

**TMUA PROJECT No. WPC 21-4,  
FY '21 SOUTHSLOPE CAPITAL EQUIPMENT  
REPLACEMENTS**

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**ATTENDANCE AT PRE-BID CONFERENCE IS MANDATORY**

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PREPARED BY:  
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CLAYTON EDWARDS, P.E., DIRECTOR  
WATER AND SEWER DEPARTMENT

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Account Number: 7503382-544003; 7503383-531105

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Water and Sewer Department  
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(918) 596-9845

**TECHNICAL SPECIFICATIONS**

**Technical Specifications for  
TMUA Project No. WPC 21-4,  
FY '21 Southslope Capital Equipment Replacements**

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## 2 Contact Information

|                                | Item Description   |
|--------------------------------|--|
| Bid Item 1                     | Replacement of two (2) sewage control gates within the wet well of the Main Lift Station (also known as the Influent Lift Station). This includes: bypass pumping; wet well cleaning; and confined space entry.  |
| Bid Item 2                     | Repair of broken pipe hanger for the sewage force main over Cherry Creek.  |
| Bid Item 3                     | Extra Work Allowance   |
| Bid Item 4                     | Mobilization Allowance. The Mobilizations Allowance shall <u>not</u> exceed 5% of the sum of Bid Items 1, 2, and 3.  |
| Bid Item 5<br>Add Alternate A  | Cleaning of Digester 3. This includes: removal of residual material; wash down of internal surfaces; and flushing of internal pipes.   |
| Bid Item 6<br>Add Alternate B  | Proper disposal of <u>Residual Material</u> in Digester 3. This bid item is a unit price per cubic yard. For bidding purposes, the estimated volume of Residual Material is <u>3,120 cubic yards</u> .   |
| Bid Item 7<br>Add Alternate C  | Proper disposal of <u>Trash</u> in Digester 3. This bid item is a unit price per cubic yard. For bidding purposes, the estimated volume of Trash is <u>110 cubic yards</u> .   |
| Bid Item 8<br>Add Alternate D  | Prepare the digester for inspection by providing ventilation, scaffolding, power washing, and lighting inside Digester 3. This work can only be done while Digester 3 is empty.  |
| Bid Item 9<br>Add Alternate E  | Replacement of four (4) critical sludge valves in the Digester 3&4 Building. This work can only be done while Digester 3 is empty.   |
| Bid Item 10<br>Add Alternate F | Miscellaneous work while Digester 3 is empty. This includes: work on the Sludge Control Box; work on the gas piping and digester lid; work on the groundwater pressure relief valves. This work can only be done while Digester 3 is empty.  |
| Bid Item 11<br>Add Alternate G | Replacement of 15 additional sludge valves in the Digester 3&4 Building. This work can only be done: while Digester 3 is empty; or after the replacement of the four (4) critical sludge valves from Bid Item 9.   |
| Bid Item 12<br>Add Alternate H | Modification of sludge piping, and modification of Plant Effluent Water (PEW) piping, and installation of one (1) additional sludge valve, and installation of two (2) pressure sensors in the Digester 3&4 Building. This work includes plumbing, electrical, SCADA programing, and painting. This work can only be done: while Digester 3 is empty; or after the replacement of the four (4) critical sludge valves from Bid Item 9. |
| Bid Item 13<br>Add Alternate I | Installation of one (1) Scum Detecting Radar on Digester 3. This work includes electrical and SCADA programing. This work can only be done while Digester 3 is empty.  |

## 2 Contact Information

The Engineer and main point of contact for this project is:

Peter R. Denis, P.E.  
City of Tulsa Water and Sewer Department  
Southside Wastewater Treatment Plant  
5300 S. Elwood Ave., Tulsa, OK 74107  
T: 918-591-4482, C: 918-381-2404  
E: pdenis@cityoftulsa.org

Alternate points of contact for this project are:

|   |  |
|---|--|
| Superintendent,<br>Southside Wastewater Treatment Plant | Josh Fisher<br>5300 S. Elwood Avenue<br>Tulsa, OK 74107<br>918-591-4450<br>jfisher@cityoftulsa.org                 |
| Water Pollution Control Manager                         | Matt Vaughan, P.E.<br>175 E. 2nd Street, Suite 1400<br>Tulsa, OK 74103<br>918-596-9845<br>mvaughan@cityoftulsa.org |

### **3 Common Requirements for All Bid Items**

#### **3.1 Contractor's Responsibility**

Contractor will refer to the following sections of the Contract Documents regarding the Contractor's risk and responsibility:

- Paragraph B-9 of the Instructions to Bidders.
- Article I of the Contract.
- Paragraph GC-7 and GC-18 of the *General Conditions of Contract*.

3.1.1 In general, the intent is for this project to be a turn-key replacement of existing equipment with minimal changes needed for installation or operation. Contractor will remove and dispose the existing equipment for each bid item and install new, like-kind equipment.

The proposed equipment will have the same capacity; have the same performance; be of the same materials; and utilize the same type of electrical power supply (voltage, phase, frequency) as the existing equipment. Any variation from this will be addressed in the specific requirements for each bid item.

Contractor will verify the Complete System is fully operational. The Complete System consists of the new equipment combined with any previously-installed facility equipment and structures.

### 3 Common Requirements for All Bid Items

3.1.2 Contractor will coordinate, provide, and bear the cost of all items below:

- Equipment, materials, tools.
- Labor, supervision, coordination.
- Delivery, unloading, storage.
- Rigging, lifting, material handling.
- Portable lighting and illumination.
- Forced air ventilation.
- Atmospheric testing.
- Flow stoppage, plugging, bypass pumping, sump pumping.
- Vacuum truck service and disposal of grit, sludge, sediment.
- Pumping or vacuum service needed if facility equipment (valves, pumps, etc.) are not functional or sufficient to drain or maintain drained conditions.
- Trash service and disposal of debris.
- Methods to prevent debris from going into drains.
- Protection of equipment and materials from damage.
- Protection of water coils and water piping from freeze damage.
- Procedures to prevent damage to underground pipes or utilities.
- Paint or coatings to protect new equipment and materials from corrosion.
- Electrical wires, cable, conduit, terminations, and other incidental items.
- Fasteners, hardware, equipment bases, and other incidental items.
- Modifications or replacement of concrete bases to accommodate the new equipment.
- Modifications to any previously-installed facility equipment and structures.
- Modifications or adaption needed to allow new equipment to properly fit with any previously-installed facility equipment and structures.
- Modifications due to new code requirements.
- Modifications due to new industry standards.
- Modifications due to lack of availability of certain equipment or materials.
- Fees, permits, inspections.
- Complying with all applicable regulations of the Occupational Safety and Health Administration (OSHA).

### 3 Common Requirements for All Bid Items

#### 3.2 Coordination with Plant Operations

- Contractor will plan his Work to minimize interruption of plant operations. It may be necessary for the Contractor to conduct Work at night, during low flow periods, and for short periods of time.
- Significant Events are define as:
  - Removing equipment from service.
  - Flow stoppage.
  - Bypass pumping.
  - Placing equipment back into service.
  - Start-up or inspection of equipment.
  - Equipment training.
  - Any other activity that requires coordination with plant operations.
- Contractor will coordinate with the Engineer or Superintendent at least two (2) days before conducting any Significant Events (as defined above).

#### 3.3 Project Schedule

Contractor will refer to Paragraph GC-13 of the *General Conditions of Contract* regarding the Project Schedule (also known as the progress schedule). Contractor will coordinate with the Engineer for approval of the Project Schedule format and delivery method. Contractor will meet with the Engineer on a regular basis to review the Project Schedule.

3.3.1 Contractor will provide a *preliminary* Project Schedule to the Engineer within two (2) weeks of issuance of Order to Proceed. The *preliminary* Project Schedule will show all the Bid Items and any additional information that the Contractor chooses.

3.3.2 Contractor will provide an *updated* Project Schedule to the Engineer on a regular basis, as necessary, to reflect changes to the schedule. The *updated* Project Schedule will change throughout the course of the project, but will ultimately show the following information for each Bid Item:

- Date when the Contractor plans to start Work.
- Date when the Contractor plans to complete Work.
- Dates of any Significant Events as defined in Section 3.2.
- Warranty-start date.

### 3 Common Requirements for All Bid Items

#### 3.4 Submittal Requirements

Contractor will refer to Paragraphs GC-2 and GC-5 of the *General Conditions of Contract* regarding documents that are submitted for review. Contractor will submit documents to the Engineer and will coordinate with the Engineer regarding the media format and delivery method.

##### 3.4.1 Documents for Review

3.4.1.1 Contractor will provide one (1) copy of Documents for Review for each Bid Item. Either soft copy or hard copy format is acceptable. Contractor will submit Documents for Review early enough to allow for review, possible corrections or changes, resubmittal, and additional review. The Contractor will plan for a two (2) week review by the Engineer for each submittal and resubmittal.

3.4.1.2 Documents for Review consist of the following for each Bid Item:

- Equipment and Material Datasheets with information such as:
  - Make and model.
  - Size and dimensions.
  - Performance information
  - Materials of construction.
- Preliminary Operation and Maintenance Manuals.
- Additional information, as appropriate, such as:
  - Installation and Start-up instructions.
  - Outline drawings showing dimensions, components, and materials.
  - Drawings or sketches showing the proposed route of new piping.
  - Plans for any modifications to current facility equipment and structures.

3.4.1.3 Documents for Review are required before starting Work on each Bid Item. See Section 3.7.1.



### 3 Common Requirements for All Bid Items

#### 3.4 Submittal Requirements (continued)

##### 3.4.2 Documents for Record

3.4.2.1 Contractor will provide one (1) Soft Copy Operations and Maintenance Manual (Soft O&M) for each Bid Item. The Contractor will create the Soft O&M by using appropriate computer software to combine the documents into a single PDF file. The Contractor will use appropriate computer software so that the text of the Soft O&M is selectable and searchable. The Contractor will mark through or remove non-applicable information in the Soft O&M which is not relevant to the equipment that has been supplied. The Soft O&M will contain the following documents in the order that they are listed:

- NAMEPLATE AND SUMMARY DATA: Contractor will coordinate with the Engineer to obtain a current soft copy of the NAMEPLATE AND SUMMARY DATA form. The Contractor will enter the information into this form using appropriate computer software so that the text is selectable and searchable when it is part of the Soft O&M.
- Manufacturer's Operation and Maintenance Information.
- Additional information, as appropriate, such as: start-up report; installation; calibration; adjustment; troubleshooting; parts list; recommended spare parts; electrical wiring diagrams; as-built construction drawings (also known as red-line drawings).

3.4.2.2 Contractor will provide three (3) Hard Copy Operations and Maintenance Manuals (Hard O&M) for each Bid Item. Each Hard O&M will contain the same information as the Soft O&M. Each Hard O&M will be printed on paper and bound together.

3.4.2.3 Documents for Record are required for each Bid Item and form a part of the Work for each Bid Item. See Section 3.12 regarding Payment.

**ANTERO NAMEPLATE AND SUMMARY DATA\***

**Antero Number:** \_\_\_\_\_

**Description (Include size):** \_\_\_\_\_

**Project #:** \_\_\_\_\_

**Spec. #:** \_\_\_\_\_

**Vendor:** \_\_\_\_\_

**Manufacturer:** \_\_\_\_\_

**Model #:** \_\_\_\_\_

**\*Item or Drawing #** \_\_\_\_\_

**\*Serial #:** \_\_\_\_\_

**Purchase Price:**       \$\_\_\_\_\_

**Date Placed in Service (for 1-yr Warranty):** \_\_\_\_\_

**Manufacturer’s Warranty Period and End Date:** \_\_\_\_\_

**Parts / Associated Details:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Maintenance Schedule**

(May be an attached sheet from O&M Manual; do not use “See O&M Manual”)

Ü Initial: \_\_\_\_\_

Ü Weekly: \_\_\_\_\_

Ü Monthly: \_\_\_\_\_

Ü Semi-Annual: \_\_\_\_\_

Ü Annual: \_\_\_\_\_

**Applicable Motor Information:**

N.A. (Circle if not applicable)

Vendor: \_\_\_\_\_

Manufacturer: \_\_\_\_\_

Model #: \_\_\_\_\_

Item #: \_\_\_\_\_

Serial #: \_\_\_\_\_

Frame: \_\_\_\_\_ Insul. Class: \_\_\_\_\_

Volts/Hz/Amps: \_\_\_\_\_

HP / RPM / SF: \_\_\_\_\_

Manufacturer’s Warranty Period and End Date: \_\_\_\_\_

**\*Item or Drawing #** may not be unique. For example, it may be the same for a group of same size valves or gates, each one having this same number that is unique to the group. The **Serial #** should be listed only when unique to this individual piece of equipment, otherwise it is N.A.

### **3 Common Requirements for All Bid Items**

#### **3.5 Contractor Access Cards**

- 3.5.1 A Contractor Access Card, issued by the City of Tulsa Security Office, is required for the following people:
- The driver of each vehicle that will be entering the facility multiple times or on a regular basis.
  - Sub-contractors and foremen that will be supervising other workers.
  - Any other individual as directed by COT Security, Plant Superintendent, or WPC Manager.
- The Contractor Access Card allows vehicular entry through the front gate of the Southside Wastewater Treatment Plant, Cherry Creek Facility, and 71st Street Dewatering Facility.
- 3.5.2 Contractor will coordinate with the Engineer to request Contractor Access Cards. Application for a Contractor Access Card will require a background investigation. Each person that is applying for a Contractor Access Card will need to complete the following two (2) forms:
- City of Tulsa Access Card / Identification Card Request Form
  - City of Tulsa Background and Prescreen Investigation Form
- A current soft copy of the forms can be obtained from the Engineer.
- 3.5.3 The Contractor will send the completed forms to the Engineer. The Engineer will submit the completed forms to the City of Tulsa Security Office. Approved individuals will coordinate with the City of Tulsa Security Office to complete the process and obtain their Contractor Access Card.
- 3.5.4 Six (6) months is the maximum time that a Contractor Access Card is active. The Contractor may coordinate with the Engineer to request re-activation of Contractor Access Cards. Re-activation may require re-application and additional background investigation.

# Access Card/Identification Card/Driver's License & Key Request Form

**NEW ISSUE**     **REPLACEMENT** (\$15 per key for lost or non-returned keys/keycards)

As per terms of this Agreement, I agree that I will NOT DUPLICATE or LOAN this key/keycard and I will **RETURN it directly to the City of Tulsa Security office** when my need for it terminates. I agree to pay the appropriate replacement charge if this key is lost.

Keys will not be issued for incomplete forms and only one key issued per form.

