

SECTION 01010
SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Work covered by contract documents
- B. Work by others
- C. Contractor use of site and premises
- D. Work sequence
- E. Easements and right-of-way
- F. Protection of public and private property
- G. Maintenance of traffic
- H. Barricades and lights
- I. Lines and grades
- J. Regulatory requirements
- K. Cutting and patching

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work will include all necessary labor, supervision, equipment, tools and materials for the repainting interior surfaces of a 4 million gallon steel water storage tank and cathodic protection work.
- B. Contractor shall furnish and pay for all materials, equipment, supplies, appurtenances; provide all construction equipment and tools; and perform all necessary labor and supervision
- C. Contractor shall coordinate the progress of the Work including coordination between trades, subcontractors, suppliers, public utilities and subsequent water treatment plant contractor performing work on site and Owner to insure the progress of Work
- D. It is the intent of this contract that Work proceed in the most expeditious manner possible
- E. Construct the Work under contract indicated in the Bid Form

- F. The cross-referencing of specification sections under the heading "Related Sections" and elsewhere within each specification section is intended as an aid to the Contractor and shall not relieve the Contractor from his responsibility to coordinate the Work under the Contract Documents. Listings of cross-references are not intended to be comprehensive. The omission of a cross-reference to an additional or related requirement shall not relieve the Contractor of his obligation to provide a complete Project.

1.3 CONTRACTOR USE OF SITE AND PREMISES

- A. Contractor shall limit use of the premises for Work and will use the tank site property for staging, field offices, equipment, and material storage. Areas off-site leased or owned by the contractor may also be used for these purposes.
- B. Coordinate use of premises under direction of Engineer and/or Owner
- C. Assume full responsibility for the protection and safekeeping of equipment and products stored on site under this Contract
- D. Contractor should plan for normal workdays, Monday through Friday, within the hours of 7:30 am to 5:00 pm. Other work hours and days may be allowed by the City of Thornton and Engineer upon 48 hours written notice

1.4 OWNER USE OF SITE AND PREMISES

- A. Owner shall coordinate with Contractor the entrance into work site for work performed under the Contract Documents to ensure Contractor's health and safety plans are followed

1.5 WORK SEQUENCE AND WORK RESTRICTIONS

- A. Provide open access for Owner to property at all times during construction. Maintain minimum width clearance for access of City and Contractor personnel and emergency vehicles at all times.
- B. Contractor shall submit a detailed CPM format schedule outlining all steps required to assure complete and satisfactory construction, testing, and startup of work in such a manner as to result in the least possible disruption to the operations and staff of the treatment facility and to allow the facility to achieve the finished water quality requirements established by regulations at all times. Address all work sequence and constraints described in this Section.
- C. Indicate required shutdowns of water storage tank or interruptions of existing operations on Progress Schedule.
- D. Water storage tank shutdown will be required to complete the scope of work. All shutdowns shall be coordinated with City operations staff and performed by the City. Tank shutdown is expected to occur in November 2023 through April 2023. Coordination with

the City will be required if construction operations are expected to keep the tank out of service for longer.

- E. Sequences other than those specified will be considered by Engineer, provided they afford equivalent continuity of operations

1.6 EASEMENTS AND RIGHT-OF-WAY

- A. Work shall be performed at the City's existing 112th Ave and Cherokee St. 4 million gallon storage tank property
- B. Construction access to the site is available at the intersection of 112th Ave and Cherokee St. Access across private property is strictly prohibited.
- C. Confine construction operations to the immediate vicinity of the location indicated on drawings and use due care in placing construction tools, and equipment so as to cause the least possible damage to property
- D. Construction Area Limits
 - 1. Confine construction operations to the tank site property and in accordance with the Owner
 - 2. Contractor shall not trespass in or on private property
 - a. Contractor shall be responsible for keeping all their personnel out of areas not designated for Contractor use without prior approval from the City.

1.7 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

- A. Contractor shall be responsible for all damage to streets, roads, highways, shoulders, street lighting and/or signage, embankments, culverts, location or character, which may be caused by transporting equipment, materials, or personnel to or from the Work or any part or site thereof, whether by him or his subcontractors
- B. Make satisfactory and acceptable arrangements with the Owner of, or the agency or authority having jurisdiction over, any damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage

1.8 PROTECTION OF WORK AND FACILITIES

- A. Contractor shall be solely responsible for the protection of Work until final acceptance
- B. Contractor shall protect all and any previously performed Work, work in progress or completed by others, and existing facilities from damage during the performance of Work in the area

1.9 MAINTENANCE OF TRAFFIC

- A. Conduct Work to interfere as little as possible with public travel, whether vehicular or pedestrian

1. Whenever it is necessary to cross, close, or obstruct private roads, driveways, multi use paths, and walks, provide and maintain suitable and safe detours, or other temporary expedients for accommodation of private travel
2. Maintenance of traffic is not required if Contractor obtains written permission from the owner and tenant of private property, or from the authority having jurisdiction over public property involved, to obstruct traffic at the designated point
3. Traffic control is not deemed necessary for this project and would only be required if the Contractor expects to impede traffic as part of their means and methods to complete the work.

1.10 REGULATORY REQUIREMENTS

- A. Comply with all federal, state, and local laws, regulations, codes, and ordinances applicable to the Work
- B. Other standards and codes which apply to the Work are designated in the specific technical specifications

1.11 CUTTING AND PATCHING

- A. Contractor shall be responsible for all cutting, and patching required to complete the Work or to
 1. Uncover portions of the Work to provide for installation of ill-timed work
 2. Remove and replace defective work
 3. Remove and replace work not conforming to requirements of Contract Documents
 4. Remove samples of installed work as specified for testing
- B. Provide products as specified or as required to complete cutting and patching operations
- C. Inspection
 1. Inspect existing conditions of the Project, including elements subject to damage or to movement during cutting and patching
 2. After uncovering work, inspect the conditions affecting the installation of products, or performance of the work
 3. Report unsatisfactory or questionable conditions to the Engineer in writing; do not proceed with the work until the Engineer has provided further instructions
- D. Preparation
 1. Provide devices and methods to protect other portions of the Project from damage
 2. Provide protection from the elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water
 3. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes
 4. Restore work which has been cut or removed; install new products to provide completed Work in accord with requirements of Contract Documents

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01035

MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing contract modifications.

1.2 MINOR CHANGES IN THE WORK

- A. The Engineer will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or Contract Time, on a JVA Field Order Form.
- B. The Contractor may request additional information or clarification by using and submitting a "Request for Information" (RFI).

1.3 WORK CHANGE DIRECTIVE (WCD)

- A. Owner-Initiated Work Change Directive: A written statement to the Contractor issued on or after the Effective Date of the Agreement and signed by the Owner and recommended by the Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.
 - 1. Within 7 days of receipt of a Work Change Directive Form, submit an estimate of cost necessary to execute the change to the Engineer for the Owner's review.
 - a. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.

1.4 CHANGE ORDER (CO)

- A. Owner-Initiated Change Order: The Engineer will issue a detailed Change Order Form indicating any changes in the Work that will require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. The Change Order Form issued by the Engineer is for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.
 2. Within 7 days of receipt of a Change Order Form, submit an estimate of cost necessary to execute the change to the Engineer for the Owner's review.
 - a. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
- B. There will be no Contractor initiated Change Orders, the Contractor may only request additional information or clarification by using and submitting a “Request for Information” (RFI), on the Contractor’s RFI form. Additional forms may be obtained from the Engineer, and Contractor-Initiated Proposals may also be provided.
- C. Upon the Owner's and the Engineer’s approval and signature from the Contractor the Change Order Form becomes valid

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01039

COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General requirements
- B. Coordination
- C. Field engineering
- D. Alteration project procedures
- E. Preconstruction conference
- F. Progress meetings
- G. Requests for information

1.2 RELATED SECTIONS

- A. Section 01010 – Summary of Work
- B. Section 01340 – Shop Drawings and Product Data
- C. Section 01700 – Contract Closeout

1.3 GENERAL REQUIREMENTS

- A. Refer to General Conditions for Owner meetings and other requirements
- B. Engineer will schedule and administer pre-construction meeting according to agenda
 1. Prepare agenda for meetings including items required by Owner and Contractor
 2. Notify Contractor and Owner 4 days in advance of meeting date
 3. Preside at meeting
- C. Contractor will schedule and administer site mobilization and weekly progress meetings. Contractor will also be responsible for coordination, field engineering, alteration, project procedures, cutting and patching procedures outlined herein. If work progress does not warrant a meeting, all parties can mutually agree to postpone meeting.
 1. Arrange for the attendance of Contractor's agents, employees, subcontractors, and suppliers as appropriate to the agenda
 2. Record the minutes; include all significant proceedings and decisions
 3. Reproduce and distribute copies of minutes within one week after each meeting
 - a. To all participants in the meetings

- b. To Engineer
 - c. To Owner
 - 4. Owner and other inspecting parties such as the welding and coating inspector as well as plant operators may attend meetings
 - 5. Engineer will attend weekly meetings either via phone or on site
- D. Representatives of contractors, subcontractors, and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents

1.4 COORDINATION

- A. Coordinate scheduling, submittals, and Work of the various Sections of specifications to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later by others.
- B. Verify that utility requirement characteristics of operating equipment are compatible with available utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment, and coordinate preparation of grading and other requirements for installation utility work by others.
- C. Coordinate completion and clean-up of Work of separate Sections in preparation for final completion and for portions of Work designated for Owner's use
- D. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.5 ALTERATION PROJECT PROCEDURES

- A. Materials: As specified in product Sections; match existing products and work for patching and extending work.
- B. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work to match existing adjacent work in texture and appearance.
- C. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Engineer.
- D. Where a change of plane of 1/4-inch or more occurs, submit recommendation for providing a smooth transition for Engineer review.
- E. Patch or replace portions of existing surfaces, which are damaged, lifted, or showing other imperfections.
- F. Finish surfaces as specified in individual product sections.

1.6 PRECONSTRUCTION CONFERENCE

- A. Engineer will schedule a conference after Notice of Award
- B. Location: On site
- C. Attendance
 - 1. Owner's Representative
 - 2. Engineer and his professional consultants
 - 3. Contractor's Project Manager
 - 4. Contractor's Superintendent
 - 5. Major Subcontractors
 - 6. Others as Appropriate
- D. Agenda:
 - 1. Execution of Owner Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of subcontractors and suppliers, list of products, Schedule of Values, and Construction Project Schedule in critical path format.
 - 5. Designation of personnel representing the parties in Contractor, Owner, and the Engineer.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, cost proposal requests, Change Orders and Contract closeout procedures.
 - 7. Construction scheduling and updates.
 - 8. Scheduling field inspections
 - 9. Critical work sequencing
 - 10. Procedures for maintaining Record Documents
 - 11. Temporary utilities provided by Owner
 - 12. Safety and first-aid procedures
 - 13. Security and housekeeping procedures

1.7 PROGRESS MEETINGS

- A. Contractor will schedule and administer meetings throughout progress of the Work at weekly intervals. If work progress does not warrant meeting, all parties can mutually agree to postpone the weekly meeting.
- B. Location of the Meetings: The project field office of the Contractor, or other locations arranged for by Contractor, convenient to all parties
- C. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within one week to Contractor, Owner, participants, and those affected by decisions made.
- D. Attendance
 - 1. Owner's Representative

2. Engineer, and his professional consultants as needed
3. Contractor's Superintendent
4. Subcontractors as appropriate to the agenda
5. Suppliers as appropriate to the agenda
6. Others, as appropriate

E. Suggested Agenda

1. Review Minutes of Previous meetings
2. Review Unresolved issues from Last Meeting
3. Review of Work Progress
4. Field Observations, Problems, Conflicts and Decisions
5. RFI Review
6. Review of Submittals Schedule and Status of Submittals
7. Schedule
 - a. General Schedule Issues
 - b. Review of off-site fabrication and delivery schedules
 - c. Planned progress during succeeding work period (3-week "Look ahead")
 - d. Maintenance of construction project schedule
 - e. Corrective measures to regain project schedules
8. Maintenance of Quality and Work Standards
9. Change Orders
10. New PR's
11. Accepted Change Orders
12. Pay Requests
13. Other Business

1.8 REQUESTS FOR INFORMATION (RFI)

- A. The Contractor shall prepare and submit an RFI upon the discovery of the need for interpretation of the Contract Documents or additional information.
 1. Only the Contractor shall submit RFIs to the Engineer.
 2. RFIs shall be submitted on Engineer's RFI form. Engineer will provide a template for the Contractor upon request.
- B. RFI shall include:
 1. Project Name
 2. Engineer Job Number
 3. Date
 4. Name of Contractor
 5. Name of Engineer
 6. RFI number, numbered sequentially
 7. Related specification section number, title, and related paragraphs, as needed
 8. Drawing number and detail references, as needed
 9. Field conditions
 10. Contractor's proposed solution. If the Contractor's solution(s) affect contract times or contract price, Contractor shall state the effects on the RFI.
 11. Contractor's signature

12. Relevant attachments including but not limited to drawings, descriptions, measurements, photos, product data, and shop drawings

C. Electronically Submitted RFIs

1. Contractor shall submit one (1) complete RFI file in Adobe Acrobat PDF format

D. Engineer's Response

1. Engineer will review each RFI, determine action required, and respond.
2. Engineer will review and respond to each RFI within seven (7) working days
3. If Engineer receives an RFI after 1:00 P.M. local time, the RFI will be considered as received the following working day.
4. Engineer will not respond to RFIs requesting approval of submittals, approval of substitutions, coordination and information already indicated in Contract Documents, adjustment in contract time or contract amount, or erroneous RFIs.
5. Engineer may respond to RFIs on related issues with a single response.
6. If Engineer requests additional information as a result of the RFI, any further action or RFIs submitted by the Contractor will restart a new seven (7) day review period.
7. Contractor shall submit any request for change of contract time or contract price utilizing proper Change Order forms.

E. Contractor shall log and track all RFIs submitted organized by RFI number.

1. RFI log shall be submitted at each progress meeting
2. RFI log shall include:
 - a. Project name
 - b. Name, address, and phone number of Contractor
 - c. Contractor representative name
 - d. RFI number
 - e. RFI description
 - f. RFI submittal date
 - g. RFI response date
 - h. Related Change Order number, as needed

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01200

PAYMENT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section
- B. This information is supplemental to the requirements as stated in the General Conditions.

