

**TMUA PROJECT No. WPC 23-3,
FY '23 NORTHSLOPE CAPITAL EQUIPMENT
REPLACEMENTS**

ATTENDANCE AT PRE-BID CONFERENCE IS MANDATORY

PREPARED BY:
MASARU BROOK IWATA, P.E.
CITY OF TULSA WATER AND SEWER DEPARTMENT
5628 N. 105TH EAST AVE., TULSA, OK 74117
918-591-4714 OFFICE, 918-218-4717 CELL
MIWATA@CITYOFTULSA.ORG



ERIC LEE, DIRECTOR WATER AND
SEWER DEPARTMENT

Account Number: 7503392 544003

Water and Sewer Department
175 E. 2nd Street
Tulsa, Oklahoma 74103
(918) 596-9845

TECHNICAL SPECIFICATIONS

PROJECT SPECIFICATIONS
FOR
TULSA METROPOLITAN UTILITY AUTHORITY
PROJECT NO. WPC 23-3
FY'23 NORTHSLOPE CAPITAL EQUIPMENT REPLACEMENTS
TULSA, OKLAHOMA
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TECHNICAL SPECIFICATIONS

214 BID ITEM EQUIPMENT REPLACEMENT SPECIFICATIONS

<u>Item No.</u>	<u>Spec. No.</u>	<u>General Description</u>
1.	214.1	Aeration Basin #4 Diffusers - NSWWTP
2.	214.2	Pew Pump Valve Replacement - NSWWTP
3.	214.3	Chemical Pump & Feedline Replacement - NSWWTP
4.	214.4	Aeration Basin #4 Butterfly Valve Actuator Replacement - NSWWTP
5.	214.98	Extra Work Allowance
6.	214.99	Mobilization Bid Item
		ADD ALTERNATIVES
A.	214.5	Chemical Feed line Replacement

215 ANCILLARY EQUIPMENT AND WORK

200 INTRODUCTION

200.1 Project work shall include all equipment, labor, materials, hardware, cable, terminations, and incidentals necessary to remove existing equipment that is to be replaced, install the new equipment, and place the new equipment in fully operational, functional and warrantable service. All equipment to be supplied shall be brand new current year model and not used, remanufactured, or discontinued items.

200.2 Contractor shall field verify all elevations and dimensions of existing piping, valves, and equipment to be removed or demolished, and for replacement and/or modification. Contractor's work shall be based on field measurements and shall include field adjustments and additions for the proper installation of equipment. The contractor shall take note of all objects in the vicinity of equipment being installed to ensure that there are no issues with interference. It is the responsibility of the contractor to make modifications necessary to adjacent objects such as pipe supports and similar items to install the new equipment unless such objects are not reasonably visible during the site visit. It is the responsibility of the contractor to review all field conditions and take necessary field measurements prior to ordering equipment. The Authority will make available the information it has pertaining to the existing equipment.

200.3 The Authority's contact people are:

Northside Wastewater Treatment Plant	Masaru Brook Iwata P.E. – Sr. Engineer 5628 N 105 th East Avenue Tulsa, OK 74117 918-591-4714
Northside Wastewater Treatment Plant	Colin Wilmering – Maintenance Manager 5628 N 105 th East Avenue Tulsa, OK 74117 918-591-4578
Water Pollution Control	Matt Vaughan P.E.– Section Manager 175 E. 2 nd Street, Suite 1400 Tulsa, OK 74103 918-596-9845

201 QUALIFICATION REQUIREMENTS

- 201.1 Only contractors holding a valid pre-qualification certificate from the Tulsa Metropolitan Utility Authority in Classification A (General) or D (Utility Construction), are eligible to bid on this project. No additional qualification information is required to be submitted.
- 201.2 Only contractors that attend the mandatory pre-bid meeting will be allowed to bid on this project.

202 SUMMARY OF BID ITEMS

The Basis of Award shall be the six (6) Bid Items 1 through 6. The lowest responsible bid shall be determined by the Base Bid amount for Bid Items 1 through 6.

Bid Item No.	Specification No.	General Description
1	214.1	All materials, labor, equipment, and supervision required for removal and replacement of all diffuser assemblies in the Northside Wastewater Treatment Plant (NWWTP) Aeration Basin #4 , per these specifications.
2	214.2	All materials, labor, equipment, and supervision required for removal and replacement of the discharge and suction butterfly and check valves at the Northside Wastewater Treatment Plant (NWWTP) , per these specifications.
3	214.3	All materials, labor, equipment, and supervision required for removal and replacement of the chemical pumps at the Northside Wastewater Treatment Plant (NWWTP) , per these specifications.
4	214.4	All materials, labor, equipment, and supervision required for removal and replacement of one (1) butterfly valve actuator at the Northside Wastewater Treatment Plant (NWWTP) Aeration Basin (FEB) , per these specifications.
5	214.98	Extra Work Allowance – \$35,000.00 Lump Sum Allowance for various mechanical, electrical, plumbing, or unforeseen circumstances work not identified in the bid items.
6	214.99	Mobilization Bid Item – Not to exceed 5% of Base Bid Items not including the Mobilization Bid Item
ALT A	214.5	Chemical Feed line replacement from disinfection building to contact basin at the Northside Wastewater Treatment Plant (NWWTP) , per these specifications.

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203 GENERAL CONTRACTOR RESPONSIBILITIES

The cost of items in this Section and other Sections of these specifications shall be equitably included in Section 202 Bid items

- 203.1 Prior to disposal of any material or equipment that is City of Tulsa property and removed as part of the contract work, Contractor shall contact the Authority and explicitly offer to the Authority first right to claim and retain such materials or equipment as City of Tulsa property. Contractor shall be responsible for the disposal of all such equipment and materials not claimed by the Authority.
- 203.2 Contractor shall field verify all elevations and dimensions of existing piping, valves, and equipment to be demolished. Contractor work shall be based on field measurements and shall include field adjustments and additions for the proper installation of equipment. The contractor shall take note of all objects in the vicinity of equipment being installed to ensure that there are no issues with interference. It is the responsibility of the contractor to make modifications necessary to adjacent objects such as pipe supports and similar to install the new equipment unless such objects are not reasonably visible during the site visit. It is the responsibility of the contractor to review all field conditions and take necessary field measurements prior to ordering equipment. The Authority will make available the information it has pertaining to the existing equipment.
- 203.3 Contractor will coordinate, provide, and bear the cost of all items below:
- Equipment, materials, tools.
 - Labor, supervision, coordination.
 - Procedures for continual operation of the wastewater facilities.
 - Flow stoppage, plugging, bypass pumping, sump pumping.
 - Rigging, lifting, material handling, illuminating.
 - Vacuum truck service and disposal of grit, sludge, sediment.
 - Trash service and disposal of debris.
 - Methods to prevent debris from going into drains.
 - Delivery, unloading, storage, and security of equipment and materials.
 - 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, coatings, and other measures to protect new equipment and materials from corrosion.

- Electrical wires, cable, conduit, terminations, and other incidental items.
- Hardware, brackets, clamps, hangers, supports, 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.

203.4 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 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.

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

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

203.6 For purposes of draining of storage or conveyance structures, the contractor will do all of the following

- Coordinate with the Engineer. If conditions permit, the plant operations crew will attempt to drain the structure using installed facility equipment such as valves and built-in pumps. If conditions permit, the plant operations crew will attempt to provide general wash-down. The contractor will provide any needed pump or vacuum service to maintain drained condition.
- Provide any needed pumping or vacuum service if installed facility equipment is not functional or not fully functional.
- Provide any needed pumping or vacuum service to remove and dispose of grit, sediment, sludge, or bulk debris.

204 SUBMITTALS

All submittals shall be accompanied by a transmittal letter and/or cover letter that includes the project name and number, the contract specification number under which the equipment is being supplied, the Equipment ID number of the equipment being referenced, and the submittal revision number as appropriate.

204.1 Contractor shall submit, for each bid item, the manufacturer's instructions and recommendations for installation, for subsequent testing of the units, and for ensuring they are in proper operation. These instructions shall be part of these specifications and binding on the contractor.

204.2 Contractor shall include, for each bid item, a work plan acceptable to the Engineer describing the duration and sequence of work. Plan shall be approved prior to commencement of work. All work requiring flow stoppage or removing equipment from service must be scheduled at least 48 hours in advance with Plant Superintendent. When flow stoppage is required for equipment installation, contractor shall have all necessary materials at the installation site prior to any flow stoppage, and shall proceed with installation of equipment to minimize downtime.

204.3 Contractor shall, within 15 days of issuance of Work Order, submit three (3) copies of the following items for review and approval - one (1) copy to be returned to Contractor following review, two (2) copies to be retained by Authority:

204.3.1 Product Data and Information: Submit catalog data including rating and descriptive literature of all components and systems for approval by Authority. This shall include items required by 204.

204.3.2 Itemized list with manufacturer's part numbers, part descriptions and schedule of values (unit prices) for the equipment proposed for each location.

- 204.3.3 Shop Drawings: Submit the following shop drawings for approval by Authority:
- 204.3.3.1 Bill of materials including manufacturers' name and catalog number
 - 204.3.3.2 Outline drawing showing dimensions, arrangement, and Identification of components and nameplate schedule for all units
 - 204.3.3.3 Individual schematic control diagrams for each unit
- 204.3.4 Manufacturer's training, reports and certifications requirements:
- Manufacturer's certification that the equipment is suitable and will perform within specification and manufacturer's design operating parameters for the locations and conditions herein specified. Manufacture's services shall also include site visits prior to construction, during installation and for start-up, as necessary for a detailed start up report and Manufacture's certification of proper installation. Submit Manufactures start-up reports and certification of proper installation when they become available and included copies in the final O&Ms. Start-up report should include pertinent start up details, equipment description, project information and complete initial set points and initial operational readings and date. Submit training agenda, handouts, power point/video and Speaker resume for acceptance prior to scheduling training. Provide two separate training days as coordinated with the Plant to accommodate both day and night shifts, to be a minimum of 4 hours minimum per training day (classroom and field training).
- 204.3.5 Safety Plan: This submittal will be checked for general conformance with Section 207 Safety requirements and applicable OSHA and local regulations. Notwithstanding, it is the Contractors responsibility to ensure that the plan is comprehensive and in full conformance with all applicable OSHA, federal, state and local regulations.
- 204.3.6 Work Plan (reference Section 204.2): Submit for approval by Authority, the work plan for each bid item clearly showing the work task sequencing plan and time requirements, including downtime durations. This shall include items required by Section 203.
- 204.3.7 Submit for approval by Authority, plans and specifications for any concrete pad, support, piping, or other construction modifications from original installation.

204.3.8 Warrantee Tracking Log: Shall be maintained by the contractor and shall be provided as a Monthly Meeting hand out and project completion end of project submittal

204.4 Operations and Maintenance Manuals:

204.4.1 Contractor shall furnish to the Engineer two (2) hard copies of an Operation and Maintenance Manual for each piece of equipment and associated control systems furnished and installed.

204.4.2 Contractor shall furnish to the Engineer one (1) soft copy of all O & M manuals. CDs/jump drives shall be formatted in pdf and shall contain all printed material included in the hard copies. A separate pdf folder shall be created for each **Equipment** numbered piece of equipment, within which all files pertaining to that piece of equipment shall be located.

204.4.3 Prior to the work reaching 80 percent completion, Contractor shall submit to the Engineer for approval two (2) copies of the manual with all specified material. Submittal of the approval copies shall be made with the partial payment request for the specified completion. Within 30 days after the Engineer's approval of the two-copy submittal, Contractor shall furnish to the Engineer the remaining hard copies of the manual and the soft copy. Contractor shall submit any missing material for the manual prior to requesting certification of substantial completion.

