the Commissioning Authority during Functional Testing.
- C. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Provide the following minimum durations of training:
  1. HVAC Control System: 1 hours.
- D. TAB Review: Instruct Owner's personnel for minimum 1 hours, after completion of TAB, on the following:
  1. Review final TAB report, explaining the layout and meanings of each data type.
  2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
  3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
  4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
  5. Other salient information that may be useful for facility operations, relative to TAB.

**END OF SECTION**

**SECTION 23 31 00**  
**DUCTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metal ductwork.
- B. Nonmetal ductwork.
- C. Casing and plenums.
- D. Duct cleaning.

**1.02 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for duct materials.
- C. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.
- D. Manufacturer's Installation Instructions: Indicate special procedures for glass fiber ducts.
- E. Manufacturer's Certificate: Certify that installation of glass fiber ductwork meet or exceed specified requirements.
- F. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

**1.03 REGULATORY REQUIREMENTS**

- A. Construct ductwork to NFPA 90A standards.

**1.04 FIELD CONDITIONS**

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

**PART 2 PRODUCTS**

**2.01 DUCT ASSEMBLIES**

- A. All Ducts: Galvanized steel, unless otherwise indicated.
- B. Low Pressure Supply (System with Cooling Coils): 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.
- C. Return and Relief: 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.
- D. General Exhaust: 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.

**2.02 MATERIALS**

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
  - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
  - 2. VOC Content: Not more than 250 g/L, excluding water.
  - 3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E84.
  - 4. For Use With Flexible Ducts: UL labeled.
- C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
6. Other Types: As required.

### **2.03 DUCTWORK FABRICATION**

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
- B. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE Handbook - Fundamentals.
- C. Duct systems have been designed for metal duct. At the Contractor's option, fibrous glass duct may be substituted for metal duct.
- D. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- E. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
- F. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
- G. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- H. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards.
- I. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

### **2.04 MANUFACTURED DUCTWORK AND FITTINGS**

- A. Slab Duct Ventilation System: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS, with G90/Z275 coating designed for installation in cast-in-place concrete floor assemblies.
  1. Fittings: Elbows, End caps, Connecting couplings, Spin-in-collar, Soffit-discharge head, Support Brackets, and Wall discharge head
- B. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
  1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
  2. Pressure Rating: 10 inches WG (2.50 kPa) positive and 1.0 inches WG (250 Pa) negative.
  3. Maximum Velocity: 4000 fpm (20.3 m/sec).
  4. Temperature Range: Minus 10 degrees F to 160 degrees F (Minus 23 degrees C to 71 degrees C).
- C. Flexible Ducts: Black polymer film supported by helically wound spring steel wire.
  1. UL labeled.
  2. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
  3. Pressure Rating: 4 inches WG (1000 Pa) positive and 0.5 inches WG (175 Pa) negative.
  4. Maximum Velocity: 4000 fpm (20.3 m/sec).
  5. Temperature Range: Minus 20 degrees F to 175 degrees F (Minus 28 degrees C to 79 degrees C).
- D. Flexible Ducts: Multiple layers of aluminum laminate supported by helically wound spring steel wire.
  1. UL labeled.
  2. Insulation: Fiberglass insulation with polyethylene vapor barrier film.

3. Pressure Rating: 10 inches WG (2.50 kPa) positive and 1.0 inches WG (250 Pa) negative.
  4. Maximum Velocity: 4000 fpm (20.3 m/sec).
  5. Temperature Range: Minus 20 degrees F to 210 degrees F (Minus 28 degrees C to 99 degrees C).
- E. Flexible Ducts: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
  2. Pressure Rating: 10 inches WG (2.50 kPa) positive and 1.0 inches WG (250 Pa) negative.
  3. Maximum Velocity: 4000 fpm (20.3 m/sec).
  4. Temperature Range: Minus 20 degrees F to 210 degrees F (Minus 28 degrees C to 99 degrees C).
- F. Flexible Ducts: UL 181, Class 0, interlocking spiral of aluminum foil.
1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
  2. Pressure Rating: 8 inches WG (2.0 kPa) positive or negative.
  3. Maximum Velocity: 5000 fpm (25.4 m/sec).
  4. Temperature Range: Minus 20 degrees F to 250 degrees F (Minus 28 degrees C to 99 degrees C).

## **2.05 FIBROUS GLASS DUCTS**

- A. Fibrous Glass Ducts: 1 inch (25 mm) thick rigid glass fiber with aluminum foil, glass scrim and Kraft or plastic jacket vapor barrier; maximum 0.23 K value at 75 degrees F (0.034 KSI at 24 degrees C).
1. UL labeled to UL 181.
- B. Fabricate in accordance with SMACNA Fibrous Glass Duct Construction Standards, except as indicated.
- C. Machine fabricate fibrous glass ducts and fittings. Make only minor on site manual adjustments.
- D. Staple duct joints and tape with 3 inch (75 mm) wide 2 mil (0.05 mm) thick or 2 inch (50 mm) wide 3 mil (0.75 mm) thick aluminum pressure sensitive tape, UL approved.
- E. Staple duct joints and tape with 2-1/2 inch (63 mm) wide pressure sensitive tape, UL approved.
- F. Staple duct joints and tape with 3 inch (75 mm) wide heat activated chemical bonding tape.
- G. Do not use fibrous glass ducts within 12 inches (300 mm) of electric or fuel fired heaters.
- H. Maximum stress exerted on structural steel members: 22000 psi (152 MPa).
- I. Maximum temperature: 250 degrees Fahrenheit (121 degrees Celsius).
- J. Conform to safety standards NFPA 90A and 90B.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards.
- B. Install in accordance with manufacturer's instructions.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Fibrous Glass Ducts: Install in accordance with SMACNA Fibrous Glass Duct Construction Standards. Obtain manufacturer's inspection and acceptance of fabrication and installation at beginning of installation.
- E. Flexible Ducts: Connect to metal ducts with mechanical fastener
- F. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- G. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with

spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

- H. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- I. Use crimp joints with or without bead for joining round duct sizes 8 inch (200 mm) and smaller with crimp in direction of air flow.
- J. Use double nuts and lock washers on threaded rod supports.
- K. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet (1.5 m) maximum length of flexible duct held in place with strap or clamp.
- L. Set plenum doors 6 to 12 inches (150 to 300 mm) above floor. Arrange door swings so that fan static pressure holds door in closed position.

### **3.02 CLEANING**

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.
- B. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

**END OF SECTION**

**SECTION 23 37 00**  
**AIR OUTLETS AND INLETS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Diffusers.
- B. Registers/grilles.

**1.02 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

**1.03 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Price Industries : [www.price-hvac.com](http://www.price-hvac.com).
- B. Titus : [www.titus-hvac.com](http://www.titus-hvac.com).
- C. MetalAire; [www.metalaire.com](http://www.metalaire.com).

**2.02 WALL SUPPLY REGISTERS/GRILLES**

- A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille with two-way deflection.
- B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting and gasket.
- C. Fabrication: Aluminum extrusions with factory clear lacquer finish.
- D. Color: To be selected by Architect from manufacturer's standard range.
- E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

**2.03 WALL EXHAUST AND RETURN REGISTERS/GRILLES**

- A. Type: Streamlined blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing, with spring or other device to set blades, vertical face.
- B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting.
- C. Fabrication: Aluminum extrusions, with factory lacquer finish.
- D. Color: To be selected by Architect from manufacturer's standard range.
- E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

**END OF SECTION**

**SECTION 23 81 27**  
**SMALL SPLIT-SYSTEM HEATING AND COOLING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Air-source heat pumps.
- B. Indoor air handler (fan & coil) units for duct connection.
- C. Controls.

Additional requirements for the split-system unit are located in Drawings M-06 and M-07.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 27 26 – Wiring Devices: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

**1.03 REFERENCE STANDARDS**

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008, Including All Addenda.
- B. ASHRAE Std 23.1 - Methods of Testing for Rating the Performance of Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Temperatures of the Refrigerant; 2010.
- C. NEMA MG 1 - Motors and Generators; 2014.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- E. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.
- F. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Carrier Corporation : [www.carrier.com](http://www.carrier.com).
- B. Trane Inc : [www.trane.com](http://www.trane.com).
- C. American Standard; [www.americanstandardair.com](http://www.americanstandardair.com).

All parts/equipment shall be locally stocked and available within 25 mile radius of JEA's Arlington water treatment plant.

**2.02 SYSTEM DESIGN**

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
  - 1. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B. Performance Requirements: See Drawings M-06 and M-07 for additional requirements. SEER of 14 or greater is required. Must meet the latest minimum EER's and SEER's as indicated by efficiency code requirements.
- C. Electrical Characteristics:
  - 1. 460 volts, three phase, 60 Hz.
  - 2. 10 amperes maximum fuse size.
  - 3. Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Section 26 2717.
- D. Refrigerant Type: HFC 410a, or JEA approved equal.

- E. Sound Level: 75 db or under.
- F. Thermostat: See Drawings M-06 and M-07 for requirements.

### **2.03 INDOOR UNITS FOR DUCTED SYSTEMS**

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
  - 1. Air Flow Configuration: Upflow.
  - 2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
- B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
  - 1. Motor: NEMA MG 1; 1750 rpm single speed, permanently lubricated, hinge mounted.
  - 2. Motor Electrical Characteristics:
    - a. 3/4 hp.
    - b. 208 volts, single phase, 60 Hz.
- C. Air Filters: UL Std. 900 Class 1 or 2 rated. 1 inch (25 mm) thick glass fiber, disposable type arranged for easy replacement, or other JEA approved equal material. MERV 8 @ 400 fpm. Submit independent laboratory ANSI/ASHRAE Std. 52.2-2012 test report for each type of filter.
- D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve. Evaporator coil, condenser coil, and connecting copper piping to be dipped in Bronz-Glow Husky Coil coating.
  - 1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
  - 2. Manufacturers: System manufacturer.

### **2.04 OUTDOOR UNITS**

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
  - 1. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23.1 and UL 207.
- B. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line).
  - 1. Provide thermostatic expansion valves.
  - 2. Provide heat pump reversing valves.
- C. Operating Controls:
  - 1. Control by room thermostat to maintain room temperature setting.
  - 2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig (1965 kPa) and off when pressure drops below 140 psig (965 kPa) for operation to 0 degrees F (-18 degrees C).

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and in correct location.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
- B. Install in accordance with NFPA 90A and NFPA 90B.

**END OF SECTION**



## **SECTION 26 05 00**

### **ELECTRICAL - GENERAL PROVISIONS**

#### **PART 1 GENERAL**

##### **1.01 Scope of Work**

- A. Furnish all labor, materials, equipment and incidentals required for a complete electrical system at the Arlington Water Treatment Pump High Service Pump Replacement project, for JEA in Jacksonville, Florida as herein and after specified and shown on the Drawings.
- B. The work, apparatus and materials which shall be furnished under these Specifications and accompanying Drawings shall include all items listed hereinafter and/or shown on the Drawings. Certain equipment will be furnished as specified in other sections of these Specifications which will require wiring thereto and/or complete installation as indicated. All materials necessary for the complete installation shall be furnished and installed by the Contractor to provide complete power, lighting, communication systems, instrumentation, wiring and control systems as indicated on the Drawings and/or as specified herein.
- C. The Contractor shall furnish and install the necessary cables, transformers, motor control centers, protective devices, conductors, exterior electrical system, etc., to serve motor loads, lighting loads and miscellaneous electrical loads as indicated on the Drawings and/or as specified hereinafter.
- D. The work shall include complete testing of all equipment and wiring at the completion of the work and making any minor connection changes or adjustments necessary for the proper functioning of the system and equipment. All workmanship shall be of the highest quality; sub-standard work will be rejected.
- E. Mount and wire speed indicators, variable frequency drives and process instruments furnished under other Divisions of these Specifications.
- F. Mount and wire isolation transformers, operator's stations, and power conversion equipment for all variable speed drive systems furnished under other Divisions of these specifications.
- G. Make all field connections to process instrument panels and other control panels furnished under other Divisions of these Specifications.
- H. For process instrumentation furnish and install all conduit, wire and interconnections between primary elements, transmitters, local indicators and receivers.
- I. Furnish necessary devices and make connections to provide power to drinking fountains, kitchen units, shop equipment, and other equipment. This will require appropriate receptacles in some cases and direct wiring in other cases, depending

upon equipment furnished.

- J. Install and wire all thermostats, aquastats and other devices furnished under other Divisions of this Specification directly controlling heating equipment or fan motors.
- K. Mount and wire electric heaters furnished under other Divisions of this Specification.
- L. Wire all ventilation equipment furnished under other Divisions of this Specification.
- M. Each bidder or his authorized representatives shall, before preparing his proposal, visit all areas of structures in which work under this division is to be performed and inspect carefully the present installation. The submission of the proposal by this bidder shall be considered evidence that he or his representative has visited the area and noted the locations and conditions under which the work will be performed and that he takes full responsibility for a complete knowledge of all factors governing his work.
- N. All power interruptions shall be at the Owner's convenience. Each interruption shall have prior approval.
- O. It is the intent of these Specifications that the electrical system shall be suitable in every way for the service required. All material and all work, which may be reasonably implied as being incidental to the work of this Section, shall be furnished at no extra cost.

#### **1.02 Codes, Inspection and Fees**

- A. All material and installation shall be in accordance with the latest edition of the National Electrical Code and all applicable national, local and state codes.
- B. Pay all fees required for permits and inspections including any charges associated with the service modifications.

#### **1.03 Tests**

- A. Test all systems and repair or replace all defective work. Make all necessary adjustments to the systems and instruct the Owner's personnel in the proper operation of the systems.
- B. The following minimum tests and checks shall be made prior to the energizing of electrical equipment. Test shall be by an independent NETA certified testing firm, and a certified test report shall be submitted stating that the equipment meets and operates in accordance with the Manufacturer's and job specifications, and that equipment and installation conforms to all applicable Standards and Specifications:
  - 1. Testing and setting of protective relays for calibration and proper operation.
  - 2. Mechanical inspection of all circuit breakers 100 amps and larger to assure

proper operation.

3. Motors: Megger to ground each motor winding. Record date, motor temperature, terminal, reading and operator and have Owner representative sign off on each reading.
4. Conductors: Megger to ground prior to termination all 600 volt conductors not used for service conductors. Record the date, conductor, reading and operator and have Owner representative sign off on each reading.
5. 480 Volt Power Panels: After installing, with circuit breakers closed, but prior to terminating any conductors or bus to the motor control center, megger each phase to phase and phase to ground. Record the date, test (i.e. A/B or A/G), reading and operator and have Owner representative sign off on each reading.
6. Connections & Terminations:
  - a. 480 Volt Panels: Torque to Manufacturer's values in the presence of the Engineer or his representative. Record the date, conductor, torque, and operator and have the Engineer sign off on each reading.
7. Data Base: After equipment suppliers test, calibrations, and inspection, megger all circuits leaving all switchgear and motor control centers. Record the date, conductor, circuit condition (i.e. load connected or unconnected), reading and operator and have Owner representative sign off on each reading.
8. Hot Spot Testing: Perform infrared hot spot inspection of the 480 volt switchgear, motor control centers and associated equipment as soon as determined by the engineer that representative loads are present. Record the date, gear conditions found, operator and have the owner's representative who must be present for the inspection sign off in each instance.
9. Miscellaneous:
  - a. Meggering must be done at 1000 VDC for one minute. The ground plane used must be the one established at the main source of energy for conductors, switchboards and control centers. The motor frame may be used for the ground plane for motors.
  - b. In the course of construction, it will become necessary to temporarily energize some systems for testing. Confirm that any motor has been meggered prior to connection and testing. Do not leave any motor or system unattended and energized without written authorization.

- c. An unsuccessful test will be one in which any one of the three megger readings differs from another by more than 25%. Engineer shall determine if cables and/or equipment bussing shall be replaced.

#### **1.04 Related Work**

- A. Division 01: Record Documents
- B. Division 02: Sitework
- E. Division 03: Concrete

#### **1.05 Sleeves and Forms for Openings**

- A. Provide and place all sleeves for conduits penetrating floors, walls, partitions, etc. Locate all necessary slots for electrical work and form before concrete is poured.

#### **1.06 Cutting and Patching**

- A. All cutting and patching shall be done in a thoroughly workmanlike manner.

#### **1.07 Interpretation of Drawings**

- A. The Drawings are not intended to show exact locations of conduit runs.
- B. All three-phase circuits shall be run in separate conduits unless otherwise shown on the Drawings.
- C. Unless otherwise approved by the Engineer conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed.
- D. Where circuits are shown as "home-runs" all necessary fittings and boxes shall be provided for a complete raceway installation.
- E. The Contractor shall harmonize the work of the different trades so that interferences between conduits, piping, equipment, architectural, civil, mechanical and structural work will be avoided. All necessary offsets shall be furnished so as to take up a minimum space and all such offsets, fittings, etc., required to accomplish this shall be furnished and installed by the Contractor without additional expense to the Owner. In case interference develops, the Owner's authorized representative is to decide which equipment, piping, etc., must be relocated, regardless which was installed first.
- F. Verify with the Engineer the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.
- G. The locations of equipment, fixtures, outlets, and similar devices shown on the Drawings are approximate only. Exact locations shall be as approved by the

Engineer during construction. Obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.

- H. Surface mounted panel boxes, junction boxes, conduit, etc., shall be supported by spacers to provide a clearance between wall and equipment.
- I. Circuit layouts shown are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting, and other electrical systems shown. Additional circuits shall be installed wherever needed to conform to the specific requirements of the equipment.
- J. The ratings of motors and other electrically operated devices together with the size shown for their branch circuit conductors and conduits are approximate only and are indicative of the probable power requirements insofar as they can be determined in advance of the purchase of equipment.
- K. All connections to equipment shall be made as shown, specified, and directed and in accordance with the Manufacturer's approved shop drawings, regardless of the number of conductors shown on the Drawings.

#### **1.08 Size of Equipment**

- A. Investigate each space in the building where equipment must pass to reach its final location. If necessary, the Manufacturer shall be required to ship his material in sections, sized to permit passing through such restricted areas in the building.
- B. The equipment shall be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the Manufacturer shall be required to brace the equipment suitably, to insure that the tilting does not impair the functional integrity of the equipment.

#### **1.09 Record Drawings**

- A. Requirements for record drawings are specified in Division 01: Project Record Documents.

#### **1.10 Component Interconnections**

- A. Component equipment furnished under this Specification will not be furnished as integrated systems. Contractor shall field install and wire completely all components.
- B. Contractor shall analyze all systems components and their shop drawings, identify all terminals and prepare drawings and wiring tables necessary for component interconnection. Contractor shall provide crimp on wire numbers on both ends of all control wiring installed between all panels furnished under this contract. These

numbers shall directly relate to the interconnect wiring drawing furnished by the Contractor and be reflected in the record drawings submitted.

### **1.11 Shop Drawings**

- A. As specified under other sections shop drawings shall be submitted for approval of all materials, equipment, apparatus, and other items as required by the Engineer.
- B. Shop drawings shall be submitted for the following equipment:
  - 1. Disconnect Switches
  - 2. Motor Starters
  - 3. Wire and Cable
  - 4. Variable Frequency Drives
  - 5. Conduit Layout Drawings
  - 6. Ground test reports
  - 7. Pumps and Motors
  - 8. Surge Protection Devices
  - 9. Field Instruments
  - 10. HVAC Equipment
- C. The Manufacturer name and product designation and catalog data sheet shall be submitted for the following material:
  - 1. Conduit
  - 2. Receptacles
  - 3. Boxes and fittings
  - 4. Wiring Devices
  - 5. Lamps
  - 6. Control Relays
- D. Prior to submittal by the Contractor, all shop drawings shall be checked for accuracy and contract requirements. Shop drawings shall bear the date checked and shall be accompanied by a statement that the shop drawings have been examined for conformity to Specifications and Drawings. This statement shall also list all discrepancies with the Specifications and Drawings. Shop drawings not so checked and noted shall be returned.
- E. The Engineer's check shall be only for conformance with the design concept of the project and compliance with the Specifications and Drawings. The responsibility of, or the necessity of, furnishing materials and workmanship required by the Specifications and Drawings which may not be indicated on the shop drawings is included under the work of this Section.
- F. The responsibility for all dimensions to be confirmed and correlated at the job site and for coordination of this work with the work of all other trades is also included under the work of this Section.
- G. No material shall be ordered or shop work started until the Engineer's approval of

shop drawings has been given.

### **1.12 Manufacturer Services**

- A. Provide Manufacturer services for testing and start-up of the following equipment:
  - 1. Variable Frequency Drives
  - 2. Other items as required by appropriate specification sections.
- B. The Manufacturer of the above listed equipment shall provide experienced Field Service Engineer to accomplish the following tasks:
  - 1. The equipment shall be visually inspected upon completion of installation and prior to energization to assure that wiring is correct, interconnection complete and the installation is in compliance with the manufacturer's criteria. Documentation shall be reviewed to assure that all Drawings, operation and maintenance manuals, parts list and other data required to check out and sustain equipment operation is available on site. Documentation shall be red-lined to reflect any changes or modifications made during the installation so that the "As-built" equipment configuration will be correctly defined. Spare parts shall be inventoried to assure correct type and quantity. The Manufacturer shall provide written approval that equipment supplied is approved for energization.
  - 2. The Field Service Engineers shall provide engineering support during the energization and check out of each major equipment assembly. They shall perform any calibration or adjustment required for the equipment to meet the Manufacturer's performance specifications.
  - 3. Upon satisfactory completion of equipment test, they shall provide engineering support of system tests to be performed in accordance with Manufacturer's test specifications.
  - 4. Two (2) 4-hour training sessions on operation, and two (2) 4-hour training sessions (one for each system) on maintenance and trouble-shooting procedures shall be provided for the Owner's maintenance personnel. All training shall be conducted at a facility provided by the Owner. The maintenance and trouble-shooting sessions shall be conducted with record "As-built" electrical drawings sufficient for a class of eight personnel.
  - 5. A final report shall be written and submitted to the Contractor within fourteen days from completion of final system testing. The report shall document the inspection and test activity, define any open problems and recommend remedial action. The Contractor shall forward a copy of this report to the Engineer for approval.

### **1.13 Materials**

- A. The materials used in all systems shall be new, unused and as hereinafter

specified. All materials where not specified shall be of the very best of their respective kinds. Samples of materials or Manufacturer's specifications shall be submitted for approval as required by the Engineer.

- B. Materials and equipment used shall be Underwriters Laboratories, Inc. listed.
- C. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored out-of-doors. Electrical equipment shall be stored in dry permanent shelters. If any apparatus has been damaged, such damage shall be repaired by the Contractor at his own cost and expense. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such special tests as directed by the Engineer, at the expense of the Contractor, or shall be replaced by the Contractor at his own expense.

#### **1.14 Conduit Layout Drawings**

- A. In addition to the manufacturer's equipment shop drawings, the Contractor shall submit for the approval, electrical installation working drawings for the overall site work, existing electrical room, and all process areas containing the following:
  - 1. Concealed and buried conduit layouts shown on floor plans drawn at not less than 1/4-inch = 1-foot-0-inch scale. The layouts shall include locations of process equipment, motor control centers, transformers, panelboards, control panels and equipment, motors, switches, motor starters, large junction or pull boxes, instruments, and any other electrical devices connected to concealed or buried conduits.
  - 2. Plans shall be drawn on high quality reproducible, bond size 36-inch x 24-inch, and shall be presented in a neat, professional manner.
  - 3. Concrete floors and/or walls containing concealed conduits shall not be poured until conduit layouts are approved.
  - 4. Site plan conduit layout drawings shall be at 1" = 20'-0".

Note: ACAD drawing files are available from the Engineer.

#### **1.15 Operation and Maintenance Data**

- A. Submit complete operations and maintenance data for all equipment furnished under this Division 01. The manuals shall be prepared specifically for this installation and shall include all required cuts, Drawings, equipment lists, descriptions, complete part lists, etc. that are required to instruct operating and maintenance personnel unfamiliar with such equipment.

#### **1.16 DEMOLITION**



- A. Remove all electrical work associated with equipment shown to be removed (TBR) except those portions indicated to remain or be reused. Remove all unused exposed conduit and wiring back to point of concealment. Remove unused wiring in concealed conduits back to source (or nearest point of usage). Electrical work to be removed corresponds to the associated mechanical equipment to be removed.
- B. Where electrical systems pass through the demolition areas to serve other portions of the premises, they shall remain or shall be suitably relocated and the system restored to normal operation. Coordinate outages in systems with the Owner. Where duration of proposed outage cannot be allowed by the Owner, provide temporary connections as required to maintain service.
- C. All removals and relocations of existing installations cannot be completely detailed on the Drawings. Survey the site before submitting bid proposal.
- D. Continuous service is required on all circuits and outlets affected by these changes, except where the Owner will permit outage for a specific time. Obtain Owner's written consent before removing any circuit from continuous service.
- E. Where required to disconnect and/or remove any part of an existing circuit, reconnect that circuit to reestablish service in the remaining portion.
- F. Remove exposed conduits, wireways, outlet boxes, pull boxes and hangers made obsolete by the alternations, unless specifically designated to remain. Exposed conduits shall be removed back to point of concealment, where they shall be cut and threaded for a cap. A threaded cap shall then be installed. Conduits may be removed back to first coupling if within 3-inches of point of concealment. Cut back in traffic areas to the floor level and patch.
- G. Repair all walls to "Like new" condition and paint to match existing wall color.

#### **1.17 DISPOSITION OF REMOVED MATERIALS AND EQUIPMENT**

- A. In general, it is intended that all materials and equipment indicated to be removed and disposed of by the CONTRACTOR shall, upon removal, become the CONTRACTOR's property and shall be disposed of off the site by the CONTRACTOR, unless otherwise directed by the Owner.
- B. Reuse of wire will not be permitted. An exception is the reuse or relocation when wire is part of an existing lighting branch circuit and reuse or relocation is specifically designated and can be accomplished without removing and re-pulling the wire.
- C. All reusable and salvageable disconnect switches, starters, control devices, control panels and instruments, receptacles, light fixtures, etc. shall be sorted and returned to the Owner.

- D. All electrical equipment to be salvaged shall be removed and shall be moved by the CONTRACTOR to a location on the site for storage as directed by the Owner.

#### **1.18 Warranty**

- A. Provide a warranty for all the electrical equipment in accordance with the requirements of other sections, but in no case less than 1 year from date of owner acceptance.

#### **PART 2 PRODUCTS (Not Used)**

#### **PART 3 EXECUTION (Not Used)**

**END OF SECTION**

## **SECTION 26 05 19**

### **WIRES AND CABLES**

#### **PART 1 GENERAL**

##### **1.01 Scope of Work**

- A. Furnish, install and test all wire, cable, and appurtenances as shown on the Drawings and as hereinafter specified.

##### **1.02 Submittals**

- A. Samples of proposed wire and cable shall be submitted to the Engineer for approval. Each sample shall have the size, type of insulation and voltage stenciled on the jacket.
- B. Installed, unapproved wire shall be removed and replaced at no additional cost to the Owner.

##### **1.03 Applications**

- A. Wire for lighting and receptacle circuits above grade shall be type THWN-2.
- B. Wire for all service conductors, power motor circuits and below grade lighting and receptacle circuits shall be type XHHW-2, stranded.
- C. Single conductor wire for control, indication and metering shall be type MTW No. 14 AWG, 19 strand or type XHHW No. 14 AWG stranded.
- D. Multi-conductor control cable shall be No. 14 AWG, 19 strand.
- E. Wire for process instrumentation or shielded control cable shall be No. 16 AWG, shielded and stranded.

##### **1.04 Minimum Sizes**

- A. Except for control and signal leads, no conductor smaller than No. 12 AWG shall be used.

#### **PART 2 PRODUCTS**

##### **2.01 Materials**

- A. All wires and cables shall be of annealed, 98 percent conductivity, soft drawn stranded copper conductors.

## **2.02 600 Volt Wire and Cable**

- A. Type XHHW shall be cross-linked polyethylene (XLP); as manufactured by the Southwire Co., Collyer Insulated Wire Co., or approved equal.
- B. Type THWN shall be as manufactured by the Southwire Co., Collyer Insulated Wire Co., or approved equal.

## **2.05 VARIABLE FREQUENCY DRIVE (VFD) OUTPUT POWER CABLE:**

- A. Section applies to power cables routed between the output of VFD's and motor terminals.
- B. Cable shall be rated for 2000 volts and shall meet the requirements below:
  - 1. Conductors shall be stranded Class B bare copper.
  - 2. All wire shall be brought to the job in unbroken packages and shall bear the data of manufacturing; not older than 12 months.
  - 3. Type of wire shall be XLPE RHH/RHW-2 rated 90 degrees C suitable for wet locations.
  - 4. Provide overall 5 millimeter metallic shield (copper tape shield) overlapped 50%.
  - 5. No wire smaller than No. 12 gauge shall be used unless specifically indicated.
  - 6. Cable construction shall consist of three insulated current-carrying phase conductors and three bare ground conductors, symmetrically placed between the phase conductors, and twisted beneath a continuous overall PVC polymeric jacket.
- C. Each ground conductor size (circular mil area) shall be one-third (1/3) of the NEC required size (circular mil area) for a single ground conductor. If one third of the required circular mil area does not correspond to a standard size (circular mil area) of construction, the next largest size of standard construction shall be used. All conductors shall be megger tested after installation and insulation must be in compliance with the Insulated Power Cable Engineers Association Minimum Values of Insulation Resistance.
- D. Manufacturers:
  - 1. Belden
  - 2. O Flex
  - 3. Lutze

## **2.03 Instrumentation and Control Cable**

- A. Process instrumentation wire shall be twisted pair, 600V, cross-linked polyethylene insulated, aluminum tape shielded, polyvinyl chloride jacketed, type "XLP" as manufactured by the American Insulated Wire Co., Eaton Corp. "Polysat," or approved equal. Multi-conductor cables shall be supplied with individually shielded twisted pairs.

- B. Multi-conductor control cable shall be stranded, 600V, cross-linked polyethylene insulated with PVC jacket, type "XLP" as manufactured by the American Insulated Wire Co., Eaton Corp. "Polyset," or approved equal.

## **2.04 Terminations and Splices**

- A. Power Conductors: Terminations shall be die type or set screw type pressure connectors as specified. Splices (where allowed) shall be die type compression connector and waterproof with heat shrink boot or epoxy filling.
- B. Control Conductors: Termination on saddle-type terminals shall be wired directly with a maximum of two conductors per termination. Termination on screw type terminals shall be made with a maximum of two spade connectors. Splices (where allowed) shall be made with insulated compression type connectors. Heat shrink boots shall be utilized for all outdoor splices.
- C. Instrumentation Signal Conductors (including graphic panel, alarm, low and high level signals): Terminations permitted shall be typical of control conductors. Splices are allowed at instrumentation terminal boxes only.
- D. Except where otherwise approved by the Engineer no splices will be allowed in manholes, handholes or other below grade located boxes.
- E. Splices shall not be made in push button control stations, control devices (i.e., pressure switches, flow switches, etc.), conduit bodies, etc.

## **PART 3 EXECUTION**

### **3.01 Installation**

- A. All conductors shall be carefully handled to avoid kinks or damage to insulation.
- B. Lubrications shall be used to facilitate wire pulling. Lubricants shall be U.L. listed for use with the insulation specified.
- C. Shielded instrumentation wire shall be installed from terminal to terminal with no splicing at any intermediate point.
- D. Shielded instrumentation wire shall be installed in rigid steel conduit and pull boxes that contain only shielded instrumentation wire. Instrumentation cables shall be separated from control cables in manholes.
- E. Shielding on instrumentation wire shall be grounded at one end only, as directed by supplier of the instrumentation equipment.
- F. Wire and cable connections to terminals and taps shall be made with compression connectors. Connections of insulated conductors shall be insulated and covered. All connections shall be made using materials and installation methods in

accordance with instructions and recommendations of the manufacturer of the particular item of wire and cable. The conductivity of all completed connections shall be not less than that of the uncut conductor. The insulation resistance of all completed connections of insulated conductors shall be not less than that of the uncut conductor.

- G. All wire and cable shall be continuous and without splices between points of connection to equipment terminals, except a splice will be permitted by the Engineer if the length required between the points of connection exceeds the greatest standard shipping length available from the manufacturer specified or approved by the Engineer as the manufacturer of the particular item of wire and cable.
- H. Steel fish tapes and/or steel pulling cables shall not be used in PVC conduit runs.
- I. All control and instrumentation circuits and wiring shall be clearly and permanently numbered and labeled at each end so as to identify the location of the opposite end and the function of the circuit. Individual wires in a multi-wire circuit shall be identified with wire numbers. Labeling shall be in place prior to turnover of any equipment, system or sub-system to Owner.
- J. Contractor shall:
  - 1. Measure the attenuation of the fiber optic cable prior to installation and determine the average attenuation per foot.
  - 2. Install the fiber cable runs in accordance with the manufacturer's recommendations and including:
    - a. Use recommended lubricant.
    - b. Continuously measure the pull tension during installation and do not exceed the manufacturer's stated maximum tension.
    - c. Note from the distance markers on the cable the exact length of each installed run.
  - 3. Following installation, measure the attenuation of each run and compare the attenuation per foot readings with those taken prior to installation. Replace any runs whose attenuation per foot reading is more than 10% higher than the pre-installation value.
- K. Profibus and Data highway cable shall be supplied and installed by the Contractor.
- L. All 600-volt wire insulation shall be tested with a meg-ohmmeter after installation. Tests shall be made at not less than 1,000 VDC. See specification section 26 05 00 for additional testing requirements.
- M. All service conductors shall be tested as in paragraph A above. These tests shall

be witnessed by the Engineer. A written report shall be submitted to the Engineer for review.

**END OF SECTION**

## **SECTION 26 05 26**

### **GROUNDING SYSTEM**

#### **PART 1 GENERAL**

##### **1.01 Scope of Work**

- A. Furnish and install a complete grounding system in strict accordance with Article 250 of the National Electrical Code and as hereinafter specified and shown on the Drawings.

##### **1.02 Related Work**

- A. Wire shall be as specified under Section 26 05 19.
- B. Conduit shall be as specified under Section 26 05 34.

#### **PART 2 PRODUCTS**

##### **2.01 Materials**

- A. Ground rods: Ground rods shall be copperclad steel 5/8-inch x 20 foot. Ground rods shall be Copperweld or be an approved equal product.

#### **PART 3 EXECUTION**

##### **3.01 General**

- A. The service entrance equipment ground bus shall be grounded to a 3/4-inch cold water pipe, to the ground grid and to the building steel. The protecting conduits shall be bonded to the grounding conductor at both ends. The Contractor shall not allow the water pipe connections to be painted. If the connections are painted, they shall be disassembled and remade with new fittings.
- B. Ground bus in all panelboards and switchboards shall be connected to the service entrance equipment ground bus with a No. 1/0 conductor.
- C. All steel building columns shall be bonded together and connected to the building ground grid and to the service entrance ground with a No. 1/0 copper conductor. The bond wire for all high service pumps shall be connected to the well pump casing via Cadweld.
- D. Conduits stubbed-up below the panelboard shall be fitted with insulated grounding bushings and connected to the panelboard ground bus. The grounding wire shall, unless otherwise indicated on the drawings, be sized in accordance with Table 250-122 of the National Electrical Code, except that a minimum No. 12 AWG shall be used.



- E. Motors shall be grounded as specified in Specification Section 26 05 50, motors.
- F. Lighting transformer neutrals shall be grounded to a grounding electrode and the service entrance ground.
- G. Grounding electrodes shall be driven as required. Where rock is encountered, grounding plates may be used in lieu of grounding rods.
- H. All equipment enclosures, motor and transformer frames, conduits systems, cable armor, exposed structural steel and similar items shall be grounded.
- I. Exposed connections shall be made by means of approved grounding clamps. Exposed connections between different metals shall be sealed with No-Oxide Paint Grade A or approved equal. All buried connections shall be made by welding process equal to Cadweld.
- J. For reasons of mechanical strength, grounding conductors extending from the grounding grid to the ground buses of control centers and switchboard shall be No. 1/0 AWG.
- K. The grounding grid conductors shall be embedded in backfill material around the structures.
- L. All underground conductors shall be laid slack and where exposed to mechanical injury shall be protected by pipes or other substantial guards. If guards are iron pipe or other magnetic material, conductors shall be electrically connected to both ends of the guard.
- M. The Contractor shall exercise care to insure good ground continuity, in particular between the conduit system and equipment frames and enclosures. Where necessary, jumper wires shall be installed.

### **3.02 Tests**

- A. The Contractor shall test the ground resistance of the system. All test equipment shall be provided by the Contractor and approved by the Engineer. Dry season resistance of the system shall not exceed 5 ohms. If such resistance cannot be obtained with the system as shown, the Contractor shall provide additional grounding as directed by the Engineer, without additional payment. The Contractor shall submit all grounding system test results to the Engineer for review. The CONTRACTOR shall test the ground resistance of the system by 3 point method fall of potential

**END OF SECTION**

## **SECTION 26 05 34**

### **RACEWAYS AND FITTINGS**

#### **PART 1 GENERAL**

##### **1.01 Scope of Work**

- A. Furnish and install complete raceway systems as shown on the Drawings and as specified herein.