**New Employees must attend Session I and Session II of New Employee Orientation before being issued an official City of Tulsa Access/Identification Card or Driver's License.**

|   |                    |   |   |                |
|---|--------------------|---|---|----------------|
| _____   |                    | <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D | _____   |                |
| <b>Employee Oklahoma Driver's License Number:</b> |                    | <b>Driver's License Class:</b>  | <b>Expiration Date:</b>   | _____          |
| _____   |                    | _____   |   | _____          |
| <b>Last Name:</b>                                 | <b>First Name:</b> | <b>Middle Initial:</b>  | <b>Suffix:</b>  |                |
| _____   | _____              | _____   | _____   |                |
| <b>Date of Birth: (MM/DD/YY)</b>                  | <b>Hair Color:</b> | <b>Eye Color:</b>   | <b>Weight:</b>  | <b>Height:</b> |
| _____   | _____              | _____   | <input type="checkbox"/> Regular <input type="checkbox"/> Temporary <input type="checkbox"/> Intern | _____          |
| <b>Department:</b>                                | <b>Job Title:</b>  | <b>Employment Status:</b>   |   |                |
| _____   | _____              | _____   |   |                |

I have received and read the computer use and the above key duplication policy:

Signature: \_\_\_\_\_

|   |                      |  |  |                    |
|---|----------------------|--|--|--------------------|
| <b>TYPE OF KEY/ACCESS REQUESTED:</b> <input type="checkbox"/> METAL KEY <input type="checkbox"/> ACCESS CARD          |                      |  |  |                    |
| Building info is needed for access card. Room, Hinge, Suite, Floor and Key number information is for metal keys only. |                      |  |  |                    |
| Building(s) Requested: _____  |                      |  |  |                    |
| _____   | _____                | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | _____              |
| <b>Room Number:</b>   | <b>Hinge Number:</b> | <b>Suite Master:</b>                                     | <b>Floor Master:</b>                                     | <b>Key Number:</b> |
| _____   | _____                | _____  | _____  | _____              |
| <b>SUPERVISOR USE ONLY – Departmental Authorization. Department Head Must Request/Approve Access Cards.</b>           |                      |  |  |                    |
| This employee <input type="checkbox"/> does or <input type="checkbox"/> does not require a COT DL.                    |                      | Supervisor Name: _____                                   |  |                    |
| <input type="checkbox"/> New Employee <input type="checkbox"/> Replacement <input type="checkbox"/> Current Employee  |                      | Supervisor Title: _____                                  |  |                    |
| Employment Status: _____  |                      | Supervisor Signature: _____                              |  |                    |
| Department Head Approval: _____   |                      | Date: _____  |  |                    |
| <b>SECURITY USE ONLY</b>  |                      | <b>FACILITIES MAINTENANCE KEY SHOP INFORMATION</b>       |  |                    |
| Security Notified by Safety Loss Control to issue City License:   |                      | Key Number: _____  |  |                    |
| <input type="checkbox"/> Yes <input type="checkbox"/> No          Date Issued: _____                                  |                      | Date Issued: _____      Date Returned: _____             |  |                    |
| Issued By: _____  |                      | Issued By: _____   |  |                    |

Issued By: \_\_\_\_\_

Date: \_\_\_\_\_

Driver's record will be reviewed by H.R. Safety Section. City of Tulsa driver's license can be revoked at anytime. Fill out and bring to City Hall, Street Level Security office with your State Identification or Driver's License

COMPLETED FORMS MUST BE SUBMITTED TO PUBLIC FACILITIES SECURITY /// Email: access@cityoftulsa.org or Fax (918) 699-3437

# Background and Prescreen Investigation Form

## City of Tulsa Security

|   |         |                           |                        |                                  |                    |
|---|---------|---------------------------|------------------------|----------------------------------|--------------------|
| Last Name:  |         | First Name:               |                        | Middle Initial:                  | Maiden Name:       |
| Aliases:  |         | Date of Birth: (MM/DD/YY) |                        | Social Security Number:          |                    |
| <input type="checkbox"/> Female <input type="checkbox"/> Male |         | Height:                   |                        | Weight:                          | Race:              |
| Gender:   | Height: | Weight:                   | Race:                  | Driver's License Number & State: | Home Phone Number: |
| Applicant Address:  |         |                           | City:                  | State:                           | Zip:               |
| Employer Name:  |         |                           | Business Phone Number: |                                  |                    |
| Employer Address:   |         |                           | City:                  | State:                           | Zip:               |

Have you ever been convicted of, pled guilty, or "no contest" to a crime that has or has not been expunged or removed from your record?

Yes  No *If yes, please explain below.*

---

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1. I understand that an investigative report may be generated on me that may include information as to my character and work habits, along with criminal history records from any criminal justice agency in any or all federal, state, city and county jurisdictions, State Department of Motor Vehicles, Military, and Social Security Administration. I fully understand that the City of Tulsa may be requesting information from public and private sources about any of the information noted earlier in this paragraph, and I freely give my consent for the City of Tulsa to do so. I also attest under the penalty of perjury that the information above is complete and true to the best of my knowledge. Lastly, I understand that presence of a conviction does not automatically preclude me from eligibility. Consideration will be given to the nature of the offense, time since conviction and all other relevant facts and circumstances pertaining to the situation. Likewise the absence of such convictions will not mean automatic acceptance of eligibility.

|                      |       |
|----------------------|-------|
| Applicant Signature: | Date: |
|----------------------|-------|

| OFFICE USE ONLY  |   |
|--|---|
| Facility:  | Contractor:   |
| Sources: <input type="checkbox"/> OSCN <input type="checkbox"/> Juris <input type="checkbox"/> TPD <input type="checkbox"/> Doc <input type="checkbox"/> Other | Disposition: <input type="checkbox"/> Affirmative <input type="checkbox"/> Negative <input type="checkbox"/> Inconclusive |

|               |       |
|---------------|-------|
| Investigator: | Date: |
|---------------|-------|

### **3 Common Requirements for All Bid Items**

#### **3.6 Equipment and Material Removal**

Contractor will provide all of the following for any equipment or material removal:

- Proper termination of any piping.
- Proper termination of electrical wire and conduit.
- Proper plugging or filling of any holes.

#### **3.7 Installation**

3.7.1 Before starting Work for each Bid Item, Contractor will do all of the following:

- Submit Documents for Review to the Engineer as per the Submittal Requirements.
- Verify the Documents for Review have been checked and accepted by the Engineer as per Paragraph GC-5 of the *General Conditions of Contract*.
- Field-verify all necessary dimensions.
- Field-verify the available electrical power supply (voltage, phase, frequency).
- Field-verify the conditions of facility equipment and structures.
- Verify that the capacity, performance, and dimensions of the new equipment will allow for proper operation of the Complete System.
- Verify that clearances between any new equipment and any previously-installed facility equipment and structures are reasonable, safe, and allow for proper operation of the Complete System.
- Coordinate with the Engineer for approval of any modifications to facility equipment and structures.
- Verify the availability of the equipment and materials the Contractor plans to use.
- Coordinate with Plant Operations in accordance with Section 3.2.

3.7.2 During and after installation of new equipment, Contractor will do all of the following:

- Install new equipment per the manufacturer's instructions.
- Verify the new equipment is installed correctly.
- Test the newly installed equipment under actual operating conditions.

### 3 Common Requirements for All Bid Items

#### 3.8 Corrosion Protection

3.8.1 Corrosive Areas are defined as:

- Areas where sewage is conveyed, stored, or treated.
- Areas that are exposed to the liquid, solid, or gaseous by-products of sewage treatment.
- Areas that are subject to spills, overflows, flooding, and subsequent wash-down.
- Areas where chemicals are used or stored.

Corrosive Areas are characterized by the following contributors to corrosion:

- The continuous presence of moisture and condensing humidity on a diurnal cycle.
- The continuous presence of trace amounts hydrogen sulfide ( $H_2S$ ).
- The natural formation of sulfuric acid ( $H_2SO_4$ ) due to the presence of both moisture ( $H_2O$ ) and hydrogen sulfide ( $H_2S$ ).
- Fugitive emissions of digester gas which contains between 900 and 1100 ppm of hydrogen sulfide ( $H_2S$ ).
- Products of combustion from the burning of digester gas which contains between 1 and 2 ppm of sulfur oxides ( $SO_x$ ).
- Chlorinated plant effluent which contains about 1 to 2 ppm of total chlorine residual.
- Caustic chemicals such as Sodium Hydroxide ( $NaOH$ )
- Oxidizing agents such as Potassium Permanganate ( $KMnO_4$ ) and Sodium Hypochlorite ( $NaClO$ ).

In designated Corrosive Areas, the Contractor will take the actions described below to protect the new equipment and materials from corrosion.

#### 3.8.2 Fasteners and Hardware in Corrosive Areas

Fasteners are defined as nuts, bolts, washers, screws, studs, anchors, and threaded rods.

- All new fasteners in Corrosive Areas are to be 300 series stainless steel (such as 304 or 316).
- Exception: New threaded rods in Corrosive Areas are to be either:
  - 300 series stainless steel (such as 304 or 316) or;
  - 6000 Series Aluminum (such as 6061 or 6063).

Hardware is defined as channels, struts, supports, hangers, clamps, and any other associated accessories.

- All new hardware in Corrosive Areas are to be either:
  - 300 Series Stainless Steel (such as 304 or 316) or;
  - 6000 Series Aluminum (such as 6061 or 6063) or;
  - Approved high-strength composite materials such as glass-fiber reinforced plastic.  
Acceptable composite materials include:
    - Unistrut, Fiberglass Strut System;
    - Aickinstrut, Fiberglass Strut System;
    - Other equivalent product that complies with the requirements of ASTM D3917 and ASTM D4385.

Contractor is to follow the manufacturer's instructions regarding loading of fasteners and hardware. Contractor will coordinate with the Engineer for approval to re-use any existing fasteners or hardware. Any re-used fasteners or hardware that is not stainless steel or aluminum is to be painted or coated in accordance with Sections 3.8.8 and 3.8.9.

### 3 Common Requirements for All Bid Items

#### 3.8 Corrosion Protection (continued)

##### 3.8.3 Recommended Metals in Corrosive Areas

The following metals hold up well in Corrosive Areas and do not need to be painted or coated:

- 300 series stainless steel. These metals might be referred to by any of the following designations:
  - 18-8 or equivalent alloys containing about 18% chromium and 8% nickel.
  - Type 304 or CF8 or A2 stainless.
  - Type 316 or CF3M or A4 stainless.
- Aluminum alloys that contain less than 1% copper such as most extruded aluminum (which are generally 1000 series, 6000 series, or 7000 series) and most other cast aluminum.
- Nickel Alloys
- Electroplated steel with a plating of either aluminum or nickel.
- Hot Dip Galvanized steel that is fabricated in accordance with ASTM A385, galvanized in accordance with ASTM A123, assembled using hardware in accordance with ASTM A153, and repaired in accordance with ASTM A780 is acceptable in corrosive areas.

##### 3.8.4 Metals to Avoid or Protect in Corrosive Areas

The following metals are susceptible to corrosion in Corrosive Areas. The Contractor will avoid these metals for any exposed components or provide other means of painting or coating these metals:

- Copper, lead, silver, zinc.
- Copper alloys such as brass, bronze, and cupronickel.
- Chrome-plated or nickel-plated brass.
- Other zinc coating are not acceptable for corrosive areas. These include galvanized sheet (ASTM A653), mechanical plated (ASTM B695), electrogalvanized (ASTM A879), and zinc plated (ASTM B633) materials. These may also be referred to as zinc-plated, electroplated, zinc electrogalvanized, zinc electroplated.
- Alloys that contain significant amounts of copper such as Monel and COR-TEN.
- Aluminum alloys that contain more than 1% copper such as 2000 series wrought aluminum, 200 series cast aluminum, and 319 cast aluminum.
- Solder containing lead, tin, or silver.

##### 3.8.5 Dissimilar Metal Connections in Corrosive Areas

Dissimilar Metal Connections are defined as the connection of any group listed in the table below with any other group.

|                |  |
|----------------|--|
| Copper Group   | Copper or any copper alloys such as brass or bronze.   |
| Ferrous Group  | Iron or any iron alloys such as black steel, carbon steel, galvanized steel, or zinc-plated steel. |
| Aluminum Group | Aluminum or any aluminum alloys.   |

Corrosion can be expected if the Dissimilar Metal Connections are left exposed in Corrosive Areas. The Contractor will avoid Dissimilar Metal Connections or use the following methods to avoid corrosion:

- Provide an electrically insulating material between dissimilar metals. Suitable materials include: vinyl electrical tape or nitrile rubber gasket material.
- Provide PTFE thread seal tape on threaded connections.



### 3 Common Requirements for All Bid Items

#### 3.8 Corrosion Protection (continued)

- Provide field-applied corrosion inhibitor between the connected metals or over the entire connection area. Contractor will use a field-applied corrosion inhibitor as specified in Section 3.8.9.

#### 3.8.6 Corrosion Protection of All Metal

Contractor will provide painting or coating on all exposed metal components of the new equipment and materials in Corrosive Areas. See Section 3.8.3 regarding metals that do not need to be painted or coated. See Section 3.8.9 regarding metal parts that are not appropriate to paint.

#### 3.8.7 Factory-applied Paint or Coating for Equipment in Corrosive Areas

- Contractor will ensure that the factory-applied paint or coating on new equipment in Corrosive Areas is approved by the manufacturer as suitable for use in a wastewater facility. One primer coat by itself is not acceptable. Contractor will bear the cost of any upgraded paint or coating system to meet this requirement.
- Contractor will provide touch-up repair of any factory-applied paint that is damaged during the installation process. Contractor will use paint as specified in Section 3.8.8 for any needed touch-up painting.

#### 3.8.8 Field-applied Paint in Corrosive Areas

- In Corrosive Areas, Contractor will provide field-applied paint to all new metal.
- Exceptions:
  - Do not paint data plates or equipment labels.
  - Metals listed in Section 3.8.3 do not need to be painted.
  - Metals that are not appropriate to paint should be coated with a field-applied corrosion inhibitor instead. See Section 3.8.9.
  - Contractor will coordinate with the Engineer for approval any other metals that do not need to be painted.
- Acceptable paints include the following:
  - Tnemec, Series N69, Hi-Build Epoxoline II
  - Sherwin-Williams, Macropoxy 646 Fast Cure Epoxy
- Contractor will follow the paint manufacturer's instructions for paint application and dry film thickness.
- Contractor will match the new paint color to be the same color as the existing equipment or the same as other similar equipment. Light-gray (ANSI #70) is also an acceptable color for new equipment.
- Contractor will follow the paint manufacturer's instructions for surface preparation, but as a minimum will remove all oil, grease, dirt, loose rust, loosely adhering paint, and other foreign matter by hand or power tool cleaning per SSPC-SP2 or SSPC-SP3. Strongly adhering paint or asphalt coatings do not need to be removed. Note: SSPC-SP2 is an abbreviation for the Society of Protective Coatings, Surface Preparation standard #2 for Hand Tool Cleaning. SSPC-SP3 is an abbreviation for Surface Preparation standard #3 for Power Tool Cleaning.
- Contractor will overlap paint slightly onto any exposed adjacent metal that is part of the current facility equipment so that the interface between new metal and old metal is protected by paint.

### 3 Common Requirements for All Bid Items

#### 3.8 Corrosion Protection (continued)

##### 3.8.9 Field-applied Corrosion Inhibitor in Corrosive Areas

- In Corrosive Areas, Contractor will provide a light coat of white lithium grease or other corrosion inhibitor to all new metal that is not appropriate to paint. These include:
  - Moving parts (or parts that are intended to move)
  - Threaded connections
  - Threaded rods
  - Valve stems
  - Sliding metal parts
  - Electrical conduit joints
  - Electrical conduit hubs
  - Any other connections that are intended to be removable.
- Exceptions:
  - Metals listed in Section 3.8.3 do not need to be coated.
  - Contractor will coordinate with the Engineer for approval any other metals that do not need to be coated.
- Acceptable corrosion inhibitors include the following:
  - White Lithium Grease (from any company)
  - WD-40 Long Term Corrosion Inhibitor
  - CRC Heavy Duty Corrosion Inhibitor
  - Corrosion X
  - Fluid Film

### 3 Common Requirements for All Bid Items

#### 3.8 Corrosion Protection (continued)

##### 3.8.10 Corrosion Protection of Electrical Equipment

The contractor will take the actions described below to protect new electrical equipment in designated Corrosive Areas.

- 3.8.10.1 In Corrosive Areas, Contractor will provide a Complete Electrical System that is protected to a “Watertight” level as defined by the National Electrical Manufacturers Association (NEMA). The Complete Electrical System consists of the new electrical equipment combined with any previously-installed facility equipment.