204.4.4 Format and Contents: Each O & M manual shall include the following:

204.4.4.1 One copy of a completed **EQUIPMENT NAMEPLATE AND SUMMARY DATA** form.

204.4.4.2 One copy of the equipment Start-Up report and Manufacture's certification of proper installation. .

204.4.4.3 One copy of the manufacturer's operating and maintenance instructions. Operating instructions include equipment start-up, normal operation, shutdown, emergency operation and troubleshooting. Maintenance instructions include equipment installation, calibration and adjustment, preventive and repair maintenance, troubleshooting, parts list and recommended spare parts.

- 204.4.4.4 List of electrical relay settings and control and alarm contact settings.
 - 204.4.4.5 Electrical interconnection wiring diagram for equipment furnished including all control and lighting systems
 - 204.4.4.6 Record drawings showing as-built schematic control diagrams for each unit and one-line diagrams.
 - 204.4.4.7 Cross-references where required between the appropriate sections of the Contractor's O&M manual and the manufacturers' manuals.
- 204.5. Equipment Nameplate Information – Contractor shall, upon startup of each piece of equipment, complete the form, titled **EQUIPMENT NAMEPLATE AND SUMMARY DATA**, found at the end of this section, and shall include the completed form in the front of that equipment's respective O & M manual. The form shall be included with each O & M manual copy submitted. Equipment ID nameplate requirements are found in specification section 204.3.6 of these specifications.
- 204.6 Submittals shall be sent to the following address:
- Andrew Liechti, P.E.
City of Tulsa Water and Sewer Department
Northside Wastewater Treatment Plant
5628 N. 105th E. Ave., Tulsa, OK 74117
T: 918-591-4714, C: 918-381-4950
E: aliechti@cityoftulsa.org

EQUIPMENT NAMEPLATE AND SUMMARY DATA

Equipment 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")

✓ Initial: _____
✓ Weekly: _____
✓ Monthly: _____
✓ Semi-Annual: _____
✓ 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.

205 MONTHLY PROGRESS REPORTS AND PROGRESS MEETINGS

- 205.1 The Contractor shall submit monthly written project progress reports detailing the project's progress to date, problems encountered or anticipated which impact project schedule, and plans for the next two weeks' work.
- 205.2 Project progress reports shall be due as agreed upon during pre-work meeting.
- 205.3 Monthly progress meetings shall be scheduled on a weekday mutually agreeable to the Authority and the Contractor and shall be specified at the pre-work conference. The Contractor shall run the Monthly Meetings for the duration of the project and provide a meeting agenda including work completed, work planned, project, updated project schedule and other pertinent project status information.
- 205.4 The contractor shall submit a work progress and planned completion schedule for each bid item at the monthly progress meeting. The pre-work conference will constitute the first monthly progress meeting.
- 205.5 The Contractor shall maintain, update and submit an Equipment Log at each monthly meeting that lists each piece of equipment by Equipment ID number and lists Startup Date, Warranty Start Date and O&M Manual Submittal Date, among other project details. The spread sheet document shall be a shared document and submitted to the City at the end of the project for City's future use. A sample Equipment log is available upon request.

206 SECURITY

- 206.1 Each project site where work is to be performed under this Contract is a secured site. The Contractor shall be responsible for security as described in this section.
- 206.2 Site Access: The Contractor shall respect all existing security measures at each project site, and shall implement the following measures to apply to all work performed under this Contract. Coordination for Plant access and City of Tulsa security pass access will be required.
 - 206.2.1 Work at both Northside and Southside shall be restricted to the hours defined by TMUA GC-19 unless otherwise authorized by the Plant Superintendent.
- 206.3 Common Requirements:
 - 206.3.1 Identification Badges: An Identification Badge, issued by the City of Tulsa Security Office, is required for the following people or any other person as directed by City of Tulsa Security, Plant Superintendent, or WPC Manager:
 - 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.

The Identification Badge also functions as an Access Card to allow access through the front gate of the facility. Six months is the maximum time that an Access Card is active.

206.3.2 Contractor will coordinate with the Engineer to request Identification Badges. Application for an Identification Badge will require a background investigation. Each person that is applying for an Identification Badge will need to complete the following two (2) forms:

- City of Tulsa Access Card / Identification Card Request Form
- City of Tulsa Security, Background and Prescreen Investigation Form

A current soft copy of the forms can be obtained from the Engineer.

206.3.3 The Contractor will send the completed forms as required. Approved individuals will coordinate with the City of Tulsa Security Office to complete the process and obtain their Identification Badge.

206.3.4 The Contractor will coordinate with the Engineer to request reactivation of Access Cards. Reactivation may require re-application and additional background investigation.

206.4 Contractor and Authority acknowledge that Contractor shall not solely be responsible for all secured access to the site, that City personnel will have access and will be performing their regular duties pertaining to the operation and maintenance of the site facilities, and that security at the site shall require the cooperation of all persons authorized to access the site for the performance of their work. To the extent the Contractor is responsible for and has control of secured access, Contractor shall restrict site access to only persons essential to the performance or inspection of the work being performed under this Contract.

206.5 Contractor shall provide Engineer twenty-four (24) hours advance notification of any delivery of equipment or materials to the site, and shall make arrangements with Engineer to provide for inspection of such delivery.

206.6 Any observation by the Contractor of activity at or associated with the project site that Contractor observes and considers to be unusual or suspicious in nature, or that poses a threat to the integrity or welfare of the project site or associated facilities, shall be duly noted at the time of the observation. Any such observation shall be immediately reported to the Engineer.

206.7 No statement pertaining to security in these Specifications shall constitute a contract between Contractor and Authority for the performance of security services.

207 SAFETY

- 207.1 Contractor shall be responsible for performing all work under this contract in a safe manner and in compliance with all applicable local, state, and federal safety and health regulations. All of the following requirements shall apply:
- 207.2 Contractor shall submit a site safety plan prior to start of work. Contractor's attention is directed to safety regulations applicable to the work under this contract, which include but are not limited to the following:
- 207.2.1 OSHA Standards 29CFR1910.147, the control of hazardous energy (Lockout/Tagout)
- 207.2.2 Fire Prevention and Protection: The Contractor shall take all necessary measures to prevent fire, and shall provide satisfactory firefighting means at the location of work.
- 207.2.3 Condition of Equipment and Materials: All equipment, tools, and appliances, and materials used in connection with the project shall be handled and operated only when they are in safe operating condition and in accordance with a standard safety procedure.
- 207.2.4 Confined Space Entry: Contractor shall determine if any work areas in this contract are considered permit spaces for entry, as defined in OSHA regulations, and shall perform all work so determined in accordance with all applicable state and federal labor, safety, and health regulations.
- 207.2.5 Combustible - Explosive Atmospheres: Contractor shall determine if any work areas in this contract are considered combustible and explosive spaces for entry, as defined in OSHA regulations, and shall perform all work and employ equipment in accordance with all applicable state and federal labor, safety, and health regulations.

208 PROTECTION OF PROPERTY

- 208.1 The protection of City, State and Government equipment, fences, gates, signs, and other City property is of prime importance, and if damaged, destroyed or removed, they shall be repaired, replaced, or paid for by the Contractor. Disturbance to this property must first be approved by the agency which controls it.
- 208.2 No valve or other control on any utility main or building service line shall be operated for any purpose by the Contractor.
- 208.3 At places where the Contractor's operations are adjacent to, or crossing, the plane of railway, telegraph, telephone, electric, and gas lines, or water lines, sanitary sewers, and storm sewers, damage to which might result in expense, loss or inconvenience,

work shall not be commenced until all arrangements necessary for the protection thereof have been made. Contractor shall notify the Notification Center of Oklahoma One-Call System, Inc., of any excavation or demolition prior to the commencement of such work. Notification shall be made no sooner than then (10) days nor later than forty-eight (48) hours prior to start of work, excluding Saturdays, Sundays, and legal holidays.

208.4 The Authority has attempted to locate all storm sewers, culverts, buried telephone or electrical conduits, sanitary sewers, water mains, and gas mains that might interfere with the construction of this project. The Contractor shall cooperate with the owners of any underground or overhead utility lines in their removal and rearrangement operations in order that these operations may progress in a reasonable manner and duplication or rearrangement work may be reduced to a minimum, and that services rendered by those parties will not be unnecessarily interrupted.

208.5 It shall be the responsibility of the contractor to follow all rules and regulations set forth by the Oklahoma Department of Environmental Quality with regards to storm water runoff associated with construction activities involving the disturbance of land. The contractor shall review the regulations and determine if a DEQ storm water discharge permit is required. If a permit is required, it is the responsibility of the contractor to apply for and obtain the permit prior to disturbance of soil. If a permit is not required, the contractor shall still take all necessary action to comply with DEQ rules.

208.6 In the event the contractor in any way fails to comply with the requirement of protecting, repairing, and restoring of any utility or utility service, the Engineer may, upon forty-eight (48) hours' notice, proceed to protect, repair, rebuild or otherwise restore such utility or utility service as may be deemed necessary, and the cost thereof will be deducted from any money due or which may become due the contractor pursuant to the terms of his contract.

209 PROTECTION OF MATERIALS

209.1 All materials and equipment delivered to the work site shall be adequately housed and protected against damage or deterioration as required by the equipment manufacturer. The Contractor shall keep his storage yard(s) in good order, arrange his materials neatly, and protect them from damage.

210 REFERENCES TO OTHER SPECIFICATIONS

210.1 Where a referenced American Society for Testing Materials (ASTM), National Electric Code (NEC), National Electrical Manufacturers Association (NEMA), American National

Standards Institute (ANSI), Institute of Electrical and Electronics Engineers (IEEE), or other agency designated specification is specified for a material, component, or device, that designated specification shall be the current revision, either tentative or adopted. If a referenced specification is in disagreement with these specifications, the Tulsa Metropolitan Utility Authority specifications shall govern.

211 CLEAN-UP

211.1 Immediately upon completion of the work at each site in the contract, the Contractor shall remove all excess materials, equipment, tools, and debris, and restore the site to a condition and in a manner satisfactory to the Engineer.

212 PLACING WORK IN SERVICE

212.1 If desired by the Authority, portions of the work may be returned to service when completed, and the Contractor shall give prior access to the work for this purpose, but such use and operation shall not constitute an acceptance of the work. Any such return to service shall comply with Section GC-38 of the General Conditions of these Contract Documents and Specifications.

212.2 Warranty: All equipment and work shall have a one (1) year factory warranty from date of acceptance, which shall include all materials and labor.

213 PAYMENT

213.1 Contractor will refer to Paragraph GC-29 of the General Conditions of Contract regarding partial payments. The Engineer will withhold the following percentage of the dollar amount for each Bid Item:

- 20% for Documents for Record, Start-up Service (if required), and Training Service (if required).
- 5% for Final Acceptance of the Work including Equipment Identification Tags.
- 5% retainage as required by Paragraph GC-29 of the General Conditions of Contract.

END OF SECTION

214.1 All materials, labor, equipment, and supervision required for removal and replacement of all diffuser assemblies in the Northside Wastewater Treatment Plant (NWWTP) Aeration Basin #4, per these specifications.