##### **1.02 Applications**

- A. Except where otherwise shown on the Drawings, or hereinafter specified. The following describes the conduit requirements of the project:
  - 1. All exposed indoor raceways shall be in aluminum conduit unless otherwise noted in 2 through 5 below.
  - 2. Underground power conductors (Non VFD motor units) shall be installed in schedule 80 PVC conduits, unless otherwise noted on the drawings.
  - 3. All VFD load side motor conductors shall be installed in Schedule 80 PVC conduit.
  - 4. All Instrumentation circuits installed above or below grade (4-20 mA signal wire) shall be installed in PVC coated GRS conduit.
  - 5. Conduits in chemical rooms shall be PVC schedule 80.
- B. Where Schedule 80 PVC is used, all below grade elbows and risers to above grade shall be PVC coated GRS. All elbows above grade shall be suitably grounded. Conduit spaces shall be provided for underground conduit installation.
- C. PVC schedule 80 conduit shall be used in chemical areas.
- D. All conduit of a given type shall be the product of one manufacturer.
- E. All switch, outlet and control station boxes and fittings in non-corrosive areas shall be cast aluminum FS boxes with aluminum covers. Plastic/FRP shall be used in all corrosive areas.
- F. Concealed switch, outlet and control station boxes in NEMA 1 areas shall be aluminum.
- G. Terminal boxes, junction boxes, pull boxes, etc.; installed outdoors shall be NEMA 4X stainless steel. All boxes installed indoors (except in corrosive areas) may be aluminum. Boxes in corrosive areas shall be PVC.

- H. Combination expansion-deflection fittings shall be used where exposed or embedded conduits cross structure expansion joints.

## **PART 2 PRODUCTS**

### **2.01 Materials**

#### **A. Rigid Metal Conduit**

1. Rigid metal conduit shall be for use under the provisions of NEC Article 346.
2. PVC coated GRS conduit shall have a 1/50-in thick, polyvinyl chloride coating permanently bonded to the aluminum conduit and an internal phenolic coating, and shall be plasti-bond 2" as manufactured by Robroy Industries, Triangle PWC Inc., Perma-Cote Industries, or approved equal.
3. A factory applied clear polyurethane coating must be provided to all PVC coated GRS conduit to protect the ends of the conduit.

#### **B. Rigid Nonmetallic Conduit**

1. Rigid nonmetallic conduit shall be for use under the provisions of NEC Article 347.
2. PVC conduit shall be rigid polyvinyl chloride schedule 80 as manufactured by Carlon, An Indian Head Co., Kraloy Products Co., Inc., Highland Plastics Inc., or approved equal.

#### **C. Liquidtight Flexible Conduit, Couplings and Fittings**

1. Liquidtight flexible conduit shall be for use under the provisions of NEC Article 351A.
2. Liquidtight flexible conduit shall be Carflex by Carlon, or approved equal.
3. Fittings used with liquidtight flexible conduit shall be nylon.
6. Fittings installed on tanks, filter area, chemical rooms and other outdoor process areas shall be aluminum.

#### **D. Flexible Couplings, Non-metallic**

1. Flexible non-metallic couplings shall be as manufactured by the Crouse-Hinds Co., Appleton Electric Co., Killark Electric Manufacturing Co., or approved equal.

#### **E. Boxes and Fittings:**

1. PVC, aluminum and stainless steel switch and outlet boxes shall be manufactured by Carlon, Appleton, or approved equal.

2. NEMA 1 terminal boxes, junction boxes, pull boxes etc., may be fiberglass (FRP) or stainless steel. Boxes shall be as manufactured by Hoffman Engineering Co., Stahlin, or approved equal. NEMA 4 boxes located outdoors shall be 316 stainless steel.
3. Cast aluminum boxes and fittings shall be copper-free aluminum with cast aluminum covers and corrosion-proof screws as manufactured by the Killark Electric Co., Crouse-Hinds Co., Appleton Electric Co., or approved equal.
4. Conduit hubs shall be as manufactured by Meyers Electric Products, Inc., Raco Div., Appleton Electric Co., or approved equal. Conduit hubs shall be provided for all outdoor conduit terminations.
5. Conduit wall seals shall be Type WSK as manufactured by the O.Z. Electrical Mfg. Co., or approved equal.
6. Combination expansion-deflection fittings shall be Type XD as manufactured by the Crouse-Hinds Co., or approved equal.
7. Telephone fittings for floor boxes shall have rubber grommets holes, Walker Catalog No. 501AL or approved equal by Hubbell, Thomas & Betts or approved equal.
8. Conduit wall seals for new concrete walls below grade shall be O.Z./Gedney Co., Type WSK, Spring City Electrical Manufacturing Co., Type WDP, or approved equal.
9. Conduit wall seals for cored holes shall be Type CSML as manufactured by the O.Z./Gedney Co., or approved equal.
10. Conduit wall and floor seals for sleeved openings shall be Type CSML as manufactured by the O.Z./Gedney Co., or approved equal.
11. Conduit sealing bushings shall be O.Z./Gedney Type CSB or approved equal.

F. Conduit Mounting Equipment:

1. Stainless steel channel and stainless steel hardware shall be used in all areas.

## **PART 3 EXECUTION**

### **3.01 Installation**

- A. No conduit smaller than 3/4-inch electrical trade size shall be used, nor shall any have more than four 90 degree bends in any one run. Pull boxes shall be provided as required or directed. Minimum size in floor slabs shall be 3/4-inch.

- B. No wire shall be pulled until the conduit system is complete in all details; in the case of concealed work, until all rough plastering or masonry has been completed; in the case of exposed work, until the conduit system has been completed in every detail.
- C. The ends of all conduits shall be tightly plugged to exclude dust and moisture while the buildings are under construction.
- D. Conduit supports shall be spaced at intervals as required to obtain rigid construction, but in no case more than as required by the NEC.
- E. Single conduits shall be supported by means of one-hole pipe clamps in combination with one-screw back plates, to raise conduits from the surface. Multiple runs of conduits shall be supported on trapeze type hangers with steel horizontal members and threaded hanger rods. The rods shall be not less than 3/8-inch diameter. Material type shall be as specified in Section 2.
- F. Conduit hangers shall be attached to structural steel by means of beam or channel clamps. Where attached to concrete surfaces, concrete inserts of the spot type shall be provided.
- G. All conduits on exposed work shall be run at right angles to and parallel with the surrounding walls and shall conform to the form of the ceiling. No diagonal runs will be allowed. Bends in parallel conduit runs shall be concentric. All conduit shall be run perfectly straight and true. Conduits not installed in this fashion shall be replaced entirely at the Contractor's expense with no cost to the Owner.
- H. No unbroken run shall exceed 300 feet in length. This length shall be reduced by 75 feet for each 90 degree elbow.
- I. Conduit terminating in pressed steel boxes shall have double locknuts and insulated bushings.
- J. Conduit terminating in gasketed enclosures shall be terminated with conduit hubs.
- K. Conduit wall seals shall be used for all conduits penetrating walls below grade or other locations shown on the Drawings.
- L. Liquidtight flexible metal conduit shall be used for all motor terminations and other equipment where vibration is present.
- M. Flexible couplings shall be used in hazardous locations for all motor terminations and other equipment where vibration is present.
- N. Conduit stub outs for future construction shall be provided with threaded PVC end caps at each end.
- O. Metallic conduit entering manholes and below grade pull boxes shall be terminated with grounding type bushings and connected to a 5/8" x 20" copperweld rod with a #6 bare copper wire.

- P. Underground 120 volt circuits (Schedule 80 PVC) shall be installed directly to the respective motor control centers, lighting panels, etc. Stainless steel pull boxes shall be wall mounted on structures to eliminate excessive bends. With prior approval, below grade pull boxes, equal to Brooks #2424 (minimum), with hot dip galvanized covers and frames may be used. Splices shall not be made in above or below grade pull boxes without prior approval.
- Q. A 4-inch concrete conduit housekeeping pad shall be required for all exposed conduit stub-ups. This applies to ALL exposed conduits installed indoors or outdoors.

**END OF SECTION**

## SECTION 26 05 73

### SHORT-CIRCUIT, PROTECTIVE DEVICE COORDINATION, AND ARC-FLASH STUDY

#### PART 1 GENERAL

##### 1.01 Description

This section describes the requirements for furnishing a short-circuit and protective device coordination study and arc-flash hazard analysis. Submit an arc flash study to facilitate compliance with NFPA 70E, Handbook for Electrical Safety in the Workplace. Arc flash study shall be performed using software specifically for the purpose and all calculations shall comply with IEEE 1584.

##### 1.02 Submittals

Submit shop drawings in accordance with Division 01 General Requirements and the General Conditions.

#### PART 2 MATERIALS

##### 2.01 Arc Flash Label

- A. Arc flash labels shall identify the following as a minimum (distances indicated shall be in inches):
  - 1. Flash Hazard Boundary: Threshold at which burn level exceeds 1.2 cal/cm<sup>2</sup>.
  - 2. Calculated incident energy at indicated working distance (18 inches).
  - 3. Hazard risk category and personal protective equipment (PPE) description.
  - 4. Equipment rated voltage.
  - 5. Required electrical glove class.
  - 6. Shock Hazard Boundaries: Limited approach, restricted approach, and prohibited approach (based on equipment rated voltage).
  - 7. Location (name of board).
  - 8. Name of organization that performed the analysis, contact information, and date analysis was performed.
- B. Labels shall carry either a "DANGER" or "WARNING" header, depending on whether an accident will or can result in injury or death, as stated in ANSI Z534.4.f. Header shall also include the following: "QUALIFIED WORKERS ONLY – PPE REQUIRED."
- C. Labels shall carry a footer that reads "Warning: Changes in equipment settings or system configuration will invalidate the calculated values and PPE requirements."
- D. Labels shall be approximately 6 inches long by 4 inches wide, die-cut and shall come on industrial-quality adhesive-backed vinyl.

- E. Provide on the Arc Flash label the calculated available fault current.

## **2.02 Arc Flash Study**

- A. Documentation: Provide an Arc Flash analysis summary including as a minimum the following information:
  - 1. Equipment name
  - 2. Equipment Voltage
  - 3. Available fault current (3 phase bolted)
  - 4. Arcing fault current
  - 5. Protective device operating time
  - 6. Arc flash boundary (inches)
  - 7. Working distance (inches)
  - 8. Incident Energy (cal/cm<sup>2</sup>)
  - 9. Protective clothing category
- B. Provide arc flash warning nameplates for each individual equipment item. Nameplates shall include the working "WARNING –Arc Flash Hazard. Protective Equipment Required." Nameplate shall also include the analysis data as listed above, settings (where applicable) of the equipment main protective device and a description of protective clothing required.
- C. Scope: Study shall include all electrical distribution equipment from the service entrance equipment down to and including branch circuit panelboards.
- D. Study Data and Submittal Requirements: Fault current and equipment data are as specified above under "Coordination Study", Arc Flash Study shall be included with or submitted concurrently with the coordination study.
- E. Submittal of Digital Data and System Model
  - 1. Following final approval of any of the above mentioned studies, the Contractor shall provide a digital copy of all reports submitted as part of the project. Reports shall not be password protected and shall be freely manipulated by the engineer or owner.
  - 2. Following final approval of any of the above studies, the Contractor shall provide the complete digital system model and system library used to build the model and complete the studies. All files needed to accurately recreate the study completed by the Contractor must be furnished and a backup of the system library used to define all system components must be provided.



## **PART 3 EXECUTION**

### **3.01 General**

- A. Perform study using commercially available computer software, such as Power Tools for Windows by SKM Systems Analysis, Inc.
- B. Perform study under the supervision of and signed by a registered professional electrical engineer in the State of Florida.
- C. The study shall include scope, results, comments, and suggestions. Evaluation procedures shall follow applicable ANSI, NEMA, IEEE, and UL standards.
- D. Obtain referenced or required characteristics and data from pertinent equipment manufacturers and from serving utility company, as applicable.
- E. Do not perform study based on assumptions for lack of data.

### **3.02 Short-Circuit Study**

- A. Short-circuit study shall provide calculations for the maximum short-circuit currents produced by balanced 3-phase and unbalanced faults as single-phase to ground at each bus shown in the single line diagrams. Short-circuit study shall be performed for system connected to utility.
- B. Motor contributions to short circuit shall be included, except for those motors controlled by VFDs with no bypass starters. Actual motor subtransient reactances shall be used for motors larger than 50 horsepower. Subtransient reactances of smaller motors may be assumed to be 17%.
- C. Evaluation shall include status (pass/fail), calculated short circuit current, short circuit rating of device, ratio of calculated short-circuit current to short-circuit rating of device in percent.
- D. Where fuses or current limiting circuit breakers are provided to reduce short-circuit levels at existing equipment that would otherwise have underrated protective devices, study shall include current limiting characteristics superimposed on time-current curves of the existing protective devices to verify compliance with NEC 240.86(A).

### **3.03 Protective Device Coordination Study**

- A. Provide time-current curves graphically indicating the coordination proposed for the system, centered on conventional, full-size log-log forms. Include with each curve sheet a complete title and single-line diagram with legend identifying the specific portion of the system covered by that particular curve sheet. Include a detailed description of each protective device identifying its type, function, manufacturer, and time-current characteristics. Tabulate recommended device tap, time dial, pick up, instantaneous, and time delay settings.

- B. Provide device coordination studies for both normal and standby source protection devices. Protective device settings shall optimize protection of equipment and, as much as practical, assure that downstream protective devices open prior to upstream protective devices.
- C. Include the following on the curve sheets:
  - 1. Utility company relay and fuse characteristics.
  - 2. Motor protection devices for all motors 100 horsepower and larger.
  - 3. Trip device characteristics of low-voltage equipment main protective devices. Exclude systems below 480 volts.
  - 4. Pertinent motor starting and generator characteristics.
  - 5. Characteristics of other system load protective devices.
  - 6. Show transformer full load current and 125%, 250%, 400%, or 600% full load currents as applicable to the selected primary and secondary protective devices. In addition, show transformer magnetizing inrush and ANSI transformer withstand parameters.
  - 7. Include all adjustable setting ground fault protective devices. Terminate device characteristic curves at a point reflecting the maximum symmetrical fault current as shown in the drawings. Ground fault settings of main disconnecting device shall comply with NEC-230.95(A).
  - 8. Include cable damage curves.
- D. Highlight protective devices that could not be coordinated and provide recommendation.
- E. Identify where cables may not be protected against high short circuits, and make necessary recommendations for correction of problems. Statements such as "Using larger cables or changing the breaker size or type, in most instances, will resolve this problem" are not acceptable.
- F. Adjust protective device settings in accordance with values established by the study.

### **3.04 Arc-Flash Hazard Analysis and Equipment Labeling**

Perform an arc-flash hazard analysis in compliance with the latest edition of NEC 110.16 and NFPA 70E 110.8(B)(1) for the electrical equipment in accordance with Annex D of NFPA 70E and IEEE 1584 to identify:

- A. The arc-flash protection boundaries, defined in Article 130.3(A) as "an approach limit at a distance from exposed live parts within which a person could receive a second-degree burn if an electrical arc flash were to occur."
- B. The shock hazard boundaries.
- C. The PPE and protective clothing necessary, based on the incident energy present at the working distance for the task to be performed, as described in Article 130.3(B) and Article 130.7.

- D. Switchboards, panelboards, industrial control panels, stand-alone VFDs, motor control centers, individually mounted starters, and instrument control panels shall be included in the study and shall be provided with arc flash labels. Labels shall be provided for each section of switchboard, VFD, and motor control center. Arc flash study shall not exclude equipment exempted by NFPA 70(E) and IEEE 1585, which allow exclusion of equipment that operates at 240 volts maximum and is fed from a transformer smaller than 125 kVA.

### **3.05 Reevaluation of Analysis**

Owner will have the right to request reevaluation of any part of the coordination and arc flash analysis to improve coordination or to reduce arc flash risk category or to eliminate cable protection inadequacy. Owner reserves the right to contact the individual who performed the study or to witness the actual reevaluation at the premises of the organization performing the study and shall be allowed to make suggestions. All of these services shall be provided at no extra cost.

**END OF SECTION**

## **SECTION 26 05 90**

### **MISCELLANEOUS EQUIPMENT**

#### **PART 1 GENERAL**

##### **1.01 Scope of Work**

- A. Furnish and install all miscellaneous equipment as hereinafter specified and as shown on the Drawings.

#### **PART 2 PRODUCTS**

##### **2.01 Materials**

###### **A. Disconnect Switches:**

1. Fusible and non-fusible disconnect switches shall be heavy-duty, NEMA type H, quick-make, quick-break, visible blades, 600 volt, 3 pole with full cover interlock. All current carrying parts shall be copper.
2. Enclosure type shall be NEMA 4X 316 stainless steel with copper lugs except as otherwise shown on the Drawings.
3. Switches shall be horsepower rated as manufactured by the Cutler Hammer, Square D Co. or equal.
4. Control wiring shall not pass through any disconnect enclosure. A junction box shall be provided, constructed of the same material as the disconnect, and utilized to separate power and control wiring prior to the disconnect enclosure.
5. Each disconnect shall be provided with a plastic nameplate, affixed to the enclosure without screws, identifying the equipment served.

###### **B. Manual Motor Starters:**

1. Manual motor starters shall be furnished and installed for single-phase motors. Manual starters shall be non-reversing, reversing or two speed type as shown on the Drawings. Built-in control stations shall be furnished where shown on the Drawings.
2. Enclosure type shall be NEMA 1 except as shown on the Drawings.
3. NEMA Type 4 enclosures shall be stainless steel.
4. Manual motor starters shall be as manufactured by the Square D. or Equal.

###### **C. Magnetic Motor Starters:**

1. Motor starters shall be 2 or 3 pole, 1 or 3-phase as required, 60 Hz, 600 volt, magnetically operated, full voltage nonreversing except as shown on the Drawings. NEMA sizes shall be as required for the horsepower shown on the Drawings.
2. Two speed starters shall be for single or two winding motors as shown on the Drawings.
3. Each motor starter shall have a 120 volt operating coil, and control power transformer. Three phase starters shall have 3 overload relays. Auxiliary contacts shall be provided as shown on the Drawings or required.
4. Overload relays shall be non-adjustable, ambient compensated and manually reset.
5. Control power transformers shall be sized for additional load where required. Transformer secondaries shall be equipped with time-delay fuses.
6. Built-in control stations and indicating lights shall be furnished where shown on the Drawings.
7. Enclosure type shall be NEMA 1 except as shown on the Drawings.
8. NEMA Type 4 enclosures shall be stainless steel.
9. Magnetic motor starter shall be as manufactured by the Square D. or equal.

D. Combination Magnetic Motor Starters:

1. Motor starters shall be a combination motor circuit protector and 3-pole, 60 Hz, 600 volt, magnetically operated, full voltage non-reversing contactor except as otherwise shown on the Drawings. NEMA sizes shall be as required for the horsepower shown on the Drawings.
2. Two speed starters shall be for single or two winding motors as shown on the Drawings.
3. Each motor starter shall have a 120 volt operating coil and control power transformer. Three phase starters shall have 3 overload relays. Auxiliary contacts shall be provided as shown on the Drawings or required.
4. Overload relays shall be non-adjustable, ambient compensated and manually reset.
5. Built-in control stations and indicating lights shall be furnished where shown on the Drawings.

6. Enclosure type shall be NEMA 1 except as shown on the Drawings.
  7. NEMA Type 4 enclosures shall be stainless steel.
  8. Motor circuit protectors shall be molded case with adjustable magnetic trip only. They shall be specifically designed for use with magnetic motor starters. Motor circuit protectors shall be furnished with bolt-on current limiting fuses.
  9. Combination magnetic motor starters shall be as manufactured by the Square D. or Equal.
- E. Control Stations:
1. Control stations shall be NEMA 4X stainless steel heavy-duty type, with full size operators when located outdoors, in "NEMA 4" locations or in "Corrosive" areas.
  2. Control stations shall be Class 9001, manufactured by the Square D Company, GE.
  3. Pilot lights shall be complete with glass jewels and 150-volt led lamps.
- F. Unless otherwise noted, all outdoor enclosures shall be NEMA 4X stainless steel. NEMA 4X push buttons and pilot lights shall be provided in all weatherproof control panels.
- G. Alarm Horn and Strobe Light:
1. Strobe light shall be as manufactured by Appleton, Zoller or Leviton. Alarm horn shall be as manufactured by Edwards, Zoller or Federal.

### **PART 3 EXECUTION (not used)**

**END OF SECTION**

## **SECTION 26 24 10**

### **PANELBOARDS**

#### **PART 1 GENERAL**

##### **1.01 Scope of Work**

- A. Furnish all labor materials, equipment and incidentals required and install all panelboards as hereinafter specified and as shown on the Drawings.

#### **PART 2 PRODUCTS**

##### **2.01 Rating**

- A. Panelboard ratings shall be as shown on the Drawings. All panelboards shall be rated for the intended voltage.

##### **2.02 Standards**

- A. Panelboards shall be in accordance with the Underwriter Laboratories, Inc. "Standard for Panelboards" and "Standard for Cabinets and Boxes" and shall be so labeled where procedures exist. Panelboards shall also comply with NEMA Standard for Panelboards and the National Electrical Code.

##### **2.03 Construction (NEMA 1)**

- A. Interiors:
  - 1. All interiors shall be completely factory assembled with circuit breakers, wire connectors, etc. All wire connectors, except screw terminals, shall be of the antiturn solderless type and all shall be suitable for copper or aluminum wire of the sizes indicated.
  - 2. Interiors shall be so designed that circuit breakers can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be so designed that circuits may be changed without machining, drilling or tapping.
  - 3. Branch circuits shall be arranged using double row construction except when narrow column panels are indicated. Branch circuits shall be numbered by the manufacturer.
  - 4. A nameplate shall be provided listing panel type, number of circuit breakers and ratings.
- B. Buses:
  - 1. Bus bars for the mains shall be of copper. Full size neutral bars shall be

included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Bussing shall be braced throughout to conform to industry standard practice governing short circuit stresses in panelboards. Phase bussing shall be full height without reduction. Cross connectors shall be copper.

2. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection.
3. Spaces for future circuit breakers shall be bussed for the maximum device that can be fitted into them.
4. Buses for 480V panelboards shall be rated for 65,000 amperes RMS symmetrical. Buses for 120/208V light panels shall be rated 10,000 amperes RMS symmetrical.

C. Boxes:

1. Recessed boxes shall be made from galvanized code gauge steel without multiple knockouts. Surface mounted boxes shall be painted to match the trim. Boxes shall be of sufficient size to provide a minimum gutter space of 4-inches on all sides.
2. Surface mounted boxes shall have an internal and external finish as hereinafter specified in paragraph D4.
3. At least four (4) interior mounting studs shall be provided.
4. All conduit entrances shall be field punched.

D. Trim:

1. Hinged doors covering all circuit breaker handles shall be included in all panel trims.
2. Doors shall have semi flush type cylinder lock and catch, except that doors over 48-inches in height shall have a vault handle and 3-point catch, complete with lock, arranged to fasten door at top, bottom and center. Door hinges shall be concealed. Two keys shall be supplied for each lock. All locks shall be keyed alike; directory frame and card having a transparent cover shall be furnished on each door.
3. The trims shall be fabricated from code gauge sheet steel.
4. All exterior and interior steel surfaces of the panelboard shall be properly cleaned and finished with ANSI Z55.1, No. 61 light gray paint over a rust-inhibiting phosphatized coating. The finish paint shall be of a type to which field applied paint will adhere.



5. Trims for flush panels shall overlap the box by at least 3/4-inch all around. Surface trims shall have the same width and height as the box. Trims shall be fastened with quarter turn clamps.

E. Manufacturer:

1. 120/240V, single phase, 3-wire, and 120/208V 3-phase, 4-wire panelboards shall be type NLAB as manufactured by the Square D Co. No equal.
2. 480V, 3-phase, 3-wire panelboards shall be type NF as manufactured by the Square D Co. No equal.

## **2.04 Construction (NEMA 3, 4 & 12)**

A. Interiors and Buses:

1. Interiors and buses shall be as herein before specified for NEMA 1 construction.

B. Boxes and Covers:

1. Boxes and covers shall be made from stainless-steel with natural finish.
2. Boxes and covers shall be bolted together and gasketed.
3. Conduit openings shall be tapped.

C. Manufacturer:

1. NEMA 4X panelboards shall be 304 stainless steel as required by voltage application; manufactured by the same as the NEMA 1 panelboards.

## **2.05 Circuit Breakers:**

- A. Panelboards shall be equipped with circuit breakers with frame size and trip settings as shown on the Drawings.
- B. Circuit breakers shall be molded case, bolt-in type.
- C. Circuit breakers used in 120/240 and 120/208V panelboards shall have an interrupting capacity of not less than 10,000 - amperes, RMS symmetrical.
- D. Three pole breakers used in 480V panelboards shall have an interrupting capacity of not less than 42,000 - amperes RMS symmetrical.
- E. GFCI (ground fault circuit interrupter) shall be provided for circuits where indicated on the Drawings. GFCI units shall be 1 pole, 120 volt, molded case, bolt-on breakers, incorporating a solid state ground fault interrupter circuit insulated and isolated from the breaker mechanism. The unit shall be U.L. listed Class A Group I

device (5 milliamp sensitivity, 25 millisecond trip time), and an interrupting capacity of 10,000 amperes RMS.

### **PART 3 - EXECUTION**

#### **3.01 Installation**

- A. Boxes for surface mounted panelboards shall be mounted so there is at least 1/2-inch air space between the box and the wall.
- B. Unless otherwise noted on the Drawings, top of cabinets shall be mounted 6-feet 0-inch above the floor, properly aligned and adequately supported independently of the connecting raceways.
- C. All wiring in panelboards shall be neatly formed, grouped, laced, and identified to provide a neat and orderly appearance. A typewritten directory card identifying all circuits shall be placed in the cardholder inside the front cover.

**END OF SECTION**

## **SECTION 26 26 50**

### **MOTORS**

#### **PART 1 GENERAL**

##### **1.01 Scope of Work**

- A. Furnish and install the motors as hereinafter specified and as called for in other sections of these Specifications.
- B. Refer to the following items listed below for related sections:
  - 1. 43 21 11 Horizontal Split-Case Centrifugal Pumps
  - 2. 26 29 23 Variable Frequency Drives (VFD)
  - 3. 40 95 00 Process Instrumentation and Control System

##### **1.02 Qualifications**

- A. Motor shall be sufficient size for the duty to be performed and shall not exceed their full-rated load when the driven equipment is operating at specified capacity. Unless otherwise noted, motors driving pumps shall not be overloaded at any head or discharge condition of the pump.

##### **1.03 Submittals**

- A. The motor manufacturer shall submit to the Engineer certified dimension prints showing nameplate data and outline dimensions within three weeks of the date they receive the order.
- B. Guarantee: All equipment furnished and installed under this Section shall be guaranteed against defects of workmanship, materials and improper installation for a period of one year from date of acceptance. All such equipment or parts proven defective, due to the above noted causes, shall be replaced in the machines by the Contractor at no expense to the Owner.
- C. Provide equipment warranty in accordance with Division 01.

#### **PART 2 PRODUCTS**

##### **2.01 Rating**

- A. Unless otherwise noted, all motors shall be of the low voltage type. All motors 1/2 through 100 horsepower shall be rated 230/460 volt, 3 phase, 60 Hertz A.C.; motors 125 horsepower through 500 horsepower shall be rated 460 volt, 3-phase, 60 Hertz, and motors below 1/2 horsepower shall be rated 115/230 volt, 1 phase, 60 Hertz A.C.

##### **2.02 Three Phase Induction Motors**

- A. Motors 20 HP and larger shall have a 120-volt space heater for moisture control.
- B. Unless specifically noted in other sections of these Specifications, all motors shall have a minimum as indicated in the table below. All motors shall be "premium efficiency" type.
- C. Motors operating with variable frequency drives shall state that they are suitable for their intended applications. Refer to specification section 26 29 23 for VFD requirements. Motor nameplate shall read "Inverter Duty Rated". In addition, Motors operating with Variable Frequency Drives (VFDs) shall meet the requirements of NEMA MG1 Part 31.

**TABLE 1**

<b>Motor HP</b>	<b>Min. Eff.</b>	<b>Max. dba</b>	<b>Motor HP</b>	<b>Min. Eff.</b>	<b>Max. dba</b>
3-5	86.5%	79	25-30	92.0%	92
7.5-10	90.2%	84	40-50	93.0%	97
15-20	91.0%	89	60-75	94.0%	100
			100	94.1%	102
			200	94.3%	105

- D. All motors shall have imbedded a winding temperature switch.

## **2.03 Construction**

- A. General:
  - 1. All drip-proof and weather protected Type I motors shall have epoxy encapsulated windings. Totally enclosed motors shall not be encapsulated. Motors not readily available with encapsulated windings may be standard type. Service Pump Motors shall be totally enclosed fan cooled (TEFC) unless otherwise specified.
  - 2. Squirrel-cage rotors shall be made from high-grade steel laminations adequately fastened together and to the shaft, or shall be cast aluminum or bar-type construction with brazed end rings.
- B. Low Voltage, Three Phase Motors:
  - 1. Motors shall be of the squirrel-cage or wound rotor induction type as

noted. Horizontal, vertical solid shaft, vertical hollow shaft, normal thrust and high thrust types shall be furnished as specified herein. All motors shall be built in accordance with current NEMA, IEEE, ANSI and AFBMA standards where applicable. Motors shall be of the type and quality described by these Specifications, fully capable of performing in accordance with manufacturer's nameplate rating, and free from defective material and workmanship.

2. Motors shall have normal or high starting torque (as required), low starting current (not to exceed 600 percent full load current), and low slip.
3. Motors shall be totally enclosed fan-cooled construction with 1.15 service factor unless otherwise noted. Indoor motors shall be WPI unless otherwise noted.
4. Motors shall be suitable for operation in moist air with hydrogen sulphide gas present.
5. The output shaft shall be suitable for direct connection or belt drive as required.
6. Motors shall have a Class B nonhygroscopic insulation system. Class F insulation may be used but shall be limited to Class B temperature rise.
7. All motors shall have a final coating of chemical resistant corrosion and fungus protective epoxy fortified enamel finish sprayed over red primer over all interior and exterior surfaces. Stator bore and rotor of all motors shall be epoxy coated.
8. All fittings, bolts, nuts, and screws shall be 316 stainless steel. Bolts and nuts shall have hex heads.
9. All machine surfaces shall be coated with rust inhibitor for easy disassembly.
10. Conduit boxes shall be gasketed. Lead wires between motor frame and conduit box shall be gasketed.
11. Totally enclosed motors shall be provided with condensate drain hole and epoxy coated motor windings to protect against moisture.
12. Nameplates shall be stainless steel. Lifting lugs or "O" type bolts shall be supplied on all frames 254T and larger. Enclosures will have stainless steel screen and motors shall be protected for corrosion, fungus and insects.
13. Low voltage, three phase motors shall be manufactured by General Electric, U.S. Motors, Westinghouse or Reliance.

14. Fractional Horsepower:

- a. Fractional horsepower motors shall be rigid, welded-steel, designed to maintain accurate alignment of motor components and provide adequate protection. End shields shall be reinforced, lightweight die-cast aluminum. Windings shall be of varnish-insulated wire with slot insulation of polyester film, baked-on bonding treatment to make the stator winding strongly resistant to heat, aging, moisture, electrical stresses and other hazards.
- b. Motor shaft shall be made from high-grade, cold-rolled shaft steel with drive-shaft extensions carefully machined to standard NEMA dimensions for the particular drive connection.
- c. For light to moderate loading, bearings shall be quiet all-angle sleeve type with large oil reservoir that prevents leakage and permits motor operation in any position.
- d. For heavy loading, bearings shall be carefully selected precision ball bearings with extra quality, long-life grease, and large reservoir providing 10 years' normal operation without relubrication.

15. Integral Horsepower:

- a. Motor frames and end shields shall be cast iron or heavy fabricated steel of such design and proportions as to hold all motor components rigidly in proper position and provide adequate protection for the type of enclosure employed.
- b. Windings shall be adequately insulated and securely braced to resist failure due to electrical stresses and vibrations.
- c. The shaft shall be made of high-grade machine steel or steel forging of size and design adequate to withstand the load stresses normally encountered in motors of the particular rating. Bearing journals shall be ground and polished.
- d. Rotors shall be made from high-grade steel laminations adequately fastened together, and to the shaft. Rotor squirrel-cage windings may be cast-aluminum or bar-type construction with brazed end rings.
- e. Motors shall be equipped with vacuum-degassed antifriction bearings made to AFBMA Standards, and be of ample capacity for the motor rating. The bearing housing shall be large enough to hold sufficient lubricant to minimize the need for frequent lubrication, but facilities shall be provided for adding new lubricant

and draining out old lubricant without motor disassembly. The bearing housing shall have long, tight, running fits or rotating seals to protect against the entrance of foreign matter into the bearings, or leakage of lubricant out of the bearing cavity.

- f. Bearings of high thrust motors will be locked for momentary upthrust of 30% downthrust. All bearings shall have a minimum B10 life rating of 100,000 hours in accordance with AFBMA life and thrust values.
- g. Vertical hollow-shaft motors will have nonreverse ratchets to prevent backspin.

C. Low Voltage, Single Phase Motors:

- 1. Single phase motors shall be split-phase and capacitor-start induction types rated for continuous horsepower at the rpm called for on the Drawings. Motors shall be rated 115/230 volts, 60 Hertz, single phase, open drip-proof, or totally enclosed fan cooled as called for on the Drawings, with temperature rise in accordance with NEMA Standards for Class B insulation.
- 2. Totally enclosed fan cooled motors shall be designed for severe-duty.
- 3. Motors shall have corrosion and fungus protective finish on internal and external surfaces. All fittings shall have a corrosion protective plating.
- 4. Mechanical characteristics shall be the same as specified for polyphase fractional horsepower motors.

## **PART 3 EXECUTION**

### **3.01 Installation**

- A. Motor Connections: All motors shall be connected to the conduit system by means of a short section 18-inch minimum of flexible conduit unless otherwise indicated. For all motor connections, the Contractor shall install a grounding conductor in the conduit and terminate at the motor control center with an approved grounding clamp.

### **3.02 Tests and Checks**

- A. The following tests shall be performed on all motors after installation but before putting motors into service.
  - 1. The Contractor shall megger each motor winding before energizing the motor, and, if insulation resistance is found to be low, shall notify the Engineer and shall not energize the motor. The following table gives minimum acceptable insulation resistance in megohms at various

temperatures and for various voltages with readings being taken after one minute of megger test run.

**TABLE 2**

<b>Degree Winding Temperature</b>		<b>Voltage</b>			
<b>°F</b>	<b>°C</b>	<b>115V</b>	<b>230V</b>	<b>460V</b>	<b>4,160V</b>
37	3.9	60	108	210	1,700
50	10	32	60	120	1,000
68	20	13	26	50	460
86	30	5.6	11	21	195
104	45	2.4	4.5	8.8	84
122	50	1	2	3.7	35
140	60	.5	.85	1.6	15

2. The Contractor shall check all motors for correct clearances and alignment and for correct lubrication, and shall lubricate if required in accordance with manufacturer's instructions. The Contractor shall check direction of rotation of all motors and reverse connections if necessary.

B. The following tests shall apply to the medium voltage motors:

1. All motors shall be given the standard short commercial test prior to shipment. This shall consist of no load current, check current balance, winding resistance, air gap measurement, high potential tests, and bearing inspection. Six (6) copies of the certified short commercial test shall be mailed to the Engineer prior to shipment.

**END OF SECTION**



## **SECTION 26 27 26**

### **WIRING DEVICES**

#### **PART 1 GENERAL**

##### **1.01 Description**

This section describes materials and installation of light switches, telephone outlets, data, coax and receptacles devices.

##### **1.02 Submittals**

- A. Submit shop drawings in accordance with Division 01 General Requirements and the General Conditions.
- B. Submit material list for each type of wiring device and cover plate. Indicate type, ratings, material, color, and manufacturer.

##### **1.03 References**

- A. NEMA WD 1, General Purpose Wiring Devices.
- B. NEMA WD 6, Wiring Device Configurations.

#### **PART 2 MATERIALS**

##### **2.01 General**

- A. Provide wiring devices that are UL listed.

##### **2.02 Receptacles**

- A. Duplex Receptacles: Provide NEMA WD 1, molded composition, ivory, specification grade receptacles. Duplex receptacles for 120-volt, single-phase, 3-wire circuit to be rated 20 amperes, 125 volts, NEMA Type 5-20R.
- B. Double Duplex Receptacles: Double duplex receptacles for 120-volt, single-phase service to be same as duplex receptacles with the two duplex receptacles installed in one 4-inch by 4-inch outlet box with one two-gang faceplate.
- C. Ground Fault Interrupter (GFI) Duplex Receptacles: Receptacles shall be rated 20 amperes and comply with UL 943, Class A. Provide Leviton 6398-HGI, 3M GFI-2701, or equal.
- D. Corrosion-Resistant Receptacles: Provide corrosion-resistant receptacles for areas identified as "Corrosive Area" in the drawings. Provide gray melamine, duplex receptacle, Hubbell 53CM62GY or equal.

- E. Isolated ground Duplex Receptacles: Provide NEMA WD 1, molded composition, orange, specification grade receptacles. Duplex receptacles for 120-volt, single-phase, 4-wire circuit to be rated 20 amperes, 125 volts, NEMA Type 5-20R.

## **2.02 Switches**

- A. Switches shall be NEMA WD 1, molded composition, ivory, specification grade, single pole, three way and four way as shown in the drawings.
- B. 120- or 277-Volt Lighting: Provide switches rated 20 amperes, 120/277-volt ac. Provide quiet operation, toggle-type switches.

## **2.04 Coax Outlets**

- A. Provide RG-6 modular jack.

## **2.05 Communications Outlet**

- A. Provide insulation displacement type, Category 5, eight-pin, eight-position, modular jack.

## **2.07 Cover Plates**

- A. Provide galvanized steel plates in electrical and mechanical equipment rooms, utility rooms, unfinished areas, and on all indoor surface-mounted boxes, fittings, and exposed extension rings. Plates to be hot-dipped galvanized.
- B. In wet areas, areas subject to hosing down, areas identified as "Corrosive Area," or where indicated, use individually gasketed weatherproof cover plates. Plates shall be gray polycarbonate lift-cover type. Provide outdoor receptacles with covers that provide weatherproof protection while outlet is in use. Provide Tay Mac Industrial Outlet Covers or equal.
- C. Provide ivory lexon plates in all remaining locations. Plates to be smooth style, noncombustible, mar-resistant thermosetting plastic.