1.2 SUMMARY

- A. This Section includes additional administrative and procedural requirements necessary to prepare and process Applications for Payment. Refer to General Conditions for most requirements of the Owner.
 - 1. Unit Prices for administrative requirements governing use of unit prices.
 - 2. Construction Progress Schedules

1.3 DEFINITIONS

- A. Unit Price: An amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES FOR UNIT PRICES

- A. Unit bid prices, as quoted in the Bid Proposal, shall be in full compensation for labor, materials, equipment, rentals, freight, applicable taxes, overhead, profit and incidentals to complete all work for each pay item; and for all risk, loss, damage, or expense of whatever nature arising from the nature of the work or the prosecution thereof.
- B. Work or materials that are essential to the work, but for which there are no pay items, will not be measured and paid for separately, but shall be included in other items of work.
- C. Prices include all necessary material, for a complete installation, insurance, applicable taxes, overhead, and profit
- D. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor.

1.5 APPLICATION FOR PAYMENTS

- A. General
 - 1. Submit itemized payment request as required in General Conditions together with Schedule of Values and other submittals as specified herein
 - 2. Contractor shall not "project" work completed beyond the date of Application for Payment submittal for the purpose of payment request

- B. Each Application for Payment shall be consistent with previous applications and payments as certified by the Engineer and paid for by the Owner.
 - 1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements

- C. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement

- D. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.
 - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
 - 2. Include amounts of Change Orders issued prior to the last day of the construction period covered by the application

- E. Transmittal
 - 1. Submit copy of each Application for Payment to the Engineer by means ensuring receipt within 24 hours
 - 2. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Engineer

- F. Initial Application for Payment
 - 1. Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:
 - a. List of subcontractors
 - b. List of principal suppliers and fabricators
 - c. Schedule of Values
 - d. Contractor's Construction Schedule (preliminary if not final)
 - e. Schedule of principal products
 - f. List of Contractor's staff assignments
 - g. Copies of building permits
 - h. Copies of authorizations and licenses from governing authorities for performance of the Work
 - i. Certificates of insurance and insurance policies
 - j. Performance and payment bonds, if required

G. Application for Payment at Substantial Completion

1. Following issuance of the Certificate of Substantial Completion, submit an Application for Payment. This application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of Work
 - a. Administrative actions and submittals that shall precede or coincide with this application include:
 - i) Warranties (guarantees) and maintenance agreements
 - ii) Test/adjust/balance records
 - iii) Maintenance instructions
 - iv) Meter readings
 - v) Start-up performance reports
 - vi) Change-over information related to Owner's occupancy, use, operation and maintenance
 - vii) Final cleaning
 - viii) Application for reduction of retainage, and consent of surety
 - ix) Advice on shifting insurance coverages
 - b. List of incomplete Work, recognized as exceptions to Engineer's Certificate of Substantial Completion

H. Application for Final Payment

1. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Price, previous payments, and sum remaining due.
2. Application for Final Payment will not be considered until the following have been accomplished:
 - a. Completion of Project closeout requirements
 - b. Completion of items specified for completion after Substantial Completion
 - c. Assurance that unsettled claims will be settled
 - d. Assurance that Work not complete and accepted will be completed without undue delay
 - e. Transmittal of required Project construction records to Owner
 - f. Proof that taxes, fees and similar obligations have been paid
 - g. Removal of temporary facilities and services
 - h. Removal of surplus materials, rubbish and similar elements

1.6 PROCEDURES FOR THE CONSTRUCTION PROGRESS SCHEDULE

A. Coordination: coordinate preparation and updates of Contractor's Construction Schedule with the preparation of Schedule of Values.

1. Correlate line items in the Construction Schedule with required project tasks, including the following:
 - a. Mobilization/demobilization
 - b. Permits and regulatory requirements
 - c. Submittals
 - d. Equipment
 - e. O&M Manuals
 - f. Work breakdown of major project work

- g. Major subcontractors work
 - h. Startup and commissioning
 - i. Training
 - j. Substantial completion
 - k. Final completion
 - l. Milestones and operational shutdown requirements
- B. Utilize the Critical Path Method (CPM) type construction schedule to establish preliminary progress schedule and track Work progress
- 1. After acceptance by Engineer of preliminary Progress Schedule submitted per requirements of General Conditions, set preliminary Progress Schedule as the Construction Baseline Schedule
 - 2. Update and submit the construction progress schedule on a monthly basis with the pay application
 - a. Monthly submittal should indicate progress of tasks, changes to baseline schedule logic, work additions such as change orders, milestone and contract date changes
 - b. Submit two (2) color print copies, 11" x 17" size, and one Adobe pdf copy
 - c. Upon request provide copy of project schedule CPM data file

PART 2 PRODUCTS (NOT APPLICABLE)

Not Used

PART 3 EXECUTION

3.1 LIST OF BID ITEMS

- A. Bid Item No. 1 – Mobilization/Demobilization
- 1. Description: No separate measurement for payment will be made for any labor, equipment, materials, and incidental work required for this item. The lump sum price will include all of Contractor's costs. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings and Specifications or as otherwise directed by Engineer: establishing Contractor's staging area, construction trailers, offices, other necessary facilities, and temporary power and communications; obtaining permits; providing required bonds and insurance; preparing the project schedule. Items also included are demobilization at the completion of the project including the removal of the Contractor's equipment, supplies, temporary facilities, excess materials, and cleaning up the site; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
 - 2. Unit of Measurement: The total bid amount for mobilization and demobilization shall not exceed eight percent (8%) of the total bid price. Bids received that exceed this amount may be grounds for rejection of the total bid. No measurement for payment will be made for this work. It shall be paid for at the Contract Lump Sum Price based upon the percentage completed and accepted of the work required by this bid item. Fifty percent (50%) of the lump sum price will be paid at the time of the first monthly

progress payment; an additional thirty percent (30%) will be paid when one-half of the original Contract amount is earned. The remaining twenty percent (20%) will be paid upon final acceptance of the Project.

B. Bid Item No. 2 – Demolition

1. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The lump sum price will include all of Contractor's costs. This bid item includes but is not limited to the following items demolished and disposed or returned to the City in accordance with the Drawings and Specifications or as otherwise directed by Engineer: cathodic protection system, and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
2. Unit of Measurement: No measurement for payment will be made for this work. It shall be paid for at the Contract Lump Sum Price based upon the percentage completed and accepted of the work required by this bid item.

C. Bid Item No. 3 – Cathodic Protection

1. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The lump sum price will include all of Contractor's costs required to install the tank cathodic protection complete in place. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings or Specifications or as otherwise directed by Engineer: tank cathodic protection, anode ring, reference electrodes, rectifier and other required devices to make a complete and functional system, testing; and providing all other related and necessary labor, equipment, and materials not covered by other items in this section.
2. Unit of Measurement: No measurement for payment will be made for this work. It shall be paid for at the Contract Lump Sum Price based upon the percentage of work completed in accordance with the Drawings and Specifications.

D. Bid Item No. 4 – Paint Tank Interior

1. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The lump sum price will include all of Contractor's costs required for surface preparation and painting of the tank interior, complete in place. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings or Specifications or as otherwise directed by Engineer: implementation of an approved tank access plan, patching of access panels, exterior painting of access panels where damaged by removal, water jetting and surface preparation of all interior surfaces including inlet/outlet, overflow box, roof hatch, columns, drain, floor, walls, and roof structure; painting of all interior surfaces, clean up, and providing all other related and necessary labor, equipment, and materials not covered by other items in this section.
2. Unit of Measurement: No measurement for payment will be made for this work. It shall be paid for at the Contract Lump Sum Price based upon the percentage of work completed in accordance with the Drawings and Specifications.

E. Bid Item No. 5 – Complete Tank Bottom Inspection

1. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The unit price will include all of Contractor's costs which are not specifically measured and paid for under other bid items. This bid item includes but is not limited to the following items. Perform full non-destructive testing of the tank floor for underside corrosion and related items. Magnetic Flux Exclusion/Leakage (MFE/MFL) inspection, ultrasonic thickness prove-up, and visual inspection of the tank floor/chime. A final report detailing locations and magnitude of soil side corrosion, identified pits, remaining life of tank floor based on corrosion rate, and recommendations to extend the life.
2. Unit of Measurement: No measurement for payment will be made for this work. It shall be paid for at the Contract Lump Sum Price with transmittal of the final inspection report.

F. Bid Item No. 6 – Steel Floor Sheet Replacement

1. Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. The measurement for payment for this item will be the number of square feet of welded plate installed as listed in the bid schedule. The unit price will include all of Contractor's costs which are not specifically measured and paid for under other bid items. This bid item includes but is not limited to the following items installed or conducted in accordance with the Drawings or Specifications or as otherwise directed by Engineer: removing steel plate found to be inadequate by MFL testing, furnishing and welding ¼" thick steel replacement plate to the remaining steel floor sheet, welds shall be continuous at sheet splices, removal and disposal of debris and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
2. Unit of Measurement: Per actual square feet of welded plate installed and accepted.

3.2 LIST OF UNIT PRICES

- A. Provide a list of unit prices as indicated in Section 00310

END OF SECTION

SECTION 01340

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submission of all shop drawings and product data as required by the Contract Documents for all equipment and materials to be furnished under this contract unless specifically indicated otherwise

1.2 RELATED SECTIONS

- A. Section 01600 – Materials and Equipment
- B. Section 01730 – Operations and Maintenance Data
- C. Specification Divisions 5 thru 13

1.3 SUBMITTALS

A. Definitions

1. Technical submittals: Shop drawings, product data and samples prepared by Contractor, subcontractors, suppliers, or manufacturers
 - a. Shall be submitted by the Contractor to Engineer for approval for the use of Equipment and Materials to complete the Work or as needed to describe the following:
 - i) Operation and maintenance
 - ii) Technical properties
 - iii) Installation
 - b. Shop drawings: Custom prepared data for the Project and Work including performance and capacity curves, diagrams, bills of material, instructions, and other information
 - c. Product data: Non-custom prepared printed information for the Project and Work on materials and products
 - d. Samples: Fabricated and non-fabricated tangible samples of products and material
 - i) Used for visual inspection and testing and analysis
2. Informational submittals: Reports, administrative informational submittals, certification and guarantees not including and defined as shop drawings, samples and product data
 - a. Reports: Include laboratory reports and tests, technical procedures and records and design analysis
 - b. Administrative informational submittals: Submittals necessary for administrative records such as construction photographs, work records, schedules, standards, record project data, safety data, and similar information submittals
 - c. Certification: Includes manufacturer or supplier certificates and guarantees

B. General Requirements

1. Quality

- a. Shall be of suitable quality for legibility and reproduction purposes
- b. Shall be useable for reproduction yielding legible hard copy
- c. Submittals not conforming to specified requirements herein and as specified in Divisions 2 through 16 shall be subject to rejection by Engineer and upon Engineer request, Contractor shall resubmit documents that are in conformance

2. Dimensions

- a. English units shall be provided on submittals
- b. Metric units are acceptable in addition to English units
- c. English units shall govern

3. Form of submittals

- a. Submittals shall be transmitted in electronic format as specified herein
- b. Scanned submittals are acceptable
- c. Electronic project documents and submittals shall be transmitted in the following format:
 - i) Native electronic format, nonproprietary
 - ii) Adobe PDF produced from native electronic format
- d. Filename:
 - i) Shall be consistent for the initial and any subsequent submission revisions for a single submittal
 - ii) Contractor shall use a consistent naming convention for all submittals
 - a) Use number of original submittal followed directly by a capital letter corresponding to the number of times a submittal is resubmitted (i.e., #001, #001A, #001B, etc.)

4. Non-conforming submittals shall be subject to rejection by Owner and/or Engineer

5. Submittal completion requirements

- a. Submittals shall include design criteria, dimensions, construction materials and all other information specified for a complete submittal to facilitate Engineer review of the submittal information adequately
- b. In the event various drawings are included a submittal for a class of Equipment, Contractor shall annotate clearly which parts apply to furnished Equipment
 - i) Information not pertaining to the submittal shall be clearly annotated. Highlighting of such information will cause rejection of the submittal by the Engineer
- c. Contract Drawings
 - i) Copies or portions thereof will not be allowed as acceptable fabrication or erection drawings
 - ii) In the event Contract Drawings are used by the Engineer for erection drawings to annotate information on erection or identify reference details, Engineer title block and professional seal shall be removed and replaced with the Contractor's title block on the Contract Drawing(s). Contractor shall revise such erection drawings for subsequent revisions by the Engineer to Contract Drawings

C. Preparation

1. Shop Drawings

- a. Drawings shall be presented in a clear and thorough manner:
 - b. Identify details by reference to sheet and detail, schedule or room numbers shown on Contract Drawings
 - c. Identify equipment by reference to equipment name and tag number shown on Contract Drawings
 - d. Scale and Measurements: Make drawings accurate to a scale with sufficient detail to show the kind, size, arrangement and function of component materials and devices
 - e. Minimum sheet size: 8.5" by 11"
 - f. Fabrication drawing size: 11" by 17" or 24" by 36"
2. Product Data
- a. Clearly mark each copy to identify pertinent products or models submitted for review
 - b. Identify equipment by reference to equipment name and P&ID number
 - c. Catalog cut sheets: Cross-out or hatch irrelevant data
- D. Technical Submittals: Shop Drawings and Product Data Submittal Requirements
1. Shop Drawings and Product Data shall include the following, at a minimum:
- a. Specifications of manufacturer(s)
 - b. Equipment parts and catalogs
 - c. Bills of materials, material lists, and schedules
 - d. Shop erection and fabrication drawings
 - e. Drawings shall include equipment dimensions, weights, installation location requirements, plates required, main components, support details, anchor bolt details/sizes/locations, support base sizes, baseplate sizes, spacing and clearance requirements for installation, erection, operation and maintenance disassembly
 - f. Electrical requirements:
 - i) Shall include schematic diagrams including one-line diagrams, terminal block numbers, internal wiring diagrams, external connections, controls, and any other information as requested in individual specification sections
 - g. List of spare parts
 - h. Instruction and Operation and Maintenance (O&M) manuals
 - i) As specified herein and in Specification Section 01730
 - i. Manufacturer's performance testing of equipment
 - j. Concrete mix design data and information
 - k. Performance characteristics and capacities
 - l. External connections, anchorages, and supports required
 - m. Other drawings, parts, catalogs, specifications, samples, or data necessary for the Engineer to determine conformance with Contract Documents
2. Samples – Office samples shall be of sufficient size and quantity to clearly illustrate:
- a. Functional characteristics of the product, with integrally related parts and attachment devices
 - b. Full range of color, texture and pattern
 - c. Comply with requirements identified in individual specification sections