- 214.1.1 The project located at the City of Tulsa's Northside Wastewater Treatment Plant's Aeration Basin #4, consists of removing and replacing all existing diffuser assembly components in Aeration Basin #4 with the proposed. The project includes the correct and complete installation of new diffuser assemblies, as specified herein. All work shall be performed in conformance with the manufacturer's instructions and recommendations for installation, including, but not limited to, use of lubricant and tools recommended. Furthermore, subsequent testing of the new units, ensuring they are in proper operation shall be completed.
- 214.1.2 Existing diffuser assemblies to be replaced location and the proposed diffuser assembly installation location are shown on the accompanying **WPC23-3** drawing sheets designated as **214.3A** thru **214.3J**.
- 214.1.3 Contractor shall be knowledgeable about and shall field verify all elevations and dimensions of existing equipment that in any way bears on the removal of the existing diffuser assemblies and installation of the proposed diffuser assemblies. Work shall be based on field measurements and counts. The City will provide the information it has pertaining to the existing equipment.
- 214.1.4 Project work shall include all materials, equipment, labor, and supervision, necessary to complete the project as specified herein, including but not limited to any and all crane work, rigging, delivery and complete installation of components to fully operational and warrantable condition.
- 214.1.5 Contractor shall submit work plan acceptable to the Engineer describing the duration and sequence of work. The plan shall be approved prior to commencement of work. All work requiring flow stoppage or basin removed from service must be scheduled four (4) weeks in advance with Plant Superintendent. Contractor shall have materials as necessary at the installation site prior to any flow stoppage. It is the contractor's responsibility to prepare the system being worked on for disassembly. This includes coordinating with plant operations the closing of upstream/downstream valves and pumping down any reservoirs necessary. It is expected that COT personnel will be able to empty and wash out the basin. If necessary, the Contractor is responsible for pumping out any fluid that may build up due to

small valve leaks and/or rain. The Plant Superintendent will instruct the contractor on where to direct any pumped fluid.

214.1.5.1 All unneeded equipment and debris from any work shall become the responsibility of the contractor and shall be removed from the site and disposed of properly.

214.1.6 The proposed diffuser assemblies shall be 9" membrane disc diffuser elements to be installed in the existing diffuser holders. Membrane disc diffuser to match the existing diffuser holder and base plate in order to allow proper fit of the membrane to ensure performance, secure connection and adequate seal on o-ring. Retainer rings shall be replaced as part of the diffuser assemblies. Diffuser Assemblies shall be model Silver Series II 9" Membrane Disc Diffusers manufactured by Sanitaire, or approved equal, that meets the following requirements:

- a. Incorporate an integral check valve into the membrane diffuser.
- b. Design and test diffusers for a dynamic wet pressure (DWP) of 12 inches \pm 20% water column @ 1.0 SCFM/diffuser and 2 inches submergence.
- c. Visual Uniformity – Observe diffusers for uniform air distribution across the active surface of the diffuser at 1.0 SCFM/diffuser and 2 inches submergence. Active surface is defined as the perforated horizontal projected area of the diffuser.
- d. Quality Control – Test diffuser using primary sampling criteria outlined in Military Standard 105E.
- e. Manufacture circular membrane diffuser discs with integral O-ring of EPDM synthetic rubber compound with precision die formed slits. Thermoplastic materials (i.e. plasticized PVC or polyurethane) are not acceptable.
- f. Add carbon black to the material for resistance to ultraviolet light.
- g. Design diffuser as one-piece injection molded part with a minimum thickness of 0.080 inches for 9 inch diameter unit.
- h. Limit the maximum tensile strength of the diffuser to 10 psi when operating at 2.4 SCFM/sq. ft. of material. Furnish proportionately thicker material for larger diameter disc diffusers to limit the maximum tensile stress and to resist stretching.

- i. Produce diffusers free of tears, voids, bubbles, creases or other structural defects.
- j. Furnish diffuser material to meet the following:

Item	Value/Units	ASTM
Base Polymer	EPDM	D573
UV Resistance	Carbon Black	
Specific Gravity	1.25 or less	
Durometer – Minimum	58% \pm 5%	D2240
Modulus of Elasticity	500 psi	D412
Ozone Resistance (72 hrs: 40°C pphm)	No cracks @ 2X magnification	D1171 Test A
Tensile Strength	1200 psi	D412
Elongation - % - Retained 70 hrs @ 100°C - minimum at break	75% Max 350%	D573 D412

214.1.7 **INSTALLATION:** Diffuser Assemblies and Retainer Rings shall be installed per manufacturers instructions including the following noted steps and concerns.

1. Before installation on a given row of diffusers, Contractor is to remove the diffusers to be replaced and flush out existing piping.
2. **It is extremely important not to over-torque the retainer rings during installation.**
3. Contractor is to report any assemblies that are missing plates, so that City personnel can purchase for replacement at a later time.
4. Contractor to report any existing diffuser holders or piping that has existing damage, so that City personnel can purchase for replacement at a later time. Contractor will be responsible for any existing holders or piping that is damaged during install.
5. Contractor Hydraulically clean airlines free of any / all debris.

214.1.8 **TESTING:** The diffuser assemblies shall be installed in strict conformance with the manufacturer's recommendations, which are to be submitted with the shop drawings. After completion of the installation, the diffuser assemblies shall be tested by the Contractor under actual operating conditions. An Authorized Manufacturer's Representative shall do onsite verification of diffusers at Start-Up and provide a report on transfer efficiency.

END OF SECTION

214.2 All materials, labor, equipment, and supervision required for removal and replacement of four (4) wafer check and eight (8) butterfly valves at the Northside Wastewater Treatment Plant (NWWTP) PEW Building, per these specifications.

- 214.1.2 The project located at the City of Tulsa's Northside Wastewater Treatment Plant, consists of removing and replacing the existing 6" check and 6" butterfly valves. The project includes the correct and complete installation of new valves and any additional piping modifications necessary for the installation, as specified herein. All work shall be performed in conformance with the manufacturer's instructions and recommendations for installation, subsequent testing of the new units, and ensuring they are in proper operation.
- 214.2.2 Existing valves to be replaced, their location and the proposed valve installation locations are shown on the accompanying **WPC23-3** drawing sheet designated as **214.2A-214.2F**.
- 214.2.3 Contractor shall be knowledgeable about and shall field verify all elevations and dimensions of existing piping and equipment that in any way bears on the removal of the existing equipment and installation of the proposed equipment. Work shall be based on field measurements. The Authority will make available the information it has pertaining to the existing equipment.
- 214.2.4 Project work shall include all materials, equipment, labor, and supervision, necessary to complete the project as specified herein, including but not limited to any and all crane work, rigging, delivery and complete installation of components to fully operational and warrantable condition.
- 214.2.5 Contractor shall submit work plan acceptable to the Engineer describing the duration and sequence of work. Plan shall be approved prior to commencement of work. All work requiring flow stoppage or equipment removed from service must be scheduled at least seven days in advance with Plant Superintendent. Contractor shall have the valves, and other materials as necessary at the installation site prior to any flow stoppage. It is the contractor's responsibility to prepare the system being worked on for disassembly. This includes coordinating with plant operations the closing of upstream/downstream valves and pumping down any reservoirs necessary. It is the responsibility of the contractor to bypass any flow during the construction. The Plant Superintendent will instruct the contractor on where to direct bypassed flow.

- 214.2.5.1 Contractor shall be responsible for providing temporary piping or any modifications needed to use existing piping for temporary bypass pumping or flow stoppage.
 - 214.2.5.2 Flow stoppage can only be achieved for one (1) 12 hour day to complete, so coordination will be critical.
 - 214.2.5.3 All unneeded equipment and debris from any work shall become the responsibility of the contractor and shall be removed from the site and disposed of properly.
- 214.2.6 The proposed 6" butterfly Valves shall be model 2006 1B08A butterfly valves manufactured by Val-Matic, Inc. or BAW Dezurik AWWA Butterfly valves. Proposed 6" silent check valves shall be series 1406AH.1 silent check valve from Val-Matic or CSC Dezurik
- 214.2.6.1. **General Rating:** Valve shall be of full lug or full flange flat face-to-face design. Valve will have threaded flange bolt holes to permit independent upstream or downstream pipe flange removal without affecting the shutoff or body shell pressure rating of the valve.
 - 214.2.6.2 **Pressure Rating:**
 - 214.1.6.2.1:** Body shell pressure rating shall be 150 psig CWP.
 - 214.1.6.2.2:** Standard Shut off pressure rating shall be 150 psi.
 - 214.1.6.2.3:** The valve body shall be tested at 1.5 times the rated pressure and the valve gate at 1.1 times the rated pressure while in the fully shut position with zero cc/min leakage permitted past the seat or to valve exterior.
 - 214.2.6.3 **Materials:**
 - 214.1.6.3.1:** shall be of cast iron per ASTM A126 Class B. Flanged end valves shall be of the AWWA C504 short body design with Class 125 flanged ends faced and drilled per ASME B16.1 standard for cast iron flanges. Mechanical Joint end valves shall meet the requirements of AWWA C111/ANSI 21.11.
 - 214.2.6.3.2** shall meet or exceed the requirements of the latest revision of AWWA Standard C504 for Class 150B butterfly valves. Valves 12" (300mm) and smaller shall have a

working pressure of 200 psi (1380 kPa). When customer specified, valves shall meet NSF/ANSI 61/372.

214.2.6.3.3: shall be designed and tested per the requirements of AWWA C504. Actuators shall be available in both weatherproof and buriable constructions with handwheel, chainwheel, or 2" (50mm) square AWWA nut input. All units shall have independently adjustable open and closed position stops that are adjustable under full line pressure and flow. Open and closed position stop adjustments shall not require the removal of any load or torque transmitting components.

214.2.6.3.4:

214.2.6.4 **Design:**

214.2.6.4.1: See attached 5600F-5700F spec sheet for additional information on the plug valves

214.2.6.4.2: See attached 7800 swing check valve for additional information

214.2.6.5 **Valve Operators:** Valves identified in the drawings as manually operated shall be oriented so that the valve indicator is visible during operation of the valve

214.2.6.6 **Coatings:** All non stainless steel metal surfaces shall be prepped, blasted, chip resistant primed, and Painted to match the other PEW line. Sherwin Williams PANTONE 522 Match or Tnemec Pantone 522 Match

214.2.7 **INSTALLATION:** The valves shall be installed in strict conformance with the manufacturer's recommendations, which are to be submitted with the shop drawings. All fasteners shall be 316 stainless steel and a nickel based anti-seize shall be applied to threaded fasteners during assembly. Contractor shall provide the piping necessary for any modifications to connect the proposed valves into the existing hard piping systems.

214.2.14 **TAGGING:** Contractor shall supply equipment tags to be mounted on the valves. Tags shall show the City of Tulsa's Equipment ID number for each valve (as listed below). The tags shall be visible without the need to "hunt" for the tags and shall be viewable and readable from eye level. Tags shall be made to conform to Section 215.1.4 of these specifications.

Equipment ID Tag Numbers:

Check valves:

N060-PEW1-CKV01
N060-PEW1-CKV02
N060-PEW1-CKV03
N060-PEW1-CKV04

Butterfly Inlet Valves:

N060-PEW1-BFV06
N060-PEW1-BFV07
N060-PEW1-BFV08
N060-PEW1-BFV09

Butterfly Discharge Valves

N060-PEW1-BFV10
N060-PEW1-BFV11
N060-PEW1-BFV12
N060-PEW1-BFV13

- 214.2.15 TESTING. After completion of the installation, the equipment shall be tested by the Contractor under actual operating conditions. An Authorized Owner's Representative shall witness the testing.

END OF SECTION

214.3 All materials, labor, equipment, and supervision required for removal and replacement of three (3) chemical pumps at the Northside Wastewater Treatment Plant (NWWTP), per these specifications.

- 214.3.1 The project located at the City of Tulsa's Northside Wastewater Treatment Bleach building, consists of removing and replacing the existing chemical pump assembly components in the bleach building with the proposed. The project includes the correct and complete installation of new pump, discharge connection feed line and check valve, as specified herein. It also includes connection of new pumps to existing controls and disconnects with new cable. All work shall be performed in conformance with the manufacturer's instructions and recommendations for installation, subsequent testing of the new units, and ensuring they are in proper operation, including proper function with the NWWTP's SCADA system.
- 214.3.2 Existing pump assemblies to be replaced, its location and the proposed pump assembly installation location are shown on the accompanying **WPC23-3** drawing sheets designated as **214.3A** thru **214.3I**.
- 214.3.3 Contractor shall be knowledgeable about and shall field verify all elevations and dimensions of existing piping and equipment that in any way bears on the removal of the existing equipment and installation of the proposed equipment. Work shall be based on field measurements. The Authority will make available the information it has pertaining to the existing equipment.
- 214.3.4 Project work shall include all materials, equipment, labor, and supervision, necessary to complete the project as specified herein, including but not limited to any and all crane work, rigging, delivery and complete installation of components to fully operational and warrantable condition.
- 214.3.5 Contractor shall submit work plan acceptable to the Engineer describing the duration and sequence of work. Plan shall be approved prior to commencement of work. All work requiring flow stoppage or equipment removed from service must be scheduled 48 hours in advance with Plant Superintendent. Contractor shall have the pumps, controls, and other materials as necessary at the installation site prior to any flow stoppage. It is the contractor's responsibility to prepare the system being worked on for disassembly. This includes coordinating with plant operations the closing of upstream/downstream valves and pumping down any reservoirs necessary. It is the responsibility of the contractor to bypass any flow during the

construction. The Plant Superintendent will instruct the contractor on where to direct bypassed flow.