# **PART 3 EXECUTION**

## **3.01 Grounding**

- A. Provide a bonding jumper between the grounded outlet box and the receptacle ground terminal.

## **3.02 Testing**

- A. Operate each switch and verify that the load is turned on and off.
- B. Test each receptacle with a circuit tester that checks voltage, polarity, and grounded conditions. Repair or replace defective receptacles and repeat the test.

- C. GFI receptacles shall be tested with the circuits energized. Devices shall be tested with a portable GFI receptacle tester capable of circulating 7.5 mA of current, when plugged in, between the "hot" line and "ground" to produce tripping of the receptacle. Resetting and tripping shall be checked at least twice at each GFI receptacle.

**END OF SECTION**

## **SECTION 26 29 23**

### **VARIABLE FREQUENCY DRIVES**

#### **PART 1 GENERAL**

##### **1.01 Scope of Work**

- A. Furnish all labor, materials, equipment and incidentals required to furnish and install variable frequency drives (VFDs) as shown on the Drawings and as specified herein.
- B. Refer to the following items listed below for related sections:
  - 1. 43 21 11 Horizontal Split-Case Centrifugal Pumps
  - 2. 26 26 50 Motors
  - 3. 40 95 00 Process Instrumentation and Control System
- C. 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 furnished. They are, however, intended to cover the furnishing, the shop testing, delivery and complete installation and field testing, of all materials, equipment and appurtenances for the variable frequency drives herein specified.
- D. All VFDs furnished for this project shall be the responsibility of the System Supplier defined in Specification section 40 95 00. The System Supplier shall be responsible for complete system operation and all required coordination with all disciplines. The System Supplier shall be responsible for coordinating the sizing of all VFDs.
- E. The System Supplier shall provide the services of a competent and experienced equipment manufacturer's factory field engineer to supervise start-up and provide training to the Owner's personnel.

##### **1.02 Description of System**

- A. The variable frequency drives will operate motors as specified in other Divisions and Division 26. The drives furnished hereunder shall be totally compatible and adequately sized with the Motors to be supplied.
- B. Variable speed drives shall be sized as shown on the electrical drawings.
- C. Installation of the VFDs in the power equipment center shall be provided where indicated on the drawings.
- D. The variable frequency control shall operate satisfactorily when connected to a bus supplying other solid state power conversion equipment which may be causing up to 10% total harmonic voltage distortion and commutation notches up to 36,500 volt microseconds, or when other variable frequency drives are operated from the same bus.

### **1.03 Qualifications**

- A. The drives covered by these Specifications are intended to be equipment of proven ability as manufactured by reputable manufacturers having long experience in the production of identical units. The equipment furnished shall be designed, constructed and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed.
- B. The variable frequency drive manufacturer shall maintain and staff engineering service and repair shops through the United States, including the State of Florida, trained to do start up service, emergency service calls, repair work, service contracts and training of customer personnel.

### **1.04 Submittals**

- A. Copies of all materials required to establish compliance with the specifications shall be submitted. Submittals shall include at least the following:
  - 1. Certified 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 the variable frequency drives. Data shall include certification that the variable frequency drives are warranted for use with the motors specified in other Divisions and Division 26.
  - 4. Complete drawings shall be furnished for approval before proceeding with manufacture and shall consist of master wiring diagrams, elementary or control schematics including coordination with other electrical control devices operating in conjunction with the variable frequency drive, and suitable outline drawings with sufficient details for locating conduit stub-ups and field wiring. Generic schematics not specific to this project shall not be acceptable.
  - 5. A list of the manufacturer's recommended spare parts with the manufacturer's current price for each item. Include gaskets, packing, etc. on the list. List bearings by the bearing manufacturer's numbers only.

### **1.05 Operating Instructions**

- A. See Division 1 for Operating and Maintenance Data requirements.

### **1.07 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 spare 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. Each box or package shall be properly marked to show its net weight in addition to its contents.

## **1.08 Warranty**

- A. 5-year on-site warranty shall be provided such that the owner is not responsible for any warranty costs including travel, labor, parts, or other costs for a full 5 years from the date of manufacture of the Drive. The warranty shall cover all Drive failures including line anomalies – load anomalies, accidental exposure to moisture or corrosives and accidental collision of other physical damage; product misapplications, vandalism and chronic problems due to the misapplication are not covered. The cost of the warranty shall be included in the bid.

## **PART 2 PRODUCTS**

### **2.01 General Requirements**

- E. The Contractor shall be responsible for the erection and installation of all equipment defined in this section of the contract documents.
- F. The System Supplier shall furnish complete variable frequency drive systems for installation by the Contractor. The System Supplier is responsible for the start up of all VFD drives furnished on this project.
- G. The variable frequency drive shall be furnished by an approved manufacturer who has actively been manufacturing variable frequency drives for a period of at least five (5) years.
- H. The variable frequency drive shall be complying with the latest applicable standards of ANSI, NEMA, IEEE, and the National Electric Code.
- I. Variable frequency drive shall operate as specified on standby generators or normal power sources.
- J. Passive harmonic filters shall be provided for each VFD. The System Supplier is responsible for confirming their size. The passive filters shall be designed as required to limit voltage and current distortion levels to acceptable limits as determined by IEEE-519. Refer to section 2.03 below for additional requirements.
- K. The System Supplier shall provide a listing of all programmable parameters that are different from the factory default values. For each indicate:

The factory default and meaning.  
The revised value and meaning.

- L. The VFD Supplier shall provide a copy of PC compatible remote programming/diagnostic software and any required cables to the Owner. The software shall permit communications to the VFDs via an Ethernet/IP network connection.

## **2.02 Construction**

- A. Each variable frequency drive shall consist of a 460V, 3-phase rectifier, DC link and variable frequency inverter with features, functions and options as specified. The inverter shall be voltage source design using pulse width modulation (PWM) techniques. VFD-1, VFD-2, VFD-3 and VFD-4 shall be limited to maximum dimensions shown on the drawings.
- B. The variable frequency drives shall be rated for continuously operating at the full load current as specified on the electrical drawings per the single line diagram. The variable frequency drives shall be designed to provide continuous speed adjustment of three-phase motors. The variable frequency output voltage shall provide constant volts-per-Hertz excitation to the motor terminals up to 60 Hertz.
- C. Inverters shall be capable of converting incoming three phase, 460V (+10 to -5%) and 60 Hertz (+/-2) Hertz power to DC bus levels. The DC voltage shall be inverted to a variable frequency output.
- D. Controllers shall be rated for an ambient temperature of 0°C to 40°C and humidity of 0 to 95% non-condensing.
- E. All openings in the VFD shall be filtered.
- F. VFDs shall have complete front accessibility.
- G. All variable frequency drives shall:
  - 1. Be furnished with integral DC link reactor.
  - 2. Have frequency stability of 2% for 24 hours with voltage regulation of +2% of maximum rated output voltage.
  - 3. Be phase insensitive to input power.
- H. The following standard basic control features shall be provided on the inverter:
  - 1. Unidirectional operation, coast to rest upon stop.
  - 2. Variable linear independent timed acceleration.
  - 3. Variable torque performance from 4 to 60 Hertz.
  - 4. LED status indication for Power On, Run, Inverter Enable, over frequency, instantaneous overcurrent, DC over voltage, AC undervoltage/loss-of-phase, emergency stop, overload, over temperature, inverter pole trip and standby modes.

5. 115V AC control power for operator devices.
  6. Automatic restart upon return of power following a utility outage. Drive shall require manual reset after three (3) attempts in a 60 second period.
- I. The following protective features shall be provided on the drive:
1. Input AC circuit breaker with an interlocked, pad lockable handle mechanism and AC input line current limiting fuses for fault current protection of AC to DC converter section and circuit breaker. Minimum short circuit rating of 100,000 AIC shall be provided.
  2. Electronic overcurrent trip for instantaneous overload protection.
  3. Undervoltage and phase loss protection of output.
  4. Over-frequency protection.
  5. Over-temperature protection.
  6. Surge protection from input AC line transients.
  7. Electrical isolation between the power and logic circuits, as well as between the 115V AC control power and the static digital sequencing.
  8. Drive to be capable of withstanding output terminal line short or open circuits without component failure.
- J. The following standard independent adjustments shall be provided on the inverter:
1. Minimum speed (12 to 54 HZ).
  2. Maximum speed (40 to 60 HZ).
  3. Acceleration time 6 to 60 Sec. (minimum).
  4. Deceleration time 6 to 60 Sec. (minimum).
  5. Volts per Hertz.
  6. Stability adjustment, if required.
  7. Voltage boost (100 to 600 percent of nominal V/HZ ratio at 1 HZ tapering to 100 percent at 20 HZ).
- K. All VFDs shall have a door-mounted key-pad display that allows:
1. Display of electrical values, parameters and faults.



2. Adjustment and configuration of the drive controller.
  3. Local control.
  4. Storage of up to four different, downloadable controller configurations.
- L. The key-pad display shall comprise:
1. LCD display that displays alphanumeric codes and numerical values.
  2. LCD display that displays plain English messages.
  3. Illuminated indication of local/remote status, direction of rotation and programming/run mode.
  4. A pushbutton keypad supporting local control, display, and configuration of the drive.
- M. The Variable Frequency Drive shall be provided with a Profibus D9 communications module for a remote connection to the existing PCP.
- N. All wiring shall have permanently affixed wire numbers.
- O. The variable frequency drives shall be as manufactured by Cutler Hammer SVX9000, no equal.

### **2.03 Integral Passive Harmonic Filter**

- A. The passive harmonic filter (hereafter called the filter) shall be designed to filter all characteristic low frequency harmonics (5th, 7th, 11th, 13th, etc.), generated from three phase diode rectifier loads such as variable frequency drives (VFD), while improving the system power factor.
- B. The filter shall consist of inductive element(s) in series with the load and an inductive-capacitive network in parallel with the load (shunt).
- C. The filter shall not adversely react with or resonate with the power system or attract harmonics from other sources. The filter shall be provided with a normally closed contact which shall open and isolate the VFD connection from the filter when the VFD is not running.
- D. The filter shall be UL- and cUL-Listed under UL 508A.
- E. The harmonic filter shall be warranted free from defects both in materials and in workmanship for a period of three years from the date of shipment, when applied in accordance with the manufacturer's recommended procedures.
- F. The filter shall be manufacturers shall be as follows:
1. TCI, Jacksonville, Florida

- 2. Approved Equal
- G. The filter described in this specification shall be used on a 480-Volt, 3-phase, 60 Hertz system. The filter horsepower ratings shall be determined in accordance with the VFD Schedule.
- H. Submittals shall include the following information:
  - 1. Outline dimensions, conduit entry locations and weight.
  - 2. Customer connection and power wiring diagrams.
  - 3. Complete technical product description.

### **PART 3 EXECUTION**

#### **3.01 Installation**

- A. Installation shall be in strict accordance with the manufacturer's instructions and recommendations in the locations shown on the Drawings. Field wiring shall be in accordance with manufacturer's recommendations. Anchor bolts shall be stainless steel and set in accordance with manufacturer's recommendations.

#### **3.02 Shop Painting**

- A. 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. Drives shall be shop painted.

#### **3.03 Tests and Checks**

- A. The drive manufacturer shall test the drive controller with a motor load prior to shipment. The motor shall have equal or greater full load current than the specified motor.
- B. Perform start-up demonstration and field testing as specified in Section 017825.
- C. A certified copy of all tests and checks performed in the field, complete with meter readings and recordings, where applicable, shall be submitted to the Owner.

#### **3.04 Training**

- A. The training and instruction shall be directly related to the System being supplied and be accomplished.
- B. Training of the Owner's personnel will only be considered valid for approval by the Engineer if it takes place after the successful start-up and demonstration test.

- C. The Supplier shall provide classroom training detailed manuals to supplement the training courses. The manuals shall include specific details of equipment supplied and operations specific to the project.
- D. The Supplier shall make use of teaching aids, manuals, slide/video presentations, etc. After the training services, such materials shall be delivered to Owner.
- E. The training program shall represent a comprehensive program covering all aspects of the variable frequency drive and maintenance of the system.
- F. All training schedules shall be coordinated with, and at the convenience of the Owner. Shift training may be required to correspond to the Owner's working schedule.
- G. On-site Training: On-site (field) training shall be conducted at the Owner's Plant Site over a total of one (1) - eight (8) hour day. It shall provide detailed hands-on instruction to Owner's personnel covering:
  - 1. System operation
  - 2. Program modification
  - 3. Trouble-shooting
  - 4. Maintenance procedures
  - 5. Calibration procedures.

**END OF SECTION**

## **SECTION 26 43 13**

### **SURGE PROTECTION DEVICES (SPD'S)**

#### **PART 1 GENERAL**

##### **1.01 Description**

This section includes materials and installation of SPD's for the protection of electrical and electronic circuits and equipment. All feeders to a structure to be protected by a SPD. Coordinate SPD requirements with the lightning protection system.

##### **1.02 Submittals**

- A. Submit shop drawings in accordance with Division 01 General Requirements and the General Conditions.
- B. Submit product data on each suppressor type, indicating component values, part numbers, and conductor sizes. Include dimensional drawing for each, showing mounting arrangements.
- C. Submit manufacturer's UL 3<sup>rd</sup> Edition certified test data and nameplate data for each SPD.
- D. Submit electrical single-line diagram showing location of each SPD.
- E. Provide copy of extended warranty.

##### **1.03 Quality Assurance**

- A. UL Compliance and Labeling:
  - 1. For power and signal circuits, SPD devices shall comply with UL 1449 3<sup>rd</sup> Edition and UL 1283 as an electromagnetic interference filter. Provide units that are listed and labeled by UL. Products that have been "Tested to UL Standards" by a Nationally Recognized Testing Laboratory (NRTL) will not be accepted.
  - 2. For telephone circuit protection, SPD devices shall comply with UL 497A.
- B. ANSI Compliance: Use SPD devices that comply with ANSI/IEEE C62.41 and ANSI/IEEE C62.33.
- C. NEC Compliance: Use SPD devices that comply with NEC Article 285.

##### **1.04 Extended Warranty**

- A. Provide written warranty, signed by the manufacturer, agreeing to replace any surge suppressor which fails in service within five years following the guarantee period specified in the General Conditions.

## **PART 2 MATERIALS**

### **2.01 General**

- A. SPD's for power circuits shall be the product of a single manufacturer and shall be of modular construction designed for field replacement.
- B. SPD's shall be capable of performance at ambient temperatures between 40°C and 60°C, at relative humidity ranging from 0% to 95%, and at elevations ranging from sea level to 12,000 feet.
- C. SPD's shall be fused to disconnect the suppressor from the electrical source should the suppressor fail. The fusing shall allow full surge handling capabilities and afford safety protection from thermal overloads and short circuits.
- D. Design SPD's for the specific type and voltage of the electrical service. Single-phase and 3-phase wye-configured systems shall have L-N, L-G, and N-G protection. Grounded delta-configured systems shall have L-L and L-G protection.
- E. Power Filter: The SPD's shall include a high-frequency extended range power filter and shall be UL 1283 listed as an electromagnetic interference filter. The filter shall provide minimum noise attenuation as follows:
- F. Provide SPD's devices at the end of all exterior (external to building) power branch circuits.
- G. Provide SPD's devices at each exterior (external to building) analog and control device.

<b>Attenuation Frequency</b>	<b>100 KHz</b>	<b>1 MHz</b>	<b>10 MHz</b>	<b>100 MHz</b>
Insertion loss (ratio)	50:1	350:1	500:1	250:1
Insertion loss (dB)	34	51	54	48

### **2.02 Manufacturer**

- A. SPD's shall be products of one of the following manufacturers:
  - 1. APT (Advanced Protection Technologies).
  - 2. Leviton Surge Suppression.

### **2.03 Main Distribution SPD's**

- A. Provide SPD's meeting ANSI/IEEE C62.41 Location Category C High (20kV/10kA)
- B. Maximum single impulse surge current rating shall be not less than the following:

1. L-L Capacity: 200 kA.
  2. L-N Capacity: 100 kA.
  3. L-G Capacity: 100 kA.
  4. N-G Capacity: 150 kA.
- C. Suppressor housing shall be in an enclosure that has the same NEMA rating as the panel it protects and painted to match.
- D. UL 1449 3<sup>rd</sup> Edition Voltage Protection Rating (VPR) shall not be more than:

System Voltage	Phase	L-L or L-N UL 3 <sup>rd</sup> Ed. VPR
120	1	900
208Y/120	3	900
480Y/277	3	1,200

#### 2.04 Panelboard SPD's

- A. Provide SPD's meeting ANSI/IEEE C62.41 Location Category B (6kV/3kA)
- B. Maximum single impulse surge current rating shall be not less than the following:
1. L-L Capacity: 100 kA.
  2. L-N Capacity: 50 kA.
  3. L-G Capacity: 50 kA.
  4. N-G Capacity: 50 kA.
- C. Suppressor shall be in an enclosure that has the same NEMA rating as the panel it protects.
- D. UL 1449 3<sup>rd</sup> Edition Voltage Protection Ratings (VPR) shall not be more than:

System Voltage	Phase	L-L or L-N UL 3 <sup>rd</sup> Ed. VPR
120	1	600
208Y/120	3	600
480Y/277	3	1,200

#### 2.05 Short-Circuit Rating

- A. Provide SPD's with short-circuiting rating permanently marked on the enclosure.
- B. Provide SPD's with the same or greater short-circuit rating as the switchboards and/or panelboards with which they are installed.

#### 2.06 Annunciation

- A. Provide unit with LED (Green/Red) indication lights to show the normal (Green=Power on/Protection present) and failed (Red) status of each module.

Provide one normally open and one normally closed contacts which operate when the unit fails or loss of AC power.

## **2.07 Surge Counter**

- A. Provide each SPD's rated above 100kA with a counter displaying the number of voltage transients that have occurred on the unit input. The counter shall have battery backup and retain the count through system power outages.

## **2.08 Paired Cable Data Line Interior Suppressors**

- A. Provide units meeting ANSI/IEEE C62.41, Location Category A.
- B. Use bipolar 1,500-watt silicon avalanche diodes between the protected conductor and earth ground.
- C. Provide units with a maximum single impulse current rating of 80 amperes (10 x 1,000 microsecond--waveform).
- D. Breakdown voltage shall not exceed 36 volts.
- E. Manufacturers: Advanced Protection Technologies Model TE/RS2321.5kw or Atlantic Scientific series devices.

## **2.09 Paired Cable Data Line Exterior Suppressors**

- A. Provide units meeting ANSI/IEEE C62.41, Location Category A.
- B. Suppressors shall be a hybrid design with a minimum of three stages, utilizing solid-state components and operating bi-directionally.
- C. Suppressors shall meet or exceed the following criteria:
  - 1. Maximum single impulse current rating of 10,000 amperes (8x20 microsecond--waveform).
  - 2. Pulse Life Rating: 3,000 amperes (8x20 microsecond--waveform); 2,000 occurrences.
  - 3. Maximum clamping voltage at 10,000 amperes (8x20 microsecond current waveform) shall not exceed the peak of the normal applied signal voltage by 200%.
- D. Manufacturers: Advanced Protection Technologies Series CEP, Atlantic Scientific Corporation, Square D SurgeLogic, or equal.

## **PART 3 EXECUTION**

### **3.01 Application Requirements**

- A. Install SPD's as indicated and:

1. On each building service entrance panel.
  2. On each motor control center.
  3. On each distribution panel, subpanel, and branch panel.
  4. On 120-volt power connections at each signal system panel, including telephone power supplies, and similar panels and dedicated circuits.
  5. On each Power supply to instrumentation and control system cabinets.
  6. Install SPD's for circuits sensing, powering, and controlling devices located or mounted external to a building.
- B. Only one SPD is required to be installed within 50 linear feet of power circuit.
- C. Electronic Equipment Paired Cable Conductors: Install data line suppressors at the low-voltage input and output of each piece of equipment.
1. Use secondary protectors on lines that do not exit the structure.
  2. Use primary protectors on lines that exit and enter the structure.

### **3.02 General Installation Requirements**

- A. Install SPDs according to manufacturer's recommendations.
- B. Install suppressors directly to the cabinet which houses the circuit to be protected so that the suppressor leads are straight and short, with all conductors laced, running directly to the point of connection within the panel, without loops or bends. If bends are unavoidable, no bend may exceed 90 degrees and bending radius may not be less than 6 inches.
- C. Provide at least 3 inches of separation between line-side and load-side connecting wires. Do not bundle line-side and load-side conductors together or run them in the same raceway.
- D. Field installed conductors shall be the same as specified for building wire, not smaller than No. 8 AWG and not larger than No. 4 AWG. Device leads shall not be longer than the length recommended by the manufacturer, unless specifically reviewed and approved by the manufacturer.
- E. Provide dedicated disconnecting means for SPD devices installed at main service entrance location, in switchboards, and in motor control centers. Provide dedicated 30-ampere circuit breakers, number of poles as required, as disconnecting means for SPD's installed in panelboards. The interrupting capacity of the circuit breakers shall be that specified for the other breakers at that location.

### **3.03 Spare Parts**

- A. Provide spare SPD components as follows:
1. Provide one spare module of each different type needed.

**END OF SECTION**



## **SECTION 31 11 00**

### **SITE PREPARATION**

#### **PART 1 GENERAL**

##### **1.01 Section Includes**

- A. Layout of work and protection of bench marks.
- B. Protection of structures, trees, or vegetation to remain.
- C. Clearing and grubbing.
- D. Stripping and storing topsoil.

##### **1.02 Coordination**

- A. Refer to Sheet G-1 for a list of utility companies that may have facilities in the project area and coordinate with them to avoid service interruptions and/or safety hazards:
- B. Contact "Sunshine State, One-Call" 1-800-432-4770, to determine if there are other utilities in the area, and their location.

#### **PART 2 PRODUCTS - Not Used**

#### **PART 3 EXECUTION**

##### **3.01 Bench Marks and Monuments**

Maintain all existing benchmarks, monuments and other reference points; if destroyed, replacement costs will be deducted from payments due the Contractor.

##### **3.02 3.02 Laying Out Work**

- A. Base lines, property lines, and easement lines, are shown on the Drawings. Benchmarks utilized are also shown on the drawings. If the bench marks are disturbed as a result of construction activities, reestablish such items by utilizing a Florida licensed surveyor.
- B. Stake out the construction, establish lines and levels, temporary bench marks, batter boards, centerlines and reference points for the work, and verify all dimensions relating to interconnection with existing features.
- C. Report any inconsistencies in the proposed grades, lines and levels, dimensions and locations to the Engineer before commencing work.

### **3.03 Burning**

Burning is not allowed.

### **3.04 Protection of Trees and Shrubs**

Existing trees and shrubs within the right-of-way and easements along the work zones shall remain unless specifically required to be removed as indicated on the Drawings. Protect branches, trunks, and roots of trees and shrubs that are to remain. Trees to remain in the construction area shall be boxed, fenced or otherwise protected before any work is started; remove boxing when directed by the Engineer. Do not permit heavy equipment or stockpiles within branch spread. Remove interfering branches without injury to trunks and cover scars with tree paint.

### **3.05 Relocation of Utilities**

- A. Active utilities which do not interfere with the work shall be supported and protected from damage. After obtaining the Engineer's approval, relocate or remove active utilities which will interfere with work as indicated. Pay for all damage to active utilities and for relocation or removal of all interfering utilities which are ascertainable from Drawings, surveys, site inspection or encountered during construction.
- B. Inactive or abandoned utilities and appurtenant structures encountered shall be removed to avoid interference as directed by the Engineer. Exposed ends of abandoned lines shall be plugged or capped in a water-tight manner.

### **3.06 Clearing and Grubbing**

- A. Areas to receive clearing and grubbing shall include all areas to be occupied by the proposed improvements, areas for fill and site grading, and borrow sites. Remove trees outside of these areas only as indicated on the Drawings or as approved in writing by the Engineer
- B. Clearing shall consist of removing trees and brush and disposal of other materials that encroach upon or otherwise obstruct the work.
- C. Exercise extreme care during the clearing and grubbing operations to not damage existing structures, pipes or utilities.
- D. Grubbing shall consist of removing and disposing of stumps, roots larger than 2" in diameter, and matted roots. Remove to a depth of not less than 18" below the original surface level of the ground.
- E. All combustible debris and refuse from site preparation operations shall be removed to legal off-site disposal areas.

### **3.07 Topsoil Removal**

- A. All areas to be occupied by proposed improvements, and borrow sites shall be stripped of all brush, weeds, grass, roots and other material.

- B. Remove all loamy, organic topsoil suitable for seeding and planting to whatever depth encountered and store separately from other excavated material. Stockpile in designated areas and provide for proper drainage. Cover storage piles as required to prevent windblown dust.
- C. In the event that inadequate space within the site or work area is available for stock-piling topsoil without interfering with other construction operations, contact Owner for determination of another storage location.
- D. Dispose of unsuitable topsoil as specified under disposal of debris. Excess topsoil shall be removed from site unless specifically noted on Contract Drawings.

### **3.08 Disposal of Debris**

- A. All combustible debris and refuse from site preparation operations shall be burned if allowable and properly permitted, or removed to legal off-site disposal areas.
- B. All non-combustible debris (not including acceptable fill material, fences, or other structures), resulting from site preparation operations shall become the property of the CONTRACTOR and shall be removed to legal off-site disposal areas.

**END OF SECTION**

## **SECTION 31 22 00**

### **FINISH GRADING**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

Topsoil placement, grading of site

#### **PART 2 PRODUCTS**

##### **2.01 TOPSOIL**

- A. Topsoil shall be fertile, friable, natural topsoil typical of the area, free from subsoil, stones, plants, roots or other extraneous material and shall not be used while muddy or frozen.
- B. Topsoil shall contain not less than 8% organic matter (AASHTO T194). The topsoil shall consist of either natural topsoils typical of the locality and free from coarse stone aggregate or surface soils stripped from the site and enriched with humus at a rate of 8% by volume. The soil mixture prepared by mixing surface soils and humus shall be free of oil, cinders, coarse stone, and woody root material.

#### **PART 3 EXECUTION**

##### **3.01 GENERAL**

Provide all topsoil placement and finish grading and filling to achieve the lines and grades indicated on the Drawings. All earthwork shall be done in a manner that provides drainage.

##### **3.02 TOPSOIL PLACEMENT**

Place topsoil in all areas of new grading. The compacted subgrade to receive topsoil shall be scarified to a depth of 3 inches. Topsoil shall be spread evenly and compacted to a thickness of not less than 4 inches, 8 inches in areas to be grassed and planted, and to the proposed elevations and grades. Grade flush with walks, curbs, and paving.

##### **3.03 FINISH GRADING**

- A. All areas of the project including all previously grassed areas that have been disturbed, borrow sites, excavated and filled sections and adjacent transition areas shall be uniformly smooth-graded. Depressions from settlement shall be filled and compacted. Tops of embankments and breaks in grade shall be rounded. All surfaces shall be finished to provide adequate drainage. Finished surfaces shall be reasonably smooth, compacted, free from irregular surface

changes and comparable to the smoothness obtained by blade-grader operations.

- B. Slope grades to drain away from structures at a minimum of 3-inch per foot for 10 feet.
- C. Finished surfaces adjacent to paved or surfaced areas and within 10 feet of structures shall be within 1 inch of the proposed grade. All other areas shall be within 3 inches of the proposed grade.
- D. Newly graded areas shall be protected from traffic and erosion. All settlement or washing away that may occur from any cause prior to seeding or acceptance shall be repaired and grades re-established to the required elevations and slopes at no additional cost to the Owner.
- E. Unless otherwise indicated, all surplus material shall be disposed of by the Contractor.

**END OF SECTION**

**SECTION 31 23 00**  
**EXCAVATION AND FILL**

**PART 1 GENERAL**

**1.01 Section Includes**

- A. Excavation and fill for roads, ponds, general site work
- B. Sheet piling, shoring and bracing
- C. Compaction

**1.02 References**

- A. American Association of State Highway and Transportation Officials (AASHTO) latest edition:
  - AASHTO M145 - Classification of Soils
  - AASHTO T180 - Moisture-Density Soil Sampling and Testing
- B. American Society for Testing and Materials (ASTM) latest edition:
  - 1. ASTM D1557 - Moisture-Density Soil Sampling and Testing
  - 2. ASTM D2487 - Classification of Soils
- C. Occupational Safety and Health Administration (OSHA) Regulations, including:
  - 1. Part 1926 Subpart P - Excavations

**1.03 Definitions**

- A. Backfill - material placed in newly excavated areas the topsoil, paving sub-grade, or foundation level.

- B. Influence Area - the area within lines sloped downward at 45 degrees from the outer edges of paving, foundations, and utility lines.

## **1.05 Quality Assurance**

- A. Field density testing frequencies:
  - 1. One test for each 10,000 square feet or fraction thereof per lift of general backfilling, minimum 2 tests each layer.
  - 2. One test for each 100 square feet or fraction thereof of backfill around and under structures.
  - 3. One test per lift per each change in type of fill.
  - 4. One test per 1000 square feet of pavement subgrade, minimum of 2 tests.

## **1.06 Preconstruction Requirements**

Precondition surveys and vibration monitoring are required for those areas where residential structures are within 100 feet of the proposed construction.

## **PART 2 PRODUCTS**

### **2.01 General**

It is intended that previously excavated materials conforming to the following requirements be utilized wherever possible.

### **2.02 Materials**

- A. Acceptable materials: AASHTO M145 classification A-1, A-3, A-2-4, A-2-6; ASTM D2487 classification GW, GP, GM, SM, SW, SP; unless otherwise disapproved within the Soil and Subsurface investigation reports. No more than 12% of acceptable materials shall pass the number 200 sieve.
- B. Unacceptable materials: AASHTO M145 classification A-2-5, A-2-7, A-4, A-5, A-6, A-7, A-8; ASTM D2487 classification GC, SC, ML, MH, CL, CH, OL, OH, PT; unless otherwise approved within the Soil and Subsurface investigation reports.
- C. Controlled low strength material ("excavatable flowable fill") shall meet the requirements of FDOT specification section 121, with a 28-day compressive strength of 80-100 psi.

## **2.03 Sheeting, Shoring, and Bracing**

- A. The structural strength and safety of all sheeting, shoring and bracing shall be the sole responsibility of the Contractor. Repair any damage resulting from failure to provide adequate supports.
- B. Provide timber work, shoring, bracing, sheeting, and sheet piling where necessary to retain banks of excavations, prevent cave-in of adjacent ground, prevent displacement of utilities and structures, and to protect public safety.
- C. Contractor is solely responsible for the design, installation, and operation of dewatering systems and their safety and conformity with local codes and regulations.

## **PART 3 EXECUTION**

### **3.01 General Construction Requirements**

- A. Provide suitable temporary drainage channels for any water that may flow along or across the work as specified hereafter.
- B. Provide barriers, warning lights and other protective devices at all excavations.
- C. Sidewalks, roads, streets, and pavements shall not be blocked or obstructed by excavated materials, except as authorized by the Engineer, in which case adequate temporary provisions must be made for satisfactory temporary passage of pedestrians, and vehicles. Minimize inconvenience to public travel or to tenants occupying adjoining property.
- D. Where necessary to place excavated material adjacent to buildings, erect barriers to keep earth at least 4' from such buildings. Earth deposited on lawns shall be promptly and carefully removed to preserve the turf. All trees, shrubs, and landscaping shall be protected. Boring and jacking shall be used, if necessary, except where written permission is granted to remove trees and shrubs.
- E. If open excavations cross existing rigid surfacing, the surfacing shall be removed for a width one foot beyond the anticipated edge of the excavation. The pavement break shall be sawed to insure a straight joint. Surface replacement shall match existing surfacing except as otherwise indicated on the Drawings. Where open excavation is allowed along or across public roadways, excavation, backfill, and surface replacement shall conform to the requirements of all permits applicable thereto. In no case shall surface replacement edges bear on less than 12" of undisturbed soil.

### **3.02 Preparation**

- A. Identify required lines, levels, contours, and datum.
- B. Locate and identify existing utilities that are to remain and protect from damage.



- C. Notify utility companies to remove or relocate utilities that are in conflict with proposed improvements.
- A. Protect plant life, lawns, fences, existing structures, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- E. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.
- F. Prior to placing fill in low areas, such as previously existing ditches, ponds, or lakes, perform following procedures:
  - 1. Drain water out by gravity with ditch having flow line lower than lowest elevation in low area. If drainage cannot be performed by gravity ditch, use adequate pump to obtain the same results.
  - 2. After drainage of low area is complete, remove mulch, mud, debris, and other unsuitable material by using acceptable equipment and methods that will keep natural soils underlying low area dry and undisturbed.
  - 3. If proposed for fill, muck, mud, and other materials removed from low areas shall be dried on-site by spreading in thin layers for observation by Engineer. Material shall be inspected and, if found to be suitable for use as fill material, shall be incorporated into lowest elevation of site filling operation, but not under building or pavement subgrade or within 10'-0" of perimeter of building subgrade or paving subgrade. If, after observation by Engineer, material is found to be unsuitable, unsuitable material shall be removed from site.

### **3.03 Sheeting, Shoring, and Bracing**

- A. Furnish, install, and maintain, without additional compensation, sheeting, bracing, and shoring support required to keep excavations within the easement provided, to support the sides of the excavation, and to prevent any movement which may damage adjacent pavements or structures, damage or delay the work, or endanger life and health. Voids outside the supports shall be immediately filled and compacted.
- B. Sheeting, where required, shall be driven below the bottom of excavation so the lowest set of wales and struts are above the bottom of the excavation to allow necessary working room.
- C. The Engineer may direct in writing that supports in trenches be cut off at any specified elevation, in which case Contractor shall be paid for the supports left in place.
- D. Contractor may leave in place, to be embedded in the backfill of the excavation, any or all supports for the purpose of preventing injury to persons or property, whether public or private. However, no supports that are within 4' of the ground or pavement surface may be left in place without written permission of the

Engineer. No extra payment will be made for supports left in place at the Contractor's option.

- E. All supports not left in place shall be removed in such manner as to avoid endangering the piping, structures, utilities or property, whether public or private. All voids left by the withdrawal of sheeting shall be immediately filled and compacted.
- F. The right of the Engineer to order supports left in place shall not be construed as creating an obligation on his part to issue such orders. Failure by the Engineer to exercise this right shall not relieve the Contractor from total liability for damages to persons or property resulting from the failure of the Contractor to leave in place sufficient supports to prevent any caving or moving of the ground adjacent to the excavation.

### **3.04 Excavation**

- A. Do not excavate for any structure until that structure is scheduled for construction. Excavate only to the depth and dimensions necessary for the construction. Slope sides of excavations in accordance with OSHA requirements and the recommendations contained within the project geotechnical report.
- B. The bottom of all excavations shall be undisturbed earth unless otherwise indicated, and shall be approved by the Engineer before any subsequent work is started. Over excavate a minimum of 2 feet where excavations occur within unsuitable soils, and replace over excavated material with suitable soils.
- C. Excavations carried below depths indicated on the Drawings without the previous approval of the Engineer shall be filled with 2500 psi concrete or flowable fill to the correct level at the expense of the Contractor.
- D. Maintain excavations in good order. If the bearing capacity of the foundation soils is reduced because the excavation is allowed to remain open prior to commencing work, the weathered soil shall be removed and replaced with 2500 psi concrete or flowable fill at the Owner's discretion at the expense of the Contractor.
- E. All suitable materials removed from excavation areas shall be used for the project. Excess excavated suitable material shall be stockpiled on site at a location of the Owner's choosing, and shall become the property of the Owner, unless otherwise indicated on the Drawings.
- F. Suitable onsite excavated materials containing silty or slightly clayey to clayey fine sands shall be sufficiently dried by surface spreading and discing if necessary, or by mixing with cleaner fine sands prior to placement in fill areas.
- G. Unsuitable materials within the influence area of construction shall be excavated, removed from the site, and disposed, unless otherwise indicated on the Drawings.
- H. Excavations shall be kept dry, compacted, and stable to a depth two feet below the bottom of the excavation.

- I. If portions of the bottom of excavations consist of material unstable to such a degree that, in the opinion of the Engineer, it cannot adequately support the construction, the bottom shall be over excavated and stabilized with approved coarse granular stabilization material. Depth of stabilization shall be as directed by the Engineer. The initial 50 tons of stabilization shall be incidental to the Contract. Compensation will be allowed only for such additional quantities as the Engineer shall direct in writing to be placed.

### **3.05 Filling**

- A. All fill material shall be suitable soils or flowable fill. Fill placed within 1 foot of structures shall not contain rock or stone larger than 2 inch diameter. If a sufficient quantity of suitable material is not available from other excavations within the site, provide additional suitable material or flowable fill.
- B. Fill within the influence area of roadways, structures, foundations, or slabs, shall be placed in layers of 8 inch loose depth. In all other areas, place fill in layers of 12 inch loose depth.
- C. Take necessary precautions not to cause settlement or damage to adjacent slabs, walls, structures, or foundations. Place fill materials evenly adjacent to structures, without wedging against structures.
- D. Where filling is required on both sides of structures, fill and compact simultaneously on opposite sides in even layers.

### **3.06 Compaction**

- A. Compaction for ductile iron piping shall meet the requirements of Section 40 20 40.
- B. Unless otherwise indicated, the type of equipment and number of passes required to obtain the specified degree of compaction shall be determined at the site, subject to the approval of the Engineer.
- C. Provide mechanical compaction for cohesive material and vibratory compaction for granular materials, unless otherwise approved by the Engineer. Vibratory compaction is not allowed within 100 feet of existing structures. In these areas, compaction shall be accomplished by static means only. If compaction difficulties arise, the Engineer shall be consulted to review and possibly modify compaction procedures.
- D. Noncohesive soils shall be compacted with vibrating roller or equivalent; cohesive soils shall be compacted with sheeps-foot roller, pneumatic tamping, or approved equivalent, unless otherwise indicated.
- E. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

### **3.07 Testing and Cleanup**

- A. Provide for testing and cleanup as soon as practicable, so these operations do not lag far behind pipe installation. Perform preliminary cleanup and grading operations immediately after backfilling.
- B. All unsuitable surplus excavated material shall be disposed of by the Contractor.