##### Acceptable conduit for use in Corrosive Areas

Contractor will use the following types of conduit in Corrosive Areas:

- Rigid Aluminum Conduit (RAC) also known as: Aluminum Rigid Conduit (ARC); or Electrical Rigid Aluminum Conduit (ERAC); or Electrical Rigid Metal Conduit - Aluminum (ERMC-A)
- Liquidtight Flexible Metal Conduit (LFMC).

##### Rigid Aluminum Conduit (RAC)

Rigid Aluminum Conduit (RAC) is to be Underwriters Laboratories (UL) listed to Safety Standard 6A; manufactured in accordance with ANSI C80.5 and installed in accordance with NEMA and NEC guidelines. Proper installation procedures should be used with Rigid Aluminum Conduit to avoid corrosion issues with dissimilar metals. See Section 3.8.5 regarding dissimilar metals.

##### Liquidtight Flexible Metal Conduit (LFMC)

Liquidtight Flexible Metal Conduit (LFMC) is to be installed in accordance with NEMA RV 3 (latest version), which addresses the application and installation of LFMC.

##### Fittings for LFMC

Fittings for LFMC are to be installed in accordance with NEMA FB 2.20 (latest version), which addresses the selection and installation of fittings for use with LFMC. Fittings for LFMC should be mounted horizontally or from underneath termination boxes to allow liquids to run away from the fittings. Fittings for LFMC should not be mounted on the top of boxes as this may allow liquids to flow through loose fittings into electrical boxes.

- 3.8.10.2 In Corrosives Areas, Contractor will ensure that new NEMA 4X enclosures comply with the following:

- are installed properly in order to retain their rating.
- are mounted by means external to the enclosure cavity.
- have gasketed conduit fitting for watertight connection at the conduit entrance.

##### 3.8.10.3 Conduit Types Not Allowed In Corrosive Areas

The following conduit types are not allowed in Corrosive Areas:

- Electrical Metallic Tubing (EMT)
- Intermediate Metal Conduit (IMC)
- Flexible Metal Conduit (FMC)
- Flexible Metallic Tubing (FMT)

### **3 Common Requirements for All Bid Items**

#### **3.9 Electrical Requirements**

3.9.1 All work is to be in compliance with National Electric Code, NFPA 70. In Corrosive Areas, Contractor will provide corrosion protection of electrical equipment as specified in Section 3.8.

3.9.2 All work is to be in compliance with OSHA Standards. Disconnect switches must be installed in accordance with OSHA Standard 1910.147 and designed to accept a lockout device.

3.9.3 Contractor will provide new disconnect switches for all new equipment that is required by OSHA to have disconnect switches.

- New equipment that has an integral disconnect switch in accordance with OSHA Standard 1910.147 is acceptable.
- If new equipment that does not have an acceptable switch, then Contractor will provide a new local disconnect switch that is in accordance with OSHA Standard 1910.147. For new equipment in a Corrosive Area, the disconnect switch will be of stainless steel or glass-fiber reinforced plastic construction meeting NEMA 4X standards. See Section 3.8.10.2 regarding NEMA 4X enclosures.

### 3 Common Requirements for All Bid Items

#### 3.10 Equipment Identification Tags

3.10.1 Contractor will provide and attach new Equipment Identification Tags for the following:

- New equipment.
- New or existing ancillary devices associated with the new equipment identifying the equipment that it controls or provides power to including:
  - Motor Start/Stop Switches
  - Electrical Disconnect Switches
  - Control Panels
  - Thermostats

3.10.2 Tags will be made from 1/16 inch thick, laminated impact acrylic such as Rowmark UltraMattes 322-512, or equivalent. Tags are to be blue with white letters.

3.10.3 Tags will be positioned on the equipment so they are easily visible from a normal avenue of approach. The minimum size requirements are listed below. Larger tags and text are also acceptable.

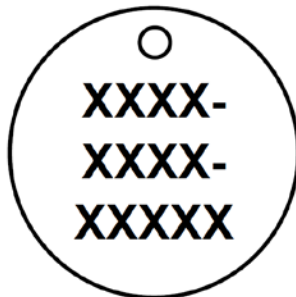
#### 3.10.4 Tags for General Equipment

- Rectangular, 3-½ inch wide by ¾ inch high.
- One line of text, centered, with white capitalized block letters 1/4" high.
- Attached with permanent adhesive.



#### 3.10.5 Tags for Valves and Gates

- Round, 1-½ inch diameter, with small hole at the top for tie wire.
- Three lines of text, centered, with white capitalized block letters 3/16" high.
- Attached with permanent stainless steel tie wire.



### 3 Common Requirements for All Bid Items

#### 3.10.6 Equipment Identification Tag Numbers

| Bid Item | Equipment Location    | Equipment Name  | Equipment Identification Tag Number |
|----------|-----------------------|---|-------------------------------------|
| 1        | Main Lift Station     | North Sluice Gate between Bar Screen Chamber and Wet Well | S101-BRS1-SGT04                     |
| 1        | Main Lift Station     | South Sluice Gate between Bar Screen Chamber and Wet Well | S101-BRS1-SGT05                     |
| 9        | Digester 3&4 Building | Plug Valve 05   | S080-DIG3-PGV05                     |
| 9        | Digester 3&4 Building | Plug Valve 27   | S080-DIG3-PGV27                     |
| 9        | Digester 3&4 Building | Plug Valve 29   | S080-DIG3-PGV29                     |
| 9        | Digester 3&4 Building | Plug Valve 31   | S080-DIG3-PGV31                     |
| 11       | Digester 3&4 Building | Plug Valve 03   | S080-DIG3-PGV03                     |
| 11       | Digester 3&4 Building | Plug Valve 04   | S080-DIG3-PGV04                     |
| 11       | Digester 3&4 Building | Plug Valve 15   | S080-DIG3-PGV15                     |
| 11       | Digester 3&4 Building | Plug Valve 16   | S080-DIG3-PGV16                     |
| 11       | Digester 3&4 Building | Plug Valve 17   | S080-DIG3-PGV17                     |
| 11       | Digester 3&4 Building | Plug Valve 18   | S080-DIG3-PGV18                     |
| 11       | Digester 3&4 Building | Plug Valve 19   | S080-DIG3-PGV19                     |
| 11       | Digester 3&4 Building | Plug Valve 20   | S080-DIG3-PGV20                     |
| 11       | Digester 3&4 Building | Plug Valve 21   | S080-DIG3-PGV21                     |
| 11       | Digester 3&4 Building | Plug Valve 22   | S080-DIG3-PGV22                     |
| 11       | Digester 3&4 Building | Plug Valve 23   | S080-DIG3-PGV23                     |
| 11       | Digester 3&4 Building | Plug Valve 24   | S080-DIG3-PGV24                     |
| 11       | Digester 3&4 Building | Plug Valve 25   | S080-DIG3-PGV25                     |
| 11       | Digester 3&4 Building | Plug Valve 26   | S080-DIG3-PGV26                     |
| 11       | Digester 3&4 Building | Plug Valve 32   | S080-DIG3-PGV32                     |
| 12       | Digester 3&4 Building | Plug Valve 57   | S080-DIG3-PGV57                     |
| 12       | Digester 3&4 Building | Pressure Sensor for Digester 3                            | S080-DIG3-PTM03                     |
| 12       | Digester 3&4 Building | Pressure Sensor for Digester 4                            | S080-DIG3-PTM04                     |
| 13       | Digester 3&4 Building | Scum Detecting Radar for Digester 3                       | S080-DIG3-RDR03                     |

### 3 Common Requirements for All Bid Items

#### 3.11 Clean-up

Contractor will take steps to ensure the work sites are kept reasonably neat and clean throughout the project. Contractor will remove all excess material and debris upon completion of Work at each site.

#### 3.12 Payment

- Contractor will refer to Paragraph GC-29 of the *General Conditions of Contract* regarding partial payments. 5% retainage of the dollar amount of the contract is required by Paragraph GC-29.
- In addition to the 5% retainage listed above, the Engineer will withhold the following percentage of the dollar amount of each Bid Item:
  - 20% for Documents for Record, Start-up of Equipment, and Training Service (if required).
  - 5% for Final Acceptance of the Work including Equipment Identification Tags.
- The Mobilization Allowance is subject the 5% retainage that is required by Paragraph GC-29, but the Engineer will not withhold any portion of the Mobilization Allowance. The Contractor may request payment of the Mobilization Allowance immediately after receipt of the order to proceed with work.

## 4 Specific Requirements for Each Bid Item

### 4.1 Bid Item 1

|            | Item Description  |
|------------|---|
| Bid Item 1 | Replacement of two (2) sewage control gates within the wet well of the Main Lift Station (also known as the Influent Lift Station). This includes: bypass pumping; wet well cleaning; and confined space entry. |

#### 4.1.1 Documents that govern Bid Item 1

The Contractor will complete the work in accordance with the following documents:

- Section 3 - *Common Requirements of All Bid Items*.
- Section 4.1 - *Specific Requirements* listed below.
- Technical Specifications Section 203.550 provided by HUB Engineering.
- Drawings 203.550 series provided by HUB Engineering.

#### 4.1.2 Contractor's Responsibility

- Refer to Section 3.1 of the *Common Requirements for All Bid Items* for Contractor's Responsibility.
- Contractor will provide all necessary components to ensure that the complete system is fully operational.
- Work on this bid item includes "Significant Events" and requires coordination with plant operations as specified in Section 3.2 of the *Common Requirements for All Bid Items*.

#### 4.1.3 Materials that May be Reused

For Bid Item 1, the following existing materials may be reused:

- Rigid Metal Conduit (RMC) that is in good condition. All electrical conduit (new or re-used) is to be sealed to a "Watertight" level. Aluminum RMC does not need to be painted. All other RMC (new or re-used) is to be painted in accordance with Section 3.8.8 of the *Common Requirements for All Bid Items*.

#### 4.1.4 Corrosion Protection Measures

- The area where the new equipment will be installed is designated as a "Corrosive Area" as defined in Section 3.8.1 of the *Common Requirements for All Bid Items*. In particular, the equipment will be exposed to the following contributors of corrosion:
  - The continuous presence of moisture and condensing humidity on a diurnal cycle.
  - The continuous presence of trace amounts hydrogen sulfide (H<sub>2</sub>S).
  - The natural formation of sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) due to the presence of both moisture (H<sub>2</sub>O) and hydrogen sulfide (H<sub>2</sub>S).
  - Mist of chlorinated plant effluent from the bar screen washing equipment.
- Contractor is to ensure that all new equipment and materials installed for this bid item complies with the corrosion protection measures described in Section 3.8 of the *Common Requirements for All Bid Items*.
- All new fasteners and hardware are to be stainless steel or other approved material as specified in Section 3.8.2 of the *Common Requirements for All Bid Items*.



## 4 Specific Requirements for Each Bid Item

### 4.1.5 Electrical

- Equipment is to be installed in accordance with NFPA 70, National Electrical Code.
- The area where the new equipment will be installed is considered a “wet location” because it is subject to overflows, flooding, and subsequent wash-down. The Contractor is to provide a Complete Electrical System that is protected to “watertight” level.
- Contractor is to comply with Section 3.8.10 of the *Common Requirements for All Bid Item* regarding corrosion protection of electrical equipment.
- All new fasteners and hardware for electrical components are to be stainless steel or other approved material.
- Contractor will provide new Rigid Aluminum Conduit (RAC) installed in accordance with NEMA and NEC guidelines.
- Contractor will provide new Liquidtight Flexible Metal Conduit (LFMC) installed in accordance with NEMA RV 3. Existing flexible electrical conduit may not be re-used.

### 4.1.6 Painting and Coating

- Contractor will provide touch-up paint or corrosion inhibitor on any new metal in accordance with Section 3.8.8 and 3.8.9 of the *Common Requirements for All Bid Items*.

### 4.1.7 Identification Tags

- Contractor will provide identification tags as specified in Section 3.10 of the *Common Requirement for All Bid Items*.

203.550 All materials, labor, equipment, and supervision required for removing and replacing Two (2) Slide Gates at the City of Tulsa's Northside WWTP Primary Splitter Boxes per these specifications.

- 203.550.1 Work covered under this specification includes removing and installing two new stainless steel sluice gates at the Southside WWTP Influent Lift Station. The project includes the correct and complete installation of new components specified herein in conformance with the manufacturer's instructions, and recommendations for installation.
- 203.550.2 Project work shall include all materials, equipment, labor, and supervision, necessary to complete the project as specified herein, including but not limited to:
- Bypass pumping
  - Confined space entry
  - Wet well dewatering and cleaning
  - Portable crane work, rigging, scaffolding as required
  - Saw cutting of existing concrete deck
  - Demolition of existing HVAC duct and existing FRP odor control piping
  - Demolition of existing gates
  - Installation of new gates
  - Installation of new motor operators
  - Electrical work to reconnect new motor operator to existing power circuits
- 203.550.3 Contractor shall have all necessary materials and equipment at the installation site prior to any flow stoppage. It is the contractor's responsibility to prepare the system being worked on for demolition and installation of the new gates. This includes closing of upstream/downstream gates, installation of bypass pumps and discharge piping, and pumping down and cleaning the wet well and screen chambers as necessary.
- 203.550.4 Bypass pumping shall be installed, operated and maintained by the Contractor to pump around the Influent Lift Station to the adjacent Primary Clarifier Influent Splitter Box. Refer to the following requirements:
- Work shall be performed during dry weather.
  - Once bypass pumping is initiated, work shall be performed continuously until completion of gate installation.
  - Contractor shall continuously monitor and operate the bypass pumps, piping and equipment through the duration of bypass activities.
  - A minimum of two bypass pumps shall be temporarily installed.

- Contractor shall have an identical spare pump available and stored at the project site.
- Provide a minimum bypass pumping capacity of 30 MGD. This should be the combined capacity of the two installed pumps.
- Install rigid restrained joint discharge piping from the bypass pumps to the primary clarifier influent splitter box. Piping shall be adequately supported and restrained.
- Contractor shall provide a separate pumping system to dewater the wet well after bypass pumping is initiated.
- Contractor shall be responsible for wet well cleaning in the sluice gate replacement immediate area. This is a requirement to clean and prep the concrete where the new gates frames attach, and to provide a safe workspace in the immediate work area. Cleaning and removing solids from the entire wet well is not intended or required.

203.550.5 Contractor shall be knowledgeable about and shall field verify all elevations and dimensions of existing structures and equipment that in any way bears on the proposed work. All work shall be based on field measurements. The Authority will make available the information it has pertaining to the existing equipment.

203.550.6 The sluice gates shall be provided as specified and as shown in the Contract Documents. Refer to the following Gate Schedule for requirements.

| GATE SCHEDULE   |                                       |  |  |                     |                       |
|-----------------|---------------------------------------|--|--|---------------------|-----------------------|
| Equipment ID:   | Description:                          | Location:                              | Operator Type                                  | Seating Head (feet) | Unseating Head (feet) |
| S010-BRS1-SGT04 | 48" x 48" Stainless Steel Sluice Gate | SSWWTP Influent Lift Station Headworks | Rising Stem Floor Stand Mounted Motor Operated | 35                  | 35                    |
| S010-BRS1-SGT05 | 48" x 48" Stainless Steel Sluice Gate | SSWWTP Influent Lift Station Headworks | Rising Stem Floor Stand Mounted Motor Operated | 35                  | 35                    |

203.550.7 The sluice gates shall be in compliance with the latest version of AWWA C561 as modified herein.

203.550.8 No cutting, drilling or welding of the new gate or part thereof as delivered from the manufacturer, for the purpose of adapting or modifying said unit to facilitate its installation, will be permitted without written prior approval by the authority. If the new gate assembly is of differing dimensions than the existing unit, the contractor shall relocate any and all fixtures as required.