214.3.5.1 Contractor shall be responsible for providing temporary discharge piping or any modifications needed to reuse existing discharge piping for temporary bypass pumping.

214.3.5.2 Contractor shall clean out as needed, to facilitate work, including dewatering.

214.3.5.3 All unneeded equipment and debris from any work shall become the responsibility of the contractor and shall be removed from the site and disposed of properly.

214.3.6 The proposed chemical pump shall be Watson matlow pumping units. The submersible pumps shall be specifically designed to pump bleach. Pumps shall be a model 630U Watson Matlow or Blue-White M2s24-QNLR pumping units manufactured by Watson Marlow Pumps Group that meets the following requirements:

214.3.6.1. **Conditions of Operation:** Each pump shall be capable of providing the following hydraulic conditions:

Design Conditions

620UMAN/RE

M012282

0.1-265 RPM

0.002-4.75 GPM

ANALOG SIGNAL OUTPUT

214.3.7 Proposed pumping units shall be installed and connected to the existing power supply through receptacles on the existing control panel using a switch-rated disconnect plug and receptacle. The switch-rated disconnect plug and receptacle shall be UL 1682 listed and shall be model DSN60 manufactured by Meltric, or approved equal. New power cables shall be six (6) feet longer than what is required by the manufacturer, coiled and hung with a stainless steel hanger. The proposed pumps shall be installed to work with existing control systems, including the NSWWTP's SCADA system.

214.3.8 Where possible, existing fasteners may be used to install the new pump and rails. New fasteners shall be used as necessary to complete the installation. All fasteners shall be 316 stainless steel and a nickel based anti-seize shall be applied to threaded fasteners during assembly.

- 214.3.9 All pumps, material and equipment to be salvaged shall be removed carefully to prevent damage, and then delivered to an area designated by the Plant Superintendent on site. The contractor shall dispose of all parts of the existing pump deemed unnecessary to the plant. The Plant Superintendent shall specify which parts of the existing pump are to be salvaged.
- 214.3.10 Contractor shall use caution to avoid damage to existing power and data cables. Existing power and data cables running from MCC and PLC to control boxes shall not be replaced unless damaged. Contractor shall be responsible for any damage to existing electrical equipment or power cables. Power and data cables between control boxes and pumps shall be new.
- 214.3.11 Contractor shall change out and provide the piping necessary to connect the proposed pumps into the existing hard piping system.
- 214.3.12 . PIPING MODIFICATION: Contractor shall furnish and install new hoses and all appurtenances necessary to complete the installation. Using manufacturer recommended connections to existing piping. Final coupling misalignment shall be within one-half of the coupling manufacturer's allowable tolerance. Cleanup of previous leaks on all threaded connections.
- 214.3.13 TAGGING: Contractor shall supply equipment tags to be mounted on the Hand/Off Auto controls directly above the wet well. Tags shall show the City of Tulsa's Equipment ID number for each pump (as listed below) as well as a designation as to which pump in the wet well corresponds to which Equipment ID number. The tags shall be visible without the need to "hunt" for the tags and shall be viewable and readable from eye level. Tags shall be made to conform to Section 215.1.4 of these specifications.

Equipment ID Tag Number:

chemical pump #	N060-CHL1-MTP01
chemical pump #	N060-CHL1-MTP02
chemical pump #	N060-CHL1-MTP03

- 214.3.14 TESTING. The pumps shall be installed in strict conformance with the manufacturer's recommendations, which are to be submitted with the shop drawings. After completion of the installation, the equipment shall be tested

by the manufacturer's representative under actual operating conditions. An Authorized Manufacturer's Representative shall do onsite verification of pumps at Start-Up. Factory calibration as well as startup calibration reports shall be furnished before startup can be finalized.

END OF SECTION

214.4 All materials, labor, equipment, and supervision required for removal and replacement of one (1) actuator at the Northside Wastewater Treatment Plant (NWWTP) Aeration Basin #4, per these specifications.

- 214.4.1 The project located at the City of Tulsa's Northside Wastewater Treatment, consists of removing and replacing the existing air valve actuator with the proposed. The project includes the correct and complete installation of new actuator, as specified herein. It also includes connection of new actuator to existing controls with new cable. All work shall be performed in conformance with the manufacturer's instructions and recommendations for installation, subsequent testing of the new units, and ensuring they are in proper operation, including proper function with the NWWTP's SCADA system.
- 214.4.2 Existing actuator assembly to be replaced, its location and the proposed pump assembly installation location are shown on the accompanying **WPC23-3** drawing sheets designated as **214.4A**.
- 214.4.3 Contractor shall be knowledgeable about and shall field verify all elevations and dimensions of existing piping and equipment that in any way bears on the removal of the existing equipment and installation of the proposed equipment. Work shall be based on field measurements. The Authority will make available the information it has pertaining to the existing equipment.
- 214.4.4 Project work shall include all materials, equipment, labor, and supervision, necessary to complete the project as specified herein, including but not limited to any and all crane work, rigging, delivery and complete installation of components to fully operational and warrantable condition.
- 214.4.5 Contractor shall submit work plan acceptable to the Engineer describing the duration and sequence of work. Plan shall be approved prior to commencement of work. All work requiring flow stoppage or equipment removed from service must be scheduled 48 hours in advance with Plant Superintendent. Contractor shall have the pumps, controls, and other materials as necessary at the installation site prior to any flow stoppage. It is the contractor's responsibility to prepare the system being worked on for disassembly. This includes coordinating with plant operations the closing of upstream/downstream valves and pumping down any reservoirs necessary. It is the responsibility of the contractor to bypass any flow into the wet well during the construction. The Plant Superintendent will instruct the contractor on where to direct bypassed flow.

- 214.4.5.1 This will need to be installed and operational before Item 214.1 can be started.
- 214.4.5.2 All unneeded equipment and debris from any work shall become the responsibility of the contractor and shall be removed from the site and disposed of properly.
- 214.4.6 Installation of new motor actuator, actuator stand, connection rod, NEMA 4X rotating weir control panel, two limit switches, two limit switch mounting brackets and hardware. This item includes the installation of an electrical connection in accordance with Specification Section 204.4.
 - 214.4.6.1 The existing actuator was manufactured by AUMA SAR07.6/GS63.3/AM01.1 Flange FA12, bore to be verified at time of order, for the Northside Wastewater Treatment Plant. The new equipment shall be manufactured by AUMA or Limitorque equal.
- 214.4.7 The actuator shall be installed to work with existing control systems, including the NSWWTP's SCADA system.
- 214.4.8 Contractor shall use caution to avoid damage to existing power and data cables. Existing power and data cables running from MCC and PLC to control boxes shall not be replaced unless damaged. Contractor shall be responsible for any damage to existing electrical equipment or power cables. Power and data cables between control boxes and actuator shall be new.
- 214.4.9 TAGGING: Contractor shall supply equipment tags to be mounted on the Hand/Off Auto controls directly above the wet well. Tags shall show the City of Tulsa's Equipment ID number for each pump (as listed below) as well as a designation as to which pump in the wet well corresponds to which Equipment ID number. The tags shall be visible without the need to "hunt" for the tags and shall be viewable and readable from eye level. Tags shall be made to conform to Section 215.1.4 of these specifications.

Equipment ID Tag Number:
- 214.4.10 TESTING. The actuator shall be installed in strict conformance with the manufacturer's recommendations, which are to be submitted with the shop drawings. After completion of the installation, the equipment shall be tested

by the Contractor under actual operating conditions. An Authorized Manufacturer's Representative shall do onsite verification at Start-Up.

END OF SECTION

214.5 All materials, labor, equipment, and supervision required for removal and replacement of two (2) chemical hoses and two (2) duck bill check valves at the Northside Wastewater Treatment Plant (NWWTP), per these specifications.

- 214.5.1 The project located at the City of Tulsa's Northside Wastewater Treatment Bleach building, consists of removing and replacing the existing chemical pump assembly components in the bleach building with the proposed. The project includes the correct and complete installation of new pump, discharge connection feed line and check valve, as specified herein. It also includes connection of new pumps to existing controls and disconnects with new cable. All work shall be performed in conformance with the manufacturer's instructions and recommendations for installation, subsequent testing of the new units, and ensuring they are in proper operation.
- 214.5.2 Existing chemical feed hose assemblies to be replaced, its location and the proposed installation location are shown on the accompanying **WPC23-3** drawing sheets designated as **214.5A** thru **214.5B**.
- 214.5.3 Contractor shall be knowledgeable about and shall field verify all elevations and dimensions of existing piping and equipment that in any way bears on the removal of the existing equipment and installation of the proposed equipment. Work shall be based on field measurements. The Authority will make available the information it has pertaining to the existing equipment.
- 214.5.4 Project work shall include all materials, equipment, labor, and supervision, necessary to complete the project as specified herein, including but not limited to any and all crane work, rigging, delivery and complete installation of components to fully operational and warrantable condition.
- 214.5.5 Contractor shall submit work plan acceptable to the Engineer describing the duration and sequence of work. Plan shall be approved prior to commencement of work. All work requiring flow stoppage or equipment removed from service must be scheduled 48 hours in advance with Plant Superintendent. Contractor shall have the pumps, controls, and other materials as necessary at the installation site prior to any flow stoppage. It is the contractor's responsibility to prepare the system being worked on for disassembly. This includes coordinating with plant operations the closing of upstream/downstream valves and pumping down any reservoirs necessary. It is the responsibility of the contractor to bypass any flow during the

construction. The Plant Superintendent will instruct the contractor on where to direct bypassed flow.

214.5.5.1 Contractor shall be responsible for providing temporary discharge piping or any modifications needed to reuse existing discharge piping for temporary bypass pumping.

214.5.5.2 Contractor shall clean out as needed, to facilitate work, including dewatering.

214.5.5.3 All unneeded equipment and debris from any work shall become the responsibility of the contractor and shall be removed from the site and disposed of properly.

214.5.6 The proposed chemical feed hoses shall be Polypropylene braided, convoluted PFA Teflon Tubing; Pureflex Inc "Proflex", or approved equal. The chemical hoses shall be specifically designed to 12.5% bleach. Check valve to be Tide Flex or equal

214.5.6.1. **Conditions of Operation:** Each feed hose shall be of the following attached spec 2-8.01. Material classification TEFL-1

214.5.7 . Where possible, existing fasteners may be used to install the new pump and rails. New fasteners shall be used as necessary to complete the installation. All fasteners shall be 316 stainless steel and a nickel based anti-seize shall be applied to threaded fasteners during assembly.

214.5.8 New fasteners shall be used as necessary to complete the installation. All fasteners shall be Hastelloy steel and a nickel based anti-seize shall be applied to threaded fasteners during assembly. Gasket shall be vitron or approved equal.

214.5.9 All hoses, material and equipment to be salvaged shall be removed carefully to prevent damage, and then delivered to an area designated by the Plant Superintendent on site. The contractor shall dispose of all parts of the existing hoses deemed unnecessary to the plant. The Plant Superintendent shall specify which parts of the existing hoses are to be salvaged.