- E. Construction Schedule: Designate in the construction schedule, or in a separate coordinated shop drawing schedule, the dates for submission and the dates that reviewed Shop Drawings and Product Data will be needed, if accelerated review is requested

1.4 CONTRACTOR RESPONSIBILITIES

- A. Review shop drawings and product data prior to submission for accuracy and completeness of each submission
- B. Approve and stamp each submission before submitting to Engineer
- C. Determine and verify:
 - 1. Field measurements
 - 2. Field construction criteria
 - 3. Catalog numbers and similar data
 - 4. Conformance with specifications and identification of all deviations
 - 5. Confirm assignment of unit responsibility
- D. Prior to each submission, carefully review and coordinate all aspects of each item being submitted
- E. Verify that each item and the corresponding submittal conform in all respects with specified requirements of the Work and of the Contract Documents with respect to means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto
- F. Make submissions promptly in accordance with Construction Schedule, and in such sequence as to cause no delay in the Work or in the work of any other Contractor
- G. Limit requirement for accelerated submittal review by Engineer to no more than 10% percent of total number of submittals
 - 1. Accelerated submittal review period: less than 14 calendar days
- H. Notify Engineer in writing, at time of submission, of any deviations in the submittals from Contract Document requirements:
 - 1. Identify and tabulate all deviations in transmittal letter
 - 2. Indicate essential details of all changes proposed, including modifications to other facilities that may be a result of the deviation
 - 3. Include required piping and wiring diagrams

1.5 SUBMISSION REQUIREMENTS

- A. Make submissions far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmissions, and for placing orders and securing delivery
- B. In scheduling, allow fourteen (14) calendar days for review by Engineer following receipt of submission in Engineer's office:

1. Time required to mail submissions or resubmissions is not considered a part of review period
- C. Submittal Naming and Numbering
1. Assign a unique number to include all shop drawings, product data and other information required for individual specification sections, beginning with #001.
 2. Resubmissions shall have the original number with a letter, starting with "A". If the first submittal required resubmission, it would be labeled #001A.
 3. Each specification section may still have more than one submittal number for later submissions (i.e., Preliminary O&M Manuals, Final O&M Manuals, etc.)
 4. Contractor shall use a consistent naming convention for all submittals
- D. Quantity of Submittals Required
1. Shop Drawings and Product Data:
 - a. Initial submittal:
 - i) Electronic – One (1) copy to Engineer
 - b. Resubmittal:
 - i) Electronic – One (1) copy to Engineer
 - c. Final Submittal for Distribution
 - i) One (1) electronic copy to Engineer
 - d. As –constructed document submittals
 - i) Electronic – One (1) copy to Engineer and one (1) copy to Owner
 2. Samples
 - a. Initial submittal:
 - i) Submit three (3) of each sample unless specified otherwise in individual specification section
 - b. Resubmittal:
 - i) Submit three (3) to Engineer
 - c. One (1) sample of approved sample submittal will be returned to Contractor
 3. Informational submittals
 - a. Technical reports and administrative submittals
 - i) Electronic – One (1) copy to Engineer
 - ii) Paper: Three (3) copies to Engineer
 - b. Certificates and guarantees:
 - i) Electronic – One (1) copy to Engineer
 - ii) Paper: Three (3) copies to Engineer
 - c. Test reports
 - i) Paper
 - a) Owner: Two (2) copies
 - b) Engineer: One (1) copy
 - c) Contractor: Two (2) copies
 - d) Manufacturer/supplier: One (1) copy
 4. Instruction and O&M manuals
 - a. In accordance to Specification Section 01730
 5. At no additional cost to the Owner and whether or not submittals are copyrighted, the Owner may copy and use for staff training and/or internal operations any submittals approved for final distribution as well as required by this Contract

E. Submittal Transmittal Requirements

1. Accompany each submittal with a letter of transmittal showing all information required for identification and checking
2. Shall include:
 - a. Drawing numbers and titles
 - b. Revision number
 - c. Electronic filename
 - d. Deviations from Contract Documents: As specified herein
 - e. Submittals unidentifiable will be returned for proper identification
 - f. Date

F. Submittals Requirements

1. Submittal number
2. Date of submission and dates of any previous submissions
3. Project title and number
4. Owner Contract identification number if applicable
5. Names of:
 - a. Contractor
 - b. Supplier
 - c. Manufacturer
6. Identification of the product, with the specification section number
7. Field dimensions, clearly identified as such
8. Relation to adjacent or critical features of the Work or materials
9. Applicable standards, such as ASTM or Federal Specification numbers
10. Identification of deviations from Contract Documents:
 - a. If Contractor proposes to provide material or equipment of Work which deviates from the Project Manual, Contractor shall indicate so under “deviations” on the transmittal form accompanying the submittal copies
 - b. Identify all requested deviations as specified and on the copies of Specifications and Drawings required by paragraph below.
11. Confirmation of compliance with Contract Documents and, if applicable, identification of deviations from Contract Documents:
 - a. Provide the following documents to demonstrate compliance with the contract specifications:
 - i) A copy of the relevant Drawing(s) with all addendum updates that apply to the equipment in various Divisions marked to show specific changes necessary for the equipment proposed in the Contractor’s submittal
 - a) If no changes are required, the Drawing(s) shall be clearly marked “No Changes Required”
 - b) Failure to include copies of relevant Drawing(s) with the submittal, whether changes are required or not, shall be cause for rejection of the entire submittal with no further review by Engineer
 - c) Relevant Drawing(s) include as a minimum the control diagrams, process and instrumentation diagrams (P&IDs), and Process (P) drawings.
 - ii) A copy of each pertinent specification section with all addendum updates included, all referenced and applicable specifications sections, with their respective addendum updates included, with each paragraph check-marked to

indicate specification compliance or marked to indicate the requested deviations from the specification requirements:

- a) If deviations from the specifications are indicated and, therefore requested, by the Contractor, the submittal shall be accompanied by a detailed, written justification for each deviation
 - b) Failure to include a copy of the marked up specification sections, along with justification for any requested deviations to the specification requirements, with the submittal shall be cause for rejection of the entire submittal with no further review by Engineer
12. Identification of revisions on resubmissions
 13. An 8" by 4" blank space for Contractor's and Engineer's stamps
 14. Stamp cover sheet of each submittal as identified in letter of transmittal
 15. Contractor's stamp: Initialed or signed, certifying review and approval of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents. Use stamp to include wording similar to the following:

<p>This submittal has been reviewed by <i>[Name of Contractor]</i> and approved with respect to the means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incidental thereto. <i>[Name of Contractor]</i> also warrants that this submittal complies with contract documents and comprises no deviations thereto: Section No: ___ Submittal No: ___ Date: _____ By: _____</p>
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- G. For equipment that is provided directly by manufacturer without specification provide:
 1. Shop drawings: Illustrate complete assembly of products; foundation, installation and anchor requirements; dimensions and total weights of each, electrical wiring diagrams
 2. Product data: Provide manufacturer's literature including general assembly, materials of construction, model and type, detailed data describing parts and accessories, sufficient data to verify compliance with specifications
 3. Manufacturer's installation instructions: Provide detailed connection requirements and startup instructions
 4. Manufacturer's field report: Indicate personnel present and actual start-up procedures that were performed by manufacturer's representative
 5. Field report and test results shall be submitted to the Engineer by the Contractor
- H. Submittal Log:
 1. Maintain an accurate submittal log for duration of the Work showing current status of all submissions
 2. Show submittal number, section number, section title, submittal description, dates and disposition of submittal
 3. Make submittal log available to Engineer for Engineer's review upon request

- I. Unless specified otherwise, make submissions in groups to facilitate efficient review and approval:
 - 1. Include all associated items from individual specification sections to assure that all information is available for checking each item when it is received
 - 2. Submit a complete initial submittal including all components when an item consists of components from several sources
 - 3. Partial submittals may be rejected as not complying with provisions of the Contract
 - 4. Engineer will not be held liable for delays due to poorly organized or incomplete submissions
 - 5. Do not include items from more than one specification section for any one submittal number

 - J. Contractor may require subcontractors to provide drawings, setting diagrams and similar information to help coordinate the Work, but such data shall remain between Contractor and his subcontractors and will not be reviewed by Engineer unless specifically called for within the Contract Documents

 - K. All submittals for each component of multi-component systems shall be compiled and submitted through the Contractor to the Engineer by the manufacturer having System Responsibility
- 1.6 DISPOSITION OF SHOP DRAWINGS, PRODUCT DATA, AND INFORMATION SUBMITTALS
- A. "No Exceptions Taken": Approved with No Corrections Noted
 - 1. One copy sent to Owner
 - 2. One copy sent to Resident Project Representative
 - 3. One copy retained in Engineer's file
 - 4. Remaining copies returned to Contractor for his use
 - a. One copy to be kept on file at Contractor's office at job site
 - b. Remaining copies for Contractor's office file, suppliers, or subcontractors
 - 5. No corrections or comments noted on the submittal or on a Submittal Response Summary Sheet
 - 6. Issues or miscellaneous comments pertaining to other related items of the Work may be included in transmittal letter
 - 7. Resubmission not required

 - B. "Exceptions Noted": Approved with Corrections Noted
 - 1. One copy sent to Owner
 - 2. One copy sent to Resident Project Representative
 - 3. One copy retained in Engineer's file
 - 4. Remaining copies returned to Contractor for his use
 - a. One copy to be kept on file at Contractor's office at job site
 - b. Remaining copies for Contractor's office file, suppliers or subcontractors
 - c. Copies of submittal data in operation and maintenance manuals to be revised according to corrections
 - 5. Comply with corrections or comments as noted on the submittal or on a Submittal Response Summary Sheet

6. Resubmission not required
- C. "Revise And Resubmit": Incorrect information provided or Significant Information Still Required
1. One copy sent to Resident Project Representative
 2. One copy retained in Engineer's file
 3. All remaining copies returned to Contractor for revision and re-submittal
 4. Copy of transmittal letter and/or Submittal Response Summary Sheet sent to Owner. A "No Exceptions Taken" or "Exceptions Noted" submittal it will be forwarded to Owner after review per above disposition requirements
 5. Submittal is either: incorrectly annotated; specific comments need to be addressed and incorporated in re-submittal; and/or additional information may be required as noted on the submittal or on a Submittal Response Summary Sheet
 6. Submitted information may not include or address specific item required per the specification as identified on the submittal or on a Submittal Response Summary Sheet
 7. Specific information related to identified item may be required for final approval of submittal
 8. Resubmission of entire submittal may be required or resubmission of specific item may be required as identified on the submittal or on a Submittal Response Summary Sheet
- D. "Rejected": Returned for Correction
1. One copy sent to Resident Project Representative
 2. One copy retained in Engineer's file
 3. All remaining copies returned to Contractor
 4. Copy of transmittal letter and/or Submittal Response sent to Owner
 5. Contractor required to resubmit complete submittal package in accordance with Contract Documents
 6. Submittal does not comply with provisions of Contract Documents as noted on the submittal or on a Submittal Response Summary Sheet
 7. Resubmission required
- E. "Receipt Acknowledged": For Reference Purposes Only, or for Record Copy:
1. Applicable to manufacturer or Contractor provided calculations and other miscellaneous documentation no subject to Engineer review and approval
 2. One copy sent to Resident Project Representative
 3. One copy retained in Engineer's file
 4. One copy returned to Contractor
 5. Copy of transmittal letter sent to Owner
 6. Remaining submittal copies destroyed
 7. Detailed review and comment by Engineer not required
 8. Resubmission not required

1.7 DISPOSITION OF SAMPLES

- A. "No Exceptions Taken": Approved with No Corrections Noted
1. One sample sent to Owner

2. One sample sent to Resident Project Representative
 3. One sample retained in Engineer's file
 4. Acknowledgement: Copy of transmittal letter sent to Contractor
 5. Resubmission not required
- B. "Exceptions Noted": Approved with Corrections Noted
1. One sample sent to Owner
 2. One sample sent to Resident Project Representative
 3. One sample retained in Engineer's file
 4. Acknowledgement: Copy of transmittal letter sent to Contractor
 5. Work performed or products furnished to comply with exceptions noted in acknowledgement
 6. Resubmission not required
- C. "Rejected": Returned for Correction
1. One sample retained in Engineer's file
 2. Remaining samples sent to Contractor for resubmittal and compliance with the Contract Documents as noted in transmittal letter
 3. Copy of transmittal letter sent to Owner
 4. Resubmission required

1.8 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in submittals required by Engineer and resubmit until approved
- B. Transmit each resubmission under new letter of transmittal. Use number of original submittal followed directly by a capital letter corresponding to the number of times a submittal is resubmitted (i.e., #001, #001A, #001B, etc.)
- C. Shop Drawings and Product Data
1. Revise initial drawings or data and resubmit as specified for the initial submittal
 2. Indicate any changes which have been made other than those requested by Engineer
- D. Samples: Submit new samples as required for initial submittal
- E. Reimbursement of Resubmission Review Costs:
1. Review of first submittal and one resubmittal will be performed by Engineer at no cost to Contractor
 2. Cost for review of subsequent resubmissions will be directly paid by Contractor
 3. Engineer will document work-hours required for review and costs for Engineer review will be deducted from payments due Contractor as Change Order deducts
 4. Charges for review of resubmissions will include Engineer at maximum rate of \$150 per hour and administrative staff at maximum rate of \$75 per hour

1.9 PROJECT RECORD SUBMITTALS

- A. After completion of the Work and prior to final payment, Contractor shall furnish record documents and final approved shop drawings and samples (as-constructed shop drawings and samples) in the number of copies specified herein.
 - 1. Contractor shall provide additional copies of final approved shop drawings and samples for insertion in Equipment instruction and O&M manuals as required
 - 2. All copies shall be clearly marked "Project Record"