203.550.9 Contractor shall install gate and frame on the wall opening first and then install gate

operator, stem and stem supports plumb to the stem attachment point on the gate. Modify the floor deck as required to correctly position the gate operator. This work shall be done with the gate in the open position.

#### 203.550.10 PERFORMANCE REQUIREMENTS

203.550.10.1 Leakage for sluice gates shall be restricted to 0.05 gpm/ft or less of the seal perimeter at the design seating head and the design unseating head.

#### 203.550.11 SUBMITTALS

203.550.11.1 Submittals shall include, at a minimum, detailed custom drawings of the gate assembly with dimensional and mounting information and a listing of the materials of construction. General arrangement drawings and cut sheets are not considered acceptable drawings.

203.550.11.2 Calculations shall be provided to confirm compliance with the safety factors listed in AWWA C561 for all parts of the frame, anchorage and slide including the portion of the slide that engage the frame.

203.550.11.3 A copy of the test results from the minimum 30,000 cycle test confirming the durability of the seal system.

203.550.11.4 A copy of the ISO 9001:2015 certification.

#### 203.550.12 QUALITY ASSURANCE

203.550.12.1 The basis for the design of the sluice gates and slide gates is the Model RW1000-S as manufactured by RW Gate Company, Troy, NY.

203.550.12.2 Welds shall be performed by welders with ASME Section IX or AWS D1.6 certification.

203.550.12.3 The gate manufacturer shall be ISO 9001:2015 certified.

#### 203.550.13 MATERIALS OF CONSTRUCTION

203.550.13.1 All gate metals and metal hardware required for a complete installation shall be

316SS. This includes all items not specifically listed in this specification but required for construction.

203.550.13.2 All stainless steel referenced in this specification shall be Type 316, ASTM A240 or ASTM A276 unless otherwise indicated herein.

- All welded stainless-steel components shall be constructed of Type 316L stainless steel.
- All structural stainless steel used in the construction of slides and frames shall have a minimum material thickness of 1/4-inch.
- All non-welded stainless-steel components, excluding anchor bolts and assembly bolts, shall be Type 316 or Type 316L stainless steel.
- Anchor bolts and assembly bolts shall be Type 316 stainless steel.

203.550.14 SLIDE

203.550.14.1 The slide shall consist of a stainless-steel plate that is reinforced with stiffeners to withstand the specified head conditions. The slide shall engage the frame a minimum of 1-inch on each side.

- The slide shall be reinforced with plates or channel shaped members to restrict deflection to 1/16-inch or less at the design head.
- The stiffeners shall be welded to the slide plate in the horizontal and vertical positions.
- The portion of the slide that engages the frame shall have a minimum thickness of 1/2-inch.
- On rising stem gates, a stem connector shall be welded to the slide as a means of connecting the operating stem. The bottom portion of the stem shall be affixed to the stem connector with a minimum of two attachment bolts.

203.550.15 FRAME

203.550.15.1 The frame shall be constructed of stainless-steel plate, with the guide section formed into a C channel shape or similar to house the seal, and shall be reinforced to withstand the specified operating conditions.

- The guides shall be of a one-piece design with gussets that extend along the outside and top to accommodate unseating head. The guide members shall incorporate a tubular cross section along the guides for additional rigidity. Two-piece, sandwich type guides that are bolted together are not acceptable.
- The mounting configuration of the frame shall be as shown on the Contract Drawings.
- Wall mounted frames shall be of the flanged frame type. Flat frames shall only be provided on gates with frames that will be embedded in the concrete wall or mounted inside existing channels.
- The guide portion of flanged frame gates shall have a minimum weight of 13 lbs/ft. The portion of the flanged frame, where the anchors penetrate, shall have a minimum thickness of 1/2-inch.
- The guide extension portion of the frame shall have a minimum weight of 6 lbs/ft. Angles are not considered acceptable guide extensions.
- Lifting lugs shall be provided on the top of the frame.
- On self-contained gates, the side frame shall extend above the operating floor and the operating mechanism shall be mounted to the yoke. When shown, the frame may extend to or below the operating floor and a floorstand may be mounted on the yoke.
- Yoke members shall be C channel shaped structural members. Angles are not considered acceptable yoke members.
- Frames may be provided with a bolted and spliced connection for disassembly to facilitate shipping.

#### 203.550.16 SEALS

203.550.16.1 The seal system shall consist of self-adjusting UHMWPE seals with a nitrile or EPDM compression cord.

- The UHMWPE seals shall be arranged to ensure that there is no metal-to-metal contact between the slide and frame.
- The compression cord shall be contained by the UHMWPE seal so that it shall not be in contact with the slide.

- Seal system shall be self-adjusting for the life of the gate. Adjustable wedging devices such as wedges, wedge bars and pressure pads are not acceptable.
- On upward-opening gates, rubber side seals and/or top seals such as J-bulb seals or similar rubber seals are not acceptable in lieu of UHMWPE seals.
- The invert seal on upward opening gates shall use a compressible EPDM seal located in the invert of the frame.
  - The invert seal shall be of a flush bottom arrangement.
  - The invert seal shall be mechanically fastened with stainless steel bolts.
  - Invert seals attached solely by the use of adhesives are not acceptable.
- All seats and seals shall be secured with assembly bolts. All seals shall be field removable and field replaceable without the need to remove the gate frame from the wall. Gates that require disassembly of any portion of the frame, to replace seals, are unacceptable.
- Anchor bolts shall not penetrate the seats or seals and anchor bolts shall not prevent the removal or replacement of seats or seals.
- The seal system shall have been shop tested with a minimum 30,000 cycle operating test in an abrasive environment to confirm the ability of the seals to withstand the abrasive condition with negligible deterioration and to confirm that the leakage restriction requirement is still possible.
  - The shop test shall have been performed on a stainless-steel sluice gate and the test results shall have been certified by the manufacturer in writing.
  - A copy of the test shall be provided to the Engineer.

#### 203.550.17 OPERATING STEM

203.550.17.1 The operating stem shall be of 316 stainless steel and shall be designed to transmit in compression at least 2 times the rated output of the operating mechanism.

203.550.17.2 The stem shall have a slenderness ratio (L/r) less than 200.

203.550.17.3 The threaded portion of the stem shall have a minimum diameter of 2 inches.

- The threads shall have machine rolled, full depth ACME threads.
- Stub threads are not acceptable.

203.550.17.4 Stems provided in multiple pieces shall be provided with couplings.

- Couplings shall be 316 stainless steel and shall be internally threaded and keyed or bored and bolted.

203.550.17.5 Stem guides shall be constructed of 316 stainless steel with UHMWPE bushings.

203.550.17.6 Gates with rising stems shall be provided with a clear plastic stem cover.

- The stem cover shall be butyrate and shall have a cap and condensation vents.

203.550.17.7 Stop collars shall be provided to limit the downward travel on gates with manual operating mechanisms.

- Stop collars shall be bronze and shall be internally threaded and provided with a stainless-steel set screw.

#### 203.550.18 OPERATING MECHANISM

203.550.18.1 Operating mechanisms shall be provided by the gate manufacturer.

203.550.18.2 Electric motor actuators shall meet the following requirements:

- General
  - Equipment Requirements - The actuators shall be suitable for use on a 480 volt, 3 phase, 60 Hz power supply and must include motor, integral reversing starters, local controls and terminals for remote control and indication housed within a self-contained, sealed enclosure.
  - Actuator sizing - The actuator shall be sized to guarantee gate closure at the specified torque and/or thrust requirement as indicated by the gate manufacturer. The actuator must be adequately sized to provide the torque required to operate the gate at 90% of the nominal voltage. The



operating speed shall provide closing and opening at approximately 12 inches per minute for gates.

- Environmental - Actuators shall be suitable for indoor and outdoor use. The actuator shall be capable of functioning in an ambient temperature ranging from -40°F to +160°F in open/close service and -40°F to +140°F in modulating service, up to 100% relative humidity.
- Enclosure - Actuators shall be O-ring sealed, watertight to NEMA 4X/6 and submersible to IP 68-8 (26 feet for 96 hours)) in accordance with EN 60529. During submersion it must be possible to operate the actuator at least 10 times. Enclosure must allow for temporary site storage without the need for electrical supply connection. All external fasteners shall be of stainless steel. Gear case shall be cast iron. In order to prevent condensation, a heater must be installed inside the actuator, suitable for continuous operation. Actuator must provide an alarm signal in case of failure of anti condensation heater. Actuators shall be certified explosion proof for Class I, Division 1 & 2, Groups C & D or Groups B, C & D.
- Motor - The electric motor shall be Class F insulated, with a duty rating of at least 15 minutes at 104°F (40°C) ambient temperature at an average load of at least 35% of rated actuator torque. Motor shall be specifically designed and built by the actuator manufacturer for electric actuator service characterized by high starting torque, low stall torque and low inertia. Commercially available motors shall not be acceptable. Electrical disconnection of the motor shall be by means of a plug and socket and motor removal shall be possible without loss of lubricant. The actuator must include a device to ensure that the motor runs with the correct rotation for the required direction of gate travel regardless of the connection sequence of the power supply.
- Motor protection - The following criteria shall be provided for motor protection:
  - The motor shall be de-energized without damage in the event of a stall condition when attempting to move a jammed gate.
  - The motor shall be de-energized in the event of an overtorque condition
  - A minimum of three thermal devices imbedded in the motor windings shall be provided to de-energize the motor in case of overheating.
  - Lost phase protection
- Gearing - The actuator gearing shall be totally enclosed in a grease-filled cast iron gearcase suitable for operation in any orientation. Oil lubrication is not permitted. Actuator gearing shall be hardened steel

with alloy bronze worm wheel. The design should permit the opening of the gearcase for inspection or disassembly without releasing the stem thrust or taking the gate out of service. Where required per application, electric actuators will be provided with worm gearboxes. The worm gearboxes shall be supplied with full 360° bronze or ductile iron worm wheels and end-of-travel mechanical stops on the worm shaft. Designs with segmented worm gears and end-of-travel stops in the gearbox housing will not be permitted.

- Manual operation - Manual operation shall be by handwheel which shall not rotate during motor operation. Handwheel declutch mechanism shall include an output contact to indicate actuator manual operation. Manual operation shall utilize the actuator worm shaft/worm wheel to maintain self-locking gearing and to facilitate changeover from motor to manual operation when the actuator is under load. Actuator designs that bypass electric actuator worm gears when declutched are unacceptable. The declutching from motor operation shall be at the motor shaft to minimize declutching effort. The amount of force required to declutch the actuator shall be the same regardless of the size of the actuator. Designs that break the gate load at the worm and worm gear are unacceptable. Return from manual to electric mode of operation will be automatic upon motor operation. A seized or inoperable motor shall not prevent manual operation.
- Drive nut and thrust base assembly - For multi-turn rising stem applications, the drive nut shall be installed in a detachable thrust base. The design shall allow actuator removal from the thrust base, leaving the thrust base attached to the yoke or pedestal to retain slide position. Thrust bearings shall be lubricated by means of an easily accessible grease fitting.
- Gate position and torque calibration - Limit switches shall be furnished at each end of travel. Limit switch adjustment shall not be altered by manual operation. Limit switch drive shall be by counter gear. Limit switches must be capable of quick adjustment requiring no more than five (5) turns of the limit switch adjustment spindle. One set of normally open and one set of normally closed contacts will be furnished at each end of travel where indicated. Contacts shall be of silver and capable of reliably switching low voltage DC source from the control system furnished by others. Mechanically operated torque switches shall be furnished at each end of travel. Torque switches will trip when the gate load exceeds the torque switch setting. The torque switch adjustment device must be calibrated directly in engineering units of torque.
- Wiring and terminals - Internal wiring shall be tropical grade insulated stranded cable of appropriate size for the control and 3-phase power. All external wiring shall terminate in a removable plug and socket head,

which allows easy disconnection of all power and control voltages. Actuators furnished without plug and socket terminal connections must have power and control disconnect switches for ease of maintenance and safety.

- Electric Actuator Control (contact closure / discrete signals or analog signal) Controls
  - Controls - All actuators will be furnished with integral actuators / motor controls. The integral controls shall be electrically connected to the actuator via a plug and socket connection. It shall be possible to re-position the integral controls at 90° increments, so that the push buttons and indication lights will face the operator. In case the actuators have to be mounted in un-accessible positions, it shall be possible to separate the integral controls including all the electronic control elements from the actuator. A wall bracket shall be available as an option to mount the controls at a convenient position near the actuator.
  - Control components - The following components/features shall be included with the integral controls:
    - Reversing contactors (mechanically and electrically interlocked).
    - Internal power supply / transformer for control power.
    - Control and signal voltage shall be either 24V DC or 110 V as indicated, internally or externally supplied.
    - Programmable control logic
    - Automatic phase correction
    - Control system interface shall be as follows:
      - Control by contact closure / discrete input signals via OPEN-STOP-CLOSE signals (either 24 V DC or 115 V as indicated) potentially separated from actuator controls by opto-isolators.
  - Local controls - Local controls with 'OPEN - STOP - CLOSE' pushbutton type controls and a lockable selector switch with 'LOCAL - OFF - REMOTE' function. Local controls shall be supplied with indicating lights red for 'OPEN', yellow for 'FAULT' and green for 'CLOSED'.
  - Output signals and for remote indication - The following output signals shall be furnished for **future installation** of remote indication:

- Output signals from selector switch when switch is in LOCAL or REMOTE positions via potential-free contacts.
  - Signals for end-of-travel positions OPEN and CLOSED shall be via potential-free contacts.
  - Monitor relay for collective fault signal (power failure, phase failure, thermal switch tripped and torque switch tripped in mid travel) shall be provided.
- Electric Actuator Commissioning and Test Reports
    - Commissioning Kit - Each actuator will be provided with a commissioning kit consisting of a wiring diagram and installation and operation manual. No special commissioning tools or parts will be required for start-up. In order to prevent loss of screws during commissioning or maintenance, all covers shall be fixed with captive screws. In order to minimize the amount of spare parts required, parts such as covers, plug and sockets, parts must be interchangeable throughout all model sizes.
    - Performance Test Documentation - Each actuator shall be performance tested. Test documentation must be provided if requested indicating the following:
      - Torque sensing tripping points in both the open and closed directions of travel
      - Current at the maximum torque tripping point
      - Actuator output speed
      - High voltage test
  - Electric Actuator Manufacturers
    - All actuators shall be manufactured by AUMA Actuators or approved equal.

#### 203.550.19 FLOORSTANDS AND WALL BRACKETS

203.550.19.1 Floorstands shall be mounted to the concrete, mounted to a wall bracket or mounted on the yoke of a self-contained gate as shown on the Contract Drawings.

203.550.19.2 All floorstands and wall brackets shall be fabricated from stainless steel.

- The base plate, adaptor plate and gussets shall be minimum 1/2-inch thick.

#### 203.550.20 ANCHORAGE

203.550.20.1 Anchor bolts shall be 316 stainless steel, fully threaded and shall have a minimum diameter of 1/2-inch.

- Anchor bolts shall Hilti HIT HY-200 or approved equal.

#### 203.550.21 FINISH

203.550.21.1 All heat tint and slag from the welding process shall be passivated in accordance with ASTM A380. If bead blasting is used, the entire slide and entire frame shall be bead blasted.

203.550.21.2 All ferrous components shall be suitably prepared and then shop coated with primer. Finish coating shall be applied by the Contractor. The ductile iron operator housing shall be finish coated by the Contractor with a suitable paint that complies with the Painting section.

#### 203.550.22 INSTALLATION

203.550.22.1 Installation shall be performed in accordance with the gate manufacturer's installation instructions and the approved installation drawings.

203.550.22.2 Installation instructions and installation drawings shall be found in the O&M manual.

203.550.22.3 Non-shrink grout shall be applied, by the Contractor, between the gate frame and the wall to ensure that there is no leakage around the gate.