214.5.10 Contractor shall change out and provide the piping necessary to connect the proposed hoses into the existing hard piping system.

214.5.11 . PIPING MODIFICATION: Contractor shall furnish and install new hoses and all appurtenances necessary to complete the installation. Using manufacturer recommended connections to existing piping. Final coupling

misalignment shall be within one-half of the coupling manufacturer's allowable tolerance. Cleanup of previous leaks on all threaded connections

- 214.5.12 TAGGING: Contractor shall supply equipment tags to be mounted on the Hand/Off Auto controls directly above the wet well. Tags shall show the City of Tulsa's Equipment ID number for each pump (as listed below) as well as a designation as to which pump in the wet well corresponds to which Equipment ID number. The tags shall be visible without the need to "hunt" for the tags and shall be viewable and readable from eye level. Tags shall be made to conform to Section 215.5.5 of these specifications.

Equipment ID Tag Number:

chemical hose #

chemical hose #

- 214.5.14 TESTING. The hoses shall be installed in strict conformance with the manufacturer's recommendations, which are to be submitted with the shop drawings. After completion of the installation, the equipment shall be tested by the manufacturer's representative under actual operating conditions.

END OF SECTION

214.98 Extra Work Allowance – \$35,000.00 Lump Sum Allowance for various mechanical, electrical, plumbing, or unforeseen circumstances work not identified in the bid items.

- 214.98.1 The allowance shall be used for cost of materials, labor, installation, and overhead and profit for additional MEP/Unforeseen Circumstances work that is not identified in the base bid items.
- 214.98.2 The allowance shall be used only at the discretion of the City of Tulsa. Any allowance balance remaining at the completion of the contract will be credited back to the City of Tulsa on the final Application for Payment submitted by the contractor.
- 214.98.3 The contractor shall provide to the City of Tulsa representative a written request for the use of any of the allowance with a schedule of values and all associated backup information.
- 214.98.4 The contractor shall proceed with Extra Work included in the allowance only after receiving a written order from the City of Tulsa representative authorizing such work. Proceeding with work expected to be covered in the allowance without a written order from the City of Tulsa representative will be at the contractor's risk. Contractor may not be paid for unapproved work/materials at the discretion of the City of Tulsa representative.
- 214.98.5 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.

END OF SECTION

214.99 Mobilization Bid Item – A mobilization bid item is included to help cover initial costs of bonds, insurance, permits, submittal preparation and other incidental costs.

214.99.1 Payment shall be made for a Mobilization Bid Item which is intended to cover the costs of bonds, insurance, permits, submittal preparation and other incidental costs. Payment of the Mobilization Bid Item maybe be requested in full on the first payment application. The Mobilization Bid Item shall not exceed five percent (5%) of the sum of all Base Bid Items excluding the Mobilization Bid Item. Add Alternate Items are not part of the Base Bid Items.

END OF SECTION

215 ANCILLARY EQUIPMENT AND WORK

215.1 Ancillary Equipment:

215.1.1 Gauges: Each pump shall be provided with a combination pressure/vacuum gauge in the suction piping and a pressure gauge in the discharge piping. Gauges shall conform to ANSI/ASME B40.1 and shall be indicating dial type, with C-type phosphor bronze Bourdon tube and stainless steel rotary geared movement, or direct drive type with stainless steel helical-wound capillary tube pressure sensing element. The gauge shall have a phenolic open front turret case, and adjustable pointer, a stainless steel or phenolic ring, and an acrylic or shatterproof glass window. The dial shall be 4 ½ inches in diameter, with white background and black markings. Pointer travel shall span not less than 200 degrees or more than 270 degrees. All gauges shall be Accuracy Grade A or better. Pressure gauges shall read in pounds per square inch. Compound gauges shall read in inches of mercury vacuum and pounds per square inch. The range of each gauge shall be per pump manufacturer's recommendation.

215.1.2 Mechanical Seals and Seal Water:

215.1.2.1 All pumps shall be equipped with mechanical seals recommended by the pump manufacturer for the specific application of each pump. Contractor shall be responsible for supplying and installing a new seal water system/station with each new pump that requires seal water. The seal water station shall include an electric solenoid valve, an electric pressure switch and a pressure gauge downstream of the pump seal and a pressure gauge upstream of seal. Seal water supply for each pumping unit shall be provided with a Y-type water strainer in series with a Pressure Regulating valve (PRV) upstream of seal. The strainer/PRV combination shall have a by-pass seal water line controlled by a globe valve. See Attached seal water sketch SW1 for seal water station configuration. Seal water volume and pressure shall be as recommended by the pump manufacturer.

215.1.2.2 The new seal water station may contain components that were not originally part of an existing seal water system that

is to be demolished. It is the responsibility of the contractor to supply and install all necessary electrical components including wiring, conduit, connectors, contactors, etc... for a complete installation of the new seal water system. It may also be necessary to integrate the new seal water system components into the existing equipment control system. The contractor shall be responsible for all labor and materials required to integrate new components into the existing control system. The new seal water station electrical and control installation shall conform to the attached sketch SWE1. All electrical work on the seal water station shall conform to the General Electrical Requirements herein.

- 215.1.2.3 Seal water piping and accessories shall not be of a rigid PVC material. All seal water lines shall be of a flexible plastic material such as PEX with positive mechanical support for all valves and inline equipment, or it shall be of a non-corrosive metal material such as stainless steel. Seal water piping and fixtures shall be submitted according to the submittal section herein.
- 215.1.2.4 Some existing pumps do not have mechanical seals. Contractor shall determine from field investigations the location of seal water for those pumps. It is the responsibility of the contractor to supply and install all seal water piping, electrical work and materials, and control work and materials required to add a seal water station where one was not used for existing equipment. Locations are to be approved by the engineer.
- 215.1.2.5 If a new pump is installed that does not require seal water and there are existing seal water lines at the pump location, it is the responsibility of the contractor to remove existing water lines. Lines shall be removed as far up stream as possible to a point that will not interfere with water supply to other equipment. No existing lines shall be abandoned in place.

215.1.3 Valves:

- 215.1.3.1 All valve parts and surfaces shall be of corrosion resistant materials or have a factory applied epoxy coating sufficient to prevent corrosion in a wastewater environment. See painting/coating section for coating thickness requirements.
- 215.1.3.2 Plug Valves and Check Valves: Plug valves and check valves shall be of the same size, style and construction as the units being replaced. It is the responsibility of the contractor to review the existing valves and provide correct similar units. Acceptable manufacturers are Pratt, DeZurik, Clow, Val-Matic, or an approved equal.
- 215.1.3.3 Butterfly Valves: Butterfly valves shall be of the same size, style, and construction as the units being replaced. It is the responsibility of the contractor to review the existing valves and provide correct similar units. Acceptable manufactures are DeZurik, Clow, Val-Matic, or an approved equal.
- 215.1.3.4 Gate Valves: Gate valves shall be of the same size, style and construction as the units being replaced. It is the responsibility of the contractor to review the existing valves and provide correct similar units. Acceptable manufacturers are Wey, DeZurik, or approved equal.
- 215.1.3.5 Plug and butterfly valves supplied with hand wheel operators that are installed more than 6'-0" above floor level shall be supplied with chain wheels and chains to allow for valve operation from the floor.
- 215.1.3.6 Valves and operators shall be selected by the contractor such that when installed in close proximity to one another the operators will be a sufficient distance apart to allow for uninhibited use by personnel.

215.1.4 Equipment Tagging: New equipment shall be tagged, according to the requirements listed below, with a permanent and visible tag showing the new equipment number using the City of Tulsa Equipment ID numbering system. All tags should be visible to anyone without the need to remove covers or otherwise "hunt" for the tag. See individual equipment sections for Equipment IDs for each item. Tags shall conform to the following specifications.

215.1.4.1 Requirements:

- All new equipment.
- Each new or existing ancillary device associated with the new equipment including:
 - Motor Start/Stop Switches and Electrical Disconnect
Switches will have one tag identifying the equipment that it controls or provides power to.
 - Split-system HVAC equipment will have one tag on the air handling unit and another identical tag on the separate condensing unit.
 - Thermostats and Control Dampers will have one tag identifying the associated HVAC equipment.
 - For complex HVAC systems with multiple Thermostats, Control Dampers, or Water Valves; each will have two (2) tags. One tag will list the Thermostat, Control Damper, or Water Valve number and the other tag will list the associated HVAC equipment number.

215.1.4.2 Before attaching tags, Contractor will submit a table of Identification Tags to the Engineer for review. The table will list all the tags the Contractor will provide for all Bid Items and will show the following information: tag shape (rectangular or round); tag text; tag location.

215.1.4.3 Equipment tag numbering shall meet the following requirements:

PRODUCTS

Equipment ID Plates

All equipment tagged on the drawings, except for buried submerged equipment shall be provided with an Equipment ID Plate bearing the equipment tag number identified on the drawings. Equipment ID Plates shall be rectangular 3.5"x .75" and 1/16" thick laminated Blue/White, laminated impact acrylic such as Rowmark UltraMattes 322-512, or equivalent. Lettering shall be 1 line of text, centered, and white capitalized block letters .25" high and engraved to a depth of 0.08mm.

Equipment ID Plates must follow the Equipment IDing scheme.

Equipment ID Plates shall be attached with permanent adhesive.

XXXX-XXXX-XXXXXX

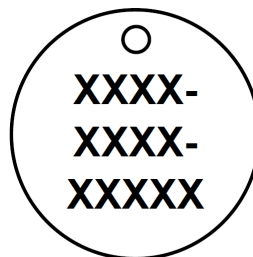
VALVE AND GATE EQUIPMENT ID PLATES

Equipment Equipment ID Plates

All valves and gates, except buried or submerged valves, that have been assigned an Equipment ID on the Drawings or in the valve or gate schedule, shall be provided with a permanent number plate. Equipment ID Plates shall be round 1.5" and 1/16" thick laminated blue phenolic plastic engraving stock that is U/V stable. Lettering shall be in 3 sections, centered, and white capitalized block letters 3/16" high and engraved to a depth of 0.08mm.

Equipment ID Plates must follow the Equipment ID Scheme.

Equipment ID Plates shall be attached with permanent ties.



215.1.5 **Equipment Coatings:** All equipment shall be supplied with a factory applied coating sufficient to withstand a wastewater environment. Factory applied coating shall be in accordance with the painting/coating section.

215.1.6 **Equipment Installation:** All anchor bolt connections shall include the use of a washer, lock washer, and nut (without nylon or similar insert).

215.1.6.1 Installation of all equipment and related items shall be performed as directed in the manufacturer's installation instructions.

215.1.6.2 No cutting, drilling or welding of new equipment 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.

215.1.6.3 The Contractor shall be responsible for any and all concrete modifications that may be required to install the new equipment. This shall include modifications or replacement of equipment pads and supports. All modifications shall be designed and constructed to conform to the recommendations of *ACI 302.1R-04 Guide for Concrete Floor and Slab Construction* and *ACI 301-10 Standard Specifications for Structural Concrete*. All concrete modifications and repairs shall be coated per the painting/coating section herein.

215.1.7 Equipment Start Up and performance:

215.1.7.1 All new equipment installed by the contractor must be started up and be in operational service for 48 hours with no performance issues prior to demolishing and installing like, adjacent equipment in the same system. If the new equipment exhibits any performance issues, the contractor shall repair the equipment/installation as required and begin a new 48 hour observation period.