1.10 ENGINEER'S DUTIES

- A. Review submittals with reasonable promptness and in accordance with approved submission schedule provided that each submittal has been called for by the Contract Documents and is stamped by Contractor as indicated above
 - 1. No extensions of time are allowed due to Engineer's delay in reviewing submittals unless all the following criteria are met:
 - a. Contractor has notified Engineer in writing that timely review of particular submittal in question is critical to the progress of the Work and Contractor has identified the requested submittal return date.
 - b. Engineer has failed to return submittal within 21 days of receipt of the submittal or receipt of said notice, whichever is later
 - c. Contractor demonstrates that delay in progress of the Work was directly attributable to Engineer's failure to return submittal within 21 days
 - 2. No extensions of time are allowed due to delays in progress of the Work caused by rejection and subsequent resubmission of data, including multiple resubmissions
 - 3. Engineer's review shall not extend to means, methods, techniques, sequences, construction operations, and safety precautions and programs incidental thereto. No information regarding these items will be reviewed whether or not included in submittals
 - 4. In the event that Engineer will require more than 21 calendar days to perform review, Engineer shall so notify Contractor
- B. Review drawings and data submitted only for general conformity with Contract Documents
 - 1. Engineer's review of drawings and data returned marked No Exceptions Taken or Exceptions Noted does not indicate a thorough review of all dimensions, quantities, and details of material, equipment device or items shown
 - 2. Engineer's review does not relieve Contractor of responsibility for errors, omissions or deviations nor responsibility for compliance with the Contract Documents
- C. Assume that no shop drawing or related submittal comprises a deviation to the Contract Documents unless Contractor advises Engineer otherwise in writing which is acknowledged by Engineer in writing:
 - 1. Consider and review only those deviations from the Contract Documents clearly identified as such on the submittal and tabulated on the Contractor's transmittal sheet.
- D. Review informational submittals for indications of Work or Material deficiencies and will respond to Contractor regarding such deficiencies

- E. Return submittals to Contractor for distribution or for resubmission
- F. Transmit, unreviewed, to Contractor all copies of submittals received directly from suppliers, manufacturers and subcontractors
- G. Transmit, unreviewed, to Contractor all copies of submittals not called for by the Contract Documents or which have not been approved by Contractor
- H. Engineer will not review uncalled-for shop drawings or product data except by special arrangement
- I. Affix stamp and indicate approval for submittal or resubmission requirements with the following stamp:

	JVA, Inc.	Received: _____
	<input type="checkbox"/> No Exceptions Noted	<input type="checkbox"/> Exceptions Noted
	<input type="checkbox"/> Revise and Resubmit	<input type="checkbox"/> Rejected
<p style="font-size: small;">JVA's review is limited to general conformance with the design intent as expressed in the Construction Documents. Notations and comments made on the product submittal or shop drawing during this review do not relieve the Contractor from compliance with the Construction Documents, as well as applicable laws, codes, and regulations. Review of a specific item shall not be construed to include review of an assembly of which the item is a component. The Contractor is responsible for dimensions and quantities to be confirmed and correlated at the job site; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences, and procedures of construction; coordination of the Work with that of all other trades; and performing all Work in a safe and satisfactory manner.</p>		
By: _____	Date: _____	10/21

1.11 SUBMITTAL SCHEDULE

- A. Unless indicated otherwise, provide all submittals required by individual sections of the Contract Documents to establish compliance with the specified requirements.
- B. Contractor to produce schedule of submittals for Engineer review

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01380

CONSTRUCTION PHOTOGRAPHS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Construction record photographs prior to commencing and during the course of the Work

1.2 RELATED SECTIONS

- A. Section 01010 – Summary of Work
- B. Section 01700 – Contract Closeout: Project Record Documents

1.3 PHOTOGRAPHY REQUIRED

- A. Take photographs of the existing conditions prior to commencing work to document existing conditions
- B. Take photographs on the date on which each scheduled Application for Payment is due. Intent is for digital photos to be kept as project record
- C. CD of Digital photos become the property of Owner

1.4 COSTS OF PHOTOGRAPHY

- A. Pay all costs for specified photography and printing
 - 1. Parties requiring additional photography or prints will pay for them directly

1.5 DELIVERY OF PHOTOS

- A. Submit digital photos to the Engineer with monthly pay requests or within 20 days of photo date

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 TECHNIQUE

- A. Factual Presentation
- B. Correct Exposure and Focus
 - 1. High resolution and sharpness

2. Maximum depth-of-field
3. Minimum distortion

3.2 VIEWS REQUIRED

- A. Photograph from locations to adequately illustrate the condition of construction and the state of the Project
 1. Photographic survey of the existing site
 - a. Show all areas to be modified
 - b. Show all areas in which Contractor will conduct operations or store equipment
 2. Weekly photographs
 - a. Minimum of eight (8) views weekly until final acceptance
 - b. Views as designated by the Engineer or Owner

3.3 PHOTOGRAPH REQUIREMENTS FOR PROGRESS SITE PHOTOGRAPHS

- A. Responsibility
 1. Site photographs for Owner record of construction progress shall be the responsibility of the Contractor
 2. Contractor shall be responsible for site photographs including the existing and progress of Work
- B. Photographs shall include, but not limited to, the following:
 1. Existing site: Photographs of existing site conditions before site work commences
 - a. Number of views shall be sufficient to cover the existing site conditions
 2. Progress of work: Shall include photographs from clearing throughout construction
 - a. Number of views shall be sufficient to cover progress in Work and shall include a minimum of eight (8) different views
 3. After completion of Work: Shall be sufficient to show completed and finished Work
- C. Digital images
 1. Provide images in uncompressed JPEG format
 2. Minimum resolution: 1500 x 2200
 3. Submitted digital images shall not be cropped
- D. Identify each digital image file
 1. Name of project
 2. Orientation and description of view
 3. Date and time of exposure

3.4 ADDITIONAL PHOTOGRAPHS

- A. Contractor shall provide additional photographs upon the request of the Engineer
- B. Additional photographs may include, but not limited to, the following:
 1. Publicity photographs
 2. Special events at Project site
 3. Major phase of Work

4. Substantial Completion
5. Follow-up investigations for on-site events such as construction damage or losses
6. Additional record photographs during final acceptance

3.5 PROJECT RECORD

- A. Submit CD of all photos, grouped by date
- B. Engineer will distribute, after review
 1. One copy of each view to Owner
 2. One copy of each view to Engineer's file
 3. One copy of each view returned to Contractor for inclusion in Project Record Document

END OF SECTION

SECTION 01400
QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance / Control of installation
- B. Inspection and testing laboratory services
- C. Qualification of laboratory
- D. Laboratory duties
- E. Limitations of authority of inspections agency
- F. Contractor's responsibilities
- G. Field inspections
- H. Inspection and services schedule

1.2 RELATED SECTIONS

- A. Section 01010 - Summary of Work
- B. Section 01340 - Shop Drawings, Product Data, and Samples
- C. Section 01600 - Material and Equipment

1.3 REFERENCES

- A. Conform to reference standard by date of issue current on date of Contract Documents
- B. Obtain copies of standards when required by Contract Documents
- C. Where specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding
- D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document

1.4 SUBMITTALS

- A. Submit under provisions of Section 01340

- B. Provide copies of written reports for materials, equipment or systems as scheduled at the end of this section. Reference each report by respective section number.
- C. Laboratory Test Reports: Provide written reports of each test and inspection to Engineer. Each report shall include:
 - 1. Date issued
 - 2. Project title and number
 - 3. Inspection laboratory name, address and telephone number
 - 4. Name and signature of laboratory inspector
 - 5. Date and time of sampling or inspection
 - 6. Record of temperature and weather conditions
 - 7. Date of test
 - 8. Identification of product and specification section
 - 9. Location of sample or test in the Project
 - 10. Type of inspection or test
 - 11. Results of tests and compliance with Contract Documents
 - 12. Interpretation of test results when requested by Engineer
- D. Shop Test Reports: Provide reports detailing results of tests and certification from manufacturer to verify compliance with specifications
- E. Field Test Reports: Provide reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials and equipment which fails to pass field tests.

1.5 QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce Work of specified quality
- B. Comply fully with manufacturer's instructions, including each step in sequence
- C. Should manufacturer's instructions conflict with Contract Documents, request clarification from Engineer before proceeding
- D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship
- E. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement
- F. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities: Conditions of the Contract
- G. Certification of products: Respective sections of specifications

1.6 INSPECTION AND TESTING LABORATORY SERVICES

- A. Owner will employ and pay for the services of a testing agency to perform specified field inspections of materials where the technical specifications specifically obligate the Owner to provide the services
 - 1. It is the Contractor's responsibility to initiate and coordinate all required tests and inspections including conformance with requirements of all applicable public agencies and authorities. Contractor will be responsible for coordinating the inspection requirement with inspection agency and provide the inspection agency no less than three (3) working days advance notification to schedule tests.
 - 2. Employment of the inspection agency shall in no way relieve Contractor's obligations to perform the Work of the Contract
 - 3. Contractor shall employ and pay for the services of a inspection agency to perform all specified services and inspections not specifically identified in the technical specifications to be provided by Owner related to the design of mixes, products and equipment, to Engineer's review of proposed materials and equipment before, during and after incorporation in the Work and to retest materials and equipment which fail original tests
- B. Retesting required because of non-conformance to specified requirements shall be performed by the same inspection agency on instructions by the Engineer. Payment for reinspection will be charged to the Contractor by deducting inspection or testing charges from the Contract Sum/Price

1.7 QUALIFICATION OF INSPECTION AGENCY

- A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories
- B. Meet basic requirements of ASTM E 329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction" as applicable
- C. Authorized to operate in the State in which the Project is located

1.8 INSPECTION AGENCY DUTIES

- A. Cooperate with Engineer and Contractor; provide qualified personnel after due notice
- B. Perform specified inspections, sampling, and testing of materials and methods of construction
 - 1. Comply with specified standards
 - 2. Ascertain compliance of materials with requirements of Contract Documents
- C. Promptly notify Engineer and Contractor of observed irregularities or deficiencies of work or products

1.9 LIMITATIONS OF AUTHORITY OF INSPECTION AGENCY

- A. Inspection Agency Is Not Authorized To
 - 1. Release, revoke, alter or enlarge on requirements of Contract Documents
 - 2. Approve or accept any portion of the Work
 - 3. Owner employed inspection agency shall not perform any duties of the Contractor

1.10 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory and inspection agency personnel and provide access to Work
- B. Secure and deliver to the laboratory adequate quantities of representative samples of materials proposed to be used and which require inspection
- C. Furnish copies of product test reports as required
- D. Furnish Incidental Labor and Facilities
 - 1. To provide access to Work to be tested
 - 2. To obtain and handle samples at the project site or at the source of the product to be tested
 - 3. To facilitate inspections and tests
 - 4. For storage and curing of test samples
- E. Cooperate with inspection agency; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested
 - 1. Notify Engineer and inspection agency 3 days prior to expected time for operations requiring services to allow for scheduling of tests and laboratory assignment of personnel
 - 2. Make arrangements with inspection agency and pay for additional samples and tests required for Contractor's use

1.11 FIELD INSPECTION

- A. Owner shall pay all costs associated with standard field testing of materials as detailed in these specifications. Contractor shall pay for all reinspection or testing due to tests or inspections indicating failed conditions.
- B. Provide all required access equipment required for inspections
- C. Repair with no additional compensation all materials and equipment which fail during testing or inspection

1.12 FIELD INSPECTION AND SERVICES SCHEDULE

A. Field inspection shall be provided for, but shall not be limited to, the following:

Specification Section	Type of Material, Equipment, or System	Owner (O) or Contractor (C) Provided
05500	Miscellaneous Metals (Field Welding)	O
09900	Coatings	O

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities: Electricity, lighting, heating, ventilating, telephone service, water and sanitary facilities
- B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.
- C. Construction Staging Facilities: Access roads, parking areas, progress cleaning, project signage, storage and temporary buildings.

1.2 GENERAL REQUIREMENTS

- A. Furnish, install and maintain all temporary utilities to assure continuous service required for the Work, except as allowed herein, and remove on completion of Work. Modify and extend systems, as work progress requires.
- B. Furnish, install and maintain all construction aids required for the Work, except as allowed herein, and remove on completion of the Work
- C. Furnish, install and maintain fences and barriers as required for protection of the public, property and the Work
- D. Contractor may use existing roadways for access and parking only where designated by Owner.
- E. Products may be new or used, but must be serviceable, adequate for the intended purpose, and must not violate the requirements of any applicable codes or standards
- F. Clean and repair damage caused by temporary installations or use of temporary facilities. Grade and seed all disturbed areas not detailed on the drawings for other treatment
- G. Provide contractor information sign posted at accessible location with contractor name and emergency phone contact information.