### **3.08 Field Quality Control**

- A. Minimum Density Requirement (ASTM D1557 or AASHTO T180)

Fill under and within the influence area of roadways, structures, slabs,  
foundations = 98%

Pond and road embankment fill = 95%

Landscape areas = 85%

Pipe bedding and backfill = 98%

All other areas = 90%

**END OF SECTION**

## **SECTION 31 23 19**

### **DEWATERING**

#### **PART 1 GENERAL**

##### **1.01 DESCRIPTION**

- A. Design, furnish, operate, maintain, and remove temporary dewatering systems to control groundwater and surface water to maintain stable, undisturbed subgrades, and permit work to be performed under dry and stable conditions. Work to be done as part of dewatering includes, but is not limited to:
  - 1. Lower the groundwater level.
  - 2. Lower hydrostatic pressure.
  - 3. Prevent surface water from entering the excavation during construction.
  - 4. Implement erosion control measures for disposing of discharge water.
  - 5. Provide groundwater recharging systems as specified and as indicated.
  - 6. Provide and monitor observation wells and geotechnical instrumentation as specified and indicated.
- B. Groundwater within the excavation area shall be lowered to at least 2 feet below the lowest excavation levels as specified and as indicated.
- C. Common dewatering methods include, but are not limited to, sump pumping, deep wells, well points, vacuum well points or combinations thereof.
- D. Common groundwater recharge methods include, but are not limited to, deep wells, large sumps or combination thereof.
- E. The Contractor shall obtain the required permits for discharge from the Contractor's dewatering systems in accordance with 40 CFR Part 122 and applicable project permits from FDEP. The discharge location shall be in accordance with permit requirements.

##### **1.02 REFERENCES**

- A. Code of Federal Regulations, Title 40 – Protection of Environment (CFR):
  - 1. [40 CFR Part 122](#): EPA Administered Permit Programs: The National Pollutant Discharge Elimination System.

##### **1.03 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01 33 00 and the following:

1. Qualification of the Contractor's dewatering specialist's or firm's qualifications a minimum of 4 weeks prior to dewatering work. The submittal shall include, but not be limited to:
  - a. Qualifications of specialist's or firm's Registered Professional Engineer.
  - b. Qualifications of specialist's or firm's field representative who will oversee the installation, operation and maintenance of the dewatering system.
2. Submit a dewatering plan, and, if applicable, a groundwater recharge plan at least 2 weeks prior to start of dewatering work. Do not submit design calculations. The review will be only for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include the following items as a minimum:
  - a. Dewatering plan and details stamped and signed by a Registered Professional Engineer registered in the State of Florida.
  - b. Certificate of Design: Refer to Section 01 30 00.
  - c. A list of equipment including, but not limited to, pumps, prime movers, and standby equipment.
  - d. Detailed description of dewatering, maintenance, and system removal procedures.
  - e. Monitoring plan and details, including, but not limited to, number and locations of observation wells and geotechnical instruments such as settlement markers (reference points on structures; minimum of two per structure) and piezometers (minimum of one per wellpoint) and frequency of reading the monitoring devices.
  - f. Erosion and sedimentation control measures, and methods for disposal of pumped water.
  - g. List of all applicable laws, regulations, rules, and codes to which dewatering design conforms.
  - h. List of assumptions made for design of dewatering and for groundwater recharge systems, including but not limited to groundwater levels, soil profile, permeabilities, and duration of pumping and or recharge.
3. Submit a groundwater sampling plan if required by FDEP.
4. Measurement records consisting of observation well groundwater records and the geotechnical instrumentation readings within one day of monitoring.
5. A modified dewatering plan within 24 hours, if open pumping from sumps and ditches results in boils, loss of fines or softening of the ground.

#### **1.04 QUALITY ASSURANCE**

- A. Employ the services of a dewatering specialist or firm having the following qualifications:
  - 1. Have completed at least five (5) successful dewatering projects of equal size and complexity and with equal systems within the last five (5) years.
  - 2. Retain the services of a Registered Professional Engineer (in the State of Florida) having a minimum of five (5) years experience in the design of well points, deep wells, recharge systems, or equal systems.
  - 3. Retain the services of a field representative having a minimum of five (5) years experience in installation of well points, deep wells, recharge systems, or equal systems.
- B. If subgrade soils are disturbed or become unstable due to dewatering operation or an inadequate dewatering system, notify the Engineer, stabilize the subgrade, and modify system to perform as specified.
- C. Notify the Engineer immediately if settlement or movement is detected on structures. If the settlement or movement is deemed by the Engineer to be related to the dewatering, take actions to protect the adjacent structures and submit a modified dewatering plan to the Engineer within 24 hours. Implement the modified plan and repair damage incurred to adjacent structures.
- D. Immediately notify the Engineer if oil or other hazardous materials are encountered after dewatering begins.

#### **1.05 HYDRAULIC UPLIFT OF PIPES**

- A. The Contractor shall be responsible for the protection of all pipes against hydraulic uplift until such structures have been accepted finally by the Owner.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

- A. Provide settlement markers, piezometers and other geotechnical instruments in accordance with the submitted dewatering plan or as specified.
- B. Provide casings, well screens, piping, fittings, pumps, power and other items required for dewatering system.
- C. Provide sand and gravel filter around the well screen. Wrapping geotextile fabric directly around the well screen shall not be allowed.
- D. When deep wells, well points, or vacuum well points are used, provide pumping units capable of maintaining high vacuum and handling large volumes of air and water at the same time.

- E. Provide auxiliary dewatering equipment in the event of breakdown. Equipment shall consist of pumps and hoses and be stored on site. Provide at least 1 pump for every 5 pumps used.
- F. Provide and maintain erosion and sedimentation control devices as indicated or specified and in accordance with the dewatering plan.
- G. Provide temporary pipes, hoses, flumes, or channels for the transport of discharge water to the discharge location.
- H. Provide cement grout having a water cement ratio of 1 to 1 by volume.

## **2.02 INSTALLATION**

- A. Execution of earth excavation, installing earth retention systems, and dewatering shall not commence until the related submittals have been reviewed by the Engineer with all Engineer's comments satisfactorily addressed and the geotechnical instrumentation has been installed.
- B. Provide and maintain dewatering system in accordance with the dewatering plan.
- C. Carry out dewatering program in such a manner as to prevent undermining or disturbing foundations of existing structures or of work ongoing or previously completed.
- D. Do not excavate until the dewatering system is operational.
- E. Unless otherwise specified, continue dewatering uninterrupted until all structures, pipes, and appurtenances below groundwater level have been completed such that they will not be floated or otherwise damaged by an increase in groundwater elevation.
- F. Discontinue open pumping from sumps and ditches when such pumping results in boils, loss of fines, softening of the ground, or instability of the slopes. Modify dewatering plan and submit revised plan to the Engineer for acceptance.
- G. Where subgrade materials are disturbed or become unstable due to dewatering operations, remove and replace the materials in accordance with Section 31 23 33.
- H. Dewatering Discharge:
  - 1. Install sand and gravel filters in conjunction with well points and deep wells to prevent the migration of fines from the existing soil during the dewatering operation.
  - 2. Transport pumped or drained water to discharge location without interference to other work, damage to pavement, other surfaces, or property.
  - 3. Provide separately controllable pumping lines.
  - 4. The Engineer and Owner reserves the right to sample discharge water at any time.



5. Immediately notify the Engineer if suspected contaminated groundwater is encountered. Do not pump water found to be contaminated with oil or other hazardous material to the discharge locations.
- I. Monitoring Devices and Records:
1. Install, maintain, monitor and take readings from the observation wells and geotechnical instruments in accordance with the dewatering plan.
  2. Install settlement markers on structures within the zone of influence for dewatering a distance equal to twice the depth of the excavation, from the closest edge of the excavation. Conduct and report settlement surveys to 1/8-inch.
- J. Install and maintain erosion/sedimentation control devices at the point of discharge as indicated or specified and in accordance with the dewatering plan.
- K. Removal:
1. Do not remove dewatering system without written acceptance from the Owner's Representative.
  2. Backfill and compact sumps or ditches with screened gravel or crushed stone wrapped with geotextile fabric.
  3. All dewatering wells shall be abandoned upon completion of the work, and completely backfilled with cement grout.

**END OF SECTION**

## **SECTION 31 23 20**

### **COMPACTION CONTROL AND TESTING**

#### **PART 1 GENERAL**

##### **1.01 Description**

- A. Work Specified Herein and Elsewhere
  - 1. Work under this Section includes:
    - a. Placement, compaction controls, and fields density testing requirements for all earthwork, including pavement subgrade.

##### **1.02 Testing**

- A. Tests will be performed by an approved independent soils laboratory to insure adequate density is being obtained. The ENGINEER shall approve soils laboratory and designate where and when samples shall be taken, in accordance with soils report provided in the appendix. The Contractor will pay initial costs to make tests. The laboratory shall submit test reports to the ENGINEER and the Contractor.

#### **PART 2 PRODUCTS**

##### **2.01 Materials**

- A. All materials and products are specified elsewhere in Division 31.

#### **PART 3 EXECUTION**

##### **3.01 Fill Placement**

- A. Compacted material that has been flooded and no longer meets the density specified shall be removed, replaced and recompacted.
- B. If the in-place surface has dried, sprinkle with water before placing the next lift. The surface of smooth lifts shall be scarified before the next lift is placed.
- C. Where fill is required on both sides of structures, fill and compact simultaneously on opposite sides in even layers. Other filling sequences shall be as specifically indicated on the Drawings.
- D. Fill shall be spread in uniform horizontal lifts. The material shall be thoroughly mixed to insure a uniform moisture content slightly wetter than optimum but not greater than 5 percent above optimum water content as determined by the Modified Proctor Test, ASTM D1557.
- E. Where cohesive structural fill is used, the moisture content when compacted shall be within 3 percent of the optimum moisture content. If the fill does not

have natural water content, which falls within the acceptable range, the Contractor shall mix, dry, or moisten as necessary.

- F. Place and compact each lift over an entire area prior to placing successive lifts, unless otherwise approved by the ENGINEER.
- G. All materials shall be placed in loose lift thicknesses indicated hereafter.

### **3.02 Compaction**

- A. General
  - 1. Unless otherwise indicated, the type of equipment and number of passes required to obtain the specified degree of compaction shall be in accordance with the soils report and/or determined at the site, subject to the approval of the ENGINEER.
  - 2. Provide mechanical compaction for cohesive material and vibratory compaction for granular materials, unless otherwise approved by the ENGINEER.
- B. Noncohesive soils shall be compacted with vibrating roller or equivalent; cohesive soils shall be compacted with sheeps-foot roller, pneumatic tamping, or approved equivalent, unless otherwise indicated.

### **3.03 Fill Lift Thicknesses and Compaction Densities**

- A. Unless otherwise indicated or approved by the ENGINEER, place fills in the loose lift thicknesses indicated hereafter, except when water jetting, and compact to a dry density not less than the following percentage of maximum dry density, determined by the Modified Proctor Test, ASTM D1557, unless otherwise noted.

### **3.04 Testing**

- A. The Contractor shall assist in providing samples for the following field density tests to insure required densities are being obtained:
  - 1. One test for each 3,000 lineal feet or fraction thereof per lift of general backfilling.
  - 2. Two tests for each 10,000 square feet or fraction thereof per lift of structural fill under slabs, foundations, and pavements.
  - 3. One test per lift for each other type of fill, if so directed by the ENGINEER.
- B. Tests shall be in accordance with ASTM D1557 or other tests suitable for the materials being tested.

- C. The Contractor will pay for initial field density tests. Subsequent tests and associated costs necessitated as a result of the initial tests failing to meet specified requirements will be at the expense of the Contractor.

TYPE OF FILL	USAGE	THICKNESS	REQ'D % OF LIFT MODIFIED PROCTOR TEST
Trenched Pipe Bedding	Beneath piping	6"	95 D1557
Trenched Pipe Cover	Over and/or around piping	6"	95 D1557
Utilities Trench Backfill	"Influence area" beneath other piping or utility lines	8"	95 D1557
	"Influence area" beneath rigid paving	6"	95 D1557
	"Influence area" beneath non-rigid paving	9"	95 D1557
	Adjacent to or under structures	9"	98 D1557
Preloading	Soil stabilization	12"	85 D1557
Structural Fill	All locations under major structures and all lagoon structures.	6"	98 D1557
	All locations under minor structures (manholes, etc.)	6"	95 D1557

Granular Fill	Below concrete slab bedding, 8" foundations, rigid paving, and excavated areas adjacent to structures		98 D1557
	All other uses	12"	85 D1557
Granular Bedding	Beneath concrete slabs	6"	95 D1557
Granular Drainage Blanket	Below concrete slabs, paving, or piping	9"	95 D2049
Structural Backfill	See Trench Backfill		
	Fill in other locations not covered herein	12"	85 D1557
	Topsoil placement	12"	85 D1557

"Influence area" shall be considered the area within lines sloped downward at 45 degrees from the outer edges of paving, foundations, and utility lines.

**END OF SECTION**

## **SECTION 31 25 00**

### **EROSION AND SEDIMENTATION CONTROL**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

Designing, providing, maintaining, removing temporary erosion and sedimentation controls.

##### **1.02 REFERENCES**

- A. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction and Roadway and Traffic Design Standards, latest editions:

Index No. 102 - Baled Hay or Straw Barriers and Silt Fences

Index No. 103 - Turbidity Barriers

Specification 300 - Prime and Tack Coats for Base Courses

##### **1.03 SUBMITTALS**

Provide erosion control plan. Show types of erosion and sedimentation control, locations, inspection and maintenance plan.

#### **PART 2 PRODUCTS**

##### **2.01 EROSION CONTROL**

- A. Seeding and Mulching
- B. Sodding
- C. Hydro-seeding
- D. Coarse Aggregate
- E. Prime Coat - Per FDOT Specification 300

##### **2.02 SEDIMENTATION CONTROL**

- A. Silt Fence - Per FDOT Index No. 102
- B. Floating Turbidity Barriers - Per FDOT Index No. 103
  - a. Hay Bales - Per FDOT Index No. 102

## **PART 3 EXECUTION**

### **3.01 EROSION CONTROL**

- A. Establish erosion control measures within 48 hours of the completion of any clearing and grading activities.
- B. Erosion control of areas to be paved shall meet the following:
  - 1. Install subgrade and base course materials within 48 hours of the completion of grading activities.
  - 2. Areas to receive asphalt shall receive erosion control measures no later than 48 hours after acceptance of base course. Temporary erosion control consists of placement of a bituminous prime coat and sanding the surface. Permanent erosion control consists of placement of the structural course.
  - 3. Areas to receive concrete paving shall be either protected with a layer of FDOT coarse aggregate material or shall be paved within 48 hours of acceptance of the subgrade.

### **3.02 SEDIMENTATION CONTROL**

- A. Install prior to construction.
- B. Inspect every two weeks during construction.
- C. Remove any sediment build-up.
- D. Repair and reinstall any damaged or missing sediment control measures. Install additional measures if inspection reveals additional sedimentation control is necessary.
- E. Rough excavate and grade any proposed stormwater ponds at the start of site grading activities. Direct site runoff to the ponds to minimize runoff to offsite areas.

**END OF SECTION**

**SECTION 32 92 10**  
**GRASSING AND SODDING**

**PART 1 GENERAL**

**1.01. SECTION INCLUDES**

Soil preparation, sodding, seeding, mulching, fertilizing, watering, and maintenance of grassed areas.

**1.02. WARRANTY**

All seeding shall be warrantied by the General Contractor to be true to name and in a vigorous growing condition through one growing cycle including one summer and one winter season.

**1.03. MAINTENANCE**

Maintenance for lawns shall begin immediately after seeding or sodding. Provide watering, mowing and replanting and continue as necessary until a close healthy stand of specified grasses is established.

**PART 2 PRODUCTS**

**2.01 LIME**

Lime shall be agricultural grade dolomitic limestone, ground sufficiently fine so that at least 80 percent will pass through a No. 8 sieve, and it shall contain not less than 80 percent calcium carbonate equivalent. Moisture content at time of delivery shall not exceed 8 percent.

**2.02 FERTILIZER**

Fertilizer shall be a composition recommended by a local County Agricultural Agent or State Agricultural Extension Service or a preformulated 10-6-4 mixture.

**2.03 WATER**

Water shall be free from oil, acid, alkali, salts, and other harmful substances.

**2.04 SOD**

- A. Sod shall be either field or nursery grown sod that is native to the locality of the Project. The Contractor shall obtain Engineer's approval of the source of the sod prior to cutting the sod.



- B. Sod grown on soil high in organic matter, such as peat, will not be acceptable. The consistency of sod shall be such that it will not break, crumble or tear during handling and placing. Sod shall be reasonably free of stones, crab grass, noxious weeds, and other objectionable plants or substances injurious to plant growth.
- C. Sod shall have at least 1-inch of soil adhering firmly to the roots and cut in rectangular pieces with the shortest side not less than 12-inches. At the time of cutting sod the grass shall be mowed to a height not less than 2-inches nor more than 4-inches.
- D. Sod cut for more than 48 hours shall not be used without the approval of the ENGINEER.
- E. Bermuda Sodding - 419 Tifway Bermuda
- F. Bahia Sodding - Argentine Bahia Sod

## **2.05 SEEDING AND MULCHING**

- A. Permanent grass seed shall be Argentine Bahia, in accordance with FDOT specification 981.
- B. Temporary grass seed shall be annual rye grass in accordance with FDOT specification 981.
- C. Mulch shall be dry mulch in accordance with FDOT specification 981.

## **PART 3 EXECUTION**

### **3.01 REGRADING OF TOPSOIL**

Topsoil shall be graded reasonably smooth and level after final settlement. All humps shall be removed and depressions or eroded areas filled in with additional topsoil before proceeding with seeding or sodding.

### **3.02 PREPARATION FOR SODDING OR SEEDING**

- A. Preparation shall not be started until all other site and utility work and finished grading within the areas to be seeded have been completed.
- B. Loosen topsoil by tilling it to a depth of at least 3 inches and smooth out all surface irregularities resulting therefrom. Leave area free of rocks or hard soil clods, which will not pass through the tines of a standard garden rake.
- C. At least 7 days before applying fertilizer, spread lime uniformly in sufficient quantity to produce in the soil a pH of 6.5. Work lime thoroughly into topsoil to a depth of 3-inches.

- D. Apply fertilizer uniformly at a rate of 20 pounds per 1000 square feet. Work fertilizer into soil prior to seeding or sodding.

### **3.03 SODDING**

- A. One row of sod shall be placed adjacent to all impervious areas disturbed by construction.
- B. Sodding shall also be used in ditches and drainage swales and on all embankment slopes unless protection is provided against erosion of seeding.
- C. Place sod with the edges in close contact and alternate courses staggered. Lightly tamp or roll to eliminate air pockets. On slopes 2 to 1 or steeper, stake sod with not less than 4 stakes per square yard and with at least one stake for each piece of sod. Stakes shall be driven with the flat side parallel to the slope. Do not place sod when the ground surface is frozen or when air temperature may exceed 90 degrees. Water the sod thoroughly within 8 hours after placement and as often as necessary to become well established.
- D. In ditches, the sod shall be placed with the longer dimension perpendicular to the flow of water in the ditch. On slopes, starting at the bottom of the slope, the sod shall be placed with the longer dimension parallel to the contours of the ground.
- E. All exposed edges of sod shall be buried flush with the adjacent turf.

### **3.04 SEEDING AND MULCHING**

- A. Scatter seed uniformly over the grassing area while the soil is still loose and moist at the rate of 100 pounds per acre.
- B. Seed of quick growing species of grass, such as rye, Italian rye, millet or other cereal grass, shall be spread in conjunction with the permanent-type seed mixture. The type of quick-growth seed used shall be appropriate to provide an early ground cover during the particular season when planting is done. The rate of spread shall be 30 pounds per acre, unless otherwise specified.
- C. Apply approximately 2 inches, loose thickness, of the mulch material uniformly over the seeded area, and cut into the soil so as to provide an early ground cover during the particular season when planting is done. The rate of spread shall be 30 pounds per acre, unless otherwise specified.
- D. Rolling: Roll thoroughly the entire seeded area immediately after completion of the seeding.

### **3.05 WATERING**

Immediately after placing erosion control or mulch, water seeded areas thoroughly with a fine mist spray. Keep soil thoroughly moist until seeds have sprouted and achieved a growth of 1 inch. For sod, immediately begin watering and continually keep moist until the sod has firmly knit itself to the topsoil.

### **3.06 PROTECTION OF WORK**

Protect newly seeded and sodded areas from all traffic by erecting temporary fences and signs. Protect slopes from erosion. Properly and promptly repair all damaged work when required.

### **3.07 APPLICATION OF FERTILIZER**

Six weeks after completion of seeding or sodding apply granular fertilizer over all areas at the rate of two pounds of nitrogen nutrients per 1000 square feet of area.

### **3.08 CLEAN-UP**

At the time of final inspection of work, but before final acceptance, remove from seeded and sodded areas all debris, rubbish, excess materials, tools, and equipment.

### **3.09 LAWN REPLACEMENT**

Lawns not showing a close uniform stand of healthy specified grasses at the end of the guarantee period shall be replaced and maintained until acceptance. Scattered bare spots, none of which is larger than one square foot, will be allowed up to a maximum of 3% of the total area.

**END OF SECTION**

## SECTION 33 13 10

### DISINFECTION OF PIPING AND STRUCTURES

#### PART 1 GENERAL

A. Description

This section includes materials and procedures for disinfection of water mains by the continuous feed method and by the slug method and disinfection of structures. Disinfect piping in accordance with AWWA C651 and disinfect structures in accordance with AWWA C652 and C653, except as modified below.

B. Submittals

Submit shop drawings in accordance with Section 01 33 00.

C. Job Conditions

1. Discharge of chlorinated water into watercourses or surface waters is regulated by the National Pollutant Discharge Elimination System (NPDES). Disposal of the chlorinated disinfection water and the flushing water is the Contractor's responsibility. Dechlorinate the disinfection water such that the chlorine residual does not exceed 0.5 mg/L.
2. Schedule the rate of flow and locations of discharges in advance to permit review and coordination with Owner and cognizant regulatory authorities: FDEP.
3. Use potable water for chlorination.
4. Submit request for use of water from waterlines of Owner 48 hours in advance.
5. At the option of the CONTRACTOR, JEA will provide bacteriological testing. The CONTRACTOR will provide means of water sampling. All disinfection is by the CONTRACTOR.

#### PART 2 MATERIALS

A. Liquid Chlorine

Inject with a solution feed chlorinator and a water booster pump. Follow the instructions of the chlorinator manufacturer.

B. Calcium Hypochlorite (Dry)

Dissolve in water to a known concentration in a drum and pump into the pipeline at a metered rate.

C. Sodium Hypochlorite (Solution)

Further dilute in water to desired concentration and pump into the pipeline at a metered rate.

D. Chlorine Residual Test Kit

For measuring chlorine concentration, supply and use a medium range, drop count, DPD drop dilution method kit per AWWA C651, Appendix A.1. Maintain kits in good working order available for immediate test of residuals at point of sampling.

E. Dechlorination Materials

If dechlorination is required and the Contractor elects to use a means of chemical dechlorination, use one of the chemicals described in AWWA C655.

### **PART 3 EXECUTION**

A. Continuous Feed Method for Pipelines

Introduce potable water into the pipeline at a constant measured rate. Feed the chlorine solution into the same water at a measured rate. Proportion the two rates so that the chlorine concentration in the pipeline is maintained at a minimum concentration of 50 mg/L. Check the concentration at points downstream during the filling to ascertain that sufficient chlorine is being added.

B. Slug Method for Pipelines

Introduce the water in the pipeline at a constant measured rate. At the start of the test section, feed the chlorine solution into the pipeline at a measured rate so that the chlorine concentration created in the pipeline is 300 mg/L. Feed the chlorine for a sufficient period to develop a solid column or "slug" of chlorinated water that will, as it passes along the line, expose all interior surfaces to a concentration of at least 300 mg/L for at least three hours.

C. Disinfection of Valves, Blind Flanges, and Appurtenances

During the period that the chlorine solution or slug is in the section of pipeline, open and close valves to obtain a chlorine residual at hydrants and other pipeline appurtenances. Swab exposed faces of valves and blind flanges prior to bolting flanges in place with a 1% sodium hypochlorite solution.

D. Disinfection of Connections to Existing Pipelines

Disinfect isolation valves, pipe, and appurtenances per AWWA C651, Section 4.7. Flush with potable water until discolored water, mud, and debris are eliminated. Swab interior of pipe and fittings with a 1% sodium hypochlorite solution. After disinfection, flush with potable water again until water is free of chlorine odor.

E. Disinfection of Tapping Sleeves and Line Stopping

Flush exterior of pipe with potable water after removal of existing coating. Swab exterior of pipe with a 1% sodium hypochlorite solution. Disinfect per AWWA C651, Section 4.8. After completion of tapping and line stopping, swab interior of pipe, valves, and faces of flanges to be connected to bypass piping with a 1% sodium hypochlorite solution.

F. Confirmation of Residual in Piping

1. After the chlorine solution applied by the continuous feed method has been retained in the pipeline for 24 hours, confirm that a chlorine residual of 50 mg/L minimum exists along the pipeline by sampling at air valves and other points of access such as tapping valves.
2. With the slug method, confirm by sampling as the slug passes each access point and as it leaves the pipeline that the chlorine concentration in the slug is at least 50 mg/L.

G. Pipeline Flushing

After confirming the chlorine residual, flush the excess chlorine solution from the pipeline until the chlorine concentration in the water leaving the pipe no higher than that generally prevailing in the distribution system.

H. Sampling and Bacteriologic Testing

1. There shall be no water in trenches up to the connection for sampling. The sampling piping shall be clean, disinfected, and flushed prior to sampling.
2. Collect two sets of samples per AWWA C651, Section 5.1, deliver to a certified laboratory within six hours of obtaining the samples, and obtain a bacteriologic quality test to demonstrate the absence of coliform organisms in each separate section of the pipeline and in each structure after chlorination and refilling. Collect at least one set of samples from every 1,200 feet of the new water main and line stopping insertion point, plus one set from the end of the pipeline and at least one set from each branch. At each connection to an existing pipeline, take two additional samples. Use pipeline blowoffs or dedicated sampling ports for obtaining samples.

I. Piping Test Facility Removal

After satisfactory disinfection, disinfect and replace air valves, restore the pipe coating, and complete the pipeline where temporary disinfection or test facilities were installed.

J. Piping to be Disinfected

1. Disinfect all piping as indicated in the drawings.

K. Disinfection of Structures – NOT USED

1. Disinfect per AWWA C652, Method 1, 2, or 3.

2. The Owner will provide potable water at no cost to the Contractor for the first disinfection effort. If bacteriological testing shows that the first disinfection effort was not successful, the Contractor will be charged the cost of additional water at the Owner's current rates.

L. Repetition of Procedure

If the initial chlorination fails to produce required residuals and bacteriologic tests, repeat the chlorination and retesting until satisfactory results are obtained.

M. Dechlorination

Dechlorinate per AWWA C655. Perform testing of residual chlorine before discharge of water into the environment.

**END OF SECTION**

## **SECTION 40 05 00**

### **GENERAL PIPING REQUIREMENTS**

#### **PART 1 GENERAL**

##### **1.01 Description**

This section describes the application of the Piping Schedule shown in the drawings and the general requirements for selecting piping materials; selecting the associated bolts, nuts, and gaskets for flanges for the various piping services in the project; and miscellaneous piping items.

##### **1.02 Submittals**

- A. Submit shop drawings in accordance with Section 01 33 00.
- B. Submit affidavit of compliance with referenced standards (e.g., AWWA, ANSI, ASTM, etc.).
- C. Submit certified copies of mill test reports for bolts and nuts, including coatings if specified. Provide recertification by an independent domestic testing laboratory for materials originating outside of the United States.
- D. Submit manufacturer's data sheet for gaskets supplied showing dimensions and bolting recommendations.

##### **1.03 Definitions of Buried and Exposed Piping**

- A. Buried piping is piping buried in the soil, commencing at the wall or beneath the slab of a structure. Where a coating is specified, provide the coating up to the structure wall. Unless detailed otherwise, coating shall penetrate wall no less than 1 inch. Piping encased in concrete is considered to be buried. Do not coat encased pipe.
- B. Exposed piping is piping in any of the following conditions or locations:
  - 1. Above ground.
  - 2. Inside buildings, vaults, or other structures.
  - 3. In underground concrete trenches or galleries.

##### **1.04 Piping Service**

Piping service is determined by the fluid conveyed, regardless of the pipe designation. For example, pipes designated "Air Low Pressure," "Air High Pressure," and "Air" are all considered to be in air service.



### 1.05 Default Piping Materials

If no material is shown in the drawings or in the Piping Schedule, use the following piping materials:

Service	Size Range (inches)	Material	Specification Section
Buried	3 and smaller	SCH80 PVC	40 20 90
	4	Ductile Iron	40 20 40
	6 and larger	Ductile Iron	40 20 40

## PART 2 - MATERIALS

### 2.01 Materials Selection and Alternative Materials

- A. The piping material is indicated in the drawings.

### 2.02 Thread Forming for Stainless Steel Bolts

Form threads by means of rolling, not cutting or grinding.

### 2.03 Bolts and Nuts for Flanges for Ductile-Iron Piping (Specification Sections, 40 20 40)

- A. Bolts and nuts for Class 125 or 150 flanges (including AWWA C207, Class D) located indoors, outdoors above ground, and in vaults and structures shall be carbon steel, ASTM A307, Grade B, hot-dipped galvanized per ASTM F2329.
- B. Bolts and nuts for buried or submerged Class 125 or 150 flanges shall be Type 304 stainless steel conforming to ASTM A193 (Grade B8) for bolts and ASTM A194 (Grade 8) for nuts.
- C. Hex head machine bolts for use with lugged valves shall comply with ASTM A193, Grade B7.
- D. Fit shall be Classes 2A and 2B per ASME B1.1 when connecting to cast-iron valves having body bolt holes.
- E. Bolts for AWWA C207 Classes E and F flanges and ASME B16.5 and B16.47 Class 300 flanges located indoors, outdoors above ground, and in vaults and structures shall conform to ASTM A193, Grade B7, with nuts conforming to ASTM A194, Grade 2H.
- F. Bolts and nuts for buried or submerged Class 300 flanges shall be Type 304 stainless steel conforming to ASTM A193, Grade 8, Class 2, for bolts and ASTM A194, Grade 8 for nuts.

- G. Bolts used in flange insulation kits shall conform to ASTM A193 (Grade B7). Nuts shall conform to ASTM A194 (Grade 2H).
- H. Provide washers for each nut. Washers shall be of the same material as the nuts.

#### **2.04 Bolts and Nuts for Flanges for Stainless Steel Piping (NOT USED)**

- A. Bolts and nuts for flanges shall be Type 304 stainless steel conforming to ASTM A193, Grade B8 for bolts and ASTM A194, Grade 8 for nuts.
- B. Hex head machine bolts for use with lugged valves shall comply with ASTM A193, Grade B8, Class 2.
- C. Bolts for flange insulation kits shall conform to ASTM A193, Grade B7. Nuts shall conform to ASTM A194, Grade 2H.
- D. Provide washer for each nut. Washers shall be of the same material as the nuts.

#### **2.05 Bolts and Nuts for Flanges for PVC Pipe (Specification Section 40 20 90)**

- A. Bolts and nuts for flanges located indoors, outdoors above ground, and in vaults and structures shall be carbon steel, ASTM A307, Grade B, hot-dipped galvanized per ASTM F2329.
- B. Bolts and nuts for buried and submerged flanges shall be Type 304 stainless steel conforming to ASTM A193, Grade B8 for bolts and ASTM A194, Grade 8 for nuts.

#### **2.06 Lubricant for Stainless Steel Bolts and Nuts**

Lubricant shall be chloride free and shall be RAMCO TG-50, Anti-Seize by RAMCO, Specialty Lubricants Corporation Husky™ Lube O'Seal, or equal.

#### **2.07 Gaskets for Flanges for PVC (Specification Section 40 20 90)**

Gaskets for flanged joints shall be full faced, 1/8-inch thick, having a hardness of 50 to 70 durometer A. Gasket material for other than sodium hypochlorite service shall be EPR. Gasket material for sodium hypochlorite service shall be Viton ETP.

#### **2.08 Gaskets for Flanges for Stainless Steel Piping (NOT USED)**

Gaskets shall be full face, 1/8-inch thick. Gaskets for services other than chemical service shall be one of the following nonasbestos materials:

- A. Cloth-inserted rubber, with a Shore "A" hardness of 75 to 85. Gaskets shall be suitable for a pressure of 200 psi at a temperature of 180°F. Products: Garlock Style 19 or equal.
- B. Acrylic or aramid fiber bound with nitrile. Products: Garlock "Bluegard," Klinger "Klingersil C4400," or equal. Gaskets shall be suitable for a water pressure of 500 psi at a temperature of 400°F.

## **2.09 Moldable Filler Tape for Pipe Surface Transition Areas**

- A. Filler tape shall be a 100% solids mastic-like butyl-rubber filler designed to fill and smooth the transition areas between adjacent coating surfaces such as step-down weld areas, surface irregularities beneath heat-shrink sleeves, pipefittings, and exothermic welds for cathodic protection bonding wire connections. Characteristics:
  - 1. Thickness per ASTM D1000: 1/8 inch minimum.
  - 2. Peel adhesion to primed pipe: 300 ounces per inch minimum.
  - 3. Elongation: 600% minimum.
- B. Products: Tapecoat "Moldable Sealant," Polyken No. 939 Filler Tape, or equal.

## **2.10 Flange Insulation Kits**

- A. Flange insulation kits shall consist of insulating gasket, an insulating stud sleeve for each bolt, insulating washers for each bolt, and a steel washer between each insulating washer and the nut. The sleeves shall be one piece, integral with the insulating washer. Provide double sleeve and washer sets for each bolt.
- B. Gasket material shall be phenolic, 1/8-inch (3 mm) thick. The flange insulating gasket shall be full diameter (full face) of the flange with a nitrile O-ring on each side of the gasket. Dielectric strength shall be not less than 500 volts per mil (0.025 mm) and a compressive strength of not less than 24,000 psi (165,000 kPa).
- C. Insulating flange bolt sleeves shall be spiral-wrapped mylar having a minimum dielectric strength of 4,000 volts per mil (0.025 mm).
- D. Insulating flange bolt washers shall be high-strength phenolic a minimum thickness of 1/8-inch (3 mm). Dielectric strength shall be not less than 500 volts per mil (0.025 mm) and a compressive strength of not less than 25,000 psi (172,000 kPa).
- E. Steel flange bolt washers for placement over the insulating washers shall be a minimum thickness of 1/8-inch (3 mm) and be zinc plated or stainless steel.
- F. Flange insulation kits shall be as manufactured by Advance Product Systems, PSI, Central Plastics Company, or equal.

## **2.11 Insulating Unions**

- A. Insulating unions shall consist of a molded nylon sealing sleeve mounted in a three-piece malleable-iron (ASTM A47 or A197) body. Ends shall be threaded (ASME B1.20.1) when connecting to steel piping and copper solder joint when connecting to copper piping. Minimum working pressure shall be 150 psi (1034 kPa). Unions shall be as manufactured by Central Plastics Company, Capital Insulation, or equal.

## **PART 3 EXECUTION**

### **3.01 Installing Pipe Spools in Concrete – NOT USED**

### **3.02 Raised Face and Flat Face Flanges**

Where a raised face flange connects to a flat-faced flange, remove the raised face of the flange.

### **3.03 Installing Aboveground or Exposed Piping**

- A. Provide pipe hangers and supports as detailed in the drawings and as specified in Section 40 07 64.
- B. Install pipe without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment.

### **3.04 Installing Flanged Piping**

- A. Set pipe with the flange bolt holes straddling the pipe horizontal and vertical centerline. Install pipe without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment. Before bolting up, align flange faces to the design plane within 1/16 inch per foot measured across any diameter. Align flange bolt holes within 1/8-inch maximum offset.
- B. Inspect each gasket to verify that it is the correct size, material, and type for the specified service and that it is clean and undamaged. Examine bolts or studs, nuts, and washers for defects such as burrs or cracks and rust and replace as needed.
- C. Clean flanges by wire brushing before installing flanged fittings. Clean flange bolts and nuts by wire brushing, lubricate carbon steel bolts with oil and graphite, and tighten nuts uniformly and progressively.
- D. Bolt lengths shall extend completely through their nuts. Any that fail to do so shall be considered acceptably engaged if the lack of complete engagement is not more than one thread.
- E. Do not use more than one gasket between contact faces in assembling a flanged joint.
- F. Tighten the bolts to the manufacturer's specifications, using the recommended cross bolt pattern in multiple steps of increasing torque, until the final torque requirements are achieved. Do not over torque.
- G. 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.

### **3.05 Installing Blind Flanges**

- A. At outlets not indicated to be connected to valves or to other pipes and to complete the installed pipeline hydrostatic test, provide blind flanges with bolts, nuts, and gaskets.

### **3.06 Installation of Stainless Steel Bolts and Nuts**

Prior to assembly, coat threaded portions of stainless steel bolts and nuts with lubricant.