#### 203.550.23 FIELD SERVICE

203.550.23.1 A factory-employed service technician shall be provided to instruct the Contractor prior to the installation of the gate. The service technician shall be available for two (2) 8-hour work days at the project site. Sales representatives are not considered acceptable service technicians.

END OF SECTION

## 4 Specific Requirements for Each Bid Item

### 4.2 Bid Item 2

|            | Item Description  |
|------------|---|
| Bid Item 2 | Repair of broken pipe hanger for the sewage force main over Cherry Creek. |

#### 4.2 Background information

The sewage pipe that crosses over Cherry Creek is suspended underneath a bridge that is part of the River Park Trails network. The suspended pipe is carried by 21 double-rod hangers. Each double-rod hanger consists of two (2) carbon steel hanger rods; one (1) pipe saddle; and associated hardware. One of the hanger rods has broken. The broken hanger rod and the associated pipe hanger is the focus of this bid item.

#### 4.2.1 Summary of Proposed Work

The Contractor will complete the following Work at the location of the broken pipe hanger.

- Remove both the existing broken hanger rod and the unbroken hanger rod along with the associated nuts and washers and provide these items to the Engineer for inspection.
- Replace both hanger rods and associated hardware as described below. The proposed hardware is to be installed as specified below. They should not be installed similar to the existing hardware.

#### 4.2.2 Contractor's Responsibility

- Refer to Section 3.1 of the *Common Requirements for All Bid Items* for Contractor's Responsibility.

#### 4.2.3 General

- Drawing 2-1 is provided for information only. It shows the plan view and elevation view of the bridge.
- All new hardware is to be **Hot Dip Galvanized steel** that is fabricated in accordance with ASTM A385, galvanized in accordance with ASTM A123, assembled using hardware in accordance with ASTM A153, and repaired in accordance with ASTM A780.
- New hanger rods and new associated hardware is to be installed in accordance with Drawings 2-2, 2-3, and 2-4. They should not be installed similar to the existing hardware.
- The Contractor should conduct this work in the safest manner using his best judgment and based on his experience and knowledge.
- Drawings 2-5 and 2-6 are provided for information only. They show the elevation of the broken pipe hanger above the creek bed.

#### 4.2.4 Painting and Coating

- Contractor will repair hot-dip galvanized coating in accordance with ASTM A780.
- After assembly, Contractor will provide field-applied paint for asthenic purposes. Contractor will match the new paint color to be the same color as the pipe and other pipe hangers. Any suitable paint is acceptable. It can be applied by spray can or paint brush. Contractor will overlap paint slightly onto adjacent metal so that the interface between new metal and old metal is covered by paint.

## 4 Specific Requirements for Each Bid Item

### 4.2.5 Coordination with River Parks Authority

In order to safely perform this work, it may be necessary to temporarily close the bridge to bicycle and pedestrian traffic. If the Contractor decides this is necessary, then he should coordinate with the following representative from the River Parks Authority.

Mr. Ryan Howell  
River Parks Authority  
2121 S. Columbia Ave., Suite 205  
Tulsa, OK 74114  
(918) 596-2008  
ryan@riverparks.org

If the contractor needs to close the bridge, then the contractor is to provide:

- Bridge closed signage;
- Barricades;
- Detour route signage;
- Advanced warning signage.

Drawing 2-7 is provided for information and shows proposed signage.

- In general, the Contractor should plan his work to minimize the length of time the bridge is closed.
- The Contractor is to ensure that the bridge is open for these upcoming events in which the race routes will cross the Cherry Creek bridge.

| Event                         | <u>2021</u> | <u>2022</u> | <u>2023</u> |
|-------------------------------|-------------|-------------|-------------|
| Go Short Go Long Go Very Long | 1/23/2021   | 1/22/2022   | 1/21/2023   |
| T-Town Half Marathon          | 3/27/2021   | 3/26/2022   | 3/25/2023   |
| Golden Driller Marathon       | 4/17/2021   | 4/16/2022   | 4/29/2023   |
| The Q Half Marathon           | 9/18/2021   | 9/17/2022   | 9/16/2023   |
| Iron Man                      | 5/23/2021   | 5/22/2022   |             |

## 4 Specific Requirements for Each Bid Item

### 4.2.6 Additional Technical Information Regarding the Pipe and Hangers

- The pipe is ductile iron pipe with a nominal diameter of 36 inches and an actual outside diameter of about 38.30 inches. The pipe was installed with project SA 83-19 and the technical specifications from that project call for the pipe to be Ductile Iron, 36 inch Nominal Diameter, AWWA C151, Thickness Class 53.
  - 36 inch, Thickness Class 53, has a listed thickness of 0.58 inches.
  - 36 inch, Pressure Class 350, has a listed thickness of 0.56 inches.
- Field measurements with an ultrasonic thickness gauge indicate that the pipe is thinner and was measured to be 0.46 inches.
  - 36 inch, Pressure Class 250, has a listed thickness of 0.47 inches.
- Therefore, the actual pipe might be 36 inch, Pressure Class 250 with standard thickness cement mortar lining, but that is not confirmed.
- The pipe was measured to have a lay length of 18 feet. The listed socket depth of 36 inch ductile iron pipe is 7 inches. Therefore, each section of pipe should actually be 18 feet and 7 inches long.
- Since this is a force main, we need to assume the pipe will be full of sewage.
- The Ductile Iron Pipe Research Association (DIRPA) provides the following listed weights for the combined weight of the pipe and water
  - Size 36 inch, pressure class 250: 665 pounds (mass) per linear foot of pipe
  - Size 36 inch, pressure class 350: 693 pounds (mass) per linear foot of pipe
- Drawing 6-6 shows that there is 188.5 linear feet of pipe of suspended over the creek.
- Drawing 6-1 shows that the suspended pipe is carried by 21 double-rod hangers. There is one double-rod hanger at the centerline of the bridge with 10 to the north and 10 to south. The double-rod hangers between the bridge piers are spaced 8.75 feet apart. The double-rod hangers beyond the bridge piers are spaced 10 feet apart.
- The pipe saddles were measured to be 7 inches wide and 3/4 inch thick. They are estimated to be at least 110 pounds each.



## 4 Specific Requirements for Each Bid Item

### 4.3 Bid Item 3

|            | Item Description     |
|------------|----------------------|
| Bid Item 3 | Extra Work Allowance |

- The Extra Work Allowance is for any additional labor, materials, or equipment that is not specified in these technical specifications.
- The Extra Work Allowance will be used only at the discretion of the City of Tulsa as detailed in Paragraph GC-26 of the General Conditions of Contract.
- Any allowance balance remaining at the completion of the contract will remain unbilled to the City of Tulsa on the final Application for Payment submitted by the Contractor.
- The Contractor shall submit to the Engineer a detailed cost estimate as described in Paragraph GC-26 of the General Conditions of Contract. The Contractor will proceed with Work included in the allowance only after receiving a written order from the Engineer authorizing such work. Proceeding with work expected to be covered in the allowance without a written order from the Engineer will be at the Contractor's risk. Contractor may not be paid for unapproved work or materials at the discretion of the Engineer.
- Any additional costs for bonds and insurance shall not be included in any Extra Work Allowance because this cost is already included in the contract.

## 4 Specific Requirements for Each Bid Item

### 4.4 Bid Item 4

|            | Item Description  |
|------------|---|
| Bid Item 4 | Mobilization Allowance. The Mobilizations Allowance shall <u>not</u> exceed 5% of the sum of Bid Items 1, 2, and 3. |

- The Mobilization Allowance is intended to cover the costs of bonds, insurance, permits, submittal preparation and other incidental costs at the beginning of the contract period.
- The Mobilization Allowance is optional. The Contractor may elect to bid any dollar value between zero and the maximum allowed Mobilization Allowance.
- The maximum allowed Mobilization Allowance is 5% of the sum of the other Base Bid items (not including the Mobilization Allowance itself). Add Alternate Items are not part of the Base Bid Items.
- To calculate the maximum allowed Mobilization Allowance, sum the dollar values of Bid Items 1, 2, and 3 and multiply that sum by 0.05.
- At the beginning of the contract period, the Contractor may request full payment of the Mobilization Allowance in accordance with Paragraph GC-26 of the *General Conditions of Contract* and Section 3.12 of the *Common Requirements for All Bid Items*.

## 4 Specific Requirements for Each Bid Item

### 4.5 Bid Item 5

|                               | Item Description   |
|-------------------------------|--|
| Bid Item 5<br>Add Alternate A | Cleaning of Digester 3. This includes: removal of residual material; wash down of internal surfaces; and flushing of internal pipes. |

#### 4.5.1 Summary of Proposed Work

- The plant staff will take the digester out-of-service. This includes the following:
  - Shut the raw sludge feed into the digester.
  - Continue to heat and recirculate the sludge to allow the digestion process to continue until digester gas production has significantly decreased.
  - Isolate the Digester 3 gas piping system.
  - De-pressurize the digester and allow the gas space to equalize to atmospheric pressure.
  - Open one (1) top-access hatch to allow natural ventilation of the digester.
  - Double-block and bleed the digester gas piping to ensure that gas from Digester 4 (in-service) cannot flow into Digester 3 (out-of-service).
  - Shut-down and isolate the sludge recirculation system.
  - Shut and lock the appropriate sludge valves to ensure that sludge from Digester 4 (in-service) cannot flow into Digester 3 (out-of-service).
  - Start monitoring groundwater levels.
  - Pump down the digester using existing facility equipment to remove liquid sludge contents down to the appropriate side-wall height.
- The Engineer will calculate the volume of residual material inside the digester as addressed in Bid Item 6 of this contract.
- The Contractor will:
  - Remove the 11 top-access hatches and replace them with grating or other type of cover to provide fall-through protection. Purpose is to increase day-light into the digester and increase natural ventilation of the digester.
  - Remove the two (2) side-access hatches.
  - Provide mechanical ventilation of the digester.
  - Remove and dispose the residual material from the digester.
  - Washdown the interior surfaces of the digester with flushing water.
  - Flush the inside of the sludge control box and 3 upper pipes into the digester.
  - Flush the inside of 3 lower pipes into the digester.
  - Remove and dispose the slurry of flushing water and residual material.
  - Prepare the digester for inspection in accordance with Bid Item 8 of this contract.
- The Engineer will examine the condition of the lid and other items inside the digester. Based on the situation, the Engineer will decide to either:
  - return the digester to In-Service;
  - or keep the digester Out-of-Service.

## 4 Specific Requirements for Each Bid Item

### 4.5.2 Contractor's Responsibility

- Refer to Section 3.1 of the *Common Requirements for All Bid Items* for Contractor's Responsibility.
- Work on this bid item is considered a Significant Event and requires coordination with plant operations. See Section 3.2 of the *Common Requirements for All Bid Items*.
- WARNING: Digester gas contains between 60 to 65% methane which is flammable. When mixed with air, it can be explosive.
- WARNING: Digester gas contains between 900 to 1100 ppm of Hydrogen Sulfide. Inhalation of digester gas can cause rapid unconsciousness, immediate collapse within 1 to 2 breaths, stop of breathing, and death within minutes.
- While work is being done, the area must be continuously ventilated to remove or dilute digester gas; Contractor is responsible for providing ventilation equipment.
- While work is being done, the air must be continuously monitored for the presence and concentration of hydrogen sulfide and methane using a multi-gas meter that detects both gases; Contractor is responsible for providing air monitoring equipment.
- If the hydrogen sulfide levels cannot be reduced to a safe level (as define by OSHA - Occupational Safety and Health Administration), workers must use appropriate respiratory protection and any other necessary personal protective equipment, rescue and communication equipment. Contractor is responsible for providing any needed equipment.
- Contractor shall have sole responsibility and risk for the following:
  - Extraction of residual material from the digester;
  - Screening of trash from the residual material;
  - Temporary storage of material on-site (if applicable);
  - Dewatering of material on-site (if applicable);
  - Proper disposal of filtrate (if applicable);
  - Proper disposal of residual material and trash in accordance with Bid Item 6 and Bid Item 7 of this contract.

### 4.5.3 General

- Drawing 5-1 is an elevation view of the digester and shows the internal structures and pipes.
- Drawing 5-2 is a plan view of the digester and shows the access hatches.
- Drawing 5-3 is an additional elevation view of the digester and shows all relevant dimensions.
- Drawing 5-4 is an overhead area view of Digester 3 and shows the locations of the side-access hatches, plant sewer and PEW location.

### 4.5.4 Access Hatches

Digester 3 has the following access hatches which are also shown on the drawings.

| Size    | Quantity | Type of Access | Location                                   | Notes  |
|---------|----------|----------------|--|--|
| 36-inch | 11       | Top            | Lid, above draft tubes                     | Actual inside diameter should be about 35.5".        |
| 30-inch | 2        | Top            | Lid, near perimeter                        | Actual inside diameter should be about 29.5".        |
| 36-inch | 2        | Side           | Ground level<br>(1 east side, 1 west side) | Actual inside diameter might be between 35" and 34". |

## 4 Specific Requirements for Each Bid Item

### 4.5.5 Removal of Residual Material

- Contractor is to remove the residual material from the digester and dispose of it in accordance with Bid Item 6 and Bid Item 7 of this contract.
- The residual material is defined as everything that is left within the digester after the plant staff pumps down the liquid sludge contents to the appropriate side-wall height. See Bid Item 6 and Bid Item 7 for more details.

### 4.5.6 Washdown

- Contractor is to washdown all interior surfaces of the digester with large volumes of flushing water. The interior surfaces include: floor; walls; ceiling; draft tube assemblies; pipes; and support structures.

### 4.5.7 Flushing Water

- Contractor is to use Plant Effluent Water (PEW) for flushing water. A 1-1/2 inch PEW connection is available in the Digester 3&4 Building on the east side of the ground floor.
- Contractor is to provide hoses and other necessary fittings in order to utilize the flushing water.
- The water pressure may not be sufficient for cleaning elevated locations (such as the ceiling). Contractor is to provide any needed equipment to boost the pressure of the flushing water.

### 4.5.8 Flushing of Three (3) Lower Pipes

- Contractor is to flush the three (3) lower pipes located at the bottom of the digester. These pipes are 6-inch (nominal diameter) and normally convey pumped sludge in or out of the digester.
- The contractor will have access to these pipes when the sludge valves in the basement of the Digester 3&4 building are removed. The replacement of these valves is addressed in Bid Item 9 of this contract.
- There are multiple existing PEW connections in the basement of the Digester 3&4 building that can be used for flushing the 3 lower pipes near the bottom of the digester.
- The contractor may use an expanding drain cleaning bladder or other method to flush the pipes.
- The slurry of flushing water combined with residual material is to be removed from the bottom of the digester and disposed in the same manner as the other residual material.

### 4.5.9 Flushing of Sludge Control Box and Three (3) Upper Pipes

- Contractor is to flush the sludge control box and the three (3) upper pipes which are connected to the sludge control box near the top of the digester. These pipes are 6-inch (nominal diameter) and normally allow digested sludge to flow out of the digester and into the sludge control box.
- The contractor is to flush the sludge control box and the three (3) upper pipes after the removal of the float balls in the sludge control box. The removal of the float balls is addressed in Bid Item 10 of this contract.
- An existing 1-1/2 inch (nominal diameter) PEW pipeline is available in the penthouse of the Digester 3&4 Building on the west side.
- The contractor may use an expanding drain cleaning bladder or other method to flush the pipes.
- The slurry of flushing water combined with residual material is to be removed from the bottom of the digester and disposed in the same manner as the other residual material.