1.3 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies
 - 1. Comply with applicable Federal and State rules and regulations, local codes and ordinances
 - 2. Comply with utility company requirements

1.4 TEMPORARY ELECTRICITY

- A. Contractor shall pay all costs associated with power service to the field offices and pay all costs for energy used.
- B. Arrange for and pay all costs associated with temporary power service either from the local utility or a portable engine-generator
- C. Provide power outlets for construction operations, with branch wiring and distribution boxes located at the site. Provide flexible power cords as required
- D. Provide main service disconnect and over current protection at convenient location
- E. Pay all costs for installation and removal of temporary electrical service

1.5 TEMPORARY LIGHTING

- A. Provide and maintain lighting to exterior staging and storage areas after dark for security purposes as required
- B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtailed, and lamps as required
- C. Maintain lighting and provide routine repairs

1.6 TEMPORARY SANITARY FACILITIES

- A. Provide sanitary facilities at staging area
 - 1. As required by laws and regulations
 - 2. Not less than 1 facility
- B. Service, clean and maintain facilities and enclosures

1.7 CONSTRUCTION AIDS

- A. Provide construction aids and equipment required by personnel and to facilitate the execution of the Work: scaffolds staging, ladders, stairs, ramps, runways, platforms, railways, hoists, cranes, chutes and other such facilities and equipment
- B. Relocate construction aids as required by progress of construction, by storage or work requirements, and to accommodate legitimate requirements by Owner
- C. Completely remove temporary materials, equipment, and services at completion of the Project
- D. Clean, repair damage caused by installation or by use of temporary facilities

1.8 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition
- B. Provide suitable barriers as required for public protection of Owner's employees
- C. Protect non-owned vehicular traffic, stored materials, site and structures from damage
- D. Install facilities of a neat and reasonable uniform appearance, structurally adequate for the required purposes
- E. Relocate barriers as required by progress of construction
- F. Completely remove barriers, including foundations, when construction has progressed to the point that they are no longer needed
- G. Clean and repair damage caused by installation, fill and grade the areas of the site to required elevations and slopes and clean the area

1.9 TEMPORARY FENCING

- A. Construction: Commercial grade chain link fence
- B. Provide additional fencing to protect stored materials & products or to insure public safety and the safety of Owner's employees
- C. Provide Owner two (2) keys to lock(s)
- D. The site of the work is fenced

1.10 FUGITIVE DUST PERMIT

- A. Comply with all conditions of CDPHE Fugitive Dust Permit. Contractor responsible for both permit filing and any required reporting.
- B. Contractor to pay for all metered water used in dust abatement

1.11 PROTECTION OF INSTALLED WORK

- A. Protect installed Work and provide special protection where specified in individual specification Sections
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage
- C. Protect finished driving surfaces, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects

- D. Prohibit construction traffic from entering future landscaped areas after grades have been established and topsoil restored

1.12 SECURITY

- A. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft
- B. Coordinate with Owner's security program

1.13 ACCESS ROADS

- A. Maintain existing roads accessing public thoroughfares to construction staging area.
- B. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow
- C. Provide and maintain access to existing fire hydrants free of obstructions

1.14 PARKING

- A. Paved and unpaved surfaces adjacent to the staging area can accommodate construction personnel until the designated building staging area has been established
- B. If staging area space is not adequate, provide additional off-site parking at location designated by Owner

1.15 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition
- B. Remove waste materials, debris, and rubbish from site periodically and dispose off-site in accordance with local and state regulations. Due to high winds experienced at the site, waste removal must be done immediately after it is generated

1.16 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Final Application for Payment
- B. Clean and repair damage caused by installation or use of temporary work

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01550

CUTTING AND PATCHING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements for cutting and patching
- B. Work included in this Section
 - 1. Cutting and patching not required to be performed as part of the work of other sections
 - 2. Cutting and patching existing work altered or disturbed to accommodate new construction
 - 3. Cutting and patching existing work damaged or defaced during new construction as required to restore to existing or better condition at the time of award of Contract
 - 4. Cutting and patching required to:
 - a. Install or correct non-coordinated work
 - b. Remove and replace defective and non-conforming work
 - c. Remove samples of installed work for testing
- C. Contractor shall be responsible for all cutting, and patching as required to complete the Work or to:
 - 1. Uncover portions of the Work to provide for installation of ill-timed work
 - 2. Remove and replace defective work
 - 3. Remove and replace work not conforming to requirements of Contract Documents
 - 4. Remove samples of installed work as specified for testing

1.2 DEFINITIONS

- A. Cutting includes cutting into nominally completed or existing construction including, but not limited to, the following, in order to provide for the coordination of Work, installation of Work, uncovering of other facilities and structures for access or inspection, or obtaining samples for testing or other similar purposes
 - 1. Steel
 - 2. Miscellaneous metal structures
 - 3. Piping and pavement
- B. Patching includes the repair required to restore cut materials to original or better condition
- C. Submittals
 - 1. Submit a proposal describing procedures in advance of the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - a. Extent: For each occurrence, describe the cutting and patching required, show how it will be performed and indicate the reason(s) it cannot be avoided

- b. In-place construction changes: Describe anticipated results and include changes to structural elements and operating components in addition to changes in building's appearance and other significant visual elements
- c. Products: List products to be used and firms or entities that will perform the Work
- d. Dates: Indicate when cutting and patching will be performed
- e. Utility services and mechanical and electrical systems:
 - i) List services and systems that cutting and patching procedures will disturb or affect
 - ii) List services and systems that will be relocated and that will be temporarily out of service
 - iii) Indicate how long services and systems will be disrupted
- f. Structural elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure
- g. Approval by Engineer:
 - i) Obtain approval of cutting and patching proposal before cutting and patching
 - ii) Approval does not waive right to later require removal and replacement of unsatisfactory work

D. Quality Assurance

1. Structural work requirements: Do not cut and patch structural elements in a manner that would reduce their load-carrying or load-deflection ratio
 - a. Obtain Engineer approval of cutting and patching proposal before cutting and patching the following structural elements:
 - i) Foundation construction, and structural concrete and structural steel
 - ii) Equipment supports, piping, ductwork, vessels, and equipment
 - iii) Miscellaneous structural metals
2. Operational limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance or decreased operational life or safety
 - a. Obtain Engineer approval of cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
 - i) Primary operational systems and equipment
 - ii) Air, smoke, water, moisture, or vapor barriers
 - iii) Membrane and flashings
 - iv) Fire protection, control, communication, or electrical wiring systems
 - v) Noise and vibration control elements and systems
3. Visual requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Engineer's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching
 - a. Retain the original installer or fabricator throughout construction phases to cut and patch the following categories of exposed work, if possible, or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm:
 - i) Concrete finishes
 - ii) Painting

- E. Warranty
 - 1. For existing warranties, Contractor shall replace, patch, and repair material and/or surfaces cut and/or damaged by methods and with materials in order to not void any warranties required or existing

PART 2 PRODUCTS

- A. Materials
 - 1. Use materials identical to existing materials unless not available
 - a. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials matching existing adjacent surfaces to the fullest extent possible with regard to visual effect
 - b. Before proceeding, Contractor shall obtain approval of the Engineer
 - c. Use materials whose installed performance will equal or surpass that of existing materials

PART 3 EXECUTION

3.1 INSPECTION

- A. Inspect existing conditions of the Project, including elements subject to damage or to movement during cutting and patching. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered
- B. After uncovering work, inspect the conditions affecting the installation of products, or performance of the work
- C. Report unsatisfactory or questionable conditions to the Engineer in writing; do not proceed with the work until the Engineer has provided further instructions

3.2 PREPARATION

- A. Provide devices and methods to protect other portions of the Project from damage
- B. Provide temporary support of Work to be cut where required
- C. Provide protection from the elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water
 - 1. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations
- D. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas
- E. Take all precautions necessary to avoid cutting existing pipe or conduit.

- F. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes
- G. Restore work which has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay
- B. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition
 - 1. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations
 - a. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use
 - b. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces
 - c. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting
 - 2. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances
 - a. Where feasible, inspect and test patched areas to demonstrate integrity of the installation
 - b. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing
 - c. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken containing the patch, after the patched area has received primer and second coat

3.4 CLEANING

- A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Administrative and procedural requirements governing Contractor's selection of products for use in Project and for Work including, but not limited to, the following:
 - 1. Definitions
 - 2. General Requirements for Materials and Equipment
 - 3. Submittals
 - 4. Quality Assurance and Qualifications
 - 5. System Responsibility
 - 6. Transportation and Shipment
 - 7. Delivery, Storage and Handling
 - 8. Maintenance Materials
 - 9. Warranty
 - 10. Examination, Installation, Adjusting and Cleaning

1.2 RELATED SECTIONS

- A. Section 01010 – Summary of Work
- B. Section 01340 – Shop Drawings, Product Data, and Samples
- C. Section 01400 – Quality Control
- D. Section 01730 – Operation and Maintenance Data

1.3 REFERENCES

- A. NSF/ANSI 60-2012 – Drinking Water Treatment Chemicals – Health Effects
- B. NSF/ANSI 61-2012 – Drinking Water System Components – Health Effects

1.4 DEFINITIONS

- A. Definitions used in this specification section are not intended to change the meaning of other terms used in the Contract Documents, such as “specialties,” “systems,” “structure,” “finished,” “accessories,” and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry
- B. Products: Items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term “product” includes the terms “material”, “equipment”, “system”, and terms of similar intent

- C. Named products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature that is current as of date of Contract Documents
- D. Foreign products: Distinguished from "domestic products" are items substantially manufactured (50 percent or more of value) outside of the United States and its possessions. Products produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens or, nor living within, the United States and its possessions are also considered to be foreign products
- E. Materials: Products substantially shaped, cut, worked, mixed, finished, refined, or otherwise fabricated, processed, or installed to form a part of the Work
- F. Equipment: Product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping
- G. Special tools, instruments, devices, or accessories: Any tools, instruments, devices or accessories required for repair, adjustment or maintenance of equipment which are designed especially for the equipment in question or which are not normally kept in stock by local tool suppliers
- H. Responsible manufacturer: Unless otherwise specified, responsible manufacturer shall be manufacturer of driven equipment. Agents, representatives or other entities who are not a direct component of manufacturing corporation will not be acceptable as a substitute for manufacturer's corporation in meeting this requirement

1.5 GENERAL REQUIREMENTS

- A. The section applies to all equipment provided under this contract
- B. The requirements of detailed specifications take precedence over this section in the event of an apparent conflict
- C. Provide all new equipment and materials, except as specified or required by testing
- D. Equipment and materials removed from existing structure: Do not use in completed Work except where specifically indicated or specified
- E. Contractor to coordinate equipment with other parts of the Work, including verification or compatibility of structures, piping, wiring and equipment components
- F. Contractor is responsible for all alterations in the Work to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Drawings or specifications:
 - 1. The arrangement of equipment shown on the Drawings is based upon information available to the Owner at the time of the design and is not intended to show exact dimensions unique to a specific manufacturer

2. More than one manufacturer has been used for mechanical layout and design to accommodate all named manufacturer's
 3. The Drawings are, in part, diagrammatic, and some features of the illustrated equipment installation may require revision to meet actual equipment installation requirements as provided by the Contractor
 4. Structural supports, foundations, connected piping, valves and electrical conduit specified may have to be altered as coordinated by the Contractor during the submittal process to accommodate the actual equipment provided by the Contractor
 5. No additional payment will be made to the Contractor for such revisions and alterations
- G. Do not use any material or equipment for any purpose other than that for which is designed or specified
- H. Equipment lists presented in these specifications and as specified on the Drawings are included for the convenience of the Engineer and Contractor and are not to be considered as complete listings of all equipment, devices and material to be provided under this contract:
1. Contractor shall prepare his own material and equipment take-off lists as necessary from the contract Drawings, addenda and this project manual to meet the requirements of this project

1.6 SUBMITTALS

- A. Provide submittals in accordance with Section 01340 – Shop Drawings, Product Data, and Samples
- B. Submittals for products are specified in Section 01340 – Shop Drawings, Product Data, and Samples and in Divisions 2 through 16
- C. All submittals for each component of multi-component systems shall be compiled and submitted through the Contractor to the Engineer by the manufacturer having system responsibility
- D. Provide a copy of this specification section with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements.
- E. Provide Certificate of System Responsibility
- F. Manufacturer's certified data showing location of critical speeds in relation to operating speeds

1.7 QUALITY ASSURANCE AND QUALIFICATIONS

- A. Source limitations and interchangeability: To the fullest extent possible, provide products of the same kind from a single source

- B. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplate or trademarks on exposed surface of products that will be exposed to view in occupied spaces or on the exterior
 - 1. Labels: Locate required product labels and stamps on concealed surfaces, or where required for observation after installation, on inconspicuous, accessible surfaces.
 - 2. Equipment nameplates: Provide a permanent nameplate on each item of service – connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. Nameplate shall contain, but not limited to, the following information and other essential operating data:
 - a. Name of product and manufacturer
 - b. Model and serial number
 - c. Capacity
 - d. Speed
 - e. Ratings
 - f. Operating and power characteristics
 - g. Labels of tested compliance with codes and standards
 - 3. Refer to additional requirements specified in Divisions 2 through 16
- C. Installers Qualifications:
 - 1. Equipment and material: Installed and placed in service by or under guidance of qualified personnel having knowledge and experience necessary for proper results
 - 2. Where Contractor's or subcontractor's employees are not properly qualified, use personnel such as factory authorized field representative of equipment supplier

1.8 SYSTEM RESPONSIBILITY

- A. Equipment systems made up of two or more components shall be provided as a single system by the responsible manufacturer. Unless otherwise specified, the Contractor shall assign system responsibility to, and obtain each system from the manufacturer of the driven equipment. The manufacturer shall design and provide all components of the system to enhance proper operation, compatibility of all components, ease of construction and efficient maintenance. The responsible manufacturer shall coordinate selection and design of all system components such that all equipment is compatible and operates properly to achieve the performance requirements specified. The Contractor is responsible to the Owner for performance of all systems as provided in the General and Special Conditions.
- B. Nothing in this provision shall be construed as relieving the Contractor of overall responsibility for the Work of this Contract and the performance of all systems as specified under paragraphs 00700 – Standard General Conditions, Article 13

1.9 TRANSPORTATION AND SHIPMENT

- A. Shipment preparation: Contractor shall require manufacturers and suppliers to prepare equipment and materials for shipment in a manner to facilitate unloading and handling, and to protect against damage or unnecessary exposure in transit and storage, for contractor supplied equipment. Provisions for protection shall include the following:
 - 1. Crates or other suitable packaging materials

2. Covers and other means to prevent corrosion, moisture damage, mechanical, injury, and accumulation of dirt in motors, electrical equipment, and machinery
3. Suitable rust-preventive compound on exposed machined surfaces and unpainted iron and steel
4. Grease packing or oil lubrication in all bearings and similar items

B. Marking

1. Each item of equipment and material shall be tagged or marked as identified in the delivery schedule or on submittals
2. Complete packing lists and bills of material shall be included with each shipment.
3. Each piece of every item need not be marked separately, provided that all pieces of each item are packed or bundled together and the packages or bundles are properly tagged or marked

1.10 DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Arrange deliveries of equipment and materials in accordance with construction schedules, in ample time to facilitate inspection prior to installation and to avoid delay of Work. Coordinate to avoid conflict with work and conditions at the site
2. Deliver products in undamaged condition, in manufacturer's sealed, weather tight, original container or packaging, with identifying labels intact and legible, all in accordance with manufacturer's instructions and recommendations using means and methods that will prevent damage, deterioration, and loss, including theft
3. Control delivery schedules to minimize long-term storage at the Site and to prevent overcrowding of construction spaces. Coordinate delivery and installation to ensure minimum holding or storage times for items known or recognized to be flammable hazardous, easily damaged, or sensitive to deterioration, theft, and other sources of loss
4. Products delivered to Work site shall be in undamaged condition, in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing
5. Mark deliveries of component parts of equipment to identify the equipment, to permit easy accumulation of parts, and to facilitate inspection and measurement of quantity or counting of units
6. Immediately on delivery, inspect shipment to ensure:
 - a. Product complies with requirements of Contract Documents and reviewed Submittals
 - b. Quantities are correct
 - c. Containers and packages are intact and labels are legible
 - d. Equipment and materials are properly protected and undamaged
7. Include complete packing lists and bills of material with each shipment including equipment identification number assigned by Drawings and Specifications of this Contract
8. Deliver anchor bolts together with templates sufficiently early to permit setting when structural concrete is placed