**END OF SECTION**

## **SECTION 40 05 15**

### **PRESSURE AND LEAKAGE TESTING OF PIPING**

#### **PART 1 GENERAL**

##### **1.01 DESCRIPTION**

###### Work Specified Herein and Elsewhere

A. Work under this Section includes:

1. Piping system testing.
2. Leakage tests.
3. Testing equipment.
4. System testing.

#### **PART 2 PRODUCTS**

##### **2.01 General**

- A. Provide all necessary equipment and instrumentation required for proper completion of testing. Source and quality of water shall be approved by the Engineer.
- B. The CONTRACTOR shall pretest all piping systems prior to scheduling a final test. The time and expense associated with any retesting shall be the responsibility of the CONTRACTOR, including the time and expense of the ENGINEER's representative witnessing the retest.

#### **PART 3 EXECUTION**

##### **3.01 Piping System Testing**

A. General Requirements

1. Test procedures and method of disposal of water shall be approved by the Engineer. All tests shall be made in the presence of the Engineer. Preliminary tests made by the CONTRACTOR without being observed by the Engineer will not be accepted. Notify the Engineer at least twenty-four (24) hours before any work is to be inspected or tested.
2. All defects in piping systems shall be repaired and/or replaced and retested until acceptable. Repairs shall be made to the standard of quality specified for the entire system.
3. Sections of the system may be tested separately, but any defect which may develop in a section previously tested and accepted shall be

promptly corrected and retested. Pressure tests shall be made between valves to demonstrate ability of valves to sustain pressure.

4. All piping shall be tested in accordance with the following test methods, in addition to any test required by local and state codes or building authorities.

B. Flushing

Prior to testing, flush all piping systems with water to remove construction debris.

C. Pressure Piping Testing

1. All piping subject to 5 psig pressure or more shall pass the following hydrostatic pressure test and leakage test.
2. Tests for any exposed piping shall be made before covering and insulation is placed.
3. The pressure and leakage test for buried piping shall be made after all jointing operations are completed and any concrete reaction blocks, and restraints have cured at least seven days. Lines tested before backfill is in place shall be retested after compacted backfill is placed.
4. Sections of piping between valves and other short sections of line may be isolated for testing. If shorter sections are tested, test plugs or bulkheads required at the ends of the test section shall be furnished and installed by the CONTRACTOR, together with all anchors, braces, and other devices required to withstand the hydrostatic pressure without imposing any thrust on the pipe line. The CONTRACTOR shall be solely responsible for any damage which may result from the failure of test plugs or supports.

D. Hydrostatic Tests for Pressure Piping

1. Piping shall be slowly filled with water and all air expelled. Care shall be taken that all air valves are installed and open in the section being filled, and that the rate of filling does not exceed the venting capacity of the air valves.
2. After the section of line to be tested has been filled with water, the specified test pressure shall be applied and maintained for a minimum period of 10 minutes and for such additional period necessary for the ENGINEER to complete the inspection of the line under test. Do not exceed pipe manufacturer's suggested time duration at the test pressure. If defects are noted, repairs shall be made and the test repeated until all parts of the line withstand the test pressure.
3. Hydrostatic test pressure shall be as determined by the ENGINEER.

E. Leakage Test for Pressure Piping

1. After the specified hydrostatic test has been completed, the line shall be subjected to a leakage test under a hydrostatic pressure in the range of 50% to 100% of the pressure required for the hydrostatic test. The selected pressure shall be maintained within a maximum variation of 5% during the entire leakage test. The duration of the leakage test shall be two hours minimum, and for such additional time necessary for the Engineer to complete inspection of the section of line under test. Leakage measurements shall not be started until a constant test pressure has been established. The line leakage shall be measured by means of a water meter installed on the supply side of the pressure pump.
2. No leakage is allowed in exposed piping, buried piping with flanged, threaded, or welded joints or buried non-potable piping in conflict with potable water lines.
3. Tested sections of buried piping with slip-type or mechanical joints will not be accepted if it has a leakage rate in excess of that rate determined by the formula:

$L = 0.00027 NDp$ , in which;

$L$  = Maximum permissible leakage rate, in gallons per hour, throughout the entire length of line being tested.

$N$  = Number of gasketed joints (two for each flexible coupling joint) in the line under test.

$D$  = Nominal internal diameter (in inches) of the pipe.

$p$  = The square root of the actual pressure in psig on all joints in the tested portion of the line. This actual pressure shall be determined by finding the difference between the average elevation of all tested pipe joints and the elevation of the pressure gauge and adding the difference in elevation head to the authorized test pressure.

4. Where the leakage rate exceeds the permissible maximum, the CONTRACTOR shall locate and repair leaking joints to the extent required to reduce the total leakage to within the prescribed amount.
5. All apparent leaks discovered within one year from the date of final acceptance of the work by the OWNER shall be located and repaired by the CONTRACTOR, regardless of the total line leakage rate.

**END OF SECTION**



## **SECTION 40 05 20**

### **VALVES AND APPURTENANCES**

#### **PART 1 GENERAL**

##### **1.01 DESCRIPTION**

- A. Provide gate valves, butterfly valves, ball valves, air release valves, and corporation stops as specified herein in the locations shown in the Construction Drawings.

##### **1.02 SUBMITTALS**

- A. Submit the following in accordance with Section 01 33 00 and the following:
- B. Submit manufacturer's catalog data and detail construction sheets showing all valve parts. Describe each part by material of construction, specification (such as AISI, ASTM, SAE, or CDA), and grade or type.
- C. Show valve dimensions including laying lengths. Show port sizes. Show dimensions and orientation of valve actuators, as installed on the valves. Show location of internal stops for gear actuators. State differential pressure and fluid velocity used to size actuators. For worm-gear actuators, state the radius of the gear sector in contact with the worm and state the handwheel diameter.
- D. Show valve linings and coatings. Submit manufacturer's catalog data and descriptive literature.
- E. Submit six copies of a report verifying that the valve interior linings and exterior coatings have been tested for holidays and lining thickness. Describe test results and repair procedures for each valve. Do not ship valves to project site until the reports have been returned by the Owner and marked "Resubmittal not required."

##### **1.03 DELIVERY, STORAGE AND HANDLING**

- A. Comply with the requirements specified in Section 01 11 00 and as specified by valve manufacturer.

#### **PART 2 MATERIALS**

##### **2.01 GENERAL**

- A. Install valves complete with operating handwheels or levers, chainwheels, extension stems, floor stands, gear actuators, operating nuts, chains, and wrenches required for operation.
- B. Valves shall have the name of the manufacturer and the size of the valve cast or molded onto the valve body or bonnet or shown on a permanently attached plate.

## **2.02 MECHANICAL GEAR VALVE ACTUATORS**

- A. Provide lever or wrench actuators for exposed valves 6 inches and smaller.
- B. Where manually operated valves (size 4 inches and larger) are installed with their centerlines more than 6 feet 9 inches above the floor, provide chainwheel and guide actuators.
- C. Provide 2-inch AWWA operating nuts for buried and submerged valves. Provide 2-inch AWWA operating nuts with the handwheels for manually actuated valves 24 inches and larger for use with a portable electric valve actuator.
- D. Provide enclosed gear actuators on butterfly valves. Gear actuators shall be of the worm and gear types. Gear actuators for valves 6 through 20 inches shall be of the worm and gear, or of the traveling nut type. Gear actuators for valves 24 inches and larger shall be of the worm and gear types.
- E. Provide gear actuators on gate valves 14 inches and larger, unless electric motorized valve actuators are shown in the drawings. Gear actuators shall be of the bevel or spur gear type. Provide grease case. Gearing shall comply with AWWA C500.
- F. Design gear actuators assuming that the differential pressure across the plug, gate, or disc is equal to the test pressure of the connecting piping and assuming a fluid velocity of 16 fps for valves in liquid service and 80 fps for valves in air or gas service and a line fluid temperature range of 33°F to 125°F unless otherwise required in the detailed valve specifications. Size actuators using a minimum safety factor of 1.5 for valves in open/close service and 2.0 in modulating service.
- G. Gear actuators shall be enclosed, oil lubricated, with seals provided on shafts to prevent entry of dirt and water into the actuator. Gear actuators for valves located above ground or in vaults and structures shall have handwheels. The actuators for valves in exposed service shall contain a dial indicating the position of the valve disc. Gear actuators for buried or submerged valves shall have 2-inch-square AWWA operating nuts.
- H. For buried or submerged service provide watertight shaft seals and watertight valve and actuator cover gaskets. Provide totally enclosed actuators designed for buried or submerged service. Traveling nut and worm and gear actuators shall be of the totally enclosed design so proportioned as to permit operation of the valve under full differential pressure rating of the valve with a maximum pull of 80 pounds on the handwheel or crank. Provide stop limiting devices in the actuators in the open and closed positions. Actuators shall be of the self-locking type to prevent the disc or plug from creeping. Design actuator components between the input and the stop-limiting devices to withstand without damage a pull of 200 pounds for handwheel or chainwheel actuators and an input torque of 300 foot-pounds for operating nuts when operating against the stops.
- I. Handwheel diameters for traveling nut actuators shall not exceed 8 inches for valves 12 inches and smaller and shall not exceed 12 inches for valves 20 inches and smaller.
- J. Self-locking worm gear shall be a one-piece design of gear bronze material (ASTM B427; or ASTM B84, Alloy C86200), accurately machine cut. Actuators for eccentric and

lubricated plug valves may use ductile-iron gears provided the gearing is totally enclosed with spring-loaded rubber lip seals on the shafts. The worm shall be hardened alloy steel (ASTM A322, Grade G41500 or G41400; or ASTM A148, Grade 105-85), with thread ground and polished. Support worm-gear shaft at each end by ball or tapered roller bearings. The reduction gearing shall run in a proper lubricant. The handwheel diameter shall be no more than twice the radius of the gear sector in contact with the worm. Worm-gear actuators shall be Limitorque Model HBC, EIM Series W, or equal.

- K. Design actuators on buried valves to produce the required torque on the operating nut with a maximum input of 150 foot-pounds.
- L. Valve actuators or levers shall open by turning counterclockwise.

## **2.03 CAST-IRON VALVE BOXES WITH DEBRIS CAPS AND VALVE COVER FOR BURIED VALVES**

- A. Valve boxes shall be two-piece sliding type, cast iron, with extension shafts. Units shall be as manufactured by Tyler Pipe, Geneco, Star Pipe Products, or equal. Extension pipes shall be cast iron as shown in the drawings.
- B. Debris cap shall be comprised of a hollow member having a cylindrical outer surface, a closure for one end, and three resilient contact pads projecting from the outer surface. Stainless steel springs under each contact pad shall hold the debris cap in position against the interior of the extension pipe or valve box. Provide handle to allow the contact pads to be extended and retracted. The cap shall have a flexible skirt providing an outward seal preventing debris from passing the cap. The cap shall withstand, without slipping, a minimum vertical force of 50 pounds when the contact pads are extended against the wall of the extension pipe or valve box. The cap shall be made of molded ABS plastic material. The cap shall have retaining prongs to retain a copper locating wire coil.
- C. Provide an HS-20 traffic rated, cast iron, minimum dimensions of 5" square, valve cover over each valve box as shown on the Valve Box and Cover detail in the Construction Drawings.
- D. Coat buried cast-iron pieces with fusion-bonded epoxy per Section 09 97 61.

## **2.04 EXTENSION STEMS FOR BURIED AND SUBMERGED VALVE ACTUATORS**

- A. Where the depth of the valve is such that its centerline is more than 4 feet below grade, provide operating extension stems to bring the operating nut to a point 6 inches below the surface of the ground and/or box cover. Where the valve is submerged, provide operating extension stems to bring the operating nut to 6 inches above the water surface. Extension stems shall be Type 316 stainless steel, solid core, and shall be complete with 2-inch-square operating nut. The connections of the extension stems to the operating nuts and to the valves shall withstand without damage a pull of 300 foot-pounds.
  - a. Extension stem diameters shall be as tabulated below:

<b>Valve Size (inches)</b>	<b>Minimum Extension Stem Diameter (inches)</b>
2	3/4
3, 4	7/8
6	1
8	1 1/8
10, 12	1 1/4
14	1 3/8
16, 18	1 1/2
20, 24, 30, 36	1 3/4
42, 48, 54	2

- b. Provide buried valves or valves located inside manholes or vaults with valve boxes cast in the manhole or vault roof with a valve position indicator designed to fit standard 5-1/4-inch valve boxes. The indicators shall show valve position and the direction and number of turns required to fully open (or close). All internal gearing shall be sealed. Ship each unit ready for field installation complete with valve box cast-iron adapter, cap screws, guide bushing, position indicator, flexible washer, centering plate, and 2-inch AWWA nut. Valve box and indicator shall be provided by the valve manufacturer. Indicators shall be Westran Position Indicator, Pratt Diviner, or equal.

**B. Floor Stands, Extension Stems, and Extension Stem Support Brackets**

- a. When required by the installations, provide floor stands and extension stems for operation of valves. Floor stands shall be of the nonrising stem, indicating type, complete with steel extension stems, couplings, handwheels, stem guide brackets, and special yoke attachments as required by the valves and recommended and supplied by the stand manufacturer. Floor stands shall be cast-iron base type: Clow, Figure F-5515; Bingham and Taylor; Stockham; or equal. Handwheels shall turn counterclockwise to open the valves.
- b. Provide Type 316 stainless steel anchor bolts.
- c. Provide Type 316 stainless steel extension stems.
- d. Provide adjustable stem guide brackets for extension stems. The bracket shall allow valve stems to be set over a range of 2 to 36 inches from walls. Provide bushings drilled to accept up to 2-inch-diameter stems. Base, arm, and clamp shall be ductile iron. Coat ductile iron components with fusion-bonded epoxy per Section 099761. Bushing shall be bronze (ASTM B584, Alloy C86400 or C83600). Bolts, nuts, screws, and washers (including wall anchor bolts) shall be Type 316 stainless steel. Provide slots in the bracket to accept 3/4-inch bolts for mounting the bracket to the wall. Products: Trumbull Industries, Inc., Adjustable Stem Guide or equal.

## **2.05 VALVE TAGGING AND IDENTIFICATION**

- A. Provide identifying valve tags per JEA standards.

## **2.06 Bolts and Nuts for Flanged Valves**

- A. Bolts and nuts for flanged valves shall be as described in Section 40 05 00.

## **2.07 Gaskets for Flanges**

- A. Gaskets for flanged end valves shall be as described in Section 40 05 00.

## **2.08 Painting and Coating**

- A. Coat metal valves located above ground or in vaults and structures the same as the adjacent piping. If the adjacent piping is not coated, then coat valves per Section 09 90 00. Apply the specified prime coat at the place of manufacture. Apply intermediate and finish coats in field. Finish coat shall match the color of the adjacent piping. Coat handwheels the same as the valves.
- B. Coat buried metal valves at the place of manufacture per Section 099000, System No. 30.
- C. Coat submerged metal valves, stem guides, extension stems, and bonnets at the place of manufacture per Section 09 90 00.
- D. Line the interior metal parts of metal valves 4 inches and larger, excluding seating areas and bronze and stainless steel pieces, per Section 09 90 00. Apply lining at the place of manufacture. All linings to be NSF61 approved.
- E. Alternatively, line and coat valves with fusion-bonded epoxy per Section 099761.
- F. Coat floor stands per Section 09 90 00.
- G. Test the valve interior linings and exterior coatings at the factory with a low-voltage (22.5 to 80 volts, with approximately 80,000-ohm resistance) holiday detector, using a sponge saturated with a 0.5% sodium chloride solution. The lining shall be holiday free.

## **2.09 PACKING, O-RINGS, AND GASKETS**

Packing, O-rings, and gaskets shall be one of the following nonasbestos materials:

- A. Teflon.
- B. Kevlar aramid fiber.
- C. Acrylic or aramid fiber bound by nitrile. Products: Garlock "Bluegard," Klinger "Klingersil C4400," or equal.
- D. Buna-N (nitrile).

## **2.10 RUBBER SEATS**

- A. Rubber seats shall be made of a rubber compound that is resistant to free chlorine and monochloramine concentrations up to 10 mg/L in the fluid conveyed.

## **2.11 Locating Markers**

- A. Provide magnetic locating ball at each valve location.

## **2.12 Valves**

- A. Gate Valves:

- 1 Ductile-Iron Resilient Wedge Tapping Gate Valves 4 Inches Through 16 Inches (AWWA C515):

Valves shall comply with AWWA C515 and the following. Valves shall be of the bolted bonnet type with nonrising stems. Valve stems shall be Type 304 or 316 stainless steel or cast, forged, or rolled bronze. Stem nuts shall be made of solid bronze. Bronze for internal working parts, including stems, shall not contain more than 2% aluminum nor more than 7% zinc. Bronze shall conform to ASTM B62 or ASTM B584 (Alloy C83600), except the stem bronze shall have a minimum tensile strength of 60,000 psi, a minimum yield strength of 30,000 psi, and a minimum of 10% elongation in 2 inches (ASTM B584 or B763, Alloy C87600 or C99500). Body bolts shall be Type 316 stainless steel. Ends shall be flanged, Class 125, ASME B16.1. One end shall have slotted bolt holes per AWWA C515, paragraph 4.4.1.3.4 to fit tapping machines.

Provide reduction thrust bearings above the stem collar. Stuffing boxes shall be O-ring seal type with two rings located in stem above thrust collar. Each valve shall have a smooth unobstructed waterway free from any sediment pockets.

Valves shall be lined and coated at the place of manufacture with either fusion-bonded epoxy or heat-cured liquid epoxy. Minimum epoxy thickness shall be 8 mils. Valves shall be certified to NSF/ANSI Standard 61.

Manufacturers: American Flow Control (2500 Series), AVK s/s stem only (Series 45), Clow (F-6100), Kennedy (8571), M&H (4067), Mueller (A2360, A2361), U.S. Pipe (250), United Water (2010), Mueller –Aqua Grip (A-2361-77), American RD (D100)

- B. Stainless Steel Gate Valves:

Stainless steel gate valves, 1/2 through 2 inches, shall be of the single wedge type with rising stem and handwheel. Minimum working pressure shall be 200 psig. Bonnet shall be of the screwed type. Ends shall be threaded, ASME B1.20.1. Materials of construction shall be as follows:

Component	Material	Specification
Body, bonnet, plug, disc, and follower	Stainless steel	ASTM A351, Grade CF8M
Packing gland, nut, retainer ring, and stem	Stainless steel	ASTM A276, Type 316
Handwheel	Malleable iron	ASTM A47, A197
Stuffing box packing	Teflon	--

Valves shall be Powell Figure 1832, Crane/Alloyco Figure 90, or equal.

## 2.13 Ball Valves:

### A. Full Port Threaded Bronze Ball Valves 2 Inches and Smaller:

Ball valves, 2 inches and smaller, for air or water service shall have a pressure rating of at least 600 psi WOG at a temperature of 100°F. Provide full port ball and body design. Valves shall comply with MSS SP-110. Provide bronze (ASTM B62 or ASTM B584, Alloy C83600 or C84400) body and plug ball retainer. Ball and stem shall be Type 316 stainless steel. Valves shall have threaded ends (ASME B1.20.1), nonblowout stems, reinforced Teflon seats, and have plastic-coated lever actuators. Valves shall be Stockham S-216 Series, Powell Fig 4210 T, Conbraco Ind. Apollo 7-100 Series, or equal.

### B. Double Union PVC Ball Valves 3 Inches and Smaller:

Thermoplastic ball valves, 3 inches and smaller, for water and chemical service shall be rated at a pressure of 150 psi at a temperature of 105°F. Body, ball, and stem shall be PVC conforming to ASTM D1784, Type 1, Grade 1. Seats shall be Teflon. O-ring seals shall be Viton. Valve ends shall be of the double-union design. Ends shall be socket welded except where threaded or flanged-end valves are specifically shown in the drawings. Valves shall have handle for manual operation. Valves shall be as manufactured by Chemtrol, Hayward, R & G Sloan, Spears Manufacturing Company, Plast-O-Matic, IPEX Series VK or VKD, or equal.

### C. Double Union PVC Ball Valves 3 Inches and Smaller with Vented Ball for sodium hypochlorite service:

Vented PVC ball valves, 3 inches and smaller, for chemical service shall be rated at a pressure of 150 psi at a temperature of 105°F. Provide machined vent hole, deburred, in the ball to allow gases to vent. The vent hole shall be part of the manufactured valve assembly. Body, ball, and stem shall be PVC conforming to ASTM D1784, Type 1, Grade 1. Seats shall be Teflon. O-ring seals shall be Viton and suitable for the intended service. Valve ends shall be of the double-union design. Ends shall be socket welded except where threaded or flanged-end valves are specifically shown in the drawings. Valves shall have handle for manual operation. Provide stem extensions when valves are installed in insulated piping. Stem extensions shall be of a

length sufficient to bring the bottom of the operating handle above the outside of the insulation. Products: Valves shall be Plast-O-Matic "Z-MBV-Vent," Asahi/America Type 21, or equal.

**D. Regular Port Threaded Stainless Steel Ball Valves 2 Inches and Smaller:**

Stainless steel ball valves, 2 inches and smaller, for water service shall be rated at a minimum pressure of 1,500 psi WOG at a temperature of 100°F. Valve body, ball, and stem shall be Type 316 stainless steel, ASTM A276 or A351. Seat and seals shall be reinforced Teflon. Valves shall have lever actuators, plastic coated. Provide locking lever handle. Valves shall have threaded ends (ASME B1.20.1) and nonblowout stems. Valves shall be McCanna Figure M402, Worcester Series 48, Stockham Figure SD 2120-SSMO-R-T, Apollo 76-100 Series, or equal.

**2.14 Check Valves:**

**A. Check Valves (Rubber Flapper):**

Check valves shall conform to AWWA C508. Check valves larger than 2-inch nominal size shall be iron body with stainless steel bolts and nuts, flanged ends, outside lever, spring loaded (stainless steel spring if available), swing-type with straight-away passageway of full pipe area. The valve shall have renewable bronze seat ring and rubber faced disc. Check valves shall be 150 psi working pressure. Valves shall be GA FLG 200 with limit switch or Valmatic 500 series with limit switch.

**a. Polypropylene Ball Check Valves, 3 Inches and Smaller:**

Polypropylene check valves, 3 inches and smaller, shall be constructed of Polypropylene per ASTM D4101, Cell Classification PP0210B67272. Ends shall be double union, socket welded. Seats and seals shall be Teflon or EPDM. Valve shall have a pressure rating of 150 psi at a temperature of 73°F. The valve shall be U.S. Plastic Corp., George Fischer Type 360 or equal.

**B. PVC Ball Check Valves, 3 Inches and Smaller:**

PVC check valves, 3 inches and smaller, shall be constructed of PVC per ASTM D1784, Type I, Grade 1. Ends shall be double union, socket welded. Seats and seals shall be Viton for sodium hypochlorite, EPDM for other water services. Valve shall have a pressure rating of 150 psi at a temperature of 73°F.

**C. Sample Valve**

Sample valve shall have 316 stainless steel body with quarter turn level handle and plain (unthreaded) outlet. It shall be NSF61 certified. Valve shall be ½-inch diameter with renewable seats. Valve shall be self-closing. Unit shall be Chicago Faucet Co. or equal.



## **2.15 Air Release Valves:**

Air release valve shall be automatic float operated, all 316 stainless steel body and trim and fasteners. A check valve on the outlet is required to prevent air from re-entering the pressurized water main. Acceptable Air Valve Manufacturers: Valmatic and H-TEC.

## **2.16 Pressure Gauges**

Pressure gauges shall be by Bristol Babcock-Helicoid 900 series. Refer to Section 40 95 00 for Pressure Indicator Transmitter requirements.

# **PART 3 EXECUTION**

## **3.01 INSTALLATION**

### **A. Valve Shipment and Storage**

- a. Provide flanged openings with metal closures at least 3/16-inch thick, with elastomer gaskets and at least four full-diameter bolts. Install closures at the place of valve manufacture prior to shipping. For studed openings, use all the nuts needed for the intended service to secure closures. Alternatively, ship flanged valves 3 inches and smaller in separate sealed cartons or boxes.
- b. Provide threaded openings with steel caps or solid-shank steel plugs. Do not use nonmetallic (such as plastic) plugs or caps. Install caps or plugs at the place of valve manufacture prior to shipping. Alternatively, ship valves having threaded openings or end connections in separate sealed cartons or boxes.
- c. Store resilient seated valves in sealed polyethylene plastic enclosures with a minimum of one package of desiccant inside. Store resilient seated valves in the open or unseated position. Valves with adjustable packing glands shall have the packing gland loosened prior to storage. Inspect valves at least once per week, replace desiccant if required and repair damaged storage enclosures. Do not store valves with resilient seats near electric motors or other electrical equipment.
- d. Inspect valves on receipt for damage in shipment and conformance with quantity and description on the shipping notice and order. Unload valves carefully to the ground without dropping. Use forklifts or slings under skids. Do not lift valves with slings or chain around operating shaft, actuator, or through waterway. Lift valves with eyebolts or rods through flange holes or chain hooks at ends of valve parts.
- e. Protect the valve and actuators from weather and the accumulation of dirt, rocks, and debris. Do not expose rubber seats to sunlight or ozone for more than 30 days. Also, see the manufacturer's specific storage instructions.
- f. Make sure flange faces, joint sealing surfaces, body seats, and disc seats are clean. Check the bolting attaching the actuator to the valve for loosening in transit and handling. If loose, tighten firmly. Open and close valves having

manual or power actuators to make sure the valve operates properly and that stops or limit switches are correctly set so that the valve seats fully. Close valve before installing.

#### B. Factory Pressure Testing

- a. Hydrostatically test the valve pressure-containing parts at the factory per the valve specification or per the referenced standard. If no testing requirement is otherwise specified or described in the referenced standards, then test with water for 30 minutes minimum at a pressure of 1.5 times the rated pressure but not less than 20 psig. Test shall show zero leakage. If leaks are observed, repair the valve and retest. If dismantling is necessary to correct valve deficiencies, then provide an additional operational test and verify that the valve components function.
- b. The chloride content of liquids used to test austenitic stainless steel materials shall not exceed 50 ppm. To prevent deposition of chlorides as a result of evaporative drying, remove residual liquid from tested parts at the conclusion of the test.

#### C. Installing Valves--General

- a. Remove covers over flanged openings and plugs from threaded openings, after valves have been placed at the point to which the valves will be connected to the adjacent piping. Do not remove valves from storage cartons or boxes until they are ready to be installed.
- b. Handle valves carefully when positioning, avoiding contact or impact with other equipment, vault or building walls, or trench walls.
- c. Clean valve interiors and adjacent piping of foreign material prior to making up valve to pipe joint connection. Prepare pipe ends and install valves in accordance with the pipe manufacturer's instructions for the joint used. Do not deflect pipe-valve joint. Do not use a valve as a jack to pull pipe into alignment. The installation procedure shall not result in bending of the valve/pipe connection with pipe loading.
- d. Make sure valve ends and seats are clean. Check exposed bolting for loosening in transit and handling and tighten to manufacturer's recommendations. Open and close the valve to make sure it operates properly and that stops or limit switches are correctly set so that the vane, ball, gate, needle, diaphragm, disc, plug, or other seating element seats fully. Close the valve before installing. Check coatings for damage and repair. Handle valves carefully when positioning, avoiding contact or impact with other equipment or structures.
- e. Prior to assembly, coat threaded portions of stainless steel bolts and nuts with lubricant.

#### D. Installing Exposed Valves

- a. Unless otherwise indicated in the drawings, install valves in horizontal runs of pipe having centerline elevations 4 feet 6 inches or less above the floor with their operating stems vertical. Install valves in horizontal runs of pipe having centerline elevations between 4 feet 6 inches and 6 feet 9 inches above the floor with their operating stems horizontal.
- b. Install valves on vertical runs of pipe that are next to walls with their stems horizontal, away from the wall. Valves on vertical runs of pipe that are not located next to walls shall be installed with their stems horizontal, oriented to facilitate valve operation.

#### E. Installing Buried Valves

- a. Connect the valve, coat the flanges, apply tape wrapping or polyethylene encasement, and place and compact the backfill to the height of the valve stem.
- b. Place block pads under the extension pipe to maintain the valve box vertical during backfilling and repaving and to prevent the extension pipe from contacting the valve bonnet.
- c. Mount the upper slip pipe of the extension in midposition and secure with backfill around the extension pipe. Pour the concrete ring allowing a depression so the valve box cap will be flush with the pavement surface.
- d. In streets without concrete curbs and in open areas, install the valve box as for a paved area with concrete curb except include a marker post. Cut the marker post from 4-inch by 4-inch dense structural grade Douglas fir No. 2 or Southern Pine No. 2 surfaced on four sides to a length of 5 feet. Chamfer the top. Set the post in concrete, 2 feet into the ground, away from traffic, and to the side of the pipeline. Coat with a seal and finish coat of white alkyd exterior paint. On the side facing the valve, letter in black the word "VALVE" and the distance in feet from the marker post to the valve box cap.
- e. Install debris cap as close as possible under the cast-iron cover without interfering with the cover operation. Trim flexible skirt to provide a smooth contact with the interior of the extension pipe.

#### F. Field Coating Buried Valves

- a. Coat flanges of buried valves and the flanges of the adjacent piping, and the bolts and nuts of flanges and mechanical joints, per Section 099000, System No. 30.
- b. Wrap buried metal valves 6 inches and larger with polyethylene sheet in two layers of polyethylene conforming to AWWA C105, 8 mils in thickness each. Pass the two sheets of polyethylene under the valve and the coated flanges or joints with the connecting pipe and draw the sheets around the valve body, the valve bonnet, and the connecting pipe. Secure the sheets with plastic

adhesive tape about the valve stem below the operating nut and about the barrel of the connecting pipe to prevent the entrance of soil. Fold overlaps twice and tape. Backfill the valve with care to avoid damaging the polyethylene.

#### G. Assembling Joints

- a. Bolt holes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Clean flanges by wire brushing before installing flanged valves. Clean flange bolts and nuts by wire brushing, lubricate threads with oil and graphite, and tighten nuts uniformly and progressively. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reseal or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.
- b. Clean threaded joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing threaded valves. Joints shall be watertight.
- c. Install lug-type valves with separate hex head machine bolts at each bolt hole and each flange (two bolts per valve bolt hole).
- d. Install grooved-end couplings for valves in accordance with Section 40 05 00.

#### H. Installing Extension Stem Guide Brackets

Install at 6- to 8-foot centers. Provide at least two support brackets for stems longer than 10 feet, with one support near the bottom of the stem and one near the top.

#### I. Mounting Gear Actuators

The valve manufacturer shall select and mount the gear actuator and accessories on each valve and stroke the valve from fully open to fully closed prior to shipment.

#### J. Field Installation of Gear Actuator

Provide the actuator manufacturer's recommended lubricating oil in each actuator before commencing the field testing.

### 3.02 FIELD TESTING

- A. Test valves for leakage at the same time that the connecting pipelines are hydrostatically tested. See Section 40 05 15 for pressure testing requirements. Protect or isolate any parts of valves, actuators, or control and instrumentation systems whose pressure rating is less than the pressure test. Valves shall show zero leakage. Repair or replace any leaking valves and retest.
- B. Operate manual valves through three full cycles of opening and closing. Valves shall operate from full open to full close without sticking or binding. Do not backfill buried valves until after verifying that valves operate from full open to full closed. If valves

stick or bind, or do not operate from full open to full closed, repair or replace the valve and repeat the tests.

- C. Gear actuators shall operate valves from full open to full close through three cycles without binding or sticking. The pull required to operate handwheel- or chainwheel-operated valves shall not exceed 80 pounds. The torque required to operate valves having 2-inch AWWA nuts shall not exceed 150 ft-lbs. If actuators stick or bind or if pulling forces and torques exceed the values stated previously, repair or replace the actuators and repeat the tests. Operators shall be fully lubricated in accordance with the manufacturer's recommendations prior to operating.

### **3.03 FIELD TOUCH-UP PAINTING**

- A. After installation and accepted testing by the Owner, apply touch-up paint to all scratched, abraded and damaged shop painted surfaces. Coating type and color shall match shop painting.

**END SECTION**

## **SECTION 40 07 22**

### **FLEXIBLE PIPE COUPLINGS AND EXPANSION JOINTS**

#### **PART 1 GENERAL**

##### **1.01 Description**

This section includes materials and installation of flexible gasketed sleeve-type compression pipe couplings for steel and ductile-iron pipe; expansion joints 4 inches in diameter and smaller for steel, PVC, pipe; flexible expansion joints; and couplings for connecting different pipe materials.

##### **1.02 Submittals**

- A. Submit shop drawings in accordance with Section 01 33 00.
- B. Submit manufacturer's catalog data on flexible pipe couplings, and expansion joints. Show manufacturer's model or figure number for each type of coupling or joint for each type of pipe material for which couplings and joints are used. Show coatings.
- C. Submit manufacturer's recommended torques to which the coupling bolts shall be tightened for the flexible gasketed sleeve-type compression pipe couplings.
- D. Show materials of construction by ASTM reference and grade. Show dimensions.
- E. Show number, size, and material of construction of tie rods and lugs for each thrust harness on the project.

#### **PART 2 MATERIALS**

##### **2.01 Coupling System Design and Component Unit Responsibility**

The coupling manufacturer shall furnish the gaskets, bolts, nuts, glands, end rings, and hardware for pipe couplings of all types and shall design these components as an integral system. Design the gaskets for the coupling and appropriately size to provide a watertight seal at the design pressure and temperature. Ship gaskets, bolts, nuts, glands, end rings, and hardware for pipe couplings with the pipe coupling and clearly label indicating the origin of the material, including place and date of manufacture. Package the manufacturer's printed installation instructions with each pipe coupling.

##### **2.02 Carbon Steel Flexible Pipe Couplings and Flanged Coupling Adapters**

- A. Steel couplings shall have center sleeves and end rings made of carbon steel conforming to AWWA C219, Section 4. Minimum center sleeve length shall be 5 inches for pipe sizes 3/4 inch through 4 1/2 inches, 7 inches for pipe sizes 5 inches through 24 inches, and 10 inches for pipe sizes larger than 24 inches.

- B. Sleeve bolts in exposed service shall be carbon steel per AWWA C219, Section 4. Sleeve bolts in buried or submerged service shall be Type 316 stainless steel per AWWA C219, Section 4.
- C. End rings shall be cast, forged, or hot rolled in one piece. Do not use rings fabricated from two or more shapes.
- D. Wall thickness of sleeve shall be at least that specified for the size of pipe in which the coupling is to be used.

#### **2.03 Stainless Steel Flexible Pipe Couplings and Flanged Coupling Adapters**

- A. Stainless steel couplings shall have center sleeves and end rings made of Type 316 stainless steel conforming to AWWA C219, Section 4. Minimum center sleeve length shall be 5 inches for pipe sizes 3/4 inch through 4 1/2 inches, 7 inches for pipe sizes 5 inches through 24 inches, and 10 inches for pipe sizes larger than 24 inches.
- B. Sleeve bolts shall be Type 316 stainless steel per AWWA C219, Section 4.
- C. End rings shall be cast, forged, or hot rolled in one piece. Do not use rings fabricated from two or more shapes.
- D. Wall thickness of sleeve shall be at least that specified for the size of pipe in which the coupling is to be used.

#### **2.04 Ductile-Iron Flexible Pipe Couplings**

- A. Couplings shall have center sleeves and end rings made of ductile iron conforming to AWWA C219, Section 4.
- B. Sleeve bolts in exposed service shall be carbon steel per AWWA C219, Section 4. Sleeve bolts in buried or submerged service shall be Type 316 stainless steel per AWWA C219, Section 4.

#### **2.05 Joint Harnesses**

- A. Tie bolts or studs shall be as shown in the following table. Bolt or stud material shall conform to ASTM A193, Grade B7. Nuts shall conform to ASTM A194, Grade 2H. Lug material shall conform to ASTM A36, ASTM A283, Grade B, C, or D, or ASTM A285, Grade C. Lug dimensions for steel pipe shall be as shown in AWWA Manual M11 (2004 edition), Figure 13-20, using the number and size of lugs as tabulated below.
- B. Lugs for steel pipe shall be Type P for pipes 6 through 10 inches and Type RR for pipes 12 inches and larger. Lug or ear dimensions for ductile-iron pipe shall be as shown in the drawings.

TIE BOLTS OR STUD REQUIREMENTS FOR FLEXIBLE PIPE COUPLINGS FOR STEEL PIPE				
Nominal Pipe Size (inches)	Tie Bolt or Stud Minimum Requirements			
	150 psi		300 psi	
	No. Bolts or Studs and Size (inches)	Minimum Pipe Wall Thickness (inches)	No. Bolts or Studs and Size (inches)	Minimum Pipe Wall Thickness (inches)
6	2 x 5/8	0.193	2 x 5/8	0.282
8	2 x 5/8	0.239	2 x 5/8	0.354
10	2 x 5/8	0.312	2 x 3/4	0.466
12	2 x 3/4	0.188	4 x 7/8	0.250
14	2 x 7/8	0.188	4 x 1	0.250
16	2 x 1	0.250	4 x 1 1/8	0.250
18	2 x 1 1/8	0.250	4 x 1 1/8	0.250
20	2 x 1 1/4	0.250	4 x 1 1/8	0.250
24	4 x 7/8	0.250	4 x 1 1/8	0.250
30	4 x 1 1/8	0.250	4 x 1 3/8	0.375
36	4 x 1 3/8	0.313	6 x 1 3/8	0.375
42	6 x 1 1/4	0.375	6 x 1 5/8	0.375
48	6 x 1 3/8	0.375	6 x 1 3/4	0.500
54	6 x 1 1/2	0.375	8 x 1 3/4	0.625
60	6 x 1 5/8	0.375	12 x 1 3/4	0.625
66	8 x 1 5/8	0.469	14 x 1 3/4	0.688
72	8 x 1 3/4	0.500	14 x 1 7/8	0.750



<b>TIE BOLTS OR STUD REQUIREMENTS FOR FLEXIBLE PIPE COUPLINGS FOR DUCTILE IRON PIPE</b>						
	<b>Tie Bolt or Stud Minimum Requirements</b>					
	<b>150 psi<sup>(1)</sup></b>			<b>300 psi<sup>(2)</sup> Pipe</b>		
<b>Nominal Pipe Size (inches)</b>	<b>No. Bolts or Studs</b>	<b>Size (inch)</b>	<b>Ear<sup>(3)</sup> Type</b>	<b>No. Bolts or Studs</b>	<b>Size (inch)</b>	<b>Ear<sup>(3)</sup> Type</b>
4	2	5/8	A	2	5/8	A
6	2	5/8	A	2	5/8	A
8	2	5/8	A	2	5/8	A
10	2	5/8	A	4	5/8	A
12	2	5/8	A	4	5/8	A
14	4	5/8	A	5	3/4	A
16	4	5/8	A	5	3/4	B
18	4	3/4	B	8	3/4	B
20	4	3/4	B	8	3/4	B
24	5	7/8	B	8	7/8	B
30	4	1 1/8	B	14	7/8	B
36	8	1	B	16	1	B
42	9	1	B	--	--	--
48	14	1	B	--	--	--
54	16	1	B	--	--	--
(1) Use ASME B16.1 Class 125 flanges. (2) Use ASME B16.1 Class 250 flanges. (3) Ear type as shown in the detail on the last page of Section 400722.						