## 4 Specific Requirements for Each Bid Item

### 4.5.10 Groundwater

Groundwater under the digester complex fluctuates with rainfall and river level. The plant staff will monitor groundwater levels throughout the project. If the groundwater level rises to certain levels it will exert tremendousness upward buoyant forces on the bottom of the digester and the basement of the building. Based on the situation, the Engineer may make the decision to stop Work and may direct the Contractor to flood the digester with Plant Effluent Water (PEW) to prevent structural damage to the digester complex.

### 4.5.11 Completion of Work

The Engineer will examine the condition of the lid and other items inside the digester. Based on the situation, the Engineer will decide to either:

- return the digester to In-Service;
- or keep the digester Out-of-Service.

Both situations are addressed below.

### 4.5.12 Return Digester to In-Service

If the Engineer decides to return the digester to In-Service, then the Contractor will:

- Remove all scaffolding, lighting and ventilation equipment.
- Reinstall the access hatches with new gaskets.
- Contractor may reuse the existing bolts and nuts for the access hatches if they are in good condition. Contractor will provide new bolts and nuts for the access hatches if they are not suitable for reuse.
- Take any other necessary steps to prepare the digester to be placed back In-Service.
- Contractor will re-paint the outer surface of the two (2) side-access hatches near ground level. These should be painted in accordance with Section 3.8.8 of the *Common Requirements for All Bid Items*. The top-access hatches do not need to be painted with this contract. They will be painted later under a future contract.

### 4.5.13 Keep Digester Out-of-Service

If the Engineer decides to keep the digester Out-of-Service, then the Contractor will:

- Leave the access hatches open.
- Provide (but do not install) new gaskets for the access hatches.
- With regard to scaffolding, lighting and ventilation equipment, the Contractor may elect to remove this equipment or leave it in-place since this equipment may be used by the Contractor to facilitate potential repairs to the digester.

### 4.5.14 Potential Repair of Digester

If the digester needs to be repaired, the Engineer may decide to keep the digester Out-of-Service. In order to complete the repairs, the Authority may:

- utilize the Extra Work Allowance (under this contract);
- issue a Change Order (to this contract);
- or issue a new contract.

The Authority may finalize this contract and issue a new contract to a different general contractor.

## 4 Specific Requirements for Each Bid Item

### 4.6 Bid Item 6 and Bid Item 7

|                               | Item Description   |
|-------------------------------|--|
| Bid Item 6<br>Add Alternate B | Proper disposal of <u>Residual Material</u> in Digester 3. This bid item is a unit price per cubic yard. For bidding purposes, the estimated volume of Residual Material is <u>3,120 cubic yards</u> . |
| Bid Item 7<br>Add Alternate C | Proper disposal of <u>Trash</u> in Digester 3. This bid item is a unit price per cubic yard. For bidding purposes, the estimated volume of Trash is <u>110 cubic yards</u> .                           |

#### 4.6.1 Definitions

The following definitions apply to these two bid items:

- Residual Material is defined as everything that is left within the digester after the plant staff pumps down the liquid sludge contents to the appropriate side-wall height.
  - The residual material consists of trash (defined below) and the remaining material (defined below).
  - The composition of the residual material is estimated below. The actual composition within will be different.
    - 48.3% volume of water that could be separated with dewatering equipment.
    - 48.2% blend of wet sand and wet organic material in a liquid state, or a semi-liquid state, or a semi-solid state that could be dewatered to produce a semi-solid cake with total solids content between 15% and 50% on a mass basis.
    - 3.5% volume of trash that should be screen out and compacted.
- Trash is defined as materials that are not suitable components of good quality Class B Biosolids.
  - The trash will include the following: rocks, grit, concrete fragments, brick fragments, metal fragments, metal hardware, broken pipe fragments, construction debris, congealed fat and grease, food scraps, rags, plastic shopping bags, towelettes, paper towels, facial tissues, baby wipes, makeup wipes, disinfecting surface wipes, floor cleaning mop refill wipes, toilet cleaning wipes, scrubbing pads, dryer sheets, feminine hygiene products, diapers, condoms, contraceptives, bandages, dental floss, hair, ear swabs, cotton balls, rubber gloves, syringes, needles, sharp objects, plastic bottles, plastic bottle caps, food wrappers, absorbent pads, clothing, sheets, socks, towels, wash clothes, plastic objects, golf balls, toys, and many other interesting items.
  - The trash will also include large masses of fibrous, stringy, and ropey material intertwined with debris.
- Remaining Material is defined as the cleaner material that is produced by screening the trash out of the residual material.
  - The Remaining Material consists of materials that are suitable components of Class B Biosolids. This includes the following:
    - Class B Biosolids;
    - blend of sand and organic material with a “soil-like” consistency that can be mixed with other biosolids to create a good quality Class B Biosolids;
    - a significant amount of water;
    - a significant amount of sand.
  - The remaining material should not contain a significant amount of visible trash nor any particles of trash larger than 3/8 inch.

## 4 Specific Requirements for Each Bid Item

### 4.6.2 Summary of Proposed Work

- The plant staff will take the digester Out-of-Service as described in Bid Item 5.
- The Engineer will calculate the volume of residual material inside the digester as describe below.
- The actual pay quantity for Bid Item 6 will be based on the measured volume of residual material in the digester.
- The Contractor will remove the residual material as described in Bid Item 5.
- The Contractor will screen out the trash from the residual material as described below.
- The Contractor will measure the volume of trash as described below. The actual pay quantity for Bid Item 7 will be based on the actual measured volume of trash.
- The Contractor will dispose of the trash as described below.
- The Contractor will dispose of the remaining material as described below.

### 4.6.3 Contractor's Responsibility

- Refer to Section 3.1 of the *Common Requirements for All Bid Items* for Contractor's Responsibility.
- Contractor shall have sole responsibility and risk for the following:
  - Extraction of residual material from the digester;
  - Screening of trash from the residual material;
  - Temporary storage of material on-site (if applicable);
  - Dewatering of material on-site (if applicable);
  - Proper disposal of filtrate (if applicable);
  - Proper disposal of residual material and trash.
- Contractor shall comply with all legal requirements regarding the transportation of the residual material and trash.
- Contractor shall comply with all Oklahoma Department of Environmental Quality (ODEQ) requirements and other legal requirements regarding the proper disposal of the residual material and trash.
- Any fines imposed on the Authority by any regulatory agency as a result of the Contractor's noncompliance with environmental regulations shall be paid or reimbursed by the Contractor.



## 4 Specific Requirements for Each Bid Item

### 4.6.4 Measurement of Residual Material

- The actual volume of residual material will be calculated by the Engineer. The volume will be calculated before any flushing water is added or any residual material is removed by the Contractor.
- There are different ways the volume may be calculated based on the situation. If the surface of the bulk residual material is relatively flat, then simple measurements from access hatches, may allow determination of the sidewall height. Other situations may justify other calculation methods. All calculation will be made available to the Contractor. The payable quantity (in cubic yards) should be mutually agreeable between the Engineer and the Contractor.
- The estimated volume of residual material is 3,120 cubic yards which is equivalent to a sidewall height of 12 feet.
- The table below is provided for information only and shows the correlation between sidewall height and volume inside Digester 3.

| Sidewall Height<br>(feet above cone) | Volume<br>(cubic yards) |
|--------------------------------------|-------------------------|
| 0                                    | 294 (volume in cone)    |
| 1                                    | 530                     |
| 2                                    | 765                     |
| 3                                    | 1,001                   |
| 4                                    | 1,236                   |
| 5                                    | 1,472                   |
| 6                                    | 1,707                   |
| 7                                    | 1,943                   |
| 8                                    | 2,178                   |
| 9                                    | 2,414                   |
| 10                                   | 2,649                   |
| 11                                   | 2,885                   |
| 12                                   | 3,120                   |
| 13                                   | 3,356                   |
| 14                                   | 3,591                   |
| 15                                   | 3,827                   |
| 16                                   | 4,062                   |
| 17                                   | 4,298                   |
| 18                                   | 4,533                   |

## 4 Specific Requirements for Each Bid Item

### 4.6.5 Screening Trash out of the Residual Material

- Contractor will provide screening equipment to separate the trash from the residual material.
- The maximum screen opening shall be 3/8 inch.

### 4.6.6 Measurement of Trash

- Contractor will measure the volume of trash in cubic yards.
- There are different ways the volume may be calculated based on the situation. The payable quantity (in cubic yards) should be mutually agreeable between the Engineer and the Contractor.

### 4.6.7 Disposal of Trash

- Contractor will coordinate directly with the landfill operator.
- Contractor will properly transport and dispose the trash at the landfill.
- Contractor will pay for all transportation and landfill expenses.

### 4.6.8 Proper Disposal of Remaining Material

- Proper disposal of remaining material may include any combination of the methods listed below and described in the subsequent sections:
  - Contractor Coordinated Land Application
  - City of Tulsa Coordinated Land Application

### 4.6.9 Contractor Coordinated Land Application

- Contractor will coordinate directly with the landowner.
- Contractor will transport the biosolids to the landsite. The biosolid may be in a liquid state or a semi-solid state that is acceptable to the landowner.
- Contractor will comply with all Oklahoma Department of Environmental Quality (ODEQ) requirements and other legal requirements and follow proper procedures for land application of biosolids.

### 4.6.10 Dewatering of the Remaining Material

If the Contractor elects to dewater the residual material on-site, then the following applies:

- Contractor will provide containment for any polymer or polymer dosing equipment.
- Contractor will provide containment for dewatering equipment.
- Filtrate (liquid) and screened flushing water, with less than 250 mg/L Total Suspended Solids (TSS), may be discharged into the plant sewer.
- Dewatering shall be completed in a manner that does not impede facility operations or cause a facility upset.

## 4 Specific Requirements for Each Bid Item

### 4.6.11 City of Tulsa Coordinated Land Application

- This method of disposal is contingent upon the composition of the material. Acceptable material includes the following:
  - Good quality Class B Biosolids Cake that has been properly dewatered to a semi-solid cake and is suitable for land application.
  - A blend of sand and organic material with a “soil-like” consistency that has been properly dewatered to a semi-solid cake and can be mixed with other biosolids cake to create a good quality Class B Biosolids Cake that is suitable for land application.
  - The material should not contain a significant amount of visible trash nor any particles of trash larger than 3/8 inch.
- Contractor will provide dewatering equipment, polymer, and polymer dosing equipment to produce a cake with a total solids content greater than or equal to 15 percent on a mass basis.
- Contractor will transport and unload the cake into a designated drying bed at the 71<sup>st</sup> Street Facility for inspection.
- The City of Tulsa will coordinate land application of the biosolids through its normal biosolids land application program.

## 4 Specific Requirements for Each Bid Item

### 4.8 Bid Item 8

|                               | Item Description  |
|-------------------------------|---|
| Bid Item 8<br>Add Alternate D | Prepare the digester for inspection by providing ventilation, scaffolding, power washing, and lighting inside Digester 3. This work can only be done while Digester 3 is empty. |

#### 4.8.1 Summary of Proposed Work

After cleaning of the digester, Contractor is to do the following:

- Provide ventilation.
- Erect scaffolding inside the digester.
- Power wash the underside of the digester lid.
- Provide lighting inside the digester.

#### 4.8.2 Contractor's Responsibility

- Refer to Section 3.1 of the *Common Requirements for All Bid Items* for Contractor's Responsibility.

#### 4.8.3 Ventilation

- Contractor is to provide an OSHA compliant work space within the digester. This includes forced air ventilation and atmospheric testing.

#### 4.8.4 Scaffolding

- Contractor is to provide scaffolding across the diameter of the digester. The scaffolding should span from the perimeter on one side to the center, and then from the center to the perimeter on the opposite side. Based on the structures inside the digester, it may not be reasonable to have the scaffolding span across as a straight diameter. The Contractor may elect to span the scaffolding using 2 or more radii.
- The standing surface of the scaffolding should be between 5 and 7 feet from the ceiling plates of the lid. The Contractor should be aware that the ceiling slopes upward toward the center and the floor slopes downward toward the center.

#### 4.8.5 Power Washing

- Contractor is to power wash the underside the digester lid in the areas under the scaffolding. The purpose of the power washing is to remove dried sludge and to reveal any failed paint or delaminating steel.

#### 4.8.6 Lighting

- Contractor is to provide sufficient lighting along the scaffolding (across the diameter of the digester).
- Lighting should be positioned in at least 4 locations and directed upward to illuminate the underside of the digester lid.
- Some of the lighting should be directed onto the scaffolding to illuminate the walking surface.

## **4 Specific Requirements for Each Bid Item**

### 4.8.7 Pumping

- Contractor is to provide temporary pumping equipment throughout the inspection period to remove any water that leaks into the digester through pipes or enters the digester as precipitation or groundwater.
- The wastewater from the pressure washing of the ceiling may be disposed into the plant sewer. It does not need to be dewatered. Other water that leaks into the digester after the cleaning process may be disposed into the plant sewer. It does not need to be dewatered.

### 4.8.8 Inspection Period

- Contractor is to provide the equipment for the Engineer, the Authority, or their representatives.
- Contractor is to provide the equipment needed for inspection for a period of two (2) weeks.

## 4 Specific Requirements for Each Bid Item

### 4.9 Bid Item 9

|                               | Item Description   |
|-------------------------------|--|
| Bid Item 9<br>Add Alternate E | Replacement of four (4) critical sludge valves in the Digester 3&4 Building. This work can only be done while Digester 3 is empty. |

#### 4.9.1 Proposed Equipment

Approved equipment and materials are listed below. Contractor will coordinate with the Engineer for approval of other makes, models, or materials.

|                            |                             |                       |
|----------------------------|-----------------------------|-----------------------|
| Equipment                  | Eccentric Plug Valve        |                       |
| Make                       | DeZurik                     |                       |
| -                          | -                           | ↓ Manufacturer's Code |
| Style                      | -                           | PEC                   |
| Valve Size                 | <b>6 inch</b>               | 6                     |
| End Connection             | Flanged, ANSI Class 125/150 | F1                    |
| Body Material              | Cast Iron with nickel seat  | CI                    |
| Packing Material           | Acrylonitrile-Butadiene     | NBR                   |
| Plug Facing                | Chloroprene                 | CR                    |
| Actuator Type              | G-Series Manual Actuator    | GS-6                  |
| Actuator Input             | See table below             | -                     |
| Wheel Size                 | 12 inch diameter            | 12                    |
| Actuator Mounting Position | See table below             | -                     |
| <b>Quantity</b>            | <b>Four (4)</b>             |                       |

| Valve Location   | Valve Number | Pipeline Orientation | Valve Hight | Actuator Input | Actuator Mounting Position |
|--|--------------|----------------------|-------------|----------------|----------------------------|
| Recirculation Suction from Digester 3  | 05           | Horizontal           | Low         | Handwheel      | Standard                   |
| Recirculation Discharge to Digester 3  | 27           | Horizontal           | Low         | Handwheel      | Standard                   |
| Crossover between recirculation suction manifold and digested sludge suction manifold for Digester 3 | 29           | Horizontal           | Low         | Handwheel      | Standard                   |
| Digested sludge suction from Digester 3  | 31           | Horizontal           | Low         | Handwheel      | Standard                   |

## 4 Specific Requirements for Each Bid Item

### 4.9.2 Removal of Existing Equipment

- Contractor is to remove and dispose the existing valves, bolts, nuts, and gaskets.
- Coordinate removal of these valves when the digester is empty.
- When the valves are removed, flush the three sludge pipe into the digester in accordance with Bid Item 5 of this contract.

### 4.9.3 Contractor's Responsibility

- Refer to Section 3.1 of the *Common Requirements for All Bid Items* for Contractor's Responsibility.
- Contractor will provide all necessary components using the make, models, and materials specified above.