B. Storage

1. If there is no interior space available from the Owner for storage of delivered equipment and material at the project site:
 - a. Provide adequate facilities for storage in accordance with Section 01500
 - b. Provide off-site storage and protection when site does not permit on-site storage or protection and if acceptable to Owner in accordance with the General Conditions
2. Submit and maintain insurance for equipment and materials at off-site storage
3. Requests for payment of stored equipment and materials by the Contractor may be rejected if storage facilities do not conform to these specifications or manufacturer's written recommendations.
4. Store equipment and materials immediately on delivery, and protect until completion of the Work. Store in accordance with manufacturer's instructions with seals and labels intact and legible
5. Store equipment and materials in a manner that will not endanger the supporting construction
6. Store equipment and materials that are subject to damage by elements in weathertight enclosures
7. Maintain temperature and humidity within ranges required by manufacturer
8. Protect motors, electrical equipment, plumbing fixtures, and machinery of all kinds against corrosion, moisture deteriorations, mechanical injury, and accumulation of dirt or other foreign matter
9. Protect electrical equipment, controls, and insulation against moisture, water, and dust damage
10. Immediately after delivery and inspection, connect and operate continuously all space heaters furnished in electrical equipment
11. Protect exposed-machined surfaces and unpainted iron and steel as necessary with suitable rust-preventive compounds
12. Protect bearings and similar items with grease packing or oil lubrication
13. Handle and store steel plate, sheet metal, and similar items in a manner to prevent deformation
14. Exterior storage:
 - a. Provide substantial platforms, blocking, or skids to support fabricated products aboveground and to prevent soiling or staining. Cover products subject to discoloration or deterioration from exposure to elements, with impervious sheet coverings. Provide adequate ventilation to avoid condensation
 - b. Store loose granular materials on solid surface areas to prevent mixing with foreign matter
 - c. Provide surface drainage to prevent flow or ponding of rainwater
15. Equipment and materials shall not show any pitting, rust, decay or other deleterious effects of storage prior to final acceptance of Work
16. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to ensure products are maintained under specified conditions and free from damage or deterioration
 - a. Prepare stored materials lists with schedules of maintenance activities and frequency of activities required to maintain the quality of the equipment and the warranty from the manufacturer

- b. List dates and activities of storage requirements such as rotating moveable parts
- c. Update lists weekly and include in progress meeting agenda
- 17. Protect painted surfaces against impact, abrasion, discoloration or other damage:
 - a. Repaint any damaged areas with manufacturer provided touch-up paint
- 18. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation
- 19. Installed products stored prior to start-up:
 - a. Equipment and materials shall not show any pitting, rust, decay or other deleterious effects of storage when installed in the Work
 - b. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations, dust, dirt, water and paint. Remove when no longer needed

C. Handling

- 1. Provide equipment and personnel necessary to unload and handle equipment and materials, by methods to prevent damage or soiling to equipment and materials or packaging
- 2. Handle by methods to prevent bending or overstressing. Where lifting points are designated, lift components only at those points
- 3. Provide additional protection to surrounding surfaces as necessary to prevent damage

D. Maintenance of storage

- 1. Inspect stored equipment and materials on a scheduled basis
- 2. Verify that storage facilities comply with manufacturer's product storage requirements, including environmental conditions continually maintained
- 3. Verify that surfaces of products exposed to elements are not adversely affected; that any weathering of finishes is acceptable under requirements of Contract Documents
- 4. For mechanical and electrical equipment in long-term storage, provide manufacturers service instructions to accompany each item, with notice of enclosed instructions on exterior of package. Service equipment on a regularly scheduled basis.

E. Protection after installation

- 1. Provide substantial coverings as necessary to protect installed equipment and materials from damage from subsequent construction operations
- 2. Remove when no longer needed or as specified

1.11 MAINTENANCE MATERIALS

A. Spare Parts:

- 1. Store spare parts, wherever required by detailed technical specification sections, in accordance with the provisions of this paragraph
- 2. Tag all spare parts with permanent, labeled tags or packaging by equipment designation number and identified as to part number, equipment manufacturer, and subassembly component (if appropriate)
- 3. Spare parts subject to deterioration such as ferrous metal items and electrical components shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping

4. Unless otherwise specified, spare parts with individual weights less than 50 pounds and dimensions less than 2 feet wide, or 18 inches high, or 3 feet in length shall be stored in a wooden box:
 - a. Provide box with a hinged wooden cover and locking hasp
 - b. Hinges to be strap type
 - c. Paint the box and identify with stenciled lettering stating the name of the equipment, equipment numbers, and the words "spare parts"
5. Prepare and provide a neatly typed inventory of spare parts taped to the underside of the box cover

1.12 WARRANTY

- A. Warranty all equipment and materials against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, leakage, breakage or other failure
- B. Warranties that begin at the time of shipment, delivery or within a limited time period from date of shipment or delivery or any other qualification that does not conform to the definition of Substantial Completion are not acceptable
- C. Cost of all manufacturer warranties are considered as part of the Bid price

PART 2 PRODUCTS

2.1 MATERIALS

- A. Suitable for the intended service conditions
- B. Structural and miscellaneous fabricated steel in equipment shall conform to American Institute of Steel Construction (AISC) standards, except as otherwise specified

2.2 FABRICATION

- A. Design, fabricate, and assemble in accordance with the best modern manufacturing and shop practices
- B. Manufacture parts to standard sizes and gages
- C. Two or more items of the same type shall be identical by the same manufacturer and interchangeable

2.3 EQUIPMENT AND PRODUCT SELECTION

- A. General product requirements: Provide products that comply with the Contract Document, are undamaged, and unless otherwise indicated or specified, are new at time of installation
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect

2. Standard products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects
3. Continued availability: Where, because of the nature of its application, the Owner is likely to need replacement parts or additional amounts of a product at a later date, either for maintenance and repair or replacement, provide standard, domestically produced product for which the manufacturer has published assurances that the product and its parts shall be available to the Owner at a later date. A reasonable doubt regarding such future availability will be grounds for rejection of products other than named products
4. As specified in each applicable Specification Sections, Drawings, codes, standards, and regulatory agencies
5. Fabricated products:
 - a. Design, fabricate, and assemble products in accordance with best engineering and shop practices
 - b. Manufacture like parts of duplicate units to standard interchangeable sizes and gauges. Two or more items of same kind shall be identically made by the same manufacturer
 - c. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically accepted in writing by Owner
 - d. Ensure that material or equipment are not used for any purpose other than that for which it is designed or is specified
 - e. Labels and nameplates shall be provided where required by regulatory agencies or in accordance to state identification and essential operation data
6. Provide products of the same kind from a single source to the fullest extent possible

PART 3 EXECUTION

3.1 EXAMINATION

- A. Inspect equipment for signs of pitting, rust decay, or other deleterious effects of storage. Do not install any equipment showing such effects. Replace damaged equipment with identical new equipment

3.2 INSTALLATION

- A. Install all equipment, accessories and materials in accordance with the manufacturer's written recommendations unless otherwise specified in the individual equipment detailed technical specifications
- B. Each product shall be securely anchored in place except as required for proper movement and performance
- C. Each product shall be located and aligned with other Work
- D. Manufacturer's Instructions

1. Contractor shall obtain and distribute hard copies and electronic copies of manufacturer's instructions and recommendations to parties involved in installation including a copy to Engineer
2. Maintain one (1) set of complete instructions at job site during installation and until completion
3. Handle, install, connect, clean, conditions, and adjust products in accordance with such instructions and in conformity with specified requirements

3.3 ADJUSTING

- A. Perform all required adjustment tests, operation checks, and other startup activities required

3.4 CLEANING

- A. Perform under provisions of Section 01700 – Contract Closeout
- B. Repaint all painted surfaces which are damaged prior to final equipment acceptance to Owner's satisfaction
- C. Clean exposed surfaces and protect as necessary and required to prevent any damage or deterioration at the time of Substantial Completion

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Substantial completion
- B. Final acceptance
- C. Project record documents
- D. Closeout procedures
- E. Final cleaning
- F. Final adjustment of accounts
- G. Final application for payment

1.2 RELATED SECTIONS

- A. Section 00700 – General Conditions
- B. Section 01500 – Construction Facilities and Temporary Controls
- C. Section 01340 – Shop Drawings and Product Data

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Prior to requesting inspection for certification of Substantial Completion, complete the following and list exceptions in the request:
 - 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100% completion for the portion of the Work claimed as Substantially Complete
 - a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Price
 - b. If 100% completion cannot be shown, include a list of incomplete items, the value of incomplete Work, and reasons the Work is not complete. All items remaining outstanding on the Contractor's punch list shall include a projected date of completion and/or correction with an explanation of why such item is not presently completed
 - 2. Advise Owner of pending insurance changeover requirements
 - 3. Submit specific warranties, workmanship Bonds, maintenance agreements, final certifications, and similar documents

4. Obtain and submit releases enabling Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases
 5. Submit record drawings, instruction books and operating manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information
 6. Deliver tools, spare parts, extra stock, and similar items
 7. Make final changeover of permanent locks and transmit keys to Owner. Advise Owner's personnel of changeover in security provisions
 8. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes
- B. Inspection Procedures: On receipt of a request for inspection, Engineer will either proceed with inspection or advise Contractor of unfilled requirements. Engineer will prepare the Certificate of Substantial Completion following inspection or advise Contractor of construction that must be completed or corrected before the certificate will be issued
1. Engineering will repeat inspection when requested and assured by Contractor that the Work is Substantially Complete.
 2. Results of the completed inspection will form the basis of requirements for final acceptance

1.4 FINAL ACCEPTANCE

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required
 2. Submit an updated final statement, accounting for final additional changes to the Contract Price
 3. Submit a certified copy of Engineer's final inspection list of items to be completed or corrected, endorsed and dated by Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by Engineer.
 4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the Date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work
 5. Submit consent of surety to final payment
 6. Submit evidence of final, continuing insurance coverage complying with insurance requirements
- B. Reinspection Procedure: Engineer will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to Engineer.

1. Upon completion of reinspection, Engineer will prepare a certificate of final acceptance. If the Work is incomplete, Engineer will advise Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance
2. If necessary, reinspection will be repeated, but at the expense of the Contractor who will reimburse the Owner for these services by the Engineer

1.5 PROJECT RECORD DOCUMENTS

A. General

1. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours
2. Maintain on site, one set of the following record documents; record actual revisions to the Work:
 - a. Contract Drawings
 - b. Specifications
 - c. Addenda
 - d. Change Orders and other Modifications to the Contract
 - e. Reviewed shop drawings, product data, and samples
 - f. Field test reports
 - g. Construction photographs
3. Store Record Documents and samples separate from documents used for construction
 - a. Provide files and racks for storage of documents
 - b. Provide locked cabinet or secure storage space for samples

B. Record Drawings

1. Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings
2. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown
3. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings
4. Give particular attention to concealed elements that would be difficult to measure and record at a later date
 - a. Record information concurrently with construction progress
 - b. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Mark each document "Project Record" in neat, large, printed letters
 - c. Mark new information that is important to Owner but was not shown on Contract Drawings or Shop Drawings
 - d. Note related Change Order numbers where applicable
 - e. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set

- f. Upon completion of the Work, submit record drawings to Engineer for Owner's records
 5. Contract Drawings and approved Shop Drawings: Legibly mark each item to record actual construction, including:
 - a. Measured depths of elements of foundation in relation to finish grade or first floor datum
 - b. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvement
 - c. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
 - d. Field changes of dimensions and details
 - e. Changes made by Addenda or Change Order(s), if any
 - f. Details not on original Contract Drawings
 - g. References to related Shop Drawings and Modifications
- C. Record Specifications: Maintain one complete copy of the Project Manual including addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and Modifications issued in printed form during construction
 1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
 2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
 3. Note related record drawing information and product data.
 4. Upon completion of the Work, submit record Specifications to Engineer for Owner's records
- D. Record Product Data: Maintain one copy of each product data Submittal. Note related Change Orders and markup of record drawings and specifications.
 1. Mark record documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Site and from the manufacturer's installation instructions and recommendations.
 2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
 3. Upon completion of markup, submit complete set of record product data to Engineer for Owner's records
 4. Legibly mark and record at each Product section description of actual Products installed, including the following:
 - a. Manufacturer's name, product model, number, trade name and supplies
 - b. Product substitutions or alternates utilized
 - c. Changes made by Addenda, field order or change order
- E. Record Samples Submitted: Immediately prior to Substantial Completion, Contractor shall meet with Engineer and Owner's personnel at the Project Site to determine which Samples are to be transmitted to Owner for record purposes. Comply with Owner's instructions regarding packaging, identification, and delivery to Owner.