- C. Select number and size of bolts based on the test pressure shown in the Piping Schedule in the drawings. Stagger bolts equally around pipe circumference. Where odd number is tabulated, place odd bolt at top. For test pressures less than or equal to 150 psi, use the 150-psi design in the table above. For test pressures between 150 and 300 psi, use the 300-psi design in the table above.
- D. Provide washer for each nut. Washer material shall be the same as the nuts. Minimum washer thickness shall be 1/8 inch.

## **2.06 Flexible Pipe Couplings for Plain-End Ductile-Iron Pipe**

- A. Couplings for pipe 12 inches and smaller shall be cast iron, Dresser Style 253 or 253 long sleeve, Smith-Blair Type 441, Baker Series 228, or equal.
- B. Couplings for pipe larger than 12 inches shall be cast iron or steel, Dresser Style 38 or 253, Smith-Blair Style 411, Baker Series 228, or equal.

## **2.07 Transition Couplings**

Couplings for connecting different pipes having different outside diameters shall be 316 stainless steel: Dresser Style 62 or 162, Smith-Blair Series 413, Baker Series 212 or 220, or equal. Couplings shall have an internal full circumference ring pipe stop at the midpoint of the coupling. Inside diameter of coupling pipe stop shall equal inside diameter of smaller diameter pipe.

## **2.08 Flanged Coupling Adapters for Cast- and Ductile-Iron Pipe**

- A. Adapters for cast- and ductile-iron pipe 12 inches and smaller shall be cast iron: Dresser Style 127, Smith-Blair Series 912, or equal.
- B. Adapters for cast- and ductile-iron pipe larger than 12 inches shall be steel: Dresser Style 128, Smith-Blair Type 913, or equal.
- C. Flange ends shall match the flange of the connecting pipe; see detail piping specifications.

## **PART 3 EXECUTION**

### **3.01 Shipment and Storage of Flexible Pipe Couplings, Dismantling Joints, AND Expansion Joints**

- A. Inspect on receipt for damage in shipment and conformance with quantity and description on the shipping notice and order. Unload carefully to the ground without dropping. Do not load or unload by inserting forklift tines or lifting chains inside the waterway. Use nonmetallic slings, padded chains, or padded forklift tines to lift items. Lift with eyebolts or rods through flange holes or chain hooks at ends.
- B. Protect from weather and the accumulation of dirt, rocks, and debris. Do not expose rubber seats to sunlight or ozone for more than 30 days. Also, see the manufacturer's specific storage instructions.
- C. Make sure flange faces, joint sealing surfaces, body seats, and disc seats are clean.
- D. Do not allow stainless steel couplings or other items to contact carbon steel surfaces during storage, handling, or installation and erection at the site.

### **3.02 Installation of Flexible Pipe Couplings, Segmented Sleeve Couplings, Dismantling Joints, and Expansion Joints**

- A. Clean oil, scale, rust, and dirt from pipe ends. Clean gaskets in flexible pipe couplings before installing.
- B. Install expansion joints per manufacturer's recommendations, so that 50% of total travel is available for expansion and 50% is available for contraction.
- C. Do not spring flanges or ends of connecting piping into position. Separately work connecting piping system into position to bring the piping flanges or ends into

alignment with the matching coupling flanges or joints. Do not move couplings to achieve piping alignment.

- D. Line up pipe flange bolt holes with coupling or joint flange bolt holes within 1/16 inch maximum offset from the center of the bolt hole to permit insertion of bolts without applying any external force to the piping.
- E. Flange face separation shall be within the gasket spacing  $\pm 1/16$  inch. Use only one gasket per flanged connection.
- F. Lubricate bolt threads with graphite and oil prior to installation.
- G. Thoroughly clean contact surfaces of gaskets and pipe ends of flexible pipe couplings just prior to assembly for a distance equal to center-sleeve length plus 2 inches. Install flexible pipe couplings such that the center sleeves are centered over the gap between the ends of the pipes being joined. Install centerline gaps per AWWA C219, Table 5 unless otherwise indicated. Install harnessed flexible pipe couplings in straight-run piping such that 50% of the total travel of the center sleeve or permissible centerline gap is available for expansion and 50% of the travel is available for contraction. In assembling the bolted or studded harnesses of flexible pipe couplings, tighten the nuts gradually and equally at diametrically opposite sides until snug. Do not misalign the harness bolts or studs. Tighten such that bolts or studs carry equal loads. Do not use wrenches or power fastening tools to tighten the nuts.
- H. Install segmented sleeve couplings per AWWA C227, Section 4.6.

### **3.03 Painting and Coating**

- A. Coat buried flexible pipe couplings (including joint harness assemblies), transition couplings, segmented sleeve couplings, and flanged coupling adapters per Section Coat buried bolt threads, tie bolt threads, and nuts per Section 09 90 00, System No. 30. Then wrap the couplings with polyethylene wrap.
- B. Coat flexible pipe couplings (including joint harness assemblies), transition couplings, segmented sleeve couplings, and flanged coupling adapters located indoors, in vaults and structures, and above ground with the same coating system as specified for the adjacent pipe. If the adjacent pipe is not coated, coat couplings per Section 09 90 00. Apply prime coat at factory.
- C. Line carbon steel and iron flexible pipe couplings and segmented sleeve couplings per Section 09 90 00.
- D. Alternatively, line and coat carbon steel and iron flexible pipe couplings with fusion-bonded epoxy.
- E. Coat, expansion joints,, and alignment guides located above ground or in vaults and structures with the same coating system as specified for the adjacent pipe. If the adjacent pipe is not coated, coat couplings per Section 09 90 00. Color shall match the color of the connecting pipe.

### **3.04     Hydrostatic Testing**

Hydrostatically test flexible pipe couplings, and expansion joints, in place with the pipe being tested. Test in accordance with Section 40 05 15.

**END OF SECTION**

## **SECTION 40 07 62**

### **WALL AND FLOOR PENETRATIONS**

#### **PART 1 GENERAL**

##### **1.01 Description**

This section includes materials, installation, and testing of wall/floor penetrations.

##### **1.02 Submittals**

- A. Submit shop drawings in accordance with Section 01 33 00.
- B. List materials of construction, with ASTM material reference and grade.

#### **PART 2 MATERIALS**

##### **2.01 Polyethylene Foam Filler for Pipe Penetrations**

Packing foam shall be an extruded closed-cell polyethylene foam rod, such as Minicel backer rod, manufactured by Industrial Systems Department, Plastic Products Group of Hercules, Inc., Middletown, Delaware; Ethafoam, as manufactured by Dow Chemical Company, Midland, Michigan; or equal. The rod shall be 1/2 inch larger in diameter than the annular space.

##### **2.02 Polyurethane Sealant for Pipe Penetrations**

Sealant shall be multipart, polyurethane sealant, to cure at ambient temperature, for continuous immersion in water. Install as recommended by the manufacturer. Products: SIKa Sikaflex 2C or equal.

#### **PART 3 EXECUTION**

##### **3.01 Location of Pipes and Sleeves**

- A. Provide wall sleeves where shown in the drawings and wherever plastic, steel or stainless steel pipe 3 inches and smaller, or stainless steel or copper tubing passes through a wall. Pack the annular space with polyethylene foam filler and fill the ends of the penetration with 2 inches of elastomeric sealant on both sides of the structure.
- B. Where pipes pass through walls or slabs and no sleeves or wall or floor pipe with seep ring is provided, pack the annular space with polyethylene foam filler and fill the ends of the penetration with 2 inches of elastomeric sealant on both sides of the structure.

##### **3.02 Installation in Existing Concrete Walls and Slabs**

Core drill holes 1 to 2 inches larger in diameter than the outside diameter of the wall flange or collar. Install wall pipe and collar assembly axially aligned with the piping to

which it will be connected or will contain. Pack the void space between the sleeve and concrete with grout. See Section 033000 for grouting specification, or polyethylene foam filler and fill the ends of the penetration with 2 inches of elastomeric sealant on both sides of the structure where shown on the drawings.

### **3.03 Installation in New Concrete Walls and Slabs**

Install wall pipes and sleeves in walls before placing concrete. Do not allow any portion of the pipe or sleeve to touch any of the reinforcing steel. Install wall pipe or sleeve and collar assembly axially aligned with the piping to which it will be attached or will contain. Provide supports to prevent the pipe or sleeve from displacing or deforming while the concrete is being poured and is curing.

### **3.04 Installation in Dry Floors and Slabs**

Install pipe sleeves and spools in concrete floors and slabs which do not have water over them such that the sleeve or pipe extends from the bottom of the floor or slab to 2 inches above the floor or slab unless shown otherwise in the drawings.

**END OF SECTION**

## **SECTION 40 07 64**

### **PIPE HANGERS AND SUPPORTS**

#### **PART 1 GENERAL**

##### **A. Description**

This section includes materials and installation of pipe hangers and supports including accessory items, such as anchor bolts and screws, neoprene isolation pads.

##### **B. Submittals**

1. Submit shop drawings in accordance with Section 01 33 00.
2. Provide line drawings of each piping system to the scale shown in the drawings, locating each support or hanger. Identify each type of hanger or support by the manufacturer's catalog number or figure.
3. Provide installation drawings and manufacturer's catalog information on each type of hanger and support used. Clearly indicate the actual pipe outside diameter (not just nominal pipe size) that is used for the hangers and supports.
4. Submit layout drawings for the drip guards, showing dimensions and thicknesses. Show design of seam or joint where field connections will be made between sections and pieces of drip guards. Submit a certificate listing the type of resin to be used, describing the manufacturer's brand name or designation, composition, and characteristics.

#### **PART 2 MATERIALS**

##### **A. Design Criteria**

1. Not all pipe supports or hangers required are shown in the drawings. Provide pipe supports for every piping system installed. Support piping by pipe support where it connects to pumps or other mechanical equipment.
2. Contractor shall install all concrete and metal pipe supports drawn on the construction plans. Additional pipe supports may be required in addition to those shown on the construction plans.
3. Pipe support and hanger components shall withstand the dead loads imposed by the weight of the pipes, fittings, and valves (all filled with water), plus valve actuators and any insulation, and shall have a minimum safety factor of five based on material ultimate strength.

##### **B. Hanger and Support Systems**

1. Pipe hangers and supports shall be as manufactured by Anvil, Unistrut, B-Line, Superstrut, or equal.

2. Pipe hangers and supports shall comply with MSS SP-58 for the standard types referenced in the drawings. Construct special hangers and supports if detailed in the drawings. Type numbers for standard hangers and supports shall be in accordance with MSS SP-58 as listed below. Latest model numbers may differ from what is shown below:

<b>Type Number</b>	<b>Description</b>	<b>Manufacturer and Model</b>
1	Adjustable steel clevis	Anvil Fig. 590 or 260, B-Line B3100 or B3102, or equal
3	Steel double-bolt pipe clamp	Anvil Fig. 295A or 295H, B-Line B3144 or B3144A, or equal
4	Steel pipe clamp (pipes smaller than 3 inches)	Anvil Fig. 212, B-Line B3140
4	Steel pipe clamp (pipes 3 inches and larger)	Anvil Fig. 216, B-Line 3142, or equal
5	Pipe hanger	B-Line B3690, or equal
6	Adjustable swivel pipe ring	Anvil Superstrut 714, Anvil Fig. 104, or equal
7	Adjustable steel band hanger	B-Line B3172, or equal
8	Extension pipe or riser clamp	Anvil Fig. 261, B-Line B3373, or equal
9	Adjustable band hanger	Anvil Fig. 97, or equal
10	Adjustable swivel ring band hanger	Anvil Fig. 70, B-Line B3170 NF, or equal
11	Split pipe ring with adjustable turnbuckle	Anvil Fig. 108, B-Line B3173, or equal
13	Steel turnbuckle	Anvil Fig. 230, B-Line B3202, or equal
14	Steel clevis	Anvil Fig. 299, B-Line B3201, or equal
15	Swivel turnbuckle	Anvil Fig. 114, B-Line B3224, or equal
16	Malleable iron socket	Anvil Fig. 110R, B-Line B3222, or equal
17	Steel weldless eye nut	B-Line B3200, or equal
18	Steel or malleable iron concrete insert	Anvil Fig. 281, Superstrut 452, or equal
19	Top beam C-clamp	Anvil Fig. 92, B-Line B3033, or equal
20	Side I-beam or channel clamp	Anvil Fig. 14 or 217, or equal
21	Center I-beam clamp	Anvil Figure 134, or equal



<b>Type Number</b>	<b>Description</b>	<b>Manufacturer and Model</b>
22	Welded attachment type	Anvil Fig. 66 B-Line B3083, or equal
23	C-clamp	Anvil Fig. 86, B-Line B3036L, or equal
24	U-bolt	Anvil Fig. 137, B-Line B3188, or equal
26	Clip	Anvil Fig. 262, B-Line B3180, or equal
28	Steel I-beam clamp with eye nut	Anvil Fig. 228, or equal
29	Steel wide flange	Anvil Fig. 228 clamp with eye nut, or equal
30	Malleable iron beam clamp with extension piece	Superstrut CM-754, B-Line B3054
31	Light welded steel bracket	Anvil Fig. 194, B-Line B3063, or equal
32	Medium welded steel bracket	Anvil Fig. 195, B-Line B3066, or equal
33	Heavy welded steel bracket	Anvil Fig. 199, B-Line B3067, or equal
34	Side beam bracket	Anvil Fig. 202, B-Line B3062, or equal
36	Pipe saddle support	Anvil Fig. 258, B-Line B3095, or equal
37	Pipe stanchion saddle	Anvil Fig. 259, B-Line B3090, or equal
38	Adjustable pipe saddle support	Anvil Fig. 264, B-Line B3089, or equal
39	Steel pipe covering	Anvil Fig. 160, 161, 162, 163, 164, or 165; Superstrut A 789; B-Line B3160/B3165, or equal
40	Insulation protection shield	Anvil Fig. 167, B-Line B3151, or equal
41	Single pipe roll	Anvil Fig. 171, B-Line B3114, or equal
43	Adjustable roller hanger with swivel	Anvil Fig. 181, B-Line B3110, or equal
44	Pipe roll, complete	Anvil Fig. 271, B-Line B3117SL, or equal

3. Pipe hangers and supports shall be carbon steel (ASTM A36, A575, or A576). Bases, rollers, and anchors shall be steel as described above or may be cast iron

(ASTM A48). Pipe clamps shall be steel as described above or may be malleable iron (ASTM A47).

**C. Offset Pipe Clamp**

C.A.1 Anvil Figure 103 or equal. Material shall be Type 316 stainless steel.

**D. Miscellaneous Pipe Supports and Hangers**

1. Pipe Anchor Chair: Anvil Figure 198 or equal.
2. One Hole Clamp: Anvil Figure 126 or equal.
3. Roller Chair: Anvil Figure 175 or equal.

**E. Steel Channel Framing System**

1. Steel channel frames shall be 1 5/8 inches wide by 1 5/8 or 3 1/4 inches high by 12-gauge metal thickness, unless otherwise shown in the drawings. Material shall conform to ASTM A36, A570 (Grade 33 minimum), or A653 unless stainless steel is indicated in the drawings. Stainless steel shall be Type 304. One side of the channel shall have a continuous open slot with intumed clamping ridges. Maximum allowable stress under any combination of applied uniformly distributed loads and concentrated loads shall not exceed those recommended in the AISC or AISI. Deflection shall not exceed 1/240 of span. Use multiple back-to-back channels to achieve these criteria if single channels are not sufficient. Products: Unistrut P1000 or P5000 Series, B-Line B11 or B22 Series, or equal.
2. Steel channels shall be hot-dipped galvanized per ASTM A153.
3. Nuts shall be machined and case hardened. Provide rectangular nuts with the ends shaped to permit a quarter turn crosswise in the framing channel. Provide two serrated grooves in the nut to engage the intumed edges of the channel.
4. Pipe clamps (including attachment screws and nuts) shall be Unistrut P1100 or P2000 Series, B-Line B2000 Series, or equal. Material shall be Type 316 stainless steel.
5. Hanger rods for trapezes shall be carbon steel (ASTM A36, A575, or A576) unless stainless steel is indicated in the drawings. Stainless steel hanger rod material shall comply with ASTM A276, Type 304.
6. Accessory fittings and brackets shall be the same material as the channel or trapeze. Provide coating on carbon steel fittings and brackets as specified for the channels and frames.
  - a. Flat Plate Fittings: Unistrut P1065, P1066, P1925; Superstrut AB-206, AB-207; or equal.
  - b. Post Bases: Unistrut P2072A, Superstrut AP-232, or equal.

- c. 90-Degree Brackets: Unistrut P1326, P1346; Superstrut AB-203; or equal.
  - d. Rounded-End Flat Plate Fittings: Unistrut P2325, Superstrut X-240, or equal.
7. Parallel pipe clamps shall be Unistrut P1563 through P1573, Superstrut AB-719, or equal. Material shall be Type 304 stainless steel.

**F. FRP Channel Framing System**

- 1. FRP pipe hangers and supports shall be Aickinstrut, Inc., or equal.
- 2. Material properties shall be as follows:

Longitudinal Direction	
Ultimate Tensile (psi)	35,000 minimum
Ultimate Compressive (psi)	35,000 minimum
Ultimate Flexural (psi)	35,000 minimum
Tensile Modulus (psi)	$3.0 \times 10^6$ minimum
Flexural Modulus (psi)	$2.0 \times 10^6$ minimum
Ultimate Shear Strength (psi)	6,000 minimum
Izod Impact (ASTM D256) ft-lb/inch notch	30 minimum
Transverse Direction	
Ultimate Tensile (psi)	10,000 minimum
Ultimate Compressive (psi)	20,000 minimum
Ultimate Flexural (psi)	14,000 minimum
Tensile Modulus (psi)	$1.0 \times 10^6$ minimum
Compressive Modulus (psi)	$1.4 \times 10^6$ minimum
Flexural Modulus (psi)	$1.0 \times 10^6$ minimum
Ultimate Shear Strength (psi)	5,500 minimum
Ultimate Bearing Stress (psi)	35,000 minimum
Izod Impact, ft-lb notch	5 minimum
Hardness	
Barcol Test	50 minimum

- 3. Glass fiber reinforced composites and plastic products shall have a flame spread rating of 25 or less when tested per ASTM E84.
- 4. Channel framing shall be 1 5/8 inches deep by 1 5/8 inches wide and shall be made using vinylester resin equal to Ashland 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. 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.

5. Channel framing connections shall be made with vinylester glass fiber composite nuts, bolts, all threaded rods, channel fittings, bases, and hanger assemblies. Nuts, bolts, and rods shall be Aickinstrut 4200 series, Strut Tech PVCG, or equal. Channel fittings shall be Aickinstrut 2800 style or equal.
6. 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.
7. Clevis hangers shall be made with vinylester glass fiber and be Aickinstrut 1500 series or equal.
8. Hanger rods for trapezes shall be carbon steel (ASTM A36, A575, or A576) unless stainless steel is indicated in the drawings. Stainless steel hanger rod material shall comply with ASTM A276, Type 304.

**G. Neoprene Isolating Sleeves for Metal Pipe 6 Inches and Smaller**

C.A.2 Unistrut P2600, B-Line "Vibrocushion," or equal.

**H. Anchor Bolts and Screws**

C.A.3 Anchor bolts and screws for attaching pipe supports and hangers to walls, floors, ceilings, and roof beams shall be Type 316 stainless steel, ASTM A276 or F593. Nuts shall be Type 316 stainless steel, ASTM A194, Grade 8M or ASTM F594, Type 316 stainless steel.

**PART 3 EXECUTION**

**A. Pipe Hanger and Wall Support Spacing**

C.A.4 Install pipe hangers and wall supports on horizontal and vertical runs at the spacing shown or detailed in the drawings. Provide hanger rods (for horizontal runs) and wall supports of the sizes shown or detailed in the drawings. If no spacing or rod sizes are given in the drawings or in the specifications for a particular piping system, use the following:

1. Pipe Hanger and Wall Support Spacing for Ductile-Iron, Stainless Steel (Sections 40 20 40, 40 20 76):

<b>Pipe Size (inches)</b>	<b>Maximum Support or Hanger Spacing (feet)</b>	<b>Minimum Rod Size (inches)</b>
3/8 and smaller	4	3/8
1/2 through 1	6	3/8
1 1/4 through 2	8	3/8
2 1/2 and 3	10	1/2
3 1/2 and 4	10	5/8
6	12	3/4
8	12	7/8
10 and 12	14	7/8
14 and 16	16	1
18	15	1
20 through 24	9	1
30	6	1

2. Pipe Hanger or Wall Support Spacing for PVC Pipes (Section 402090):

<b>Pipe Size (inches)</b>	<b>Maximum Support or Hanger Spacing (feet)</b>	<b>Minimum Rod Size (inches)</b>
3/4	4	3/8
1	4	3/8
1 1/2	5	3/8
2	5	3/8
2 1/2	5	1/2
3	6	1/2
4	6	5/8
6	7	3/4
8	7	7/8

3. Pipe Hanger or Wall Support Spacing for Copper Tubing and Pipe (Section 402022):

<b>Pipe Size (inches)</b>	<b>Maximum Support or Hanger Spacing (feet)</b>	<b>Minimum Rod Size (feet)</b>
1 and smaller	4	3/8
1 1/4 through 2	6	3/8
2 1/2 through 3	8	1/2

4. Pipe Hanger or Wall Support Spacing for Polypropylene Pipe (Sections 402455):

Pipe Size (inches)	Maximum Hanger or Support Spacing (feet)	Minimum Rod Size (inches)
1	3	3/8
1 1/2	4	3/8
2	5	3/8
3	6	1/2
4	6	5/8
6	7	3/4
8	8	7/8
10	9	7/8
12	10	7/8
14 to 16	10	1
18	10	1
20 to 24	9	1
30	6	1

5. Pipe Hanger or Wall Support Spacing for Stainless Steel Tubing (Sections 402078):

Tube Outside Diameter (inches)	Maximum Hanger or Support Spacing (feet)	Minimum Rod Size (inches)
1/8 to 1/4	2	3/8
5/16 to 1/2	3	3/8
5/8 to 7/8	4	3/8
1 to 2	6	3/8

**B. Pipe Support Spacing for Supports on Top of Slabs or Grade**

C.A.5 Install pipe supports on horizontal runs at the spacing shown or detailed in the drawings. Provide supports of the type shown or detailed in the drawings. If no spacings are given in the drawings or in the specifications for a particular piping system, use the following:

1. Pipe Support Spacing for Steel and Ductile-Iron Pipe (Sections 40 20 40 and 40 20 76):

<b>Pipe Size (inches)</b>	<b>Maximum Support Spacing (feet)</b>
3/8 and smaller	4
1/2 through 1	6
1 1/4 through 2	8
2 1/2 and 3	10
3 1/2 and 4	10
6	12
8	12
10 and 12	14
14 and 16	16
18	16
20 through 24	18
30	18

2. Pipe support spacing for other pipe materials shall be the same as described above in paragraph entitled "Pipe Hanger and Wall Support Spacing."

### **C. Installing Pipe Hangers and Supports**

1. Provide separate hangers or supports at each valve. Provide one hanger or support around each end of the valve body or on the adjacent connecting pipe within one pipe diameter of the valve end. Provide additional hangers or supports to relieve eccentric loadings imposed by offset valve actuators.
2. Provide separate hangers or supports at each pipe elbow, tee, or fitting. Provide separate hangers or supports on both sides of each nonrigid joint or flexible pipe coupling.
3. Adjust pipe hangers per MSS SP-89, paragraph 10.6.
4. Install leveling bolts beneath support baseplates. Provide 1-inch thick grout pad beneath each base.
5. Install piping without springing, forcing, or stressing the pipe or any connecting valves, pumps, and other equipment to which the pipe is connected.

### **D. Installing Steel and FRP Channel Frames**

1. Use 1-5/8-inch-high channel frames unless 3-1/4-inch is needed to provide clearance from walls. Use multiple back-to-back channels if additional clearance is needed.
2. Seal the ends of cut FRP channel frames with the channel manufacturer's sealant or resin.

**E. Installing Neoprene Isolating Sleeves**

C.A.6 Install a sleeve around each metal pipe 6 inches and smaller at the point of bearing or contact with the pipe hanger or support.

**F. Painting and Coating**

1. Grind welds of fabricated steel pipe supports smooth, prepare surface by sandblasting, and apply coating system.
2. Paint exposed pipe hangers and supports to match the color of the adjacent wall using per Section 09 90 00. If the adjacent wall is not painted, paint the hangers and supports to match color code of the largest pipe on the support.
3. Coat submerged pipe hangers and supports per Section 09 90 00.

**END OF SECTION**



## **SECTION 40 07 75**

### **EQUIPMENT, PIPING, DUCT, AND VALVE IDENTIFICATION**

#### **PART 1 GENERAL**

##### **A. Description**

This section includes materials and installation of markers, labels, and signs for pipes, ducts, and valves; for mechanical equipment; for hazardous materials warnings; and for miscellaneous plant services.

##### **B. Submittals**

1. Submit shop drawings in accordance with Section 01 33 00.
2. Submit manufacturer's catalog data and descriptive literature describing materials, colors, letter size, and size of labels.

#### **PART 2 MATERIALS**

##### **A. Labels for Exposed Piping**

1. Labels for piping shall bear the full piping system name as shown in the Piping Schedule in the drawings. Provide separate flow directional arrows next to each label. Color, size, and labeling shall conform to ANSI A13.1 and Z535.1. Labels for piping inside buildings shall be vinyl cloth: W. H. Brady Co. B-500 vinyl cloth, Seton Name Plate Corporation Pipe Markers, or equal. Labels for piping located outdoors shall be weather- and UV-resistant acrylic plastic and shall be W. H. Brady Co. B-946, Seton Name Plate Corporation Pipe Markers, or equal.
2. Alternatively, provide preprinted, semirigid, snap-on, color-coded pipe markers. Color, size, and labeling shall conform to ANSI A13.1 and Z535.1. Label shall cover 360 degrees (minimum). Labels shall be fabricated of weather- and UV-resistant acrylic plastic. Labels shall be Seton Nameplate Corporation SetMark pipe marks or equal.

##### **B. Labels for Exposed Valves**

Provide each valve with an identification tag. Tag shall be 2-inch-square or circular aluminum or 1/16-inch-thick fiberglass: W. H. Brady B-60, Seton Name Plate Corp. Series SVT, or equal. PVC tags shall have black-filled letters. Tag shall show the valve tag number and/or name or designation as given in the drawings.

##### **C. Labels for Mechanical Equipment**

Provide a label for each pump, blower, compressor, tank, feeder, flocculator, flash mixer, clarifier mechanism, or other piece of mechanical equipment. Label shall show the equipment name and tag number as shown in the drawings. Labels shall be 1 1/2 inches

(minimum) by 4 inches (minimum) brass, aluminum, or 1/8-inch-thick fiberglass tags: Brady B-120 Fiber-Shield, Seton Style 2065, or equal.

**D. Labels for Automatic Start/Stop Equipment**

Provide a sign reading "CAUTION--EQUIPMENT STARTS AND STOPS AUTOMATICALLY" on each piece of equipment listed below. Signs shall be pressure-sensitive vinyl with adhesive for application to equipment. Signs mounted on adjacent walls are also acceptable. Size shall be 10 inches by 7 inches minimum. Products: Seton, Brady, or equal.

Equipment Type	Location	Tag Number
High Service Pumps	HSP Building	

**E. Hazardous Materials Warning and Danger Signs**

1. Provide hazardous materials warning diamond signs complying with NFPA 704. Size shall be 10 inches square. Wall signs shall be 1/8-inch-thick fiberglass: Brady B-120 Fiber-Shield or equal. Signs attached to tanks, cabinets, or pieces of equipment shall be self-adhesive vinyl cloth: Brady B-946 or equal. Provide signs at the following locations:

Room No.	Tag Number	Tank or Equipment	
		Location	Chemical

2. Provide signs reading "DANGER" followed by the name of the chemical, gas, or hazard. Size shall be 10 inches by 14 inches. Signs shall be 1/8-inch-thick fiberglass: Brady B-120 or equal. Provide signs at the following locations:

Room No.	Sign Location	Name of Hazardous Material

**F. Labels for Exposed Ventilation Ducts**

Identify air supply, return exhaust, intake, and relief ductwork with duct markers, showing ductwork service and direction of flow. Signs shall be pressure-sensitive vinyl with adhesive for application to ducts and duct insulation. Size shall be 10 inches by 7 inches minimum. Products: Seton, Brady, or equal.

**G. Underground Plastic Warning Tape for Metallic Pipe**

Provide permanent, bright-colored, continuous-printed plastic tape, intended for direct burial service, not less than 6 inches wide by 3.5 mils thick. Provide tape with printing

which most accurately indicates type of service of buried pipe. Provide the following colored tape for the various piping services:

<b>Service</b>	<b>Color</b>
Cable TV	Orange
Fiber Optic	Orange
Chemical	Yellow
Electric	Red
Fuel Oil, Gasoline	Yellow
Gas	Yellow
Reclaimed Water	Violet
Sewer	Green
Telephone	Orange
Water	Blue
Oxygen	Yellow

#### **H. Underground Detectable Metallic Pipe Warning Tape for Nonmetallic Pipe**

Provide permanent, bright-colored, continuous-printed tape consisting of an aluminum or steel foil sheathed in a plastic laminate, not less than 2 inches wide by 3 mils thick. Provide tape with printing which most accurately indicates type of buried service. Provide the following colored tape for the various piping services:

<b>Service</b>	<b>Color</b>
Cable TV	Orange
Fiber Optic	Orange
Chemical	Yellow
Electric	Red
Fuel Oil, Gasoline	Yellow
Gas	Yellow
Reclaimed Water	Violet
Sewer	Green
Telephone	Orange
Water	Blue
Oxygen	Yellow

## **PART 3 EXECUTION**

### **A. Installing Pipe Labels**

1. Provide label and flow arrow at each connection to pumps or other mechanical equipment, at wall boundaries, at tees and crosses, and at 20-foot centers on straight runs of piping.
2. On piping having external diameters less than 6 inches (including insulation, if any), provide full-band pipe markers, extending 360 degrees around pipe at each location.
3. On piping having external diameters of 6 inches and larger (including insulation, if any), provide either full-band or strip-type pipe markers but not narrower than three times letter height (and of required length), fastened by one of the following methods:
  - a. Laminated or bonded application of pipe marker to pipe or insulation.
  - b. Strapped-to-pipe or insulation application of semirigid type with Type 304 or 305 stainless steel bands.

### **B. Installing Valve and Equipment Labels**

1. Attach labels to the valve or piece of equipment with Type 304 or 316 stainless steel chains or wires.
2. Attach valve labels to the valve handwheels. If the valve has no handwheel, attach the label to the valve by tying the tag wire or chain around the operating shaft or nut.

### **C. Installing Miscellaneous Signs**

Attach per sign manufacturer's recommendations and per OSHA requirements.

### **D. Installing Wall and Door Signs**

Attach to walls and doors using epoxy adhesive.

### **E. Installing Labels for Automatic Start/Stop Equipment and Hazardous Materials Warning Signs for Equipment**

1. Attach signs for exposed equipment directly to the equipment.
2. Attach signs for sump pumps on the adjacent wall.

### **F. Installing Ventilation Ductwork Labels**

1. In each space where ductwork is exposed or concealed only by a removable ceiling system, locate signs near points where ductwork originates or continues into concealed enclosures (shaft, underground, or similar concealment) and at 20-foot spacings along exposed runs.

2. Provide markers on each access door in ductwork and housings, indicating purpose of access.
3. Assure that all identification labels are clearly visible.

**G. Installing Underground Plastic Warning Tape for Metal Pipe**

During backfilling of each exterior underground piping system, install continuous underground-type plastic line marker, located directly over buried line at 6 to 8 inches above the top of the pipe. Where multiple small lines are buried in common trench and do not exceed overall width of 16 inches, install single line marker.

**END OF SECTION**

## **SECTION 40 20 35**

### **PLASTIC HOSE AND TUBING**

#### **PART 1 GENERAL**

##### **A. Description**

This section includes materials and accessories for rubber and plastic hoses and tubing:

1. Flexible nylon-reinforced clear PVC tubing for water and chemical service.

##### **B. Submittals**

1. Submit shop drawings in accordance with Section 01 33 00.
2. Submit manufacturer's catalog data and descriptive literature for hoses, tubing, and couplings. Show pressure rating and materials of construction for tube, carcass, and cover. Show design of hose and tubing ends.
3. Submit procedures for making up insert fittings and joints and compression fittings and joints.

#### **PART 2 MATERIALS**

##### **A. Flexible Nylon-Reinforced Clear PVC Tubing (1/8 Through 2 Inches)**

1. Provide clear PVC tubing with nylon braid reinforcement embedded in the wall of the tubing with smooth inside bore and smooth outside. Minimum operating pressure shall be 200 psi for tubing 3/4 inch and smaller, 150 psi for 1 inch, 100 psi for 1-1/4 and 1-1/2 inches, and 75 psi for 2 inches. Burst pressure shall be at least 4.0 times the specified operating pressure. Tubing shall be NSF 61 listed for potable water service and suitable for 12.5% concentration of sodium hypochlorite. Join tubing to pipe with a single-barb male adapter fitting. Secure tubing to the fitting with a stainless steel hose clamp. Connect tubing sections by means of single or multi-barb thermoplastic couplings with titanium hose clamps.
2. Products: Kuriyama "Kuri-Tech Clearbraid K3130 Series BF Heavy Wall PVC Food and Beverage Hose", Ryan-Herco "Herco-Braid Heavy Duty Food Grade Clear PVC Tubing" or equal.

##### **B. Insert Fittings for Tubing**

1. When insert fittings are specified, they shall be of the compression type fitting. The completed tubing and fitting system shall have the same operating pressure ratings as specified for the tubing.
2. Rigid PVC pipe to PVC tubing transition fittings shall be solvent cement socket by compression style fittings.

### **C. Quantities**

See drawings for total tubing lengths or quantities. Provide tubing in minimum 100-foot lengths or sections.

## **PART 3 EXECUTION**

### **A. Storage**

Store hoses in a protected room or building at a temperature range of 50°F to 70°F. Do not store hoses near sources of heat such as radiators or base heaters. Do not store hoses so that they are exposed to sunlight; provide covers to protect hoses from sunlight and from fluorescent or mercury lamps. Storage areas shall be cool and dark, free of dampness and mildew. Protect hoses from rodents and insects. Store hose that is shipped in coils so that the coils are in a horizontal plane.

### **B. Hose Installation**

Prior to assembling hose and components such as fittings and connectors, carefully examine components for correct material, style, size, catalog number, and length. Examine hoses for cleanliness, obstructions, blisters, cover looseness or damage, kinks, cracks, cuts, or any other visible defects. Inspect the fitting and sealing surfaces for burrs, nicks, corrosion, or other imperfections. Do not use any components that display such signs of nonconformance. No couplings (joints) shall be used between chemical junction boxes.

### **C. Service Conditions**

1. Service and design conditions for hoses and tubing shall be as follows:
  - a. Type: 8.
    - (1) Minimum Working Pressure:
    - (2) Material Conveyed: 12.5% Sodium Hypochlorite
    - (3) Hose or Tubing Size: See drawings.

### **D. Field Testing**

1. Hydrostatically test hose for leakage in accordance with Section 40 05 15. Leakage shall be zero. Perform pressure testing using water. Fill hoses with water with the outlet ends raised and any outlet valves open to allow the complete removal of air. When the air has been expelled, close outlet valves or install blind flanges or plugs on the outlets and lower the raised ends. Raise the pressure to the specified test pressure. Examine hose for leaks at couplings, fitting slippage, or any indication of weakness in the hose structure. Remove and replace the hose or couplings or fittings if there are any signs of leakage, fitting slippage, or weakness in the hose. Drain the water from the hoses after completion of the pressure tests. See the Piping Schedule in the drawings for test pressures.

2. After completing the pressure testing and draining the water out of the hoses and before filling the hoses with the specified chemicals, flush the Type 8 hoses with alcohol to remove moisture. Then blow clean, dry, oil-free air having a dew point of at least 40°F through the hoses. Circulate the air through the hoses until the exiting air has the same dew point as the applied air. Dispose of the effluent from the hoses in accordance with local water quality requirements.

**END OF SECTION**



## SECTION 40 20 40

### DUCTILE IRON PIPE AND FITTINGS

#### PART 1 GENERAL

##### 1.01 Description:

- A. Provide and test ductile iron pipe, fittings and appurtenances as specified. Ductile iron pipe shall be limited to those areas identified and detailed on the drawings. Generally only ductile iron fittings and castings are being used on this project.
- B. Options:
  - 1. For buried exterior pipelines provide push-on joint pipe.
    - a. Provide restrained push-on pipe as specified
    - b. Provide either restrained push-on joint fittings as specified and indicated or provide mechanical joint fittings with restraint system as specified herein
  - 2. For piping exposed as in buildings and galleries, provide flanged or rigid-joint, grooved-coupled pipe and fittings.
  - 3. Cast iron pipe and fittings are not acceptable.