END OF SECTION

215.2 GENERAL ELECTRICAL REQUIREMENTS:

- 215.2.1 Electric Code Compliance: All electrical work shall be performed in compliance with current electrical code.
- 215.2.2 Electrical Disconnects: All equipment installed or worked on with an electrical portion in the scope of work shall have a new local disconnect switch installed. All local disconnect switches shall be of stainless steel construction meeting NEMA 4X standards (reference Section 215.7.12.2). In the event a Class 1, Division 1 rating is required for explosion proof service, the disconnect shall meet all required ratings for Class 1, Division 1 service. Control panels that incorporate an integral disconnect will not be required to have an external disconnect.
- 215.2.3 Electric Motors: All electric motors shall be premium efficiency, suitable for operating the intended equipment per the equipment manufacturer's recommendations.
- 215.2.4 Electrical Wiring & Related Items: Contractor shall use caution to avoid damage to existing power cables. These cables shall be reused in new equipment installation provided their reuse meets current code requirements. Contractor shall be responsible for any damage to existing electrical equipment or power cables. The contractor shall be responsible for removing the existing control system and replacing it with the new control system. No unused remnants of the existing control system shall be abandoned in place.
- 215.2.5 Identification: Conduits in manholes, handholes, building entrance pull boxes, junction boxes and equipment shall be provided with identification tags. Identification tags shall be 19 gage stainless steel with ½ inch stamped letters and numbers as indicated on the drawings. Identification tags shall be attached to conduits with nylon tie wraps and shall be positioned to be readily visible.
- 215.2.6 Rigid Steel Conduit: Rigid steel conduit shall be heavy wall, hot-dip galvanized, shall conform to ANSI C80.1, and shall be manufactured in accordance with UL 6.
- 215.2.7 Liquidtight Flexible Metal Conduit: Liquidtight Flexible Metal Conduit shall be hot-dip galvanized steel, shall be covered with a moisture proof polyvinyl chloride jacket, and shall be UL labeled.
- 215.2.8 Rigid Nonmetallic (PVC) Conduit: PVC conduit shall be heavy wall, Schedule 40, UL labeled for aboveground and underground uses, and shall conform to NEMA TC-2 and UL651.

215.2.9 PVC-Coated Rigid Steel Conduit:

215.2.9.1 The conduit shall be rigid steel. Before the PVC coating is applied, the hot-dip galvanized surfaces shall be coated with a primer to obtain a bond between the steel substrate and the coating. The PVC coating shall be bonded to the primed outer surface of the conduit. The bond on conduit and fittings shall be stronger than the tensile strength of the PVC coating. The thickness of the PVC coating shall be at least 40 mils.

215.2.9.2 A chemically cured two-part urethane coating, at a nominal 2 mil thickness, shall be applied to the interior of all conduit and fittings. The coating shall be sufficiently flexible to permit field bending the conduit without cracking or flaking of the coating.

215.2.9.3 Every female conduit opening shall have a PVC sleeve extending one conduit diameter or 2 inches, whichever is less, beyond the opening. The inside diameter of the sleeve shall be the same as the outside diameter of the conduit before coating. The wall thickness of the sleeve shall be at least 40 mils.

215.2.9.4 All fittings, condulets, mounting hardware, and accessories shall be PVC-coated. All hollow conduit fittings shall be coated with the interior urethane coating described above. The screw heads on condulets shall be encapsulated by the manufacturer with a corrosion-resistant material.

215.2.9.5 PVC coated rigid steel conduit shall be ETL Verified as PVC-001 and shall be manufactured by OCAL, Perma-Cote or Robroy.

215.2.10 Aluminum Rigid Conduit System:

215.2.10.1 The conduit shall be rigid aluminum, T-1 temper as part of electrical of an all-aluminum conduit system with couplings, bends and fittings as required. Any fasteners and other hardware shall be 316 stainless steel as required and applicable.

215.2.10.2 The conduit system shall be UL 6A and ANSI C80 5 rated for application.

215.2.10.3 Provide "seal-off" corrosion protection at all end panels, device outlets and equipment as recommended by the conduit manufacturer.

215.2.10.4 Acceptable manufacturers are Wheatland Tube, Republic Conduit, and American Conduit by Sapa, or approved equal.

215.2.11 Conductors: All conductors in power, control and instrumentation circuits shall be identified and color coded as described herein.

215.2.11.1 Conductor Identification Number. Except for lighting and receptacle circuits, each individual conductor in power, control and instrumentation circuits shall be provided with wire identification markers at the point of termination.

215.2.11.2 The wire numbers shall be of the heat-shrinkable tube type, with custom typed identification numbers.

215.2.11.3 The wire numbers shall be as indicated on the equipment manufacturer's drawings.

215.2.11.4 The wire markers shall be positioned to be readily visible for inspection.

215.2.12 Conductor Color Coding: Power conductors shall be color coded as indicated below. For conductors 6 AWG and smaller, the color coding shall be insulation finish color. For sizes larger than 6 AWG, the color coding may be by marking tape. The equipment grounding conductor shall be green or green with one or more yellow stripes if the conductor is insulated.

215.2.12.1 The following color coding system shall be used for Power conductors:

215.2.12.1.1 120/240V, single-phase – black, red and white

215.2.11.1.2 120/208V, three-phase – black, red, blue and white

215.2.11.1.3 120/240V, three-phase – black, orange, blue and white

215.2.11.1.4 277/480V, three-phase – brown, orange, yellow and gray

215.2.11.1.5 Where 120/240 and 120/208 volt system share the same conduit or enclosure, the neutral for either the 120/240 volt system or the 208 volt system shall be white with a permanent identifiable violet stripe.

215.2.11.2 Control and instrumentation circuit conductors shall be color coded as indicated below:

- 215.2.11.2.1 Multiconductor Control Cable: 600 Volt
Multiconductor 14 AWG Control Cable
- 215.2.11.2.2 REFERENCE: UL 83, UL 1277, ICEA S-73-532,
ICEA S-58-679.
- 215.2.11.2.3 CONDUCTOR: 14 AWG, 7 OR 19 strands,
concentric-lay, uncoated copper. Maximum
operating temperature 90°C dry, 75°C wet.
- 215.2.11.2.4 INSULATION: Polyvinyl chloride, not less than 15
mils average thickness; 13 mils minimum thickness,
UL 83 Type THHN and THWN.
- 215.2.11.2.5 SHIELD: None.
- 215.2.11.2.6 JACKET: Conductor: Nylon, 4 mils minimum
thickness, UL 83.
- 215.2.11.2.7 Cable assembly: Black, flame-retardant polyvinyl,
UL 1277, applied over tape-wrapped cable core.
- 215.2.11.2.8 COLOR IDENTIFICATION: ICEA S-58-679,
Method 1, Table 2 or ICEA S-58-679, Method 3,
Table 2. White or green conductors shall not be
provided. A durable marking shall be provided on
the surface of the cable at intervals not exceeding
24 inches. Marking shall include manufacturer's
name, Type THWN or THHN, conductor size,
number of conductors, and voltage class.

215.2.13 Signal Control Cable:

- 215.2.13.1 REFERENCE: UL 62, UL 1277.
- 215.2.13.2 CONDUCTOR: 16 AWG, 7-strand, concentric-lay, uncoated
copper. Maximum operating temperature 90°C dry, 75°C wet.
- 215.2.13.3 INSULATION: Polyvinyl Chloride, not less than 15 mils average
thickness: 13 mils minimum thickness, UL 62, Type TFN.
- 215.2.13.4 LAY: Twisted pair with 1-1/2 inch to 2-1/2 inch lay.
- 215.2.13.5 SHIELD: Cable assembly, combination aluminum-polyester tape
and 7-strand, 20 AWG minimum size, tinned copper drain wire,
shield applied to achieve 100 percent cover over insulation
conductors.

215.2.13.6 JACKET: Conductor. Nylon, 4 mils minimum thickness, UL 62.

215.2.13.7 Cable assembly: Black, flame-retardant polyvinyl chloride, UL 1277, applied over tape-wrapped cable core.

215.2.13.8 CONDUCTOR IDENTIFICATION: One conductor black, one conductor white.

215.2.14 Single Conductors: 600 Volt, Single Conductor Power Cable

215.2.14.1 REFERENCE: UL 83, ICEA S-95-658 (NEMA WC 70).

215.2.14.2 CONDUCTOR: Stranded, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.

215.2.14.3 INSULATION: Polyvinyl, UL 83, type THHN and THWN, ICEA S-95-658.

215.2.14.4 SHIELD: None

215.2.14.5 JACKET: Conductor. Nylon, 4 mils minimum thickness, UL 83.

215.2.15 Sump Pump Control Panels: Unless otherwise noted, Contractor shall provide each unit with the following system components to conform to the following specifications:

215.2.15.1 Input Disconnect: Furnish an input circuit breaker with an interrupting rating of 65,000 rms symmetrical amperes.

215.2.15.2 Control Devices: Include door mounted control and monitoring devices for each sump pump as follows:

- A. "Manual-OFF-Auto" control selection
- B. Maintained Emergency shutdown button – Palm press and red in color
- C. Elapsed time meter; shall be non-resettable, rollover at 9999 hours showing resolution of 0.1 hours
- D. Indicator lamps for Power On, Run, Phase Loss, Overload, Auto status conditions.

215.2.15.3 NEMA contactors size 1 or larger rated to handle the connected load.

215.2.15.4 Coil Voltage: 120-volts, 60-hertz.

END OF SECTION

215.3 EQUIPMENT PAINTING/COATING

215.3.1 Surface Preparation and Shop Prime Painting: All equipment and disturbed surfaces shall be cleaned and shop primed per equipment manufacturer's recommendation as part of the work. Equipment nameplates and similar information tags shall be masked off for removal after finish coat applications. All surface preparation for applying a specified coating system shall be done in accordance with the appropriate "Application Bulletin" from the manufacture for the specific product specified. Equipment vendors/manufactures shall be consulted concerning the required final coating system to insure that it will be compatible with the primer coat applied at the factory, in the event that the shop applied primer coat is not removed prior to the coating installation.

215.3.2 Final Coat: Unless otherwise specified, all new equipment shall be shop or field painted with a final coat, provided all shop painted finish surfaces shall receive matching field touch-up painting as final treatment, all with a finish coat per the equipment manufacturer's recommendation. All disturbed surfaces shall be field painted after equipment installation with a finish coat per the equipment manufacturer's recommendation.

215.3.2.1 Disturbed surfaces will be defined as including piping between suction and discharge valves on pump assembly replacements and pipe to either side of valves on individual valve replacements. All other disturbed surfaces will be defined as existing materials adjacent to new equipment.

215.3.3 Coating Systems:

215.3.3.1 The Coating System for painting structural steel, piping, valves, etc. not exposed to sunlight shall be Sherwin-Williams Coating System Identification A-1, Alkyd 2-coat system. This system has a primer "KemKromik, Univ. Primer" and a finish coat "Industrial Urethane, Alkyd Enamel" or an approved equal. Contractor shall submit supplier information for approval prior to painting.

215.3.3.2 The Coating System for painting structural steel, piping, valves, etc. non-immersed, mildly corrosive, wet environments and not exposed to sunlight shall be Sherwin-Williams Coating System Identification E-1, Polyimide Epoxy system. This system has a primer "Macropoxy 646" and a finish coat "Macropoxy 646" or an approved equal. Contractor shall submit supplier information for approval prior to painting.

215.3.3.3 The Coating System for painting metal surface for exterior weathering exposure in a corrosive environment shall be Sherwin-Williams Coating System Identification EU-2,Urethane Finish, Corrosive Areas 3-coat system. This system has a primer "CorothaneGalvapac" , second coat "Macropoxy 646" and a finish coat "Hi-solids Polyurethane" or an approved equal. Contractor shall submit supplier information for approval prior to painting.

215.3.3.4 Coating System for painting metal surface for full or partial immersion service shall be Sherwin-Williams Coating System Identification E-3, Amine Epoxy Glass Flake Reinforcement. This is a two-coat system using Sher-Glass Epoxy FF. The first coat shall have a red oxide color with a dry film thickness of 10-15 mils. The second coat shall have a haze gray color. Total dry film thickness shall be 20-25 mils.