- F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and Submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records, and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to Engineer for Owner's records
- G. Maintenance Manuals: Contractor shall organize operation and maintenance data as specified in Section 01730
- H. Submit documents to Engineer with claim for final Application for Payment
- I. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes
- J. Make documents and samples available at all times for inspection by Engineer
- K. Label each document "Project Record" in neat, large printed letters

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 CLOSEOUT PROCEDURES

- A. General
 1. Comply with requirements stated in the Owner's General Conditions of the Contract and in these specifications for administrative procedures in closing out the Work
 2. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection
 3. Provide submittals to Engineer/Owner that are required by governing or other authorities
 4. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due
- B. Operation and Maintenance Instructions: Arrange for each installer of Equipment that requires regular maintenance to meet with Owner's personnel at Project Site to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
 1. Maintenance manuals
 2. Record documents
 3. Spare parts, materials and tools
 4. Lubricants and fuels
 5. Identification systems

6. Control sequences
 7. Hazards, hazardous chemicals data sheets
 8. Cleaning
 9. Warranties and bonds
 10. Maintenance agreements and similar continuing commitments
- C. As part of instruction for operating Equipment, demonstrate the following procedures:
1. Startup
 2. Shutdown
 3. Emergency operations
 4. Noise and vibration adjustments
 5. Safety procedures
 6. Economy and efficiency adjustments
 7. Effective energy utilization

3.2 FINAL CLEANING

- A. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion
 - a. Remove labels that are not permanent labels
 - b. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition
 - c. Wipe surfaces of mechanical and electrical Equipment. Remove excess lubrication and other substances
 2. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction
 3. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the Site and dispose of lawfully.
 - a. Where extra materials of value remaining after completion of associated Work become Owner's property. Dispose of these materials as directed by Owner

3.3 CONTRACTOR'S CLOSEOUT SUBMITTALS

- A. Evidence of Payment and Release of Liens: As specified in the General Conditions
- B. Final inspection reports by all regulatory agencies demonstrating the agencies' final approval
- C. At Contract close-out, deliver Record Documents to Engineer for the Owner
- D. Accompany Submittal with Transmittal Letter in Duplicate, Containing

1. Date
2. Project title and number
3. Contractor's name and address
4. Title and number of each Record Document
5. Signature of Contractor or his authorized representative

3.4 FINAL ADJUSTMENTS OF ACCOUNTS

- A. Submit a Final Statement of Accounting to Engineer
- B. Statement Shall Reflect All Adjustments to the Contract Sum
 1. The original Contract Sum
 2. Additions and deductions resulting from
 - a. Previous Change Orders
 - b. Deductions for uncorrected Work
 - c. Deductions for liquidated damages
 - d. Deductions for reinspection payments
 - e. Other adjustments
 3. Total Contract Sum, as adjusted
 4. Previous payments
 5. Sum remaining due

3.5 FINAL APPLICATION FOR PAYMENT

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

END OF SECTION

SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittals
- B. Format
- C. Content of each volume
- D. Manual for equipment and systems
- E. Instruction of Owner's personnel

1.2 QUALITY ASSURANCE

- A. Preparation of data shall be done by personnel
 1. Trained and experienced in maintenance and operation of the described products
 2. Completely familiar with requirements of this section
 3. Skilled as a technical writer to the extent required to communicate essential data
 4. Skilled as a draftsman competent to prepare required drawings
- B. Manuals for equipment systems shall be prepared by the equipment manufacturer or system supplier
- C. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract
- D. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications

1.3 SUBMITTALS

- A. Submit under provisions of Section 01340
- B. Manuals for equipment and systems
 1. Submit three (3) preliminary copies prior to the date of shipment of the equipment or system
 - a. Engineer will review
 - b. If acceptable, one (1) copy will be returned to Contractor, one (1) copy sent Owner, and one (1) copy retained in Engineer's file

- c. If unacceptable, two (2) copies will be returned to Contractor with Engineer's comments for revision and one (1) copy retained in Engineer's file. Resubmit three (3) revised preliminary copies for Engineer's review
 - d. No partial payments will be made for equipment and systems on hand or installed until preliminary manuals are submitted and acceptable
 - e. See Section 01340 for electronic submittal requirements, for the preliminary copy of the O&M manual an electronic submittal is allowable
- C. Submit three (3) final copies no less than 30 days prior to putting the equipment or system in service. If final manuals differ from accepted preliminary manuals, submit two (2) copies of any necessary supplemental material with instructions for insertion for conforming Engineer's and Owner's copies of preliminary manuals to final manuals
- 1. Engineer will compare with accepted preliminary manual
 - 2. If identical or otherwise acceptable, Contractor will be so notified. Two (2) copies will be transmitted to Contractor, three (3) copies will be held for later transmittal to Owner
 - 3. If not acceptable, four (4) copies will be returned to Contractor for revision or retained by Engineer and the necessary revision data requested from Contractor at Engineer's option
 - 4. No portion of the Work is substantially complete until final equipment and system manuals relating to that portion of the Work are accepted by Engineer
 - 5. Submit three (3) copies of any revisions found desirable during instruction of Owner's personnel with instructions for insertion for revising Owner's and Engineer's copies of manual
- D. Manual for materials and finishes
- 1. Submit two (2) preliminary copies 15 days prior to request for final inspection
 - a. Engineer will review
 - b. One copy will be returned to Contractor with comments, one (1) retained in Engineer's file
 - c. No final inspection shall be conducted until preliminary manuals are submitted
 - 2. Submit three (3) final copies, revised in accordance with Engineer's comments, within 10 days after final inspection
 - a. One copy will be transmitted to Contractor and two (2) copies retained by Engineer for later transmittal to Owner
 - b. No final payment shall be made until final manuals are submitted
 - 3. Additional requirements for specialized instruction of Owner's personnel are given in the detailed equipment specifications

1.4 FORMAT

- A. Prepare data in the form of an instructional manual for use by Owner's personnel
- B. Presentation of Information
 - 1. Size: 8 ½" by 11"
 - 2. Paper: 20 lb weight minimum, white, for typed pages

3. Text: Manufacturer's printed data or neatly typewritten
4. Drawings
 - a. Provide reinforced punched binder tab, bind in with text
 - b. Reduced to 11" by 17" and folded to 8 ½" by 11"
 - c. Where reduction is impractical, folded and placed in 8 ½" by 11" envelopes bound in text
 - d. Suitably identified on drawings and envelopes
5. Provide flysheets for each separate product or each piece of operating equipment
 - a. Provide typed description of product and major component parts of equipment
 - b. Provide indexed tabs, may be in color
6. Spine and cover: identify each volume with typed or printed title "OPERATION AND MAINTENANCE INSTRUCTIONS" preceded by the word. "PRELIMINARY" or "FINAL" as applicable. Final manuals to list information on the cover and the spine. List the following:
 - a. Title of project, reference Owner and project location as applicable
 - b. Identity of separate structure as applicable
 - c. Identity of general subject matter covered in manual and specification section number
7. As much as possible, assemble and bind material in the same order as specified

C. Binders

1. Preliminary manuals: Commercial quality permanent 3-ring or 3-post binders with durable, cleanable, hard plastic covers. GBC bound manual may be accepted upon review by Engineer
2. Final manuals: Commercial quality permanent 3-ring or 3-post binders with durable, cleanable, hard plastic covers with clear plastic cover and spine pockets suitable for title and cover inserts. Manufacturer's pre-printed binder may be accepted upon review by Engineer. "Deluxe Round Ring View Binder" as manufactured by Wilson Jones or accepted substitution
3. Final electronic manual: Provide one copy in digital format, all documents to be in native file format (Word, Excel, AutoCAD, pdf) or converted from native file format into Adobe pdf. Provide one copy on an electronic disk, CD or DVD

D. Arrange content by systems under section numbers and sequence of table of contents of this Project Manual

E. Provide tabbed flyleaf for each separate product and system, with typed description of product and major component parts of equipment

F. Electronic Manual: Compile in an electronic book format with Chapter bookmarks (equal to tabbed fly leaves) and OCR (optical character recognition) to allow for document searches.

1.5 CONTENTS OF EACH VOLUME

A. Neatly typewritten table of contents for each volume, arranged in a systematic order

1. Contractor, name of responsible principal, address and telephone number
2. A list of each product required to be included, indexed to the content of the volume
3. List, with each product, the name, address and telephone number of
 - a. Subcontractor or installer
 - b. Maintenance contractor, as appropriate
 - c. Identify the area of responsibility of each
 - d. Local source of supply for parts and replacement
4. Identify each product by product name and other identifying symbols as set forth in Contract Documents

B. Product Data

1. Include only those sheets which are pertinent to the specific product
2. Annotate each sheet to
 - a. Clearly identify the specific product of part installed
 - b. Clearly identify the data applicable to the installation
 - c. Delete references to inapplicable information

C. Drawings

1. Supplement product data with drawings as necessary to clearly illustrate
 - a. Relations of component parts of equipment and systems
 - b. Control and flow diagrams
2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation
3. Do not use Project Record Documents as maintenance drawings

D. Written text, as required to supplement product data for the particular installation

1. Organize in a consistent format under separate headings for different procedures
2. Provide a logical sequence of instructions for each procedure

E. Copy of each warranty, bond and service contract issued

1. Provide information sheet for Owner's personnel, give
 - a. Proper procedures in the event of fracture
 - b. Instances which might affect the validity of warranties or bonds

1.6 MANUALS FOR EQUIPMENT AND SYSTEMS

A. Provide an operation and maintenance manual for each item of equipment or system listed in the schedule of manuals in the quantity listed in the submittal schedule

B. Content for each of equipment and system as appropriate

1. Description of unit and component parts
 - a. Function, normal operating characteristics and limiting conditions
 - b. Performance curves, engineering data and tests
 - c. Complete nomenclature and commercial number of all replaceable parts
2. Operating procedures
 - a. Startup, break-in, routine and normal operating instructions

- b. Regulation, control, stopping, shutdown and emergency instructions
 - c. Summer and winter operating instructions, as applicable
 - d. Special operating instructions
 - 3. Maintenance procedures
 - a. Routine operations
 - b. Guide to "trouble-shooting"
 - c. Disassembly, repair and reassembly
 - d. Alignment, adjusting and checking
 - 4. Servicing and lubrication schedule
 - a. List of lubricants required
 - 5. Manufacturer's printed operating and maintenance instructions
 - 6. Description of sequence of operation by control manufacturer
 - 7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance
 - a. Predicted life of parts subject to wear
 - b. Items recommended to be stocked as spare parts
 - 8. As-installed control diagrams by controls manufacturer
 - 9. Each contractor's coordination drawings
 - a. As-installed color-coded piping diagrams
 - 10. Charts of valve tag numbers with the location and function of each valve
 - 11. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage
 - 12. Other data as required under pertinent sections of specifications
- C. Content for each electric and electronic item or system, as appropriate
- 1. Description of system and component parts
 - a. Function, normal operating characteristics and limiting conditions
 - b. Performance curves, engineering data and tests
 - c. Complete nomenclature and commercial number of replaceable parts
 - 2. Circuit directories of panelboards
 - a. Electrical service
 - b. Controls
 - c. Communications
 - 3. As-installed color-coded wiring diagrams
 - 4. Operating procedures
 - a. Routine and normal operating instructions
 - b. Sequences required
 - c. Special operating instructions
 - 5. Maintenance procedures
 - a. Routine operations
 - b. Guide to "trouble-shooting"
 - c. Adjustment and checking
 - 6. Manufacturer's printed operating and maintenance instructions
 - 7. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage
 - 8. Other data as required under pertinent sections of specifications

- D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel
- E. Additional requirements for Operation and Maintenance Data: The respective sections of specifications

1.7 INSTRUCTIONS OF OWNER'S PERSONNEL

- A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment and system
- B. Operation and maintenance manual constitutes the basis of instruction
 - 1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance

1.8 Additional requirements for specialized instruction of Owner's personnel are given in the detailed equipment specifications

- A. Equipment and systems Operation and Maintenance manuals shall be prepared for each of the following

<u>Specification Section</u>	<u>Type of Equipment or System</u>
13110	Cathodic Protection

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 02676

DISINFECTION OF WATER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Disinfection of potable water storage facilities, testing and reporting results

1.2 REFERENCES

- A. American Water Works Association (AWWA):
 1. B300 – Standard for Hypochlorites
 2. B301 – Standard for Liquid Chlorine
 3. C651 – Disinfecting Water Mains
 4. C652 – Disinfection of Water Storage Facilities
 5. C653 – Disinfection of Water Treatment Plants
- B. National Sanitation Foundation (NSF):
 1. Standard 60 – Drinking Water Treatment Chemicals – Health Effects

1.3 SUBMITTALS

- A. Test Reports: Indicate results comparative to specified requirements

1.4 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700
- B. Disinfection report; record:
 1. Type and form of disinfectant used
 2. Date and time of disinfectant injection start and time of completion
 3. Test locations
 4. Initial and 24 hour disinfectant residuals (quantity in treated water) in parts per million (ppm) or milligram per liter (mg/L) for each outlet tested
 5. Date and time of flushing start and completion
 6. Disinfectant residual after flushing in ppm for each outlet tested
- C. Bacteriological (Bac-T) report; record:
 1. Date issued, project name, and testing laboratory name, address, and telephone number
 2. Time and date of water sample collection
 3. Name of person collecting samples
 4. Test locations
 5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested
 6. Coliform bacteria test results for each outlet tested

7. Bacteriologist's signature and authority

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with AWWA C651, C652, C653, and the Colorado Department of Public Health and Environment (CDPHE)

1.6 REGULATORY REQUIREMENTS

- A. Conform to AWWA C651, C652, C653, as appropriate, and CDPHE regulations for performing the work of this Section

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS

- A. Calcium and sodium hypochlorite shall conform to AWWA B300 and B301
- B. Store hypochlorite in a cool, dark place away from flammable materials

PART 3 EXECUTION

3.1 CLEANING

- A. Verify that piping in work area and water storage tank has been cleaned and inspected
- B. Contractor work in tank is to be completed using “clean procedures”. Clean procedures require Contractor personnel to only have controlled access into tank wearing appropriate personal protective equipment and sanitized rubber boots prior to entry. No debris, foreign objects or materials to remain in tank after work is completed. Disinfection and filling of tank will then be completed by the Contractor

3.2 DISINFECTION

- A. Provide and attach required equipment to perform the work of this Section
- B. Tablet, continuous, or slug disinfection may be followed in accordance with AWWA C651
- C. The preferred method is continuous disinfection, summarized as follows:
 1. Inject treatment disinfectant, free chlorine in liquid form into piping system to obtain 50 to 80 ppm residual
 2. Bleed water from outlets to ensure distribution and test for disinfectant residual
 3. Maintain disinfectant in system for 24 hours
 4. If final disinfectant residual tests less than 25 ppm, repeat treatment
 5. Flush, circulate and clean until residual equal to that of incoming potable water or 1.0 mg/L is achieved

- D. Replace permanent system devices removed for disinfection

3.3 FINAL FLUSHING

- A. Maintain a flushing velocity of 2.5 feet per second in piping
- B. Collect chlorinated water for proper disposal and/or dechlorinate to less than 0.1 ppm free chlorine prior to discharge in accordance with State, County, and local regulations
- C. City of Thornton to provide and pay for flushing water

3.4 FIELD QUALITY CONTROL

- A. After final flush, and before tank is placed in service, collect water samples from representative points along the outlet and field test for chlorine residual
- B. Chlorine residual shall be within 50 percent of the chlorine residual prevailing in the source
- C. If initial disinfection fails to provide satisfactory samples, repeat disinfection until satisfactory samples have been obtained

3.5 TESTING AND ACCEPTANCE

- A. If any portion of the tank fails Bacteriological testing, the Contractor is responsible for repeating disinfection procedures until passing Bac-T test is obtained
- B. City of Thornton shall provide and pay for services of a certified laboratory to complete Bac-T testing
- C. Submit test reports per Section 01700

END OF SECTION

SECTION 09900

COATINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Coating of surfaces as noted on the Drawings and as specified herein, including:
 - 1. Interior steel tank surfaces including columns, tank walls, tank roof, overflow box, piping as noted, and roof beams.
 - 2. Existing surfaces remodeled or damaged during construction which presently have a finish. Refinish surrounding areas as required so touch-up not visible from 6 ft away.
 - 3. Existing surfaces exposed by removals where adjacent surface has a finish. Finish areas as required so touch-up not visible from 6 feet away.
 - 4. Existing interior lining: Sherwin-Williams Envirolastic AR520PW polyurea at thickness of 40-125 mils shall be completely removed prior to recoating. Removal shall be accomplished by ultra-high-pressure water jetting (UHPWJ) in accordance with SSPC-SP WJ-1/NACE WJ-1, followed immediately by abrasive blasé cleaning to sspc-sp 10 to achieve a 2-3 mil angular profile.