##### 1.02 REFERENCES”

- A. American Society of Mechanical Engineers (AMSE):
  - 1. [B16.1](#): Cast-Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
  - 2. [B16.21](#): Nonmetallic Flat Gaskets for Pipe Flanges.
  - 3. [B16.42](#): Ductile Iron Pipe Flanges and Flanged Fittings.
  - 4. [B31.1](#): Power Piping.
- B. American Society for Testing and Materials (ASTM):
  - 1. [A240](#): Specification for Heat Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels.
  - 2. [A307](#): Carbon Steel Bolts and Studs, 60,000 psi Tensile.
  - 3. [A380](#): Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment and Systems.
  - 4. [A530](#): Specification for General Requirements for Specialized Carbon and Alloy Steel Pipe.

5. [A774](#): Specification for As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures.
6. [A778](#): Specification for Welded, Unannealed Austenitic Stainless Steel Tubular Products.

C. American Water Works Association (AWWA):

1. [A21.4](#): Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. [A21.10](#): Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and Other Liquids.
3. [A21.11](#): Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe Fittings.
4. [A21.15](#): Flanged Ductile-Iron Pipe with Threaded Flanges.
5. [A21.50](#): Thickness Design of Ductile-Iron Pipe.
6. [A21.51](#): Ductile-Iron Pipe, Centrifugally Cast in Metal Molds, or Sand-Lined Molds, for Water or Other Liquids.
7. [A21.53](#): Ductile-Iron Compact Fittings, 3-in through 16-in. for Water and Other Liquids.

D. Fluid Sealing Association: Technical Handbook.

**1.03 SUBMITTALS:**

A. Submit the following in accordance with General Conditions and Section 01 33 00:

1. Pipe manufacturer's technical specification and product data.
2. Certified shop and erection drawings. Contractor shall submit electronic files of the piping layout including the following.
  - a. Pipe layouts in full detail.
  - b. Location of hangers and supports.
  - c. Location and type of anchors.
  - d. Location of couplings and expansion joints.
  - e. 1/2-inch = 1 foot-0 inch (25) scale details of all wall penetrations and special fittings.
  - f. Schedules of pipe, fittings, special castings, couplings, expansion joints and other appurtenances.

3. Certificates: Sworn certificates in duplicate showing compliance with material used and shop tests performed.
4. Catalog cuts and technical data for expansion joints, couplings, gaskets, pipe supports and other accessories.
5. Brochures and technical data on coatings and linings and proposed method of application.
6. Manufacturer's descriptive literature and technical data on insulation and proposed method of installation.

B. Material Certification:

1. Provide certification from the pipe and fittings manufacturer that the materials of construction specified are recommended and designed for the service conditions specified and indicated. If materials other than those specified are proposed based on incompatibility with the service conditions, provide technical data and certification that the proposed materials are recommended and designed for the service conditions specified and indicated including an installation list of a minimum of five (5) installations in operation for a minimum of five (5) years. Provide proposed materials at no additional cost to the Owner.
2. Where materials are not specified, provide technical data and certification that the proposed materials are recommended and designed for the service conditions specified and indicated.

C. A copy of the contract mechanical process, civil and structural drawings, with addenda that are applicable to the equipment specified in this section, marked to show all changes necessary for the equipment proposed for this specification section. If no changes are required, mark all drawings with "No changes required" or provide a statement that no changes are required.

1. Failure to include all drawings or a statement applicable to the equipment specified in this section will result in submittal return without review until a complete package is submitted.
2. A copy of this specification section with addenda and all referenced specification sections with addenda, with each paragraph check-marked to indicate specification compliance or marked and indexed to indicate requested deviations and clarifications from the specified requirements.
  - a. If deviations and clarifications from the specifications are indicated, therefore requested by the Contractor, provide a detailed written justification for each deviation and clarification.
  - b. Failure to include a copy of the marked-up specification sections and or the detailed justifications for any requested deviation or clarification will result in submittal return without review until marked up specifications and justifications are submitted in a complete package.

#### **1.04 QUALITY ASSURANCE:**

- A. Provide in accordance with Section 01 43 00 and as specified.
- B. Provide manufacturer's certification in writing, that materials meet or exceed minimum requirements as specified.
- C. Inspect and test at foundry according to applicable standard specifications.
- D. Owner reserves right to inspect and test by independent service at manufacturer's plant or elsewhere at his own expense.
- E. Visually inspect before installation.
- F. Job Conditions:
  - 1. Coordinate dimensions and drillings of flanges with flanges for valves, pumps and equipment to be installed in the piping systems.

#### **1.05 DELIVERY, STORAGE AND HANDLING:**

- A. During loading, transportation and unloading, prevent damage to pipes and fittings. Load and unload each pipe under control at all times. Under no circumstances will a dropped pipe be used unless inspected and accepted by Owner. Place skids or blocks under each pipe in the shop and securely wedge pipe during transportation.

### **PART 2 PRODUCTS**

#### **2.01 PIPE:**

- A. Ductile Iron:
  - 1. Design conforming to AWWA A21.50.
  - 2. Manufacture conforming to AWWA A21.15 or AWWA A21.51.
  - 3. Thickness class, unless otherwise indicated or specified:
    - a. Minimum Thickness Class 52.
    - b. Minimum thickness Class 53 for use with threaded flanges.
    - c. Minimum thickness Class 53 for use with flanged pipe.

#### **2.02 PIPE FOR USE WITH COUPLINGS:**

- A. As specified above except ends shall be plain.
- B. With bolted split sleeve couplings, ends cast or machined at right angles to axis.
- C. With grooved type coupling:

1. Ductile-Iron of thickness class specified above.

### **2.03 FITTINGS:**

- A. Fittings shall conform to ANSI Specification A21.10 (AWWA C110), A21.11 (AWWA C111), A21.15 (AWWA C115), and/or A21.53 (AWWA C153), at least Class 150 and match piping class.
- B. Provide all bell push-on or mechanical-joint fittings unless otherwise indicated or specified.
- C. Face and drill flanged fittings conforming to AWWA A21.10 except special drilling or tapping for correct alignment and bolting.
- D. If flanged fittings are not available under AWWA A21.10 provide fittings conforming to ASME B16.1 in 125 lb. pressure class.
- E. Provide standard base fittings where indicated.
- F. All fittings shall be UL/FM approved and shall conform to NSF Standard 61 as applicable.

### **2.04 NONSTANDARD FITTINGS:**

- A. Acceptable design.
- B. Same diameter and thickness as standard fittings.
- C. Manufactured to meet requirements of same specifications as standard fittings except for laying length and types of ends.

### **2.05 ADAPTERS:**

- A. Furnish and install for joining pipe of different types, unless solid sleeves indicated.
  1. Provide ends conforming to above specifications for the correct type of joint, to receive adjoining pipe.
  2. Joining two classes of pipe may be of lighter class provided annular space in bell-and-spigot type joints sufficient for jointing.

### **2.06 CONNECTIONS – TAPPED:**

- A. Provide service saddles for all taps for lines 24-inch (600 mm) and smaller.
  1. Body: Ductile iron ASTM A395 or Bronze.
  2. Straps and Hardware: Type 316 stainless steel.
- B. For 30-inch and larger provide watertight joint with adequate strength against pullout. Use only tapered thread taps.

1. Maximum size of taps in pipe or fittings without bosses not to exceed that listed in table of Appendix to AWWA A21.51 based on: 2 full threads.
2. Where size of connection exceeds that given above for pipe, provide boss on pipe barrel or use tapping saddle. Make tap in flat part of intersection of run and branch of tee or cross, or connect by means of tapped tee, branch fitting and tapped plug or reducing flange, or tapping tee and tapping valve, or permitted.
3. Provide taps and piping for gauges and pressure sensing instruments in accordance with ANSI/HI standards so that there are no erroneous readings.

## **2.07 STANDARD LINING AND COATING:**

- A. Inside of pipe and fittings: Provide double thickness cement lining and bituminous seal coat conforming to AWWA A21.4.
- B. Outside of pipe and fittings within structures: Provide coating system No. 10 per specification section 09 90 00.
- C. Outside surfaces of castings to be encased in concrete: No coating.
- D. Machined surfaces cleaned and coated with rust-preventative compound at shop.
- E. Outside of buried pipe and fittings: Standard bituminous coating conforming to AN Standard/AWWA C151.

## **2.08 GASKETS, BOLTS, AND NUTS:**

- A. Provide ring or full face synthetic rubber gaskets for flanged joints and neoprene faced phenolic for insulating gaskets in accordance with AWWA A21.11 and ASME B16.21.
  1. 1/8 inch (3 mm) thick.
- B. Make flanged joints with:
  1. Bolts.
  2. Bolt studs with nut on each end.
  3. Studs with nuts where flange is tapped.
  4. Plastic bolt sleeves and washers for insulating joints.
- C. Number and size of bolts conform to same ANS as flanges.
- D. Provide bolts and nuts, except as specified or indicated, Grade B, ASTM A307.
- E. Provide bolt studs and studs of same quality as machine bolts.
- F. Provide Type 316 stainless steel bolts, washers and nuts in the following areas:
  1. Submerged

2. Wet Wells
3. Chemical Area
4. Piping exposed to weather

## **PART 3 EXECUTION**

### **3.01 HANDLING AND CUTTING:**

- A. Mark pipe and fittings "Rejected" and remove from site when cracked or has received a severe blow.
- B. If permitted, cut on sound barrel at a point at least 12 inch (300 mm) from visible limit of crack, at Contractor's expense.
- C. Machine cut with milling type cutters, knives, or saws. Snap cutters, torch, or hammer and chisel NOT ALLOWED. Examine for possible cracks.
- D. Chamfer cut ends if used for push-on joints.
- E. Do not cut glass lined pipes.

### **3.02 INSTALLATION:**

- A. Visually inspect before installation.
- B. Ensure pipelines parallel to building walls wherever possible. Install piping to accurate lines and grades. Where temporary supports are used, ensure rigidity to prevent shifting or distortion of pipe. Provide for expansion where necessary.
- C. Pitch piping toward low points. Provide for draining low points.
- D. Before assembly, remove dirt and chips from inside pipe and fittings.
- E. Piping Support: Provide in accordance with Section 40 23 19.01.
- F. Pipe and Fittings:
  1. Remove and replace defective pieces.
  2. Clear of all debris and dirt before installing and keep clean until accepted.
  3. Lay accurately to lines and grades indicated or required. Provide accurate alignment, both horizontally and vertically.
- G. Temporary Plugs: When pipe laying not in progress, close open ends of pipe with temporary watertight plugs. If water in trench, do not remove plug until danger of water entering pipe passed.
- H. Appurtenances: Set valves, fittings and appurtenances as indicated.

### **3.03 JOINTS AND COUPLINGS:**

#### **A. Flanged Joints:**

1. Make up tight.
2. Do not put strain on nozzles, valves, and other equipment.

#### **B. Flexible Joints:**

1. Clean and dry before assembly.
2. Place gaskets, rings, glands and followers in position in back of spigot ball.
3. Coat ball and socket with thin film of lubricant conforming to joint manufacturer's standards.
4. Insert ball and seat in socket. Seat gasket against ball.
5. Boltless joints:
  - a. Assemble retainer rings and glands conforming to manufacturer's standard.
  - b. Lock in place with lead strips.

#### **C. Tapped Connection:**

1. Drill and tap normal to longitudinal axis.
2. Drilled by skilled mechanics using proper tools.
3. Use only tapered threads.

### **3.04 FIELD TESTING:**

#### **A. Provide in accordance with Section 40 05 15.**

#### **B. Clean of all dirt, dust, oil, grease and other foreign material, before conducting pressure and leakage tests.**

#### **C. Pressure and Leakage Tests:**

1. Conduct combined pressure and leakage test in pipelines.
2. Furnish and install temporary testing plugs or caps; pressure pumps, pipe connections, meters, gages, equipment, and labor.
3. Test when desired and comply with specifications.
4. Test pipelines in excavation or embedded in concrete before backfill or placing of concrete and test exposed piping before field painting.



5. Fill section of pipe with water and expel air. If hydrants or blowoffs are not available at high points for releasing air, make necessary taps and plug after test completion.
6. Maintain section full of water for 24 hours before conducting combined pressure and leakage test.
7. Conduct pressure and leakage test consisting of first raising water pressure (based on elevation of lowest point of section under test and corrected to gage location) to pressure in psi numerically equal to pipe pressure rating, but not more than 150 psi.
8. If unable to achieve and maintain specified pressure for one hour with no additional pumping, section fails test.
9. If section fails pressure and leakage test, locate, uncover, and repair or replace defective pipe, fitting, or joint, at no additional expense and without time extension. Conduct additional tests and repairs until section passes test.
10. Modify test procedure only if permitted by Owner.

**3.05 FIELD PAINTING:**

- A. Provide in accordance with Section 09 90 00.

**3.06 DISINFECTING AND FLUSHING:**

- A. Disinfect potable water lines using procedures and materials conforming to AWWA C651.
- B. Dosage to produce minimum 10 ppm after minimum of 24 hour contact period.
- C. After treatment, flush with clean water until residual chlorine content less than 0.2 ppm.
- D. Prevent contamination of water in existing water mains. Neutralize chlorine content of water used in disinfecting and flushing accordance with AWWA C651.

**END OF SECTION**

**SECTION 40 20 78**  
**STAINLESS STEEL TUBING**

**PART 1 GENERAL**

**1.01 Description**

- A. This section includes materials and installation of stainless steel tubing and fittings 2 inches in diameter and smaller.
- B. Stainless steel pipe may be substituted for stainless steel tubing. However, tubing may not be substituted for pipe.
- C. Submit shop drawings in accordance with the General Conditions and Section 01 33 00.
- D. Submit materials list showing material of pipe and fittings with ASTM reference and grade. Submit manufacturer's catalog data for swaged fittings and joints.
- E. Submit fitting manufacturer's instructions for assembling fittings and joints.

**PART 2 MATERIALS**

**2.01 Tubing**

- A. Tubing shall conform to ASTM A269, Grade TP 316, seamless. Hardness shall not exceed Rockwell B80. Tube wall thicknesses shall be as follows:

<b>Tube O.D. (inches)</b>	<b>Minimum Wall Thickness (inches)</b>
1/8	0.028
3/16	0.028
1/4	0.028
5/16	0.035
3/8	0.035
1/2	0.042
5/8	0.058
3/4	0.065
7/8	0.072
1	0.083
1 1/4	0.109
1 1/2	0.134
2	0.165

- B. Tubing shall be free of scratches. Tubing shall be suitable for bending and flaring.

- C. Tubing shall be heat-treated, which shall consist of quenching in water or rapidly cooling by other means at a rate sufficient to prevent precipitation of carbides, as demonstrated by the capability of passing practice ASTM A262, Practice E (Supplementary Requirement S4 in ASTM A269).

## **2.02 Fittings and Joints**

- A. Fittings and joints shall be of the SWAGelok type as manufactured by Crawford Fitting Company, utilizing a nut and dual ferrule design to connect to tubing. Fitting and joint material shall comply with ASTM A479, Type 316, or ASTM A182, Grade F316. End connections shall be of the union type.
- B. Joints connecting two straight tubes together shall be of the nut and ferrule union type.

## **2.03 Protective End Caps**

Provide protective end caps on each piece of tubing, completely sealing the piece from contamination during shipment and storage. Provide the same type of seals on each fitting, or ship and store fittings in sealed boxes or containers.

## **2.04 Outlets and Nozzles**

Use a tee with nut and ferrule union ends to connect to the tubing and with an outlet to match the connecting valve or instrument.

## **2.05 Connections to Threaded-End Valves**

When connecting tubing to threaded-end valves, provide tube to female NPT connectors. Provide a threaded Schedule 80S Type 316 stainless steel nipple (ASTM A312, seamless) between the connector and the valve end.

# **PART 3 EXECUTION**

## **3.01 Installing Tubing**

- A. Do not drag tubing out of tube racks. Do not drag tubing across any surface that could scratch it.
- B. Keep tube cutters and saws sharp. Do not cut too deeply with each turn of the cutter or motion of the saw.
- C. Deburr tube ends before inserting into fittings and joints. Clean both the inside and outside of fitting and pipe ends before making up joints. Do not miter joints for elbows or notch straight runs of pipe for tees. Do not kink tubing.
- D. Bends in tubing shall be long sweep. Provide the straight length of tubing recommended by the fitting and joint manufacturer to allow the tube to be inserted into the fitting. Shape bends with shaping tools. Form bends without flattening, buckling, or thinning the tubing wall at any point. Do not use bends to make turns greater than 45 degrees. Use fittings to make turns greater than 45 degrees.

### **3.02 Installing Buried Tubing**

Install in accordance with Section 31 23 33.

### **3.03 Installing Exposed Tubing**

- A. Install tubing without springing, forcing, or stressing the tubing or any adjacent connecting valves or equipment.
- B. Provide pipe hangers and supports as specified in Section 40 07 64.

### **3.04 Installing Fittings and Joints**

- A. Follow the manufacturer's instructions for installing fittings and joints.
- B. For fittings and joints larger than 1 inch, use the manufacturer's hydraulic swaging unit to make up the connections.

### **3.05 Coating Buried Tubing**

Coat buried tubing per Section 09 90 00.

### **3.06 Installing Wrapped or Coated Tubing**

Install buried tubing having wrapped coatings by extending the wrapping to the first joint after entering a building, penetrating a slab, or 6 inches above finished grade. Wrap joints spirally with a minimum overlap of 50% of the tape width.

### **3.07 Field Hydrostatic Testing**

- A. See Section 40 05 15.
- B. Do not allow test water to remain in the tubing for more than five days. Drain and dry the tubing after completing the testing.

**END OF SECTION**

## **SECTION 40 20 90**

### **PVC PIPE, 3 INCHES AND SMALLER**

#### **PART 1 GENERAL**

##### **1.01 Description**

This section includes materials, installation, and testing of PVC pipe and fittings of size 3 inches and smaller for use in process piping having a maximum design pressure of 150 psi and having a maximum design temperature of 105°F.

##### **1.02 Submittals**

- A. Submit shop drawings in accordance with the General Conditions and Section 01 33 00.
- B. Submit materials list showing materials of pipe and fittings with ASTM reference and grade. Submit manufacturer's certification of compliance with referenced standards, e.g., ASTM D1784, D1785, and D2467. Show wall thickness of pipe and fittings. Show fitting dimensions.
- C. Submit data sheets for solvent cement demonstrating compliance with ASTM D2564 and F656.

#### **PART 2 MATERIALS**

##### **2.01 Pipe**

Pipe shall be Schedule 80, Type I, Grade 1 (Class 12454-B), conforming to ASTM D1784 and D1785.

##### **2.02 Fittings**

Fittings shall be Schedule 80 and shall conform to ASTM D2464 for threaded fittings and ASTM D2467 for socket-type fittings.

##### **2.03 Flanges**

PVC flanges shall be of the one-piece solid socket design and shall be made of the same material as the pipe. Pressure rating shall be at least 150 psi at a temperature of 73°F. Minimum burst pressure shall be 500 psi. Flanges shall match the dimensions of ASME B16.5, Class 150, steel flanges for outside diameter, bolt circle, and bolt holes. Do not use Van Stone flanges.

##### **2.04 Unions**

- A. Unions shall have socket-type ends, Viton or EPDM O-rings shall be compatible with the service, and shall be Schedule 80. Material shall be Type I, Grade 1 PVC, per ASTM D1784.

- B. Union connections to other metal piping materials shall comply with MSS SP-107. The fitting end for connection to PVC pipe shall be a female socket. Provide wrought or cast copper tailpieces for connection to copper piping and tubing. Provide Type 316 stainless steel tailpieces for connection to steel piping.

## **2.05 Joints**

Pipe and fitting joints shall be socket welded except where threaded and flanged joints are required to connect to valves and equipment.

## **2.06 Solvent Cement in Other Than Sodium Hypochlorite Service**

Solvent cement for socket joints shall comply with ASTM D2564 and F656.

## **2.07 Solvent Cement in Sodium Hypochlorite Service**

Solvent cement shall be free of silica. Products: IPS "Weld-On" CPVC 724 or Oatey "Lo V.O.C. PVC Heavy Duty Gray," or Spears 24.

## **2.08 Gaskets for Flanges**

See Section 40 05 00.

## **2.09 Bolts and Nuts for Flanges**

See Section 40 05 00.

## **2.10 Lubricant for Stainless Steel Bolts and Nuts**

See Section 40 05 00.

## **2.11 Wye Strainers**

PVC wye strainers shall be manufactured of the same basic material as the pipe, but clear, with 30-mesh screens and Viton seals. Connecting ends shall be the socket type, solvent welded. Provide one spare screen for each strainer.

# **PART 3 EXECUTION**

## **3.01 General**

- A. Do not install PVC pipe when the temperature is below 40°F or above 90°F. Store loose pipes on racks with a maximum support spacing of 3 feet. Provide shades for pipe stored outdoors or installed outdoors until the pipe is filled with water.
- B. Store fittings indoors in their original cartons.
- C. Store solvent cement indoors or, if outdoors, shade from direct sunlight exposure. Do not use solvent cements that have exceeded the shelf life marked on the storage container.

- D. Before installation, check pipe and fittings for cuts, scratches, gouges, buckling, kinking, or splitting on pipe ends. Remove any pipe section containing defects by cutting out the damaged section of pipe.
- E. Do not drag PVC pipe over the ground, drop it onto the ground, or drop objects on it.

### **3.02 Solvent-Welded Joints**

- A. Prior to solvent welding, remove fittings and couplings from their cartons and expose them to the air at the same temperature conditions as the pipe for at least one hour.
- B. Cut pipe ends square and remove all burrs, chips, and filings before joining pipe or fittings. Bevel solvent-welded pipe ends as recommended by the pipe manufacturer.
- C. Wipe away loose dirt and moisture from the inside and outside of the pipe end and the inside of the fitting before applying solvent cement. Clean the surfaces of both pipes and fittings that are to be solvent welded with a clean cloth moistened with acetone or methylethyl ketone. Do not apply solvent cement to wet surfaces.
- D. The pipe and fitting socket shall have an interference fit. Perform a dry fit test at each joint before applying solvent cement. The pipe shall enter the fitting socket between one-third and two-thirds of the full socket depth when assembled by hand.
- E. Make up solvent-welded joints per ASTM D2855. Application of cement to both surfaces to be joined and assembly of these surfaces shall produce a continuous bond between them with visual evidence of cement at least flush with the outer end of the fitting bore around the entire joint perimeter.
- F. Allow at least eight hours of drying time before moving solvent-welded joints or subjecting the joints to any internal or external loads or pressures.
- G. Acceptance criteria for solvent-welded joints shall be as follows:
  - 1. Unfilled Areas in Joint: None permitted.
  - 2. Unbonded Areas in Joint: None permitted.
  - 3. Protrusion of Material into Pipe Bore, Percent of Pipe Wall Thickness: Cement, 50%.

### **3.03 Flanged Joints**

- A. Lubricate carbon steel bolt threads with graphite and oil before installation.
- B. Tighten bolts on PVC flanges by tightening the nuts diametrically opposite each other using a torque wrench. Complete tightening shall be accomplished in stages and the final torque values shall be as shown in the following table:

Pipe Size (inches)	Final Torque (foot-pounds)
1/2 to 1 1/2	10 to 15
2 to 3	20 to 30

### **3.04 Installation of Stainless Steel Bolts and Nuts**

See Section 40 05 00.

### **3.05 Assembling Threaded Joints**

- A. Cut threaded ends on PVC to the dimensions of ASTM F1498. Ends shall be square cut. Follow the pipe manufacturer's recommendations regarding pipe hold-down methods, saw cutting blade size, and saw cutting speed. Gauges, gauge tolerances, and gauging procedures shall comply with ASTM F1498, Sections 7 and 8. Perform field gauging on every field-cut threaded connection.
- B. Pipe or tubing cutters shall be specifically designed for use on PVC pipe. Use cutters manufactured by Reed Manufacturing Company, Ridge Tool Company, or equal.
- C. If a hold-down vise is used when the pipe is cut, insert a rubber sheet between the vise jaws and the pipe to avoid scratching the pipe.
- D. Thread cutting dies shall be clean and sharp and shall not be used to cut materials other than plastic.
- E. Apply Teflon® thread compound or Teflon® tape lubricant to threads before screwing on the fitting.
- F. Assemble threaded flanges and fittings per ASTM F1498, Sections 4, 7, and 8. Do not tighten threaded connections more than two turns past finger tightness for both internal and external threads.

### **3.06 Installing Unions**

Provide unions on exposed piping 3 inches and smaller as follows:

- A. At every change in direction (horizontal and vertical).
- B. 6 to 12 inches downstream of valves.
- C. Every 40 feet in straight pipe runs.
- D. Where shown in the drawings.

### **3.07 Installing Buried Pipe**

- A. Install in accordance with Section 31 23 33 and as follows.
- B. Trench bottom shall be continuous, smooth, and free of rocks. See the details in the drawings for trench dimensions, pipe bedding, and backfill.



- C. After the pipe has been solvent-welded and the joints have set, snake the pipe in the trench per the pipe manufacturer's recommendations in order to allow for thermal expansion and contraction of the pipe.
- D. Do not backfill the pipe trench until the solvent-welded joints have set. Support the pipe uniformly and continuously over its entire length on firm, stable soil. Do not use blocking to change pipe grade or to support pipe in the trench.
- E. Install buried PVC pipe in accordance with ASTM D2774 and the pipe manufacturer's recommendations.

### **3.08 Installing Aboveground or Exposed Piping**

- A. See Section 40 05 00.
- B. Fill empty piping with water and provide temporary shading or other means to keep the surface temperature of the pipe below 100°F.

### **3.09 Painting and Coating**

Coat piping per Section 09 90 00.

### **3.10 Hydrostatic Testing**

Perform hydrostatic testing for leakage in accordance with Section 40 05 15.

**END OF SECTION**

## **SECTION 40 95 00**

### **PROCESS INSTRUMENTATION AND CONTROL SYSTEM (PICS)**

#### **PART 1 GENERAL**

##### **1.01. Scope of Work**

- A. Work includes engineering, installing and furnishing field instruments and modifications to the existing Process Control Panel (PCP) at JEA Arlington Water Treatment Plant (WTP). JEA is henceforth referred to as OWNER.
- B. All programming associated with the PCP equipment shall be performed by OWNER.
- C. The existing PCP shall communicate with the new High Service Pump VFDs and Finished Water Analyzer furnished by SYSTEM SUPPLIER, via a Profibus network.
- D. The work defined in this Specification Section shall be performed by one of the following control panel suppliers listed in the OWNER's list of Approved Suppliers and henceforth referred to as the SYSTEM SUPPLIER:
  - 1. ECS. Contact Ralph Sinn at 904/367-5000.
  - 2. EG Controls. Contact Brian Dail at 904/292-0110.
  - 3. ITG. Contact Dale Young at 904/425-4760.
  - 4. Suncoast. Contact Mark Owens at 904/693-3318.
  - 5. Sun State Systems. Contact Barney Messer at 904/269-2544.
- E. It is the ultimate responsibility of the SYSTEM SUPPLIER to furnish a complete and fully operable PCP that reliably performs the specified functions. It is the intent of these Contract Documents that a single entity (henceforth referred to as the SYSTEM SUPPLIER) have overall responsibility for designing, furnishing, interfacing, adjusting, testing, documenting, and checking out the PICS equipment described in the Contract Documents.
- F. Equipment storage and protection until installed shall follow the storage and handling instructions recommended by the SYSTEM SUPPLIER. Anti-static and winterization requirements shall be per the SYSTEM SUPPLIER's instructions and the SYSTEM SUPPLIER shall periodically verify that these instructions are followed.
- G. The SYSTEM SUPPLIER shall observe and advise on the installation of the PICS to the extent required to certify, with the operational check-out tests, that the equipment will perform as required.
- H. All engineering development required by the SYSTEM SUPPLIER will be in accordance with the Conditions of this Contract.
- I. Equipment found to be defective prior to system acceptance shall be replaced and installed at no additional cost to the OWNER.

### **1.02. Related Work**

- A. Specification Section 26 29 23 “Variable Frequency Drives” defines requirements associated with the equipment to be interconnected with the PLC via Profibus.

### **1.03. Submittals**

- A. Furnish, as prescribed under the General Requirements, all required submittals covering the items included under this section and its associated sections of the work. Provide submittals for the following items:
  - 1. Existing Process Control Panel PCP (ARL1CP-1) Modifications
  - 2. Chlorine Analyzer
  - 3. Pressure Indicating Transmitters
- B. Submit complete, neat, orderly, and indexed submittal packages. Handwritten diagrams are not acceptable and all documentation submittals shall be made using CADD generated utilities.
- C. Partial submittals or submittals that do not contain sufficient information for complete review or are unclear will not be reviewed and will be returned by the ENGINEER as not approved.
- D. Provide all shop drawing submittals electronically in PDF format.
- E. Provide a single PICS shop drawing submittal containing the following:
  - 1. Loop diagrams, consisting of complete wiring and/or plumbing diagrams for each control loop showing all terminal numbers, the location of the dc power supply, the location of any booster relays or common dropping resistors, surge arrestors, etc. The loop diagrams shall meet the minimum requirements of ISA S5.4 plus divide each loop diagram into four areas for identification of element locations: PLC I/O point(s), panel face, back-of-panel, and field, respectively.
  - 2. System interconnect diagram that shows all connections required between component parts of the items covered in this section and between the various other systems specified in this Contract. Number all electrical terminal blocks and field wiring. Identify each line at each termination point with the same number. Do not use this number again for any other purpose in the complete control scheme.
  - 3. Bill of Materials: A list of all components, including all 3<sup>rd</sup> party software. Group components by type and include component model number and part number, component description, quantity supplied, and reference to component catalog information.
  - 4. Descriptive Information: Catalog information, descriptive literature, performance specifications, internal wiring diagrams, power and grounding requirements, power consumption, and heat dissipation of all elements. Clearly mark all options and features proposed for this project.

5. Installation Details. Equipment installation drawings showing external dimensions, enclosure material and spacing, mounting connections, and installation requirements.
  6. A list of, and descriptive literature for, spares and expendables.
- F. Submit the following Field Instrumentation Shop Drawings in a single package:
1. Catalog information, descriptive literature, wiring diagrams, and shop drawings on all components of the field instruments, including all miscellaneous electrical and mechanical devices furnished under this section.
  2. Individual data sheets for all components of the field instruments to supplement the above information by citing all specific features for each specific component (e.g. scale range, materials of construction, special options included, etc.). Each component data sheet shall bear the component name and instrument tag number designation shown in the Drawings and Specifications.
  3. Installation details for all field mounted devices to show conformance with the Contract Documents.
  4. Configuration documentation for all programmable devices to indicate actual settings used to set the device scale, range, trip points, and other control parameters.
- G. Test Procedures: Submit the procedures proposed to be followed during all system testing. Procedures shall include test descriptions, forms, and check lists to be used to control and document the required tests.
- H. Test Reports: Upon completion of each required test, document the test by submitting a copy of the signed off test procedures to the ENGINEER.

#### **1.04. Final Documentation**

- A. As a part of the final acceptance requirements, submit the PICS record drawings. Record drawings shall include, corrected for any changes that may have been made up through Substantial Completion:
1. instrument loop wiring diagrams
  2. panel wiring diagrams
  3. panel elevations
  4. interconnection diagrams showing terminal numbers at each wiring termination
- B. Record drawings shall be developed or converted to the latest version of AutoCAD. Provide AutoCAD files on a USB flash drive.
- C. Operating and Maintenance (O&M) Manuals: Provide two complete sets of three-ring bound O&M manuals. Include descriptive material, drawings, and figures bound in appropriate places. Include:
1. Cross references to 3<sup>rd</sup> party O&M manuals.

2. Additional operating and maintenance instructions in sufficient detail to facilitate the operation, removal, installation, adjustment, calibration and maintenance of each component provided with the PICS.
3. All the submittal data for each component from the approved shop drawing submittals with corrections made on approved as noted items.
4. A USB Flash drive containing the shop drawing data in PDF format in the binder sleeve.

#### **1.05. Quality Control**

- A. The SYSTEM SUPPLIER shall meet all of the requirements of these specifications, and, unless specifically stated otherwise, no prior acceptance of any subsystem, equipment, or materials has been made.
- B. All equipment furnished by the SYSTEM SUPPLIER shall be of the latest and most recent design and shall have overall accuracy as guaranteed by the manufacturer.
- C. Materials and equipment used shall be U.L. approved wherever such approved equipment and materials are available.
- D. Component equipment shall be as supplied by one of the manufacturers named or approved equal. The design of the PICS is based on the first-named manufacturer's equipment if there is a difference.
- E. To facilitate the OWNER's operation and maintenance, products shall be of the same major MANUFACTURER, with panel mounted devices of the same type and model as far as possible.
- F. In order to insure the interchangeability of parts and the maintenance of quality, strict compliance with the above requirements shall be maintained.
- G. The SYSTEM SUPPLIER shall designate a single point of contact for interface with the ENGINEER on this project. The ENGINEER reserves the sole right to approve or reject this point of contact.
- H. The SYSTEM SUPPLIER shall provide experienced personnel on-site to coordinate and/or perform installation, termination, and adjustment, on-site testing and startup assistance for the PICS.

#### **1.06. Standards**

- A. The design, testing, assembly, and methods of installation of the wiring materials, electrical equipment and accessories proposed under this Contract shall conform to the National Electrical Code and to applicable state and local requirements. UL listing and labeling shall be adhered to under this Contract.
- B. International Society of Automation (ISA) and National Electrical Manufacturers Association (NEMA) standards shall be used where applicable in the design of the PICS.

- C. Any equipment that does not have a UL, FM CSA, or other approved testing laboratory label shall be furnished with a notarized letter signed by the supplier stating that the equipment furnished has been manufactured in accordance with the National Electric Code and OSHA requirements.
- D. Any additional work needed resulting from any deviation from codes or local requirements shall be at no additional cost to the OWNER.

#### **1.07. Warranty and Guarantees**

- A. The SYSTEM SUPPLIER shall furnish to the OWNER a written two year guarantee commencing with substantial completion, that all equipment and parts thereof, material and/or workmanship are of top quality and free from defects.
- B. The SYSTEM SUPPLIER shall guarantee all equipment provided under these specifications.

### **PART 2 PRODUCTS**

#### **2.01. General**

- A. Equipment to be installed in a hazardous area shall meet Class, Group, and Division classification as shown on the Contract Electrical Drawings, or comply with the local or National Electrical Code, whichever is the most stringent requirement.
- B. Electronic equipment shall utilize printed circuitry suitably coated to prevent contamination by dust, moisture and fungus. Solid-state components shall be conservatively rated for their purpose, to assure optimum long-term performance and dependability over ambient atmosphere fluctuations and 0 to 100 percent relative humidity. The field mounted equipment and system components shall be designed for installation in dusty, humid, and slightly corrosive service conditions.
- C. All equipment shall be designed to operate on a 60-Hertz alternating current power source at a normal 120 volts, plus or minus 10 percent, except where specifically noted otherwise. All regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.
- D. All equipment, cabinets and devices furnished hereunder shall be heavy-duty type, designed for continuous industrial service. The system shall contain products of a single MANUFACTURER, insofar as possible, and shall consist of equipment models which are currently in production. All equipment provided shall be of modular construction and shall be capable of field expansion through the installation of plug-in circuit cards or additional cabinets.
- E. The equipment furnished shall be designed to operate satisfactorily between 0 degrees C and 40 degrees C at up to 95 percent Relative Humidity (non condensing).

- F. All instruments requiring plumbing shall utilize stainless steel components as follows:
  - 1. Test Tap: Shall consist of Crawford Fitting Co. Swagelock quick connects Series QC4-DE, or equal.
  - 2. Tubing, Stainless Steel: Shall be ASTM A 312, TP 316, seamless, soft annealed with 0.065 inch wall. Fittings shall be ASTM A 276, TP 316 compression or socket weld type.
  - 3. Valve, Ball: Shall be stainless steel ball valves, Whitey Series 40, Hoke Flamite Series 7100, or equal.
- G. All instruments shall be provided with mounting hardware and floor stands, wall brackets, or instrument racks.
- H. All transmitters shall be provided with either integral indicators or conduit mounted indicators in process units, accurate to two percent. Indicator readouts shall be linear in process units.
- I. All switches shall have double-pole, double-throw contacts rated at a minimum of 600 volts-amperes (VA), unless specifically noted otherwise.
- J. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting when power is restored.

## **2.02. Lightning/Surge Protection**

- A. Surge suppressors and arrestors meeting the requirements of ANSI Standard C-62.41 (latest revision) shall be provided as further detailed below.
- B. Profibus Connections. Each Profibus drop shall be furnished with a 2-wire RS-485 surge protector. Provide Phoenix Contact PT 3-HF-12 DC or approved equal.
- C. AC Powered Instruments. Lightning and surge protection shall be provided on both the AC power supply and signal lines. The instrument, a breaker and the surge suppressor shall be mounted on a ½-inch aluminum plate. Outdoor instrument mounting plates shall also be equipped with 1/8 inch sun shields on top and both sides with front panel facing north wherever practical. The protectors shall meet the following criteria:
  - 1. NEMA 4X small case.
  - 2. Response time of less than five nanoseconds.
  - 3. AC Power protection: IEEE/ANSI Std. C-62.41 rated C3 at 330 Volts clamping level.
  - 4. Signal line protection: 10,000 Amp 8 x 20 microsecond surge, clamped at 36 Volts clamping level.
  - 5. Test jacks for low level signal monitoring.
  - 6. Manufacturer/model: EDCO SLAC series or approved equal.