215.3.3.5 Paint Color Schedule (All colors and codes are Sherwin Williams. A crossover for Tnemec and Carboline is available on request.):

a. Potable	WaterFlyway SW6794
b. Plant Effluent Water (PEW)	Blueblood SW6966 w/ Orange bands
c. Chilled Water	French Roast SW6069 w/ Heartthrob SW6866 bands
d. Heating Water Supply	Gray Screen SW7071 w/ White bands
e. Heating Water Return	Gray Screen SW7071 w/ Black bands
f. Compressed Air	Supreme Green W6442
g. Instrument Air	Supreme Green SW6442
h. Blower Air	Supreme Green SW6442
i. Natural Gas	Heartthrob SW6866
j. Sludge Return	Bagel SW6114
k. Sludge Waste	Sensational Sand SW6094
l. Digested Sludge	French Roast SW6069
m. Sludge Sample	Web Gray SW7075 w/ Heartthrob SW6866 bands
n. Drain/Sump	Web Gray SW7075
o. Raw Sewage	Software SW7074

215.3.3.5.1 If the equipment or piping being painted does not fall under any of these categories, the contractor shall make the best color match to the materials being replaced and adjacent like materials.

215.3.3.6 After painting, any labeling or tags covered by the paint shall be re-applied or uncovered such that all labels are readable. In the event of new piping or equipment replacing piping or equipment with labeling, the new equipment shall be labeled to match the existing.

215.3.3.7 Equipment supplied from the manufacturer with an epoxy coating or manufactured from a corrosion resistant material (stainless steel, etc...) shall not be painted/coated after installation.

215.3.3.8 Factory applied epoxy coating systems shall be in the following thicknesses unless noted otherwise:

- | | |
|----------------|-----------------|
| a. Primer Coat | 3.0 to 5.0 mils |
| b. Finish Coat | 4.0 to 6.0 mils |

215.4 COATING SYSTEMS FOR INTERIOR AND EXTERIOR SURFACES:

215.4.1 System 1: Pre-Painted Existing Metals:

- Type of Structure: All exterior non-submerged process steel located above an imaginary plane 9" above high water level and miscellaneous exterior ferrous metal, pumps, motors, piping, fittings & valves, catwalks, bridges, window frames, etc.
- Surface Preparation: All surfaces shall be dry, clean and free of all contaminants. Remove all loosely adhering paint by hand or power tool cleaning per SSPC-SP2 or SP3. Apply a test patch to ensure compatibility. Remove and replace all loose, deteriorated, cracking or otherwise unsound window glazing.
- Painting system:
 - First Coat: One coat of C. Spot Prime all bare steel or areas with tight rust. Apply at 4.0-6.0 Mils DFT.
 - Second Coat: One coat of C. Apply one coat to all areas of substrate. Apply at 4.0-6.0 Mils DFT
 - Finish Coat: One coat of D. Apply to all areas of substrate. Apply at 3.0-4.0 mils DFT.Total dry film thickness shall be 11.0 mils minimum.

215.4.2 System 2: Ferrous Metal

- Type of Structure: All exterior non-submerged process steel located below an imaginary plane 9" above high water level, gates, troughs, weirs, pipes, fittings, baffles, aerators, air diffusers, underside of digester covers, pumps, flights, skimming arms, and MCC buildings.
- Surface Preparation: Remove all foreign contaminants to meet SSPC-SP 1 Standard. Abrasive blast to meet SSPC-SP10 Near White Metal Blast Clean Standard. Blast profiles 1.5-2.0 mils.
- Painting system:
 - First Coat: One coat A applied at 2.5-3.5 dry mils
 - Second Coat: One coat B, applied at 4.0-6.0 dry mils.
 - Third Coat: One coat D, applied at 2.0-3.0 dry mils.Total dry film thickness shall be 8.5 mils minimum.

215.4.3 System 3: Pre-Painted Overhead Doors and Entry Doors

- Type of Structure: Role up overhead doors
- Surface Preparation: Clean per SSPC-SP 1. Remove all loose coatings, dirt, dust, and chalk by hand or power tool cleaning per SSPC-SP2 or SP3. Feather sand all edges of repaired areas. Slick areas will be lightly abraded.
- Painting System
 - Prime Coat: One coat C, applied at 2.0-3.0 mils DFT.
 - Second Coat: One coat D, applied at 2.0-3.0 mils DFT.Total dry film thickness shall be 4.0-6.0 mils minimum.

215.4.4 System 4: Pre-Painted Dryvit

- Surface Preparation: High-pressure wash with water. Must be clean, dry and free of oil, grease, and other contaminants. Fill any holes or cracks.
- Coating System:
 - Finish Coat: Two coats G, applied at 120-140 sqft/gal.

215.4.5 System 5: Pre-Painted Ferrous Metal

- Type of Structure: Interior, non-submerged hand railing
- Surface Preparation: Clean per SSPC-SP 1. Remove all loose coatings, dirt, dust, chalk by hand or power tool cleaning per SSPC-SP2 or SP3.
- Painting System:
 - Prime Coat: One coat E, applied at 4.0-6.0 mils DFT.
 - Second Coat: One coat B, applied at 4.0-6.0 mils DFT.

215.4.6 System 6: Split Face Block

- Type of Structure: Used for exterior split face block.
- Surface Preparation: The surface must be sound, dry and free of cracks, dirt, oils, efflorescence, paint, curing compounds and all other contaminants, which may affect the penetration.
- Painting System:
 - Coat: Two coats I, applied at 50-75 sq ft/gallon

215.4.7 System 7: Pre-painted Immersed Ferrous Metals

- Type of Structure: Immersed ductile or iron pipe, valves, motors, etc.
- Surface Preparation: Remove all foreign contaminants to meet SSPC-SP 1 Standard. Abrasive blast to meet SSPC-SP10 Near White Metal Blast Clean Standard.
- Painting System:
 - Prime Coat: One coat B, applied at 2.0-4.0 mils DFT
 - Second Coat: One coat B, applied at 2.0-4.0 mils DFT

215.4.8 System 8: Pre-painted Smooth Concrete and Concrete Block

- Type of Structure: Previously painted smooth concrete and concrete block
- Surface Preparation: Remove any loose adhering coatings. Surface must be clean and dry.
- Painting System:
 - Prime Coat: One coat F, applied at 200-250 sqft/gallon.
 - Second Coat: One coat H, applied at 120-140 sqft/gal
 - Second Coat: One coat H, applied at 120-140 sqft/gal

The paint and paint products listed below are as manufactured by Sherwin-Williams (SW), Carboline and Tnemec Co., Inc., and are intended to establish standards of quality. No request for substitution will be considered which decreases the film thickness designated and/or the number of coats to be applied, or which offers a change from the generic type of coating specified. Any request for substitution shall contain the full name of each product, descriptive literature, directions for use, generic type, non-volatile content by volume, certified test reports showing results to equal the performance criteria of the products specified herein, and at least 5 treatment plants where each of the coatings has been used on new construction and has rendered satisfactory service. Paint thickness shall be based on dry film thickness.

- A. SW GalvaPak Zinc Primer B65 or
Tnemec Series 91-H20 Hydro Zinc or
Carboline Carboguard 859
- B. SW Macropoxy 646 Epoxy or
Tnemec Series N69 HB Epoxoline II or
Carboline Carboguard 893 S.G.
- C. SW Macropoxy 646 Epoxy or
Tnemec Series 27WB Typoxy or
Carboline Carboguard 890
- D. SW Hi-Solids Polyurethane or
Tnemec Series 1074-1075 Endura-Shield II or
Carboline Carbothane 134 HG
- E. SW Macropoxy 646 Epoxy or
Tnemec Series 135 Chembuild or
Carboline Carboguard 890
- F. SW Macropoxy 920 Pre-Prime or
Tnemec Series 151 Elasto-Grip FC or
Carboline Sanitile 120
- G. Tnemec Series 156 Enviro-Crete or
Sherwin-Williams Loxon XP Smooth
A24 Series or Approved equivalent
- H. SW Epo-Plex Multi-Mil B71V110 or
Tnemec Series 113 H.B. Tneme-Tufcoat
- I. Tnemec Series 633 Prime-A-Pell H2O or
Sherwin-Williams H&C HB150 Waterproofor
or Approved equivalent

215.5. QUALITY ASSURANCE:

215.5.1 Quality assurance procedures and practices shall be utilized to monitor all phases of surface preparation, application and inspection throughout the duration of the project. Procedures or practices not specifically defined herein may be utilized provided they meet recognized and accepted professional standards and are approved by the Engineer.

215.5.2 Surface preparation will be based upon comparison with "Pictorial Surface Preparation Standards for Painting Steel Surfaces" SSPC-Vis-1 and ASTM Designation D2200; "Standard Methods of Evaluating Degree of Rusting on Painted Steel Surfaces: SSPC-Vis-1 and ASTM Designation D610; Visual Standard for Surfaces of New Steel Airblast Cleaned and Sand Abrasive."

215.5.3 No coating or paint shall be applied: When the surrounding air temperature or the temperature of the surface to be coated or painted is below the minimum surface temperature for the products specified herein; or when the surrounding air temperature is wet or damp (5° F. or less) above the dew point; or when the air temperature is expected to drop below specified minimum temperature within six hours after application of coating. Dew point shall be measured by use of an instrument such as a Sling Psychrometer in conjunction with U. S. Department of Commerce Weather Bureau Psychrometric Tables. If above conditions are prevalent, coating or painting shall be delayed or postponed until conditions are favorable. The day's coating or painting shall be completed in time to permit the film sufficient drying time prior to damage by atmospheric conditions. When necessary for proper application, a temporary enclosure shall be erected and kept heated until the coating has fully cured.

Application of the first coat shall follow immediately after surface preparation and cleaning and before rust bloom occurs. Any cleaned areas not receiving first coat within this period shall be re-cleaned prior to application of first coat.

215.5.4 Thickness of coatings and paint over steel substrates shall be checked with a non-destructive, magnetic-type thickness gauge. Use an instrument such as a Tooke Gauge if a destructive tester is deemed necessary. The integrity of coated interior surfaces shall be tested with an approved inspection device. Non-destructive holiday detectors shall not exceed 67.5 volts nor shall destructive holiday detectors exceed the voltage recommended by the manufacturer of the coating system.

For thicknesses between 10 and 20 mils (250 microns and 500 microns) a non-sudsing type wetting agent, such as Kodak Photo-Flo, shall be added to the water prior to wetting the detector sponge. All pinholes shall be marked, repaired in accordance with the manufacturer's printed recommendations and retested. No pinholes or other irregularities will be permitted in the final coating.

215.5.5 The Contractor shall furnish, until final acceptance of coating and paint, inspection devices in good working condition for detection of holidays and measurement of dry film thickness of coating and paint. The Contractor shall also furnish U.S. Department of Commerce, National Bureau of Standards certified thickness gauges and certified instrumentation to test accuracy of holiday detectors.

Dry film thickness gauges and holiday detectors shall be made available for the Engineer's use at all times until final acceptance of application. All inspection and testing shall be witnessed by the Engineer. All inspection and testing,

including daily weather conditions, shall be recorded and a copy turned in to the Engineer at the weekly progress meetings. The original shall be kept onsite for review.

215.5.6 Warranty inspection shall be conducted during the eleventh month following completion of all coating and painting work. All defective work shall be repaired in accordance with this specification and to the satisfaction of the Engineer/Owner.

215.5.7 The coating manufacturer shall observe the surface preparation, mixing and application of the coating systems and submit a written report of what has been observed and any additional recommendations.

215.5.8 The Contractor's coating and painting equipment shall be designed for application of material specified and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. The Contractor's equipment shall be subject to approval of the Engineer.

215.6 CONCRETE COATING:

215.6.1 Materials: Concrete coating shall be Sikagard 62, Raven 405, Sauereisen SewerGard No. 210, Sherwin-Williams Duraplate 6100, B62-475 Series, or an approved equal to protect concrete and concrete repairs from H₂S and other corrosive elements found in wastewater process facilities. Epoxy coating to be applied according manufacturer's installation instructions and shall extend beyond repair areas by a minimum of 6". All concrete coating products shall be handled and stored in the manner set forth in the manufacturer's installation instructions.