### 4.9.4 General

- Drawing 9-1 is provided for information and shows the location of the valves in the basement of the Digester 3&4 Building.
- Drawing 9-2 shows a zoomed-in view of the valve locations.

|                                   |   |
|-----------------------------------|---|
| In <u>horizontal</u> pipelines... | ... install the valve so that the <u>plug shaft is horizontal</u> , and the <u>plug rotates to the top</u> of the valve as the valve is opened. |
| In <u>vertical</u> pipelines...   | <del>... install the valve with the end marked "<u>SEAT</u>" at the <u>top</u> of the valve.</del><br>(not applicable for this bid item)        |

- Contractor is to provide new bolts, nuts, and gaskets.
- Contractor is to paint the new valves in accordance with Section 3.8.8 and 3.8.9 of the *Common Requirements for All Bid Items*.

### 4.9.5 Identification Tags

- Contractor will provide identification tags as specified in Section 3.10 of the *Common Requirement for All Bid Items*.

## 4 Specific Requirements for Each Bid Item

### 4.10 Bid Item 10

|                                | Item Description  |
|--------------------------------|---|
| Bid Item 10<br>Add Alternate F | Miscellaneous work while Digester 3 is empty. This includes: work on the Sludge Control Box; work on the gas piping and digester lid; work on the groundwater pressure relief valves. This work can only be done while Digester 3 is empty. |

#### 4.10.1 Summary of Proposed Work

After cleaning of the digester, Contractor is to do the following:

- work on the Sludge Control Box;
- work on the gas piping and digester lid;
- work on the groundwater pressure relief valves.

#### 4.10.2 Contractor's Responsibility

- Refer to Section 3.1 of the *Common Requirements for All Bid Items* for Contractor's Responsibility.

#### 4.10.3 Work on the Sludge Control Box

Contractor is to remove and dispose the old level sensors and associated hardware in the sludge control box for Digester 3 as shown in Drawing 10-1. This includes the following:

- Leave the horizontal strut in place.
- Cut off and remove the vertical strut.
- Remove the float balls and wires.
- Remove the electrical conduit and wire.
- Properly terminate the electrical conduit and wires at the brick wall.
- After hardware and float balls are removed, clean the three (3) pipes in accordance with Section 4.5.9 of Bid Item 5.

#### 4.10.4 Work on the Gas Piping and Digester Lid.

Contractor is to remove 12 sections of gas pipe and patch 12 manway cylinders as shown in Drawing 10-2. This includes the following:

- Cut off pipe and insulation about 6 inches after the nearest pipe support. The cut pipe and insulation can be left open. It does not need to be properly terminated. Do this at all 12 locations. The pipe should be 2 inch stainless steel. The schedule thickness is unknown but probably schedule 10 or schedule 40. Outside the pipe is about 1 inch of glass fiber insulation with aluminum metal jacketing.
- Remove and dispose the pipe between the pipe support and the manway cylinder at all 12 locations.
- After removing gas pipe, grind surface of manway cylinder smooth and weld in place a patch that will make the manway cylinder gas tight. Do this at all 12 locations
- There is about 6 inches of vertical space between the flanges at the location where the patch needs to be welded. Some of the other locations have more space. Each manway cylinder has the same outside diameter of 36 inches. The welder has multiple options to install this patch. These options include:
  - one 4" x 6" patch that is curved with an 18" radius
  - two 4" x 3" patches that are flat



## 4 Specific Requirements for Each Bid Item

- one flat plug
  - other reasonable solution based on the welder's skill and experience
- The patch should be 1/4" thick carbon steel and fully welded so that it is gas-tight. When the digester is operational, the gas pressure will be less than 1 psi.
- After the patch is complete, the external area at and near the patch should be painted to provide a few years of corrosion protection. The entire lid will be repainted in a few years so the paint on the patch is not critical. Basic surface preparation using a wire brush is acceptable. Any suitable paint or paint primer is acceptable. It can be applied with spray can or paint brush. The color of paint is not important, light-gray or red-oxide or any other similar color is acceptable. Only the external area of the patch should be painted. The internal area can be left as is.

### 4.10.5 Work on the Groundwater Pressure Relief Valves

Contractor it to clean and inspect the six (6) groundwater relief valves in floor of Digester 3 as shown in Drawing 10-3. Below is a recommended procedure:

- Open the valve by lifting the valve plate by hand (it should open about an inch).
- Use a wet/dry shop vacuum to suck out any dirt or grit that is under the valve plate.
- Use a rag to wipe the seal.
- Close the valve by pushing the valve plate down by hand.
- Check that the valve is properly sealed by pouring clear water on top. The valve should remain shut and hold the water above.

## 4 Specific Requirements for Each Bid Item

### 4.11 Bid Item 11

|                                | Item Description   |
|--------------------------------|--|
| Bid Item 11<br>Add Alternate G | Replacement of 15 additional sludge valves in the Digester 3&4 Building. This work can only be done: while Digester 3 is empty; or after the replacement of the four (4) critical sludge valves from Bid Item 9. |

#### 4.11.1 Proposed Equipment

Approved equipment and materials are listed below. Contractor will coordinate with the Engineer for approval of other makes, models, or materials.

|                            |                             |                       |
|----------------------------|-----------------------------|-----------------------|
| Equipment                  | Eccentric Plug Valve        |                       |
| Make                       | DeZurik                     |                       |
| -                          | -                           | ↓ Manufacturer's Code |
| Style                      | -                           | PEC                   |
| Valve Size                 | <b>6 inch</b>               | 6                     |
| End Connection             | Flanged, ANSI Class 125/150 | F1                    |
| Body Material              | Cast Iron with nickel seat  | CI                    |
| Packing Material           | Acrylonitrile-Butadiene     | NBR                   |
| Plug Facing                | Chloroprene                 | CR                    |
| Actuator Type              | G-Series Manual Actuator    | GS-6                  |
| Actuator Input             | See table below             | -                     |
| Wheel Size                 | 12 inch diameter            | 12                    |
| Actuator Mounting Position | See table below             | -                     |
| <b>Quantity</b>            | <b>15</b>                   |                       |

## 4 Specific Requirements for Each Bid Item

### 4.11.1 Proposed Equipment (continued)

| Valve Location  | Valve Number | Pipeline Orientation | Valve Height | Actuator Input | Actuator Mounting Position |
|---|--------------|----------------------|--------------|----------------|----------------------------|
| Downstream of sludge splitter box   | 03           | Horizontal           | High         | Chainwheel     | 270°                       |
| Downstream of sludge splitter box   | 04           | Horizontal           | High         | Chainwheel     | 270°                       |
| Recirculation discharge manifold  | 15           | Horizontal           | High         | Chainwheel     | 270°                       |
| Recirculation discharge manifold  | 16           | Horizontal           | High         | Chainwheel     | 270°                       |
| Crossover between recirculation discharge manifold and recirculation suction manifold | 17           | Horizontal           | High         | Chainwheel     | 270°                       |
| Crossover between recirculation discharge manifold and recirculation suction manifold | 18           | Horizontal           | High         | Chainwheel     | 270°                       |
| Inlet to Sludge Heat Exchanger #4   | 19           | Vertical             | Low          | Handwheel      | Standard                   |
| Inlet to Sludge Heat Exchanger #5   | 20           | Vertical             | Low          | Handwheel      | Standard                   |
| Inlet to Sludge Heat Exchanger #6   | 21           | Vertical             | Low          | Handwheel      | Standard                   |
| Outlet from Sludge Heat Exchanger #4  | 22           | Horizontal           | High         | Chainwheel     | 270°                       |
| Outlet from Sludge Heat Exchanger #5  | 23           | Vertical             | High         | Chainwheel     | Standard                   |
| Outlet from Sludge Heat Exchanger #6  | 24           | Horizontal           | High         | Chainwheel     | 270°                       |
| Heated sludge manifold  | 25           | Horizontal           | High         | Chainwheel     | 270°                       |
| Heated sludge manifold  | 26           | Horizontal           | High         | Chainwheel     | 270°                       |
| Southside of digested sludge suction manifold   | 32           | Horizontal           | Low          | Handwheel      | Standard                   |

## 4 Specific Requirements for Each Bid Item

### 4.11.2 Removal of Existing Equipment

- Contractor is to remove and dispose the existing valves, bolts, nuts, and gaskets.
- Coordinate removal of these valves: while Digester 3 is empty; or after the replacement of the four (4) critical sludge valves from Bid Item 9.

### 4.11.3 Contractor's Responsibility

- Refer to Section 3.1 of the *Common Requirements for All Bid Items* for Contractor's Responsibility.
- Contractor will provide all necessary components using the make, models, and materials specified above.

### 4.11.4 General

- Drawings 11-1, 11-2, 11-3, and 11-4 are provided for information and shows the location of the valves in the Digester 3&4 Building.

|                                   |   |
|-----------------------------------|---|
| In <u>horizontal</u> pipelines... | ... install the valve so that the <u>plug shaft is horizontal</u> , and the <u>plug rotates to the top</u> of the valve as the valve is opened. |
| In <u>vertical</u> pipelines...   | ... install the valve with the end marked " <u>SEAT</u> " at the <u>top</u> of the valve.   |

- Contractor is to provide new bolts, nuts, and gaskets.
- Contractor is to provide proper length chain for valves with chainwheels.
- Contractor is to paint the new valves in accordance with Section 3.8.8 and 3.8.9 of the *Common Requirements for All Bid Items*.

### 4.11.5 Identification Tags

- Contractor will provide identification tags as specified in Section 3.10 of the *Common Requirement for All Bid Items*.

## 4 Specific Requirements for Each Bid Item

### 4.12 Bid Item 12

|                                | Item Description  |
|--------------------------------|---|
| Bid Item 12<br>Add Alternate H | Modification of sludge piping, and modification of Plant Effluent Water (PEW) piping, and installation of one (1) additional sludge valve, and installation of two (2) pressure sensor in the Digester 3&4 Building. This work includes plumbing, electrical, SCADA programing, and painting. This work can only be done: while Digester 3 is empty; or after the replacement of the four (4) critical sludge valves from Bid Item 9. |

#### 4.12.1 Proposed Equipment

Approved equipment and materials are listed below. Contractor will coordinate with the Engineer for approval of other makes, models, or materials.

| Equipment                 | <b>Pressure Sensor</b>   |                 |
|---------------------------|--|-----------------|
| Purpose                   | Measure steady-state, hydrostatic pressure within each digester and detect any transient-state hydrodynamic pressure within each digester. |                 |
| Make                      | Endress + Hauser   | ↓ Ordering Code |
| Model                     | Cerabar M, gauge pressure transmitter with diaphragm seal  | PMP55           |
| Approval                  | Non-hazardous area   | AA              |
| Output                    | 4-20mA HART  | 2               |
| Display, Operation        | LCD, push button on display/electronics  | 1               |
| Housing                   | F31 Aluminum with glass window   | J               |
| Electrical Connection     | Threaded NPT ½ inch, IP66/IP68 NEMA 4X/6P  | D               |
| Sensor Range              | To be determined later during the submittal process.   | [TBD]           |
| Reference Accuracy        | Standard   | G               |
| Calibration Unit          | To be determined later during the submittal process.   | [TBD]           |
| Process Connection        | NPS 3 inch, Class 150, raised face, 316 flange, AMSE B16.5   | AGJ             |
| Membrane Material         | 316L   | A               |
| Fill Fluid                | Silicone oil   | 1               |
| Diaphragm Seal Connection | Direct   | A               |
| Accessory                 | Flushing ring NPS 3" Cl.150-2500, 316L, 2x flushing connection thread ASME FNPT 1/2  | PM              |
| <b>Quantity</b>           | <b>Two (2)</b>   |                 |

## 4 Specific Requirements for Each Bid Item

### 4.12.1 Proposed Equipment (continued)

|                            |  |                       |
|----------------------------|--|-----------------------|
| Equipment                  | <b>Eccentric Plug Valve</b>  |                       |
| Purpose                    | Isolation valve on the northside of digested sludge suction manifold |                       |
| Make                       | DeZurik  |                       |
| -                          | -  | ↓ Manufacturer's Code |
| Style                      | -  |                       |
| Valve Size                 | <b>6 inch</b>  | 6                     |
| End Connection             | Flanged, ANSI Class 125/150  | F1                    |
| Body Material              | Cast Iron with nickel seat   | CI                    |
| Packing Material           | Acrylonitrile-Butadiene  | NBR                   |
| Plug Facing                | Chloroprene  | CR                    |
| Actuator Type              | G-Series Manual Actuator   | GS-6                  |
| Actuator Input             | See table below  | -                     |
| Wheel Size                 | 12 inch diameter   | 12                    |
| Actuator Mounting Position | See table below  | -                     |
| <b>Quantity</b>            | <b>One (1)</b>   |                       |

| Valve Location                                | Valve Number | Pipeline Orientation | Valve Hight | Actuator Input | Actuator Mounting Position |
|---|--------------|----------------------|-------------|----------------|----------------------------|
| Northside of digested sludge suction manifold | 57           | Horizontal           | Low         | Handwheel      | Standard                   |

|                   |  |                       |
|-------------------|--|-----------------------|
| Equipment         | <b>Eccentric Plug Valve</b>                                |                       |
| Purpose           | Isolation valve for each pressure sensor                   |                       |
| Make              | DeZurik  |                       |
| -                 | -  | ↓ Manufacturer's Code |
| Style             | Eccentric Plug   |                       |
| Valve Size        | <b>3 inch</b>  | 3                     |
| End Connection    | Flanged, ANSI Class 125/150                                | F1                    |
| Body Material     | Cast Iron, Nickel Welded Seat                              | CIN                   |
| Packing Material  | Acrylonitrile-Butadiene Reinforced filler in a PTFE U-ring | NBR                   |
| Plug Facing       | Chloroprene (RS16)   | CR                    |
| Actuator Type     | Manual Gear  | MG-7                  |
| Actuator Input    | Handwheel  | HD                    |
| Handwheel Size    | 8 inch diameter  | 8                     |
| Actuator Mounting | Standard Position  | -                     |
| Actuator Option   | Safety Lockout   | LK                    |
| Actuator Option   | Flag Indicator   | FL                    |
| <b>Quantity</b>   | <b>Two (2)</b>   |                       |

## 4 Specific Requirements for Each Bid Item

### 4.12.1 Proposed Equipment (continued)

|                 |                                   |                       |
|-----------------|-----------------------------------|-----------------------|
| Equipment       | <b>Stainless Steel Ball Valve</b> |                       |
| Purpose         | Discharge valve for flushing ring |                       |
| Make            | Apollo                            |                       |
| -               | -                                 | ↓ Manufacturer's Code |
| Model           | 76-100 Series                     | 76                    |
| Valve Size      | <b>1/2 inch</b>                   | 103                   |
| Configuration   | Standard                          | 01                    |
| Ball            | A276-316 Stainless Steel          | -                     |
| Body            | A351-CF8M stainless steel         | -                     |
| <b>Quantity</b> | <b>Two (2)</b>                    |                       |

|                 |   |                       |
|-----------------|---|-----------------------|
| Equipment       | <b>Stainless Steel Ball Valve</b>             |                       |
| Purpose         | Shut-off valve for Plant Effluent Water (PEW) |                       |
| Make            | Apollo  |                       |
| -               | -   | ↓ Manufacturer's Code |
| Model           | 76-100 Series                                 | 76                    |
| Valve Size      | <b>2 inch</b>                                 | 108                   |
| Configuration   | Lock Plate                                    | 19                    |
| Ball            | A276-316 Stainless Steel                      | -                     |
| Body            | A351-CF8M stainless steel                     | -                     |
| <b>Quantity</b> | <b>Two (2)</b>                                |                       |

|                 |  |                       |
|-----------------|--|-----------------------|
| Equipment       | <b>Stainless Steel Ball Cone Check Valve</b> |                       |
| Purpose         | Check valve for Plant Effluent Water (PEW)   |                       |
| Make            | Apollo                                       |                       |
| -               | -  | ↓ Manufacturer's Code |
| Model           | 62 Series                                    | 62                    |
| Valve Size      | <b>2 inch</b>                                | 108                   |
| Configuration   | Standard                                     | 01                    |
| Body            | A351-CF8M stainless steel                    | -                     |
| Ball Check      | RPTFE – Reinforced Teflon                    |                       |
| <b>Quantity</b> | <b>One (1)</b>                               |                       |

## 4 Specific Requirements for Each Bid Item

### 4.12.2 Contractor's Responsibility

- Refer to Section 3.1 of the *Common Requirements for All Bid Items* for Contractor's Responsibility.
- Contractor will provide all necessary components to ensure that the complete system is fully operational.