- D. Loop Powered Instruments. Lightning and surge protection shall be provided on the 4-20 mA DC signal line. The protectors shall meet the following criteria:
1. Encapsulated in 316 Stainless Steel Pipe nipples for in-line conduit mounting.
  2. Response time of less than one nanosecond.
  3. Capable of withstanding up to 10 occurrences of 8/20 microsecond impulses at 5000 Amps.
  4. Protection of both lines plus shield
  5. Manufacturer/model: Citel model TSP15M, no equal
- E. Signals. Lightning and surge protection shall be provided on all 4-20 mA and discrete signal wires entering or leaving the panel. The protectors shall meet the following criteria:
1. 35 mm DIN rail mounted with spring terminals.
  2. Response time of less than one nanosecond.
  3. Operating signal voltage: as required for signal type.
  4. Capable of withstanding up to 10 occurrences of 8/20 microsecond impulses at 10,000 Amps.
  5. Nominal series resistance of less than 2 ohms each leg
  6. Manufacturer/model:
    - a. Citel model DLA series, no equal.
- F. Single phase AC Power (to 15Amps). Lightning and surge protectors for AC power supply lines up to 15 Amps service shall meet the following criteria:
1. Serial protection with replaceable fuse.
  2. Failure indicator
  3. Response time of less than five nanoseconds.
  4. Capable of withstanding up to 10,000 Amps at IEEE/ANSI C-62.41 8 x 20 microseconds combination wave.
  5. Manufacturer/model:
    - a. EDCO HSP121BT
    - b. Dehn DG S 150
    - c. Approved equal.
- G. Single phase AC Power (over 15Amps). Lightning and surge protectors for AC power supply lines over 15 Amps service shall meet the following criteria:
1. Parallel protection using MOVs and thermal fusing technology.
  2. Failure indicator
  3. Response time of less than five nanoseconds.
  4. Capable of withstanding up to 6,500 Amps at IEEE/ANSI C-62.41 8 x 20 microseconds combination wave.
  5. Manufacturer/model:
    - a. EDCO FAS-120AC
    - b. Approved equal.



## 2.03. Field Instruments

- A. Pressure Transducer. The pressure transducer shall sense variations in pressure and produce a standard current output signal linear with gage pressure (Pressure Indicating Transmitter, PIT), differential pressure (Differential Pressure Indicating Transmitter, DPIT), flow via square root extraction of differential (Flow Indicating Transmitter, FIT) or, via inference, level (Level Indicating Transmitter, LIT). The transducer shall use a diaphragm activated cell method to monitor process pressure via impulse piping connected through a valve manifold and, where noted, diaphragm seals.
1. Performance:
    - a. Total accuracy of less than or equal to 0.2% of span for +/- 50 degree temperature changes from 1:1 to 10:1 range down.
    - b. Adjustable zero and span values anywhere within the nominal range.
    - c. Differential transducers shall provide direct reading or integral square-root extraction.
  2. Materials:
    - a. Metallic Wetted parts – 316 Stainless Steel.
    - b. Wetted O-rings – Glass filled TFE.
    - c. Fill liquid - NSF approved for use in drinking water applications.
    - d. Electronics Housing – Low copper aluminum with polyurethane paint.
    - e. Mounting hardware – 316 Stainless Steel.
  3. Ratings:
    - a. Enclosure – NEMA 4X
  4. Electrical:
    - a. Transmitter excitation: 10.5 to 32 Volts DC at up to 18 mA.
  5. Options:
    - a. Provide surge/lightning protection within the transmitter.
    - b. Provide 3-way SS valve manifold.
    - c. Provide integral LCD indicator with displayed value in process units.
    - d. Provide minimum half inch process connection.
  6. Manufacturer, Model series:
    - a. Rosemount, 3051 series.
    - b. Endress & Hauser, CerebarS series.
    - c. Siemens, Sitrans P series.
    - d. Approved equal.
- B. Limit Switch. The limit switch shall detect the closed position of a hatch, door, check valve, etc. by means of an actuator. The actuator shall energize the switch while the door is closed.
1. General:
    - a. Actuator orientation: As required for application
    - b. Actuator mechanism: Adjustable lever roller.
    - c. Switch shall not be mounted on the moving portion of the door, hatch or valve.

2. Materials:
    - a. Normal applications: Phosphate coated zinc with Epoxy coating.
    - b. Corrosive locations: All 316 Stainless Steel including actuating lever.
  3. Ratings:
    - a. NEMA 4X for normal applications.
    - b. NEMA 6 where potential submergence exists.
    - c. Use explosion proof switches with factory installed cable for all Class I rated locations.
  4. Electrical:
    - a. Normally open and normally closed dry contacts
    - b. Dry contact rated to 10 Amps at 120 VAC
  5. Options
    - a. Provide stainless steel supports/mounting and strike plates as required.
  6. Manufacturer, model:
    - a. Honeywell, model HDLS or LSX as applicable
    - b. Approved equal.
- C. Finished Water Analyzer. The analysis system shall continuously measure the level of free chlorine and pH using two sensors, Analysis Elements (AE), in a flow cell and the Analysis Indicating Transmitter (AIT). Automatic pH and temperature compensation shall be provided.
1. Type:
    - a. The flow cell shall be equipped with an integral flow regulator to maintain a constant 33 l/hr sample flow.
    - b. The sensor shall have an integral PT 1000 temperature monitor.
    - c. The analyzer shall be provided with a loss of sample flow alarm.
    - d. The analyzer shall be provided with a Profibus DP interface module for connection to the plant control system.
  2. Performance:
    - a. Chlorine residual range: 0-10 ppm (mg/L).
    - b. pH Range: 4-10.
    - c. The analyzer must operate for at least 30 days continuously without maintenance or calibration.
    - d. Analyzers that require reagents or buffers shall not be acceptable.
    - e. Two programmable alarm contacts.
  3. Materials:
    - a. Sensors: Suitable for application.
    - b. Transmitter: ABS.
  4. Ratings:
    - a. Transmitter: NEMA 4X.
  5. Electrical:
    - a. 120 V AC, 60 Hz supply.
    - b. Backlit LCD display.
  6. Manufacturer:
    - a. Wallace & Tiernan Depolox 3 plus, No equal.

## **PART 3      EXECUTION**

### **3.01.   General**

- A.    Prerequisite Activities and Lead Times: Do not start the following key project activities until the listed prerequisite activities have been completed and lead times have been satisfied:
  - 1.     Hardware Purchasing, Fabrication, and Assembly: Associated design related submittals completed (no exceptions, or approved as noted).
  - 2.     Shipment: Completion and approval of all design related submittals.
  - 3.     Startup: Operational Checkout Tests.
- B.    Substantial Completion: The following requirements must be fulfilled before consideration will be given for Substantial Completion of the PICS:
  - 1.     All PICS submittals have been completed.
  - 2.     The PICS has successfully completed the Demonstration Tests.
  - 3.     All spares, expendables, and test equipment have been received by OWNER.

### **3.02.   Product Handling**

- A.    Adequately pack manufactured material to prevent damage during shipping, handling, storage and erection. Pack all material shipped to the project site in a container properly marked for identification. Use blocks and padding to prevent movement.
- B.    Ship materials that must be handled with the aid of mechanical tools in wood-framed crates.
- C.    Ship all materials to the project site with at least one layer of plastic wrapping or other approved means to make it weatherproof. Anti-stat protection shall be provided for all sensitive equipment.
- D.    Inspect the material prior to removing it from the carrier. Do not unwrap equipment until it is ready to be installed. If any damage is observed, immediately notify the carrier so that a claim can be made. If no such notice is given, the material shall be assumed to be in undamaged condition, and any subsequent damage that is discovered shall be repaired and replaced at no additional expense to the OWNER.
- E.    Store and protect equipment until installation following the storage and handling instructions recommended by the equipment manufacturers. Place special emphasis on proper anti-static protection of sensitive equipment.
- F.    Protection During Construction: Throughout this Contract, provide protection for materials and equipment against loss or damage and from the effects of weather. Prior to installation, store items in indoor, dry locations. Provide heating in storage areas for items subject to corrosion under damp conditions. Provide covers for panels and other elements that may be exposed to dusty construction

environments. Specific storage requirements shall be in accordance with the SYSTEM SUPPLIER's recommendations.

- G. Corrosion Protection: Protect all consoles, panels, enclosures, and other equipment containing electrical or instrumentation and control devices, including spare parts, from corrosion through the use of corrosion-inhibiting vapor capsules. Prior to shipment, include capsules in the shipping containers, and equipment as recommended by the capsule manufacturer. During the construction period, periodically replace the capsules in accordance with the capsule manufacturer's recommendations. Replace all capsules just prior to Final Acceptance.
- H. The CONTRACTOR shall be responsible for any damage charges resulting from the handling of the materials.

### **3.03. Installation**

- A. Install the PICS in the location indicated on the Drawings and follow manufacturers' installation instructions explicitly, unless otherwise indicated. Wherever any conflict arises between manufacturers' instruction, and these Contract Documents, follow ENGINEER's decision, at no additional cost. Keep a copy of manufacturers' instructions on the jobsite available for review at all times
- B. Install materials and equipment in a workmanlike manner utilizing craftsmen skilled in the particular trade. Provide work which has a neat and finished appearance. Coordinate I&C work with the OWNER and work of other trades to avoid conflicts, errors, delays, and unnecessary interference with operation of the existing plant during construction.
- C. Provide finish on instruments and accessories that protects against corrosion by the elements in the environment in which they are to be installed. Finish both the interior and exterior of enclosures. Provide extra paint of each color used in the material from the manufacturer for touch-up purposes.
- D. Keep the premises free from accumulation of waste material or rubbish. Upon completion of work, remove materials, scraps, and debris from premises and from interior and exterior of all devices and equipment. Touch-up scratches, scrapes, or chips in interior and exterior surfaces of devices and equipment with finishes matching as nearly as possible the type, color, consistency, and type of surface of the original finish. Clean and polish the exterior of all panels and enclosures upon the completion of the demonstration tests.
- E. Ground each analog signal shield on one end at the receiver end only. Properly ground all surge and transient protection devices. Coordinate grounding system with Division 16, Electrical.
- F. For the purposes of uniformity and conformance to industry standard, provide analog signal transmission modes of electronic 4-20 ma DC. No other signal characteristics are acceptable.

- G. Fully isolate outputs for transmitted electronic signals between transmitters and receivers, equipment of different manufacturers and between control panels to conform to ISA Standard S 50. 1.

### **3.04. Testing – General**

- A. The ENGINEER reserves the right to test or retest any and all specified functions whether or not explicitly stated in the approved test procedures. The ENGINEER's decision shall be final regarding the acceptability and completeness of all testing.

### **3.05. Operational Readiness Test**

- A. These inspections and tests shall include Loop/Component inspections and tests. The SYSTEM SUPPLIER shall fully debug problems in the system as a whole.
- B. Check the entire PICS for proper installation, calibration and adjustment on a loop-by-loop and component-by-component basis to ensure that it is in conformance with related submittals and the PICS Specifications.
- C. The Loop/Component Inspections and Tests shall be implemented using approved forms and checklists. These shall be developed by the SYSTEM SUPPLIER and submitted for approval.
- D. Loop Status Report: Each control loop shall have a Loop Status Report to organize and track its inspection, adjustment, and calibration. These reports shall include the following information and check-off items with spaces for sign-off by the SYSTEM SUPPLIER:
  - 1. Project Name
  - 2. Control Loop Number or description
  - 3. Tag Number or description for each component of the control loop
  - 4. Check-offs/sign-offs for each component for proper installation, termination, and calibration/adjustment
  - 5. Check-offs/sign-offs for the control loop for proper panel interface terminations, I/O interface terminations, I/O signal operation relative to the computer network, and total loop operation ready
  - 6. Space for comments
- E. Maintain the Loop Status Reports and Component Calibration Sheets at the jobsite and make them available to the ENGINEER at any time.
- F. Witnessing: These inspections and tests do not require witnessing. However, the ENGINEER will review the Loop Status Sheets and Component Calibration Sheets and spot-check their entries periodically and upon completion of the Operational Check-out Tests. Correct any deficiencies found.

**END OF SECTION**

## **SECTION 43 21 11**

### **HORIZONTAL SPLIT-CASE PUMPS**

#### **PART 1 GENERAL**

##### **1.01 DESCRIPTION**

This section includes materials, installation, and testing of horizontal split case, single-stage, flexible-coupled centrifugal pumps for water service.

##### **1.02 RELATED SECTIONS**

- A. Section 26 26 50 Motors
- B. Section 26 29 23 Variable Frequency Drives (VFD)
- C. Section 40 95 00 Process Instrumentation and Control Systems (PICS)

##### **1.03 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01 33 00.
- B. Submit dimensional drawings.
- C. Submit manufacturer's catalog data and detail drawings showing all pump parts and describe by material of construction specification (such as AISI, ASTM, SAE, or CDA) and grade or type. Show linings and coatings. Identify each pump by tag number to which the catalog data and detail sheets pertain.
- D. Submit pump curves from manufacturer's catalog data on which the specified operating points are marked. Show efficiency and brake horsepower for the selected pump curve. Show NPSH required.
- E. Submit manufacturer's reports on hydrostatic tests and performance tests.

- F. Submit manufacturer's sample form for reporting the performance test results at least two weeks before the tests. The test form should contain the data presented in the sample form in Section 6 of the ASME PTC 8.2 or ANSI/HI 1.6.
- G. Submit manufacturer's certified performance curves for review at least two weeks prior to shipping the units from the factory. Show flow, pump total head, brake horsepower, pump efficiency. Provide copies of the data recorded during the test and methods of data reduction for determining certified test results.
- H. Submit certification that pumps are lead free per NSF/ANSI 372

#### **1.04 DEFINITIONS**

Terms shall be as defined in the Hydraulics Institute Standards ANSI/HI 1.1-1.2 for horizontal pumps.

#### **1.05 MANUFACTURER'S SERVICES**

Provide equipment manufacturer's services at the jobsite for the minimum labor days listed below, travel time excluded:

- A. One labor day for each service listed in the subsection on "Service Conditions" to check the installation and advise during start-up, testing, and adjustment of the equipment.
- B. One labor day to instruct the Owner's personnel in the operation and maintenance of the equipment.

### **PART 2 MATERIALS**

#### **2.01 PUMP DESIGN**

- A. The pump manufacturer shall provide equipment for the pumps, including motors and baseplates, as a complete unit.
- B. Pumps shall be horizontal, split-case, single stage. Pumps and motors shall be flexible coupled.

- C. The design pressure of the casing, including the stuffing box and gland, shall be at least as great as the pressure-temperature rating of ASME B16.1, Class 125 flanges. Design casing and cover to withstand a hydrostatic test pressure of 150% of the maximum design pressure for the pump or 125% of the shutoff head whichever is greater.
- D. Each pump shall be capable of at least a 10% head increase at normal operating conditions by installing a larger impeller or an impeller of different hydraulic design.
- E. Pump curve shall be continuously rising and shall be free of dips and valleys from the design point to the shutoff head. The shutoff head shall be at least 110% of the head that occurs at the design point.
- F. The NPSH required shall be at least 10 feet less than the minimum NPSH available at the design point and less than the NPSH available at all other points on the pump curve up to 120% of the flow at the BEP.
- G. Design the pumps and its components to operate continuously over a preferred operating range (POR, as defined in ANSI/HI 9.6.3-1997) of 70% to 120% of the flow at the BEP.

## **2.02 SUCTION AND DISCHARGE CONNECTIONS**

- A. Suction and discharge connections smaller than 2 inches shall be threaded, ASME B1.20.1; or flanged Class 125, ASME B16.1.
- B. Suction and discharge connections 2 inches and larger shall be flanged, ASME B16.1, Class 125 or Class 250, as shown in the subsection on "Service Conditions."
- C. Flanges shall be flat faced. Bolt holes shall straddle the horizontal and vertical centerlines.

## **2.03 CASING**

- A. The casing halves shall be flanged, bolted, and doweled together. Provide machined surfaces where the casings mate. The design shall permit removal of the rotating elements from the back of the casing without disturbing the suction



and discharge connections. The internal wall of the casing halves shall match with not more than 1/16-inch overhang or underhang between the two casing halves. Support the pump by feet at two points: beneath the rear bracket and beneath the front bracket or casing.

- B. Provide threaded (ASME B1.20.1) drain connections in the bottom of the casing. Provide threaded (ASME B1.20.1) vent connections in the top of the casing if the discharge is on the side of the casing. Provide plugs in the connections. Minimum connection or outlet size shall be 1/2 inch.
- C. Casing, cover, and gland shall have a corrosion allowance of at least 1/8 inch.

## **2.04 IMPELLERS AND SLEEVES**

Impellers shall be of the double suction enclosed. Statically and dynamically balance the impellers. Provide shaft and sleeve design such that the sleeves tighten with the rotation of the shaft. Provide Teflon or neoprene gaskets between impeller hub and shaft sleeves.

## **2.05 SHAFT**

- A. Tolerance on the shaft diameter, with shaft rotated on centers, shall not exceed 0.002-inch TIR. Shaft runout at the seal chamber face and at the impeller shall not exceed 0.002-inch full indication movement. The shaft stiffness shall limit the total deflection under the most severe dynamic conditions over the allowable operating range of the pump, with the maximum impeller diameter installed, to 0.002 inch at the primary seal faces or at the stuffing box faces.
- B. The first lateral critical speed of the rotating assembly shall be at least 120% of the maximum pump operating speed.
- C. Machine and finish shafts and sleeves so that the surface finish of the shafts or sleeves through the stuffing box and at the rubbing contact-bearing housing seals shall not exceed a roughness of 32-microinch TIR.

## **2.06 SEAL CHAMBER OR STUFFING BOX**

- A. The design of the seal chamber shall provide space and clearance for the packaging, and for the seals as described in the Services Conditions (Part 3.A), herein.
- B. The type of packing or seal shall be as shown in the subsection on "Service Conditions."

## **2.07 GLAND**

Design pumps to accept glands having four bolts. Gland shall be:

- A. Four-bolt for conventional packing.
- B. Four-bolt for mechanical seals.

## **2.08 BEARINGS**

- A. Provide two labyrinth-style antifriction-bearing assemblies for flexible-coupled pumps. Do not use lip-seal type. One assembly shall be free to float within the frame to carry radial thrust only. Design the other assembly to carry both radial and axial thrust. Provide one bearing assembly within the motor frame for close-coupled pumps. Bearings subject to radial thrust only shall be single row. Bearings subject to both radial and axial thrust shall be single row. Bearing life shall be a minimum of 100,000 hours per the AFBMA L-10 rating.
- B. Bearings shall be grease lubricated as shown in the subsection on "Service Conditions." Bearing housings shall have register fits and shall be bolted to the pump casing. Provide constant level oiler when oil lubrication is used.

## **2.09 VIBRATION AND RESIDUAL UNBALANCE**

- A. The maximum vibration levels shall not exceed those shown in Figure 9.6.4.12 in ANSI/HI 9.6.4. Maximum residual unbalance in rotors shall not exceed that shown in Figure 9.6.4.15B in ANSI/HI 9.6.4.

- B. Provide two-plane balancing for impellers in which the D/b ratio (per API 610, tenth edition, Figure 30) is 6.0 or greater.

## 2.10 MATERIALS OF CONSTRUCTION

- A. Materials of construction shall be as listed below.

Component	Material	Specification
Casing	Cast iron	Class 35
Impeller	Stainless Steel	AISI Type 316
Impeller Nuts	Stainless Steel	AISI Type 316
Shaft		
	or Stainless steel	ASTM A582 type 416
Shaft sleeve (for pumps having steel shafts)	Stainless steel	AISI 420 or 440C or 316 stainless steel (450 Brinell hardness)
Shaft sleeve (for pumps having stainless-steel shafts)	Stainless steel	AISI Type 316
Lantern ring	Bronze	See paragraph 2 below

- B. Bronze components shall have the following chemical characteristics:

Constituent	Content
Zinc	7% maximum
Aluminum	2% maximum
Lead	0%
Copper + Nickel + Silicon	83% minimum

All bronze and other wetted materials shall be lead free as defined by Section 1417 of the 2011 Safe Drinking Water Act

## **2.11 COUPLINGS AND COUPLING GUARDS FOR FLEXIBLE COUPLED PUMPS**

- A. Flexible couplings shall be heavy duty Falk corporation “SteelFlex” nonspacer T-type couplings, sized in accordance with the manufacturer’s recommendations.
- B. Spacer-type elastomeric flexible coupling may be provided for pumps 25 horsepower and smaller. The spacer length shall permit the removal of the coupling halves from the pump and driver shafts and the impeller/rotor and bearing frame as an assembly without moving the pump casing, piping, or driver. Provide carbon steel hubs. Provide weather-resistant cover. Coupling-to-shaft fits shall be Class I clearance fits as defined in AGMA 9002. Service factor shall be at least 1.50 times the nameplate rating of the driver.
- C. Provide coupling guards conforming to OSHA requirements.

## **2.12 BASEPLATE**

Provide fabricated steel baseplate.

## **2.13 SPARE PARTS**

- A. Provide the following spare parts for each model of pump:

Quantity	Description
2	Sets packing (for pumps specified to have packing)
1	Lantern ring (for pumps specified to have packing)
2	Mechanical seal (for pumps specified to have mechanical seals)
1	Radial bearings (complete set)
1	Thrust bearings (complete set)
1	Set of gaskets and o-rings

- B. Pack spare parts in a wooden box; label with the manufacturer's name, local representative's name, address, and telephone number; and attach list of materials contained within.

## PART 3 EXECUTION

### 3.01 SERVICE CONDITIONS

- A. Pump hydraulic performance conditions and design data shall be as shown below.

Pump Tag Numbers: HSP No. 3,4,5 & 6

Location	HSP Building
Service	Indoors, ventilated, not airconditioned, environmental temperature range of 20°F to 100°F
Elevation	Approximately 50 feet above mean sea level
Relative humidity	35% to 95%
Fluid temperature range	50°F to 90°F

#### Pump Data

Capacity (gpm)	Pump Total Head (feet)	Minimum Pump Efficiency (%)
500	200	45
2,083 *	160	80
2,500	140	76
*Design point.		

Maximum pump speed	1800 rpm
Minimum NPSH available	26 feet
Motor and pump coupling type	Falk Steelflex
Motor horsepower (minimum)	125
Motor type (4AEHMTV)	Per Section 26 26 50
Variable speed drive required per Section 26 29 23	YES
Type of packing or seals	Stainless steel with EPDM elastomers  Seals shall be cartridge type; John Crane or Chesterton
Suction flange rating	Class 125
Discharge flange rating	Class 125
Bearing lubrication	Grease
Manufacturers	Aurora 410-6x8x15 or equivalent pump by Goulds Model 3410 size 6x8-14H, Peerless 6AE14N, or Flowserve 6LR-18A

### 3.02 FACTORY PERFORMANCE TESTING

- A. Each pumping unit shall be subjected to a nonwitnessed laboratory performance test. Conduct tests in accordance with the ASME PTC 8.2 or ANSI/HI 1.6, using

the actual job driver or a calibrated test motor. The performance test shall be equivalent to Level "A" per ANSI/HI 1.6.

- B. No motor overload along the entire published performance curve will be allowed at any flow.
- C. Deviations and fluctuations of test readings shall conform to ASME PTC 8.2, 1.11 (Type A), or ANSI/HI 1.6, paragraph 1.6.5.4.2.
- D. Measure flow by the "Capacity Measurement by Weight," the "Capacity Measurement by Volume," or the "Capacity Measurement by Venturi Meter, Nozzle, or Thin Plate Orifice" methods in ASME PTC 8.2 or ANSI/HI 1.6.
- E. For pumps in variable speed service, factory tests at hertz ratings less than 100% rating shall not be required, however manufacturer shall be plot VFD curves from the full speed test curves using the affinity laws.
- F. Perform tests and record data, including head, flow rate, speed, and power, at a minimum of seven points. These points shall include shutoff, minimum flow, midway between minimum flow and design flow, design flow, 120% of design flow, and maximum flow.
- G. Perform a hydrostatic test on pump pressure-containing components per ANSI/HI 1.6, paragraph 16.4.

### **3.03 ALIGNMENT CRITERIA**

- A. All rotating machinery (drivers, transmission devices and driven equipment) shall be installed using the following guidelines for final machinery setup.
- B. Equipment shall be aligned using a certified laser alignment system. These systems shall meet or exceed the capabilities of the OPTALIGN or OPTALIGN plus, which may include the ROTALIGN, ROTALIGN Pro or ROTALIGN Ultra. These systems must be able to print out the final alignment readings to be given to JEA.
- C. Prior to the installation of rotating machines, the sole plates or skid pads shall be checked for level to ensure there is no more than a 0.001" deviation per foot



across each pad. These measurements shall be taken in two directions across the pad (i.e. the pad shall not slope more than 0.001" per foot in any direction). For continuous sole plates extending across two or more machine hold down feet, a maximum of 0.001" per foot or a total of 0.005" across the entire sole plate will be accepted.

- D. The equipment shall be installed on the pad and a final alignment performed prior to any piping or ductwork connections being made. All equipment will be installed with 0.200" of shims, not to exceed 5 shims, with no one shim being over .100", under each foot to accommodate future alignment changes. (The shims are to be stainless steel, "Full Foot" machine shims, preferably Precision brand, due to testing has shown other mfg shims to have cupping causing induced soft foot of equipment). Soft foot shall not exceed .002" on each machine foot. A run-out check of the couplings and shafts shall indicate no more than 0.002" run-out on machines with a running speed of 1800 rpm or less or no more than 0.001" of run-out on machines with a running speed of greater than 1800 rpm.
- E. Pipe strain shall be less than .003" deflection on equipment and shall not cause the soft foot readings to be greater than .002".

The final alignment across the coupling shall not exceed the following tolerance (based on a 10" diameter coupling, these values are true centerline to centerline shaft deviations, i.e. they are 1/2 T.I.R. (total indicated run-out)):

RUNNING SPEED	PARALLEL OFFSET (inches)	ANGULAR OFFSET (inches/10"dia)
<= 600	0.003	0.006
1200	0.0025	0.005
1800	0.002	0.003
3600	0.001	0.002
7200	0.0005	0.001

For couplings with a diameter greater than 10", the values for angular offset shall be calculated on a per inch basis following the above. For couplings with a diameter of 10" or less, the above numbers shall be used as absolute values.

- F. Machine feet to base gaps shall be checked with both feeler gauges and dial indicators and no machine foot shall have more than 0.002" soft foot when the foot bolts are tightened.

### **3.04 PAINTING AND COATING**

- A. Coat exterior of pump, frame, and baseplate per Section 099000. Apply the specified prime coat at the place of manufacture. Apply intermediate and finish coats in field. Color of finish coat shall match the color of the connecting piping.
- B. Line and coat volute interior wetted surfaces, with fusion-bonded epoxy per Section 09 97 61 meeting NSF 61. Do not coat wear rings. Apply coating in factory.

### **3.05 SHIPMENT AND STORAGE**

- A. Prepare equipment for shipment including blocking of the rotor when necessary. Identify blocked rotors by means of corrosion-resistant tags attached with stainless steel wire. The preparation shall make the equipment suitable for six months of outdoor storage from the time of shipment, with no disassembly required before operation, except for inspection of bearings and seals.
- B. Identify the equipment with item and serial numbers and project equipment tag numbers. Material shipped separately shall be identified with securely affixed, corrosion-resistant metal tags indicating the item and serial number and project equipment tag numbers of the equipment for which it is intended. In addition, ship crated equipment with duplicate packing lists, one inside and one on the outside of the shipping container.
- C. Pack and ship one copy of the manufacturer's standard installation instructions with the equipment. Provide the instructions necessary to preserve the integrity of the storage preparation after the equipment arrives at the jobsite and before start-up.

- D. Store and protect pumps per API 686 (first edition), Chapter 3, paragraphs 1.4 through 1.9, 1.15, 1.16, 1.20, and 1.21 and as described below.
- E. Coat exterior machined surfaces with a rust preventative.
- F. The interior of the equipment shall be clean and free from scale, welding spatter, and foreign objects.
- G. Provide flanged openings with metal closures at least 3/16-inch thick, with elastomer gaskets and at least four full-diameter bolts. Provide closures at the place of pump manufacture prior to shipping. For studded openings, use all the nuts needed for the intended service to secure closures.
- H. Provide threaded openings with steel caps or solid-shank steel plugs. Do not use nonmetallic (such as plastic) plugs or caps. Provide caps or plugs at the place of pump manufacture prior to shipping.
- I. Clearly identify lifting points and lifting lugs on the equipment or equipment package. Identify the recommended lifting arrangement on boxed equipment.
- J. Wrap exposed shafts and shaft couplings with waterproof, moldable waxed cloth or volatile-corrosion-inhibitor paper. Seal the seams with oil-proof adhesive tape.
- K. If electric motors are stored or installed outside or in areas subject to temperatures below 40°F or are exposed to the weather prior to permanent installation, provide the manufacturer's recommended procedures for extended storage. Provide temporary covers over the motor electrical components. Provide temporary conduits, wiring, and electrical supply to space heaters. Inspect electrical contacts before start-up.

### **3.06 PUMP INSTALLATION**

- A. Provide the manufacturer's recommended lubricants in the pumps, bearings, and other mechanical equipment.
- B. Verify that the installed pump is fully self-supporting before bolting pipe flanges, so that no strain is imparted on the flanges, pipes, or pipe supports from the pump assembly. Adjust the position of the pump assembly so that the pump flanges are

plumb and aligned with the adjacent pipe flanges. Do not use temporary shims or jacking nuts for leveling, aligning, or supporting equipment.

- C. Provide continuous protection of the equipment from the elements, dust, debris, paint spatter, or other conditions that will adversely affect the unit's operation until such time as the equipment is scheduled for start-up testing.

### **3.07 FIELD TESTING**

- A. Bump motor to ensure that motor has been connected for proper rotation.
- B. Perform field tests for 24 consecutive hours on each pump. Measure flows at the head points shown in the service conditions for each pump.
- C. If the measured flows at the above tabulated pump heads are more than 5% below the flows obtained on the laboratory or factory test, adjust the impellers or provide new impellers or otherwise repair or replace the pumps or calibrate meters or pressure gauges.
- D. Conduct vibration-level tests with pumps operating at their rated capacity. Adjust or replace pumps that exceed the maximum vibration levels.
- E. Operate each pump one at a time. Manually adjust the speed for each pump (one at a time) via the respective speed control unit starting at 100% and dropping down incrementally until shutoff is demonstrated and then back up in 10% increments in order to demonstrate flow range capability. The duration at each flow rate shall be at least 10 minutes.
- F. Assure that in the automatic mode each pump responds to its flow or pressure signal. Assure that each pump operates at a steady rate ( $\pm 5\%$  of set point) at any given flow or pressure for each increment of the maximum capacity specified.
- G. Assure that limit switches on the pumps' check valves indicate and transmit the signals for the valves in the open and closed positions.
- H. Demonstrate that the pumping units, motors, and control system meet the following requirements:

- a. The pumping units operate as specified without excessive noise, cavitation, vibration, and without overheating of the bearings.
  - b. Automatic and manual controls function in accordance with the specified requirements.
  - c. A drive equipment operates without being overloaded.
- I. Certification-Provide a written certification from the pump supplier that the pump components have been properly installed according to the drawings, specifications and manufacturer's specifications, and that the equipment is operating normally. Make all necessary corrections and adjustments including but not limited to labor, parts or freight at no additional cost to the Owner.
- J. Pump supplier shall provide laser alignment of the pump and motor. Two (2) trips, one (1) for preliminary alignment and one (1) for final alignment shall be conducted at no additional cost to the Owner.

**END OF SECTION**

## **SECTION 43 21 48**

### **SUMP PUMP**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION**

The contractor shall provide labor, material, equipment, and incidentals required to provide the centrifugal sump pump as specified herein.

##### **1.02 SUBMITTALS**

- A. Manufacturer's Literature and Data:
  - 1. Manufacturer and model.
  - 2. Operating speed.
  - 3. Capacity.
  - 4. Characteristic performance curves.
  - 5. Efficiency.
- B. Certified copies of all the factory and construction site test data sheets and reports.
- C. Complete operating and maintenance manuals including wiring diagrams, technical data sheets and information for ordering replaceable parts:

#### **PART 2 - PRODUCTS**

##### **2.01 SUMP PUMP**

- A. Centrifugal submersible pump and motor, designed for 140 degrees F maximum water service. Driver shall be electric motor. Support shall be rigid type. Provide perforated, suction strainer. System includes one pump. Pump shall be capable of continuous duty cycle, 50 gpm flow at 20 feet total head.
- B. Pump housings may be cast iron, bronze, aluminum, plastic or stainless steel. Cast iron and aluminum housings for submersible pumps shall be epoxy coated.
- C. Impeller: Brass, bronze or cast iron.
- D. Shaft: Stainless steel or other approved corrosion-resisting metal.
- E. Bearings: As required to hold shaft alignment, anti-friction type for thrust permanently lubricated.
- F. Motor: Maximum 104 degrees F ambient temperature rise above the maximum fluid temperature being pumped. Motor shall be completely enclosed, oil-filled 120 V single phase conforming to NEMA 250 Type 6P. Size the motor capacity to operate pump

without overloading the motor at any point on the pump curve. Motor shall be a minimum ½ horsepower.

- G. The submersible pump shall be supplied with 25 feet of power cable. The power cord shall be sized for the rated full load amps of the pump in accordance with the National Electric Code. The power cable shall not enter the motor housing directly but will conduct electricity to the motor by means of a water tight compression fitting cord plate assembly, with molded pins to conduct electricity to eliminate the ability of water to enter internally through the cord, by means of a damaged or wicking cord.
- H. Provide a check and ball valve in the pump discharge line.

### **PART 3 - EXECUTION**

#### **3.01 STARTUP AND TESTING**

- A. Make tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements.
- B. The tests shall include system capacity and all control functions.
- C. When any defects are detected, correct defects and repeat test.
- D. JEA will observe startup and Contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the JEA inspector. Provide a minimum of 7 days prior to notice.

**END OF SECTION**

**APPENDIX B-LIST OF SUBCONTRACTORS FORM**

**090-17 Construction Services for Arlington Water Treatment Plant High Service Pump Replacement**

JEA Solicitation Number 090-17 requires certain major Subcontractors be listed on this form, unless the work will be self-performed by the Company.

The undersigned understands that failure to submit the required Subcontractor information on this form will result in bid rejection, and the Company agrees to employ the Subcontractors specified below: (Use additional sheets as necessary)

Note: This list of Subcontractors shall not be modified subsequent to bid opening, without a showing of good cause and the written consent of JEA.

Type of Work	Corporate Name of Subcontractor (If work will be self-performed list "Self-performed" below)	Subcontractor Primary Contact Person & Telephone Number	Subcontractor's License Number (if applicable)	Percentage of Work or Dollar Amount
a) Electrical				
b) Pump Supplier				
c) Generator Supplier				

Signed: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

Date: \_\_\_\_\_



**APPENDIX B**  
**BID FORM FOR SOLICITATION # 090-17**  
**Construction Services for Arlington Water Treatment Plant High Service Pump Replacement**

Submit an **original, two (2) copies and one (1) CD or thumb drive** along with other required forms in a sealed envelope to: JEA Procurement Dept., 21 W. Church St., Bid Office, Customer Center, 1<sup>st</sup> Floor, Room 002, Jacksonville, FL 32202-3139.

Company Name: \_\_\_\_\_

Company's Address \_\_\_\_\_

License Number \_\_\_\_\_

Phone Number: \_\_\_\_\_ FAX No: \_\_\_\_\_ Email Address: \_\_\_\_\_

**BID SECURITY REQUIREMENTS**

- ☐ None required  
☒ Certified Check or Bond Five Percent (5%)

**TERM OF CONTRACT**

- ☐ One Time Purchase  
☐ Annual Requirements  
☒ Other, Specify- Project Completion

**SAMPLE REQUIREMENTS**

- ☒ None required  
☐ Samples required prior to Response Opening  
☐ Samples may be required subsequent to Bid Opening

**SECTION 255.05, FLORIDA STATUTES CONTRACT BOND**

- ☐ None required  
☒ Bond required 100% of Bid Award

**QUANTITIES**

- ☐ Quantities indicated are exacting  
☒ Quantities indicated reflect the approximate quantities to be purchased Throughout the Contract period and are subject to fluctuation in accordance with actual requirements.

**INSURANCE REQUIREMENTS**

**Insurance required**

**PAYMENT DISCOUNTS**

- ☐ 1% 20, net 30  
☐ 2% 10, net 30  
☐ Other \_\_\_\_\_  
☐ None Offered

Item No.	ENTER YOUR BID FOR THE FOLLOWING DESCRIBED ARTICLES OR SERVICES	BID PRICE
1	Total Lump Sum Cost of Construction Service for Arlington Water Treatment Plant High Service Pump Replacement	\$ _____
2	Cost associated with completing the enterprise asset management form (Equipment attribute sheet)	\$ _____
3	Cost associated with the schedule of assets form and schedule of values	\$ _____
4	General/Special Conditions (MAX. 10% OF SUBTOTAL)	\$ _____
5	Supplemental Work Authorization (SWA)	\$ 80,000.00
	Total Bid Price	\$ _____

**BIDDER CERTIFICATION**

By submitting this Bid, the Bidder certifies that it has read and reviewed all of the documents pertaining to this Solicitation, that the person signing below is an authorized representative of the Bidding Company, that the Company is legally authorized to do business in the State of Florida, and that the Company maintains in active status an appropriate contractor's license for the work (if applicable). The Bidder also certifies that it complies with all sections (including but not limited to Conflict Of Interest and Ethics) of this Solicitation.

We have received addenda \_\_\_\_\_

\_\_\_\_\_ through \_\_\_\_\_

Handwritten Signature of Authorized Officer of Company or Agent \_\_\_\_\_ Date \_\_\_\_\_

\_\_\_\_\_  
Printed Name and Title