215.6.2 Surface Preparation: Concrete surfaces to receive coating shall be inspected prior to surface preparation to determine the condition of the surfaces specified to receive the coating product(s) and the appropriate method or combination of methods to be used for surface preparation to meet the requirements of the coating system(s) to be applied per manufacturer's instructions.

215.6.2.1 Oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants which may affect the performance and adhesion of the coating to the substrate shall be removed per ASTM D-4258.

215.6.2.2 Concrete fins, protrusions, burrs, sharp edges and concrete spatter shall be corrected by grinding or scraping.

- 215.6.2.3 Unless otherwise submitted and approved by the Engineer, surfaces to receive coating shall be abrasive blasted per ASTM D-4259 to remove laitance and weak concrete to expose subsurface voids, open honeycomb and air pockets. After blasting, surfaces shall be cleaned of all loose blast grit, dust and other debris by sweeping, vacuuming, air blasting and washing as necessary.
- 215.6.2.4 Surface preparation method(s) used shall be performed in a manner that provides a uniform, sound clean neutralized surface suitable for the specified coating product(s).
- 215.6.2.5 Infiltration shall be stopped by using a material which is compatible with the repair products and is suitable for top coating with the coating product(s).
- 215.6.3 Application of coating products: Application procedures shall conform to the recommendations of the coating product(s) manufacturer, including environmental controls, product handling, mixing, application equipment and methods.
 - 215.6.3.1 Prepared surfaces shall be primed by application of the waterborne epoxy primer described herein at an application rate of 200 square feet per gallon (8 mils wet film thickness). The primer shall be allowed to dry to a tack free state. The solvent-free epoxy topcoat described herein shall then be spray applied to a minimum wet film thickness of 80-100 mils.
 - 215.6.3.2 No more than 12 hours shall be permitted to pass between each application of the waterborne epoxy, the solvent-free epoxy primer and the epoxy topcoat. Subsequent top coating or additional coats of the coating product(s) shall occur within the product's recoat window as adjusted for temperature extremes. Additional surface preparation procedures will be required if this recoat window is exceeded.
 - 215.6.3.3 Coating product(s) shall interface with adjoining construction materials throughout the structure to effectively seal and protect concrete substrates from infiltration and attack by corrosive elements. Procedures and materials necessary to effect this interface shall be as recommended by the coating product(s) manufacturer.

END OF SECTION

215.7 PROTECTION OF EQUIPMENT IN CORROSIVE AREAS

215.7.1 The contractor will take the actions described in the following sections to protect the new equipment and materials in designated Corrosive Areas. Corrosive Areas are described as: areas where sewage is conveyed, stored, or treated; areas that are exposed to the liquid, solid, or gaseous by-products of the sewage treatment process; areas that are subject to spills, overflows, flooding, and subsequent wash-down.

These areas are characterized by the following contributors to corrosion:

- The continuous presence of hydrogen sulfide (H₂S); greater than 1 ppm.
- The continuous presence of moisture; more than normal humidity.
- Fugitive emissions of digester gas which contains between 900 and 1100 ppm of hydrogen sulfide (H₂S).
- Products of combustion from the burning of digester gas which contains between 1 and 2 ppm of sulfur oxides (SOX).
- Chlorinated plant effluent which contains about 1 to 2 ppm of total chlorine residual.

Corrosive Areas also include areas where the following chemicals are used or stored:

- Sodium Hydroxide (NaOH) commonly known as caustic soda or lye.
- Potassium Permanganate (KMnO₄).
- Sodium Hypochlorite (NaClO) commonly known as liquid bleach or chlorine bleach.
- Sodium Bisulfite (NaHSO₃).

215.7.2 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, silver, lead
- Copper alloys such as brass, bronze, and cupronickel
- Chrome-plated or nickel-plated brass
- Galvanized steel
- 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.

215.7.3 Recommended Metals for Use 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.

215.7.4 Dissimilar Metal Corrosion in Corrosive Areas: For this contract, dissimilar metal connections are defined as the connection of any group listed in the table below connected with any other group. Dissimilar Metal Corrosion can be expected if the dissimilar metal connections are left exposed in Corrosive Areas.

Copper Group	Copper or any copper alloys such as brass or bronze.
Iron Group	Iron or any iron alloys such as black steel, carbon steel, galvanized steel or stainless steel.
Aluminum Group	Aluminum or any aluminum alloys.

The Contractor will use any of the following acceptable methods to avoid dissimilar metal corrosion in Corrosive Areas:

- Connect metals from same group together.
- Provide an electrically insulating material between dissimilar metals. Suitable materials include: electrical tape; proper gasket materials; PTFE thread seal tape may be used for threaded connections.
- Provide Field-applied Paint between the connected metals or over the entire connection area.

215.7.5 Protection of All Metal in Corrosive Areas: Contractor will provide painting or coating on all exposed metal components of the new equipment and materials in Corrosive Areas. See paragraph 215.7.3 regarding metals that do not need to be painted or coated. See paragraph 215.7.8 regarding metal parts that are not appropriate to paint.

215.7.6 Factory-applied Paint or Coating for Equipment in Corrosive Areas: Contractor will ensure that the paint or coating on new equipment in Corrosive Areas is resistant to hydrogen sulfide and 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. Acceptable factory-applied paint systems include the following:

- Two coats of epoxy paint.
- One primer coat inorganic zinc primer and one top coat epoxy paint.
- Any other paint or coating system approved by the manufacture as resistant to hydrogen sulfide and suitable for use in a wastewater facility.

Contractor will provide touch-up repair of any factory-applied paint that is damaged during the installation process. Contractor will use epoxy paint (such as Tnemec N69, Sherwin-Williams 646, or equivalent) for any needed touch-up painting.

215.7.7 Field-applied Paint in Corrosive Areas:

- Contractor will provide field-applied paint to all new metal in Corrosive Areas except those identified above in paragraph 215.7.3 or those that are not appropriate to paint (see paragraph 215.7.8). Contractor will coordinate with the Engineer for approval any other metals that do not need to be painted or coated.
- Contractor will apply two (2) full coats of epoxy paint such as Tnemec N69, Sherwin-Williams 646, or equivalent.
- Contractor will match the new paint color to be the same color as the existing equipment and materials.
- 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 SP3. Strongly adhering paint or asphalt coatings do not need to be removed.
- Contractor will follow the paint manufacturer's instructions for paint application and dry film thickness.
- 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.

215.7.8 Field-applied Corrosion Inhibitor in Corrosive Areas: Contractor will provide a light coat of white lithium grease or other corrosion inhibitor on any exposed metal parts in Corrosive Areas that are not appropriate to paint. These include sliding metal parts or metal connections that are intended to be removable. Acceptable products include any of the following:

- White Lithium Grease (from any company)
- WD-40 Long Term Corrosion Inhibitor
- CRC Heavy Duty Corrosion Inhibitor
- Corrosion X
- Fluid Film

215.7.9 Gasket Materials in Corrosive Areas: The Contractor will provide following gasket materials in Corrosive Areas:

- EPDM (Ethylene Propylene Diene Monomer) commonly known as Vistalon.
- Other gasket material approved by the manufacturer as resistant to hydrogen sulfide.

The following gasket materials are susceptible to deterioration from hydrogen sulfide (H₂S) and should not be used in in Corrosive Areas:

- Nitrile Butadiene Rubber (NBR) commonly known as Nitrile Rubber or Buna-N.
- Isobutylene Isoprene Rubber (IIR) commonly known Butyl Rubber.
- Natural Rubber.
- Chloroprene Rubber (CR) commonly known as Neoprene.
- Polysiloxane (Q) commonly known as Silicon.
- Fluorocarbon (FKM) commonly known as Viton.

215.7.10 Fasteners and Mounting Hardware in Corrosive Areas: Fasteners are defined as nuts, bolts, washers, screws, and anchors. All fasteners in Corrosive Areas are to be 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

Mounting Hardware is defined as channels, struts, supports, framing, and hangers.

Acceptable materials for mounting hardware in Corrosive Areas include:

- 300 Series Stainless Steel (such as 304 or 316)
- 6000 Series Aluminum (such as 6061 or 6063)

Contractor is to follow the manufacturer's instructions regarding loading of fasteners and mounting hardware. Contractor will coordinate with the Engineer for approval to reuse any existing fasteners or mounting hardware. Any reused fasteners or mounting hardware that is not stainless steel or aluminum is to be painted in accordance with paragraph 215.7.7.

215.7.11 Protection of HVAC Equipment in Corrosive Areas: The contractor will take the actions described below to protect the new HVAC equipment in designated Corrosive Areas.

215.7.11.1 Contractor will provide complete protective coatings on the following parts of the HVAC system:

- All heat exchanger coils (including water coils, evaporator coils, and condensing coils).
- All copper refrigerant piping between the evaporating coil and the condensing coil.
- All soldered connections of copper refrigerant piping.
- All other copper or brass components.

The protective coating must be approved by the coating manufacture as resistant to hydrogen sulfide and suitable for use in a wastewater facility.

215.7.11.2 All heat exchanger coils (including water coils, evaporator coils, and condensing coils) will have a factory-applied protective coil coating that is applied by the coil manufacturer or by a coating manufacture's certified applicator. Acceptable factory-applied protective coil coatings include:

- York ElectroFin E-Coat
- Carrier E-Coat
- Trane CompleteCoat
- Heresite P-413C Baked Phenolic Coating
- Bronz-Glow Husky Coil Coat
- other equivalent product.

215.7.11.3 Contractor will provide touch-up repair of any protective coil coating that is damaged during the installation process. Contractor will use a product that is intended for touch-up repair of damaged coil coatings (such as Bronz-Glow Husky Green Fin Coil Protector or equivalent).

215.7.11.4 All other copper piping, soldered connections, and copper or brass components of the HVAC system will have a complete protective coating. The protective coating will be applied directly on the copper piping, soldered

connections, and copper or brass components and will therefore be under any pipe insulation. Acceptable protective coatings include the following:

- Factory-coated copper tube such as:
 - Mueller Industries Streamline Plastic Coated Copper Tube.
 - Kamco Polyethylene Coated Copper Tube
 - or other equivalent product.
- Field-applied chemically-resistant heat shrinkable sleeves such as:
 - U.S. Plastic Corp. VinylGuard Heat Shrink Tubing or equivalent.
- Field-applied protective coatings such as:
 - Bronz-Glow "Component Coat" or equivalent.
- Field-applied tape coatings such as:
 - Polyken #930 Tape Coating for Joints and Fittings.
 - Tytan International 513 Pipe Wrap Tape.
 - or other equivalent product.

215.7.12 Protection of Electrical Equipment in Corrosive Areas: The contractor will take the actions described below to protect new electrical equipment in designated Corrosive Areas.

215.7.12.1 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 Metal Conduit (RMC) made from Aluminum - should be mounted horizontally or from underneath termination boxes to allow liquids to run away from the fittings
- Liquidtight Flexible Metal Conduit (LFMC) - 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.

215.7.12.2 In Corrosive 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 new conduit fitting for watertight connection at the conduit entrance.
- gasket material is to be EPDM or other material approved by the manufacturer as resistant to hydrogen sulfide.

215.7.12.3 Conduit Types Not Allowed In Corrosive Areas:

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

215.7.12.4 In Corrosives Areas, Contractor will apply corrosion inhibitor compound to electrical connections, including connections that are within enclosures and connections between copper, aluminum, and ferrous metals. Contractor will apply corrosion inhibitor compound to conduit joints and conduit hubs.

Contractor will wipe off excess compound from insulation.

Acceptable corrosion inhibitor compounds include the following:

- Ideal Industries, Noalox Anti-Oxidant Compound
- Penn-Union, CUAL-GEL Oxide Inhibitor Compound
- Thomas&Betts, Conductor Termination Compound
- or other equivalent product.

END OF SECTION