### 4.12.3 Corrosion Protection Measures

- The area where the new equipment will be installed is designated as a "Corrosive Area" as defined in Section 3.8.1 of the *Common Requirements for All Bid Items*. In particular, the equipment will be exposed to the following contributors of corrosion:
  - Overflows, flooding, and subsequent wash-down.
- Contractor is to ensure that all new equipment and materials installed for this bid item complies with the corrosion protection measures described in Section 3.8 of the *Common Requirements for All Bid Items*.
- All new fasteners and hardware are to be stainless steel or other approved material as specified in Section 3.8.2 of the *Common Requirements for All Bid Items*.

### 4.12.4 Modifications to the Digester Sludge Suction Manifold

- Contractor is to replace the existing south section with one (1) solid piece of flange ductile iron pipe (AWWA C150) as shown on Drawing 12-1.
- Contractor is to modify the middle section as shown on Drawings 12-1, 12-2, and 12-3.
- Pipe is to be 6-inch diameter flanged ductile iron pipe (AWWA C150).
- Tee fittings and flanges are to be ductile iron (AWWA 153).
- Contractor is to provide new bolts, nuts, and gaskets.
- Contractor is to paint the new sections of pipe as specified below.

### 4.12.5 Installation of Pressure Sensors

- Pressure sensors and flushing rings are to be installed in accordance with the Manufacturer's Installation Instructions and as shown on Drawing 12-3.
- Contractor is to provide any needed equipment calibration and commissioning service.

### 4.12.6 SCADA Programming

- Contractor will ensure that the proposed pressure sensors integrate correctly with the plant's existing SCADA (Supervisory Control And Data Acquisition) system.
- Contractor will provide SCADA programming changes so that information from the pressure sensors can be viewed from the SCADA display screen as shown on Drawing 12-5.



## 4 Specific Requirements for Each Bid Item

### 4.12.7 Electrical

- Electrical work is to be installed in accordance with NFPA 70, National Electrical Code.
- The area where the new equipment will be installed is considered a “wet location” because it is subject to overflows, flooding, and subsequent wash-down. The Contractor is to provide a Complete Electrical System that is protected to “watertight” level.
- Contractor is to comply with Section 3.8.10 of the *Common Requirements for All Bid Item* regarding corrosion protection of electrical equipment.
- All new fasteners and hardware for electrical components are to be stainless steel or other approved material.
- Contractor will provide new Rigid Aluminum Conduit (RAC).
- Contractor will provide new Liquidtight Flexible Metal Conduit (LFMC). Existing flexible electrical conduit may not be re-used.
- For Bid Item 12, the following existing materials may be reused: Rigid Metal Conduit (RMC) that is in good condition. All electrical conduit (new or re-used) is to be sealed to a "Watertight" level. Aluminum RMC does not need to be painted.

### 4.12.8 Plumbing of PEW Piping

- Plumbing work is to be installed in accordance with the following:
  - City of Tulsa Title 56 Plumbing Code;
  - International Plumbing Code.
- Contractor is to modify the PEW piping as shown in Drawings 12-3 and 12-4.
- Pipe and fittings are to be CPVC, Schedule 80.
- Ball valves and check valve are to be stainless steel as specified above.
- Pipe nipples between the valves are to be carbon steel, Schedule 40 as shown on Drawing 12-3.
- Install one ball valve in the overhead pipe near the tee connection as shown on Drawing 12-4.
- Install one ball valve and one check valve in the vertical pipe as shown on Drawing 12-3.
- Install the ball valves so that the handles are easy to operate, and the movement of the handle does not interfere with other items.
- Brace the pipe to the column and wall as shown on Drawing 12-4. During operation, there should be no noticeable movement of the newly installed pipe.
- Provide pipe hangers and support struts as needed. See Section 3.8.2 regarding fasteners and hardware in corrosive areas. For Bid Item 12, galvanized or coated pipe hanger hardware, threaded rods, and support struts are acceptable, but are to be painted in accordance with Section 3.8.8.

## 4 Specific Requirements for Each Bid Item

### 4.12.9 Painting and Marking of PEW Piping

- The Plant Effluent Water (PEW) in the Digester 3&4 building is Category 6 Reclaimed Water as defined by Oklahoma Department of Environmental Quality (DEQ) Title 252, Chapter 656, Subchapter 27.
- Contractor is to paint and mark the new PEW piping as specified below.
- Color: The paint color is to be Purple (Pantone 522) per the Oklahoma Department of Environmental Quality (DEQ) Title 252, Chapter 656, Section 252:656-27-4.
- Lettering: The following language: “CAUTION: RECLAIMED WATER-DO NOT DRINK.” shall be provided on the pipe near the equipment served, adjacent to valves, at each branch or tee, and at least every 50 feet in straight runs of pipe. Additionally, the capital letters, “PEW”, shall be centered at intervals evenly spaced between the “CAUTION: RECLAIMED WATER-DO NOT DRINK” language along straight runs and as possible at branches or tees.
- Lettering is to be painted or stenciled on piping. Snap-on plastic sleeve markers are also acceptable.
- Lettering shall be white.
- Lettering size requirements are listed in the table below:

| Lettering Dimensions  |                           |
|-----------------------|---------------------------|
| Outside Pipe Diameter | Minimum Height of Letters |
| 5/8 inch and smaller  | Metal Tags – 1/4 inch     |
| 3/4 to 1-1/4 inches   | 1/2 inch                  |
| 1-1/2 to 2 inches     | 3/4 inch                  |
| 2-1/2 to 6 inches     | 1-1/4 inches              |
| 8 to 10 inches        | 2-1/2 inches              |
| Over 10 inches        | 3-1/2 inches              |

- Signs: At every PEW hose bib or similar outlet, Contractor is to provide a sign in accordance with DEQ 252:656-27-4(a)(3) which should have the following information:
  - The language: “CAUTION: RECLAIMED WATER-DO NOT DRINK.”
  - The international “Do Not Drink” symbol.
- Acceptable paints include the following:
  - Tnemec, Series N69, Hi-Build Epoxoline II
  - Sherwin-Williams, Macropoxy 646 Fast Cure Epoxy
- Contractor will follow the paint manufacturer’s instructions for paint application and dry film thickness.
- Contractor will follow the paint manufacturer’s instructions for surface preparation, but as a minimum will remove all oil, grease, dirt, loose rust, loosely adhering paint, and other foreign matter by hand or power tool cleaning per SSPC-SP2 or SSPC-SP3. Strongly adhering paint or asphalt coatings do not need to be removed. Note: SSPC-SP2 is an abbreviation for the Society of Protective Coatings, Surface Preparation standard #2 for Hand Tool Cleaning. SSPC-SP3 is an abbreviation for Surface Preparation standard #3 for Power Tool Cleaning.
- Do not paint the following:
  - Stainless steel valves
  - Data plates of valves.
  - Moving parts of valves.

## 4 Specific Requirements for Each Bid Item

### 4.12.10 Painting of Digester Sludge Suction Manifold

- Contractor is to paint the new sections of the Digester Sludge Suction Manifold.
- Contractor is to match the new paint color to be the same as the existing paint color on the Digester Sludge Suction Manifold.
- Acceptable paints include the following:
  - Tnemec, Series N69, Hi-Build Epoxoline II
  - Sherwin-Williams, Macropoxy 646 Fast Cure Epoxy
- Contractor will follow the paint manufacturer's instructions for paint application and dry film thickness.
- Contractor will follow the paint manufacturer's instructions for surface preparation, but as a minimum will remove all oil, grease, dirt, loose rust, loosely adhering paint, and other foreign matter by hand or power tool cleaning per SSPC-SP2 or SSPC-SP3. Strongly adhering paint or asphalt coatings do not need to be removed. Note: SSPC-SP2 is an abbreviation for the Society of Protective Coatings, Surface Preparation standard #2 for Hand Tool Cleaning. SSPC-SP3 is an abbreviation for Surface Preparation standard #3 for Power Tool Cleaning.
- Do not paint the following:
  - 3-inch plug valve, flushing ring, nor pressure sensor
  - Stainless steel ball valve nor stainless steel check valve
  - Data plates nor moving parts of 6-inch plug valves.

### 4.12.11 Identification Tags

- Contractor will provide identification tags as specified in Section 3.10 of the *Common Requirement for All Bid Items*.

## 4 Specific Requirements for Each Bid Item

### 4.13 Bid Item 13

|                                | Item Description  |
|--------------------------------|---|
| Bid Item 13<br>Add Alternate I | Installation of one (1) Scum Detecting Radar on Digester 3. This work includes electrical and SCADA programing. This work can only be done while Digester 3 is empty. |

#### 4.13.1 Proposed Equipment

Approved equipment and materials are listed below. Contractor will coordinate with the Engineer for approval of other makes, models, or materials.

| Equipment             | <b>Scum Detecting Radar</b>  |                 |
|-----------------------|--|-----------------|
| Purpose               | Measure the distance from the digester ceiling to the top of the scum surface. |                 |
| Make                  | Endress + Hauser   | ↓ Ordering Code |
| Model                 | Micropilot, 80 GHz, non-contact radar  | FMR62           |
| Approval              | Class 1, Division 1, Gas groups A-D  | FA              |
| Power Supply; Output  | 2-wire; 4-20mA HART  | A               |
| Display, Operation    | Prepared for display FHX50 + M12 connection                                    | L               |
| Housing               | GT20 dual compartment, Aluminum, coated  | C               |
| Electrical Connection | Thread NPT ½, IP66/68 NEMA 4X/6P   | D               |
| Antenna               | PTFE cladded flush mount 80 mm / 3-inch  | GN              |
| Seal                  | PTFE cladded, -40...392°F, including gas-tight feed through                    | F6              |
| Process Connection    | NPS 3-inch, Class 150, PTFE>316/316L flange ASME B16.5                         | AGK             |
| Accessory             | Weather Protection Cover   | PB              |
| <b>Quantity</b>       | <b>One (1)</b>   |                 |

| Equipment          | <b>Remote Display</b>                                  |                 |
|--------------------|--|-----------------|
| Purpose            | Wall mounted display for radar                         |                 |
| Make               | Endress + Hauser                                       | ↓ Ordering Code |
| Model              | Remote Display   | FHX50           |
| Approval           | Class 1, Division 1, Gas groups A-D                    | FB              |
| Display, Operation | 4-line, illuminated, touch control + data backup       | E               |
| Housing            | Single compartment, Aluminum, coated                   | C               |
| Cable              | To Be Determined later during the submittal process.   | (TBD)           |
| Process Connection | NPS 3-inch, Class 150, PTFE>316/316L flange ASME B16.5 | AGK             |
| <b>Quantity</b>    | <b>One (1)</b>   |                 |

## 4 Specific Requirements for Each Bid Item

### 4.13.1 Proposed Equipment (continued)

|                   |  |                       |
|-------------------|--|-----------------------|
| Equipment         | <b>Stainless Steel, Flanged, Full Port, Ball Valve</b> |                       |
| Purpose           | Isolation valve for radar                              |                       |
| Make              | Apollo   |                       |
| -                 | -  | ↓ Manufacturer's Code |
| Model             | 87A-200 Series   | 87A                   |
| Valve Size        | <b>3 inch</b>  | 200                   |
| Configuration     | Standard   | 01                    |
| Flange connection | ASME Class 150   | -                     |
| Lock Plate        | Included   | -                     |
| Ball              | A276-316 Stainless Steel                               | -                     |
| Body              | A351-CF8M stainless steel                              | -                     |
| Inside Diameter   | 3.00 inches  |                       |
| <b>Quantity</b>   | <b>One (1)</b>   |                       |

### 4.13.2 Contractor's Responsibility

- Refer to Section 3.1 of the *Common Requirements for All Bid Items* for Contractor's Responsibility.
- Contractor will provide all necessary components to ensure that the complete system is fully operational.

### 4.13.3 Corrosion Protection Measures

- The area where the new equipment will be installed is designated as a "Corrosive Area" as defined in Section 3.8.1 of the *Common Requirements for All Bid Items*. In particular, the equipment will be exposed to the following contributors of corrosion:
  - The continuous presence of moisture and condensing humidity on a diurnal cycle.
  - Fugitive emissions of digester gas which contains between 900 and 1100 ppm of hydrogen sulfide (H<sub>2</sub>S).
- Contractor is to ensure that all new equipment and materials installed for this bid item complies with the corrosion protection measures described in Section 3.8 of the *Common Requirements for All Bid Items*.
- All new fasteners and hardware are to be stainless steel or other approved material as specified in Section 3.8.2 of the *Common Requirements for All Bid Items*.

### 4.13.4 Installation of Scum Detecting Radar

- Contractor is to remove the existing carbon steel cover for entrance hatch and store it on-site.
- Contractor is to provide a new fabricated stainless steel plate that will serve as both a removable cover for the entrance hatch and a mounting location for the radar.
- Radar is to be installed in accordance with the Manufacturer's Installation Instructions and as shown on Drawings 13-1, 13-2, 13-3 and 13-5.
- Contractor is to fabricate custom mounting plate for radar as shown on Drawings 13-4 and 13-5.
- Contractor is to provide equipment calibration and commissioning service as described in the Operating Instructions.

## 4 Specific Requirements for Each Bid Item

### 4.13.5 Installation of Remote Display

- Remote Display is to be installed in accordance with the Manufacturer's Installation Instructions.
- Mount the remote display on the inside north wall of the Penthouse of Digester 3&4.
- Mount the remote display for about 5'-6" above the floor.
- This display will be for Digester 3. There may be a future display for Digester 4. Therefore, mount the display for Digester 3 the right-hand side of the north wall and leave space to the left-hand side for a potential future display for Digester 4.

### 4.13.6 SCADA Programming

- Contractor will ensure that the proposed radar and remote display integrate correctly with the plant's existing SCADA (Supervisory Control And Data Acquisition) system.
- Contractor will provide SCADA programming changes so that information from the radar can be viewed from the SCADA display screen as shown on Drawing 13-6.

### 4.13.7 Electrical

- Electrical work is to be installed in accordance with NFPA 70, National Electrical Code.
- The area where the new equipment will be installed is considered a "wet location". The Contractor is to provide a Complete Electrical System that is protected to "watertight" level.
- Contractor is to comply with Section 3.8.10 of the *Common Requirements for All Bid Item* regarding corrosion protection of electrical equipment.
- All new fasteners and hardware for electrical components are to be stainless steel or other approved material.
- Contractor will provide new Rigid Aluminum Conduit (RAC).
- Contractor will provide new Liquidtight Flexible Metal Conduit (LFMC). Existing flexible electrical conduit may not be re-used.
- For Bid Item 12, the following existing materials may be reused: Rigid Metal Conduit (RMC) that is in good condition. All electrical conduit (new or re-used) is to be sealed to a "Watertight" level. Aluminum RMC does not need to be painted.

### 4.13.8 Identification Tags

- Contractor will provide identification tags as specified in Section 3.10 of the *Common Requirement for All Bid Items*.