- B. Do not coat the following unless specifically noted otherwise:
 - 1. Factory-finished electrical motor control panels (MCC), main instrument panels (MIP), flow indicators, and related equipment.
 - 2. Moving parts of operating units, electrical parts, linkages, sensing devices, and motor shafts.
 - 3. Buried equipment and piping unless specifically noted.
 - 4. Stainless steel, chrome plate, copper, bronze, galvanized surfaces, and similar finished materials.

- C. Do not coat over any code-required labels such as UL and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

- D. Equipment manufacturers are responsible for surface preparation and coating of equipment, motors, and appurtenances. Equipment to be coated and coating system is identified in the equipment specification sections.

1.2 DEFINITIONS

- A. Definitions as used in Coating Schedule included herein.
 - 1. Coatings: Paint or heavy duty finishes for use on surfaces subject to interior and exterior exposure, submergence, high moisture, splash, or chemical environment, including primers, sealers, fillers, and intermediate and finished coats.
 - 2. Submerged P: Surfaces submerged in potable water plus 1 foot-6 inches above high water level.
 - 3. First Coat: Field primer, factory primer, or shop primer. When only one coat is required, first coat is the finished coat.

4. Second, Third, or Intermediate Coats: Successive finished coats applied over first coat.
5. DFT: Dry film thickness (mils/coat).
6. sfpg: Square feet per gallon (per coat).

1.3 REFERENCES

- A. MSDS: Material Safety Data Sheets
- B. ASTM: American Society for Testing and Materials
- C. SSPC: The Society for Protective Coatings
- D. OSHA: Occupational Safety and Health Administration
- E. NSF: National Sanitation Foundation
- F. AWWA: American Water Works Association D102-2017
- G. SSPC-SP WJ-1, WJ-2, WJ-3, WJ-4 – Surface Preparation by Water Jetting
- H. ASTM D8271 – Standard Practice for Use of Ultra-High-Pressure Water Jetting Equipment

1.4 SUBMITTALS

- A. Product Data:
 1. Manufacturer's literature including application recommendations and generic makeup for each coating scheduled.
 2. Factory or shop-applied primer manufacturer's literature including application recommendations and generic makeup shall be submitted with all material and equipment submittals. All primers shall conform to the requirements of this Section.
- B. Samples:
 1. Actual color samples available for each coating scheduled.
- C. Miscellaneous:
 1. Schedules:
 - a. Schedule of proposed coating systems within 60 days after Notice to Proceed.
 - b. Schedule of proposed coating systems shall contain all information as indicated in Coating Schedule included herein.
 2. Submit one copy of manufacturer's SDS, for each type of coating, to Engineer's field office for information. Contractor shall post copy of SDS on Site at all times coating is in progress.
 3. Coating Removal Plan outlining UHPWJ equipment, procedures, sequencing, containment, water supply, filtration, waste characterization, and disposal
- D. Submit in accordance with Section 01340.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. All coatings shall conform to OSHA requirements for allowable exposure to lead and other hazardous substances.
2. All coatings and associated solvents or thinners in contact with potable water or within potable water reservoirs shall be NSF 600 approved.
3. Comply with current state requirements for Volatile Organic Compounds (VOC's) for all coatings

B. Applicator Qualifications:

1. Engage an experienced field applicator with a minimum of 5 yrs successful experience and who has successfully completed coating system applications similar in material and extent to those indicated.

C. Single-Source Responsibility:

1. Provide coating material produced by same manufacturer for each system.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered to site in original containers with labels intact and seals unbroken.

B. Protect and heat or cool material storage location to maintain temperature ranges recommended by coating manufacturers, but not less than 55° F.

C. Avoid danger of fire. Oily rags and waste must be removed from buildings each night or kept in appropriate metal containers. Provide fire extinguishers of type recommended by coating manufacturer's in areas of storage and where finishing is occurring. Allow no smoking or open containers of solvent.

D. Empty containers shall have labels canceled and clearly marked as to use.

1.7 PROJECT / SITE CONDITIONS

A. Environmental Requirements:

1. Dry-heat and ventilate areas to obtain conditions recommended by coating manufacturer.
2. Relative humidity conditions as specified by coating manufacturer shall be adhered to.
3. No unprotected, unheated exterior coating shall be undertaken when cold, damp, foggy, or rainy weather appears probable, nor when the temperature of the substrate is below 55° F, unless approved in writing by coating manufacturer.
4. Maintain manufacturer's environmental requirements until coating is fully cured.
5. Apply no coating in areas where dust is being generated.
6. Testing and disposal of any waste and coating shall be the responsibility of the Contactor.

- B. Protection:
 - 1. Drop cloths shall be provided in all areas where coating is done to fully protect other surfaces.
 - 2. Remove hardware, accessories, plates, lighting fixtures, and similar items or provide protection by masking. Upon completion, replace items or remove protection and clean.
 - 3. Provide ventilation during coating evaporation stage in confined or enclosed areas in accordance with AWWA D102 and manufacturer's instructions.
- C. Upon Substantial Completion, remaining unused material will become property of Owner. Seal material as required for storage, mark contents with color, type, location, and shelf life, and store on Site where required by Owner. Provide minimum of two gallons of each system component and color used.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Tnemec.
- B. Sherwin-Williams.

2.2 MATERIALS

- A. Coatings shall meet surface burning characteristics as required by code and established by ASTM E84.
- B. Coating products of Tnemec or Sherwin Williams, listed in the Coating Schedule, are set as a standard of quality. Coatings of substitute manufacturers shall meet or exceed the characteristics of the products listed as established by the following ASTM standards; B117, C307, C413, C579, C580, C868, D870, D1014, D1653, D2047, D2240, D2370, D2794, D3363, D4060, D4141, D4541, D4585, D4587, and G85.
- C. The Contractor and top coat coating manufacturer shall verify the compatibility of their products with the various primers used on shop primed materials and equipment.
- D. All materials used within System 32 shall carry current NSF 600 certification.

2.3 COLORS

- A. Color shall be formed of pigments free of lead, lead compounds, or other materials which might be affected by presence of hydrogen sulfide or other gases likely to be present at Site.
- B. Colors shall be as selected by Owner from available options for system specified.
- C. Coat access doors of electrical distribution panels and grilles to match color of adjacent wall or ceiling surfaces.

- D. In areas scheduled for finishing, coat exposed piping to match color of adjacent or near surfaces.

2.4 THINNING, MIXING, AND TINTING

- A. Where thinning is necessary, only the products of the manufacturer furnishing the coating will be allowed. All such thinning shall be done in strict accordance with coating manufacturer's recommendations.
- B. Mix in accordance with manufacturer's recommendations.
- C. Each coat shall be slightly darker than preceding coat, unless otherwise noted. Tint undercoats similar to finish coat.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Materials removed and replaced to correct defects due to Work placed on unsuitable surfaces shall be at Contractor's expense.

3.2 SURFACE PREPARATION

- A. All surfaces to be coated shall be prepared as specified herein and in accordance with coating manufacturer's recommendations. The object shall be to obtain a uniform, clean, and dry surface.
- B. Quality of surface preparation described herein is considered a minimum. If coating manufacturer requires a higher degree of preparation, comply with coating manufacturer's recommendations.
- C. Where surface dryness is questioned, test with dampness indicating instrument. Do not apply coatings over surfaces where moisture content exceeds that permitted by coating manufacturer.
- D. Shop primed surfaces shall be scarified before applying top coats. Conform to top coat manufacturers recommendations.
- E. If recoat time between application of primer and second coat or between top coats is exceeded, scarify surface before applying coatings. Conform to top coat manufacturers recommendations.
- F. Workmanship for surface preparation shall conform to the following SSPC specifications:
 - a. Solvent Clean: SP-1.
 - b. Hand Tool Cleaning: SP-2.

- c. Power Tool Cleaning: SP-3.
 - d. White Metal Blast Cleaning: SP-5.
 - e. Commercial Blast Cleaning: SP-6.
 - f. Brush-Off Blast Cleaning: SP-7.
 - g. Pickling: SP-8.
 - h. Near-White Blast Cleaning: SP-10.
 - i. Power Tool Cleaning to Bare Metal: SP-11.
 - j. Surface Preparation by Water Jetting: SP-WJ-1.
 - k. Surface Preparation of Concrete: SP-13.
 - l. Industrial Blast Cleaning: SP-14.
 - m. Commercial Grade Power Tool Cleaning: SP-15.
 - n. Brush-Off Blast Cleaning of Non-Ferris Metals: SP-16
- G. Tank Interior Surface:
- 1. The tank interior has been coated with Sherwin Williams – Envirolastic AR520PW polyurea.
 - 2. Remove 100% of the interior tank coating by means of ultra-high-pressure water jetting to SSPC SP-WJ-1 Clean Condition
 - 3. Utilize automated six-nozzle rotary water-jetting crawlers on shell and floor; employ hand lances for rafters, stiffeners, and other tight geometries. Other approaches may be employed with approval by the Engineer.
 - 4. Maintain substrate temperature below 120 degrees Fahrenheit during jetting to mitigate flash rust.
 - 5. Within 12 hours of completing UHPWJ in any area, abrasive blast to SSPC SP-10 with and angular profile of 2-3 mils prior to priming.
 - 6. Surfaces shall exhibit SSPC Visual Flash-Rust Grade less than or equal to FR-02 before primer application; acceptance by third-party coating inspector is required prior to proceeding.
- H. Tank Exterior Surfaces where necessary:
- 1. Ferrous metal primed in the shop shall have all rust, dust, scale, and other foreign substances removed by abrasive cleaning conforming to SSPC SP-10. Cleaned metal shall be primed or pretreated immediately after cleaning to prevent new rusting.
 - 2. Ferrous metal not primed in the shop shall be abrasive blast cleaned in the field prior to application of primer, pretreatment, or coating. Blast cleaning shall conform to SSPC SP-10 for submerged service. Blast cleaning shall conform to SSPC SP-6 for non-submerged service.
 - 3. Prior to finish coating, primed areas that are damaged shall be cleaned and spot primed.
- I. Existing Surfaces:
- 1. Remove and replace or mask attachments if attachments are not to be coated.
 - 2. Remove surface contamination such as oil, grease, loose or defective coatings, mill scale, dirt, rust, mold, mildew, mortar, efflorescence, and sealers to assure sound bonding to tightly adhered old coatings. Glossy surfaces of old coatings shall be cleaned and dulled before overcoating.
 - 3. Sand surfaces and feather edges where chips have occurred.
 - 4. Cut out and fill cracks or other defects to match adjacent surface.

5. Exact nature of existing coatings is not known. Check compatibility of new coating by application to small area prior to starting coating. If lifting or other problems occur, notify Engineer for direction.
6. Comply with new coating manufacturer's recommendations for preparation of previously coated surfaces.
7. Prepare surfaces subject to submerged service as specified for new surfaces.

3.3 APPLICATION

- A. Surfaces shall be dry at time of application.
- B. The minimum surface temperature shall be 55°F and rising. Some coatings are modified so that they may be applied at lower temperatures, conform to manufacturer's recommendations.
- C. Apply in strict accordance with manufacturer's recommendations by brush, roller, spray, or other application method. The number of coats and thickness required is the same regardless of application method.
- D. Each coat shall be allowed to dry in accordance with manufacturer's requirements. Drying time shall be construed to mean "under normal conditions". Where conditions other than normal exist, because of weather or because of confined space, longer times will be necessary. Units shall not be put in service until coatings are thoroughly dry and cured.
- E. Surfaces to be coated that will be inaccessible in the completed work shall receive the final coat before enclosure.
- F. Coatings shall be applied to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, or other surface imperfections will not be acceptable. Areas cut-in by brush prior to rolling shall have uniform appearance in comparison with adjoining surfaces.
- G. Make edges of coating adjoining other materials or colors sharp and clean without overlapping.
- H. Crevices and other hard-to-apply areas shall be back-rolled/back-brushed in conjunction with application of field applied prime coat or intermediate coat. This includes, but is not limited to: between pipe flanges, pipe flange/barrel joints, equipment fittings, and other narrow openings.
- I. Finish edges of doors as specified for faces. Apply first finish coat on edges before fitting. After doors fitted and hung apply second finish coat.
- J. Manufacturer-Applied Coatings:
 1. Repair abraded areas on factory-finished items in accordance with equipment manufacturer's recommendations.
 2. Blend repaired areas into original finish.

3.4 FIELD QUALITY CONTROL

- A. Owner has retained the services of an AMPP Certified inspector to visit the Site throughout surface preparation and painting for product application quality assurance, and to determine compliance with manufacturer's instructions and these Specifications, and as may be necessary to resolve field problems attributable to, or associated with, the manufacturer's products furnished under this Contract.
1. The Inspection Agency for the work of this Section is S&S Coating Services, Inc., CO
 2. Contractor shall coordinate inspections with the inspection agency, provide at least a three day notice prior to start of any required inspections.
 3. The Contractor shall inform the Engineer and the inspection agency of the progress and the quality of the work through daily reports. Summarize test data, work progress, areas covered, ambient conditions, quality control inspection test findings, and other information pertinent to the coating system installation in daily reports to be submitted to the Engineer.
 4. The inspection agency shall perform site visits throughout the course of the surface preparation and coating installation. At a minimum, the site visits by the inspection agency shall be performed as follows:
 - a. Inspect all containers for coating type, temperature limitations, date of manufacture, and shelf life for acceptance.
 - b. Verify environmental conditions are in conformance with product data sheet limitations
 - c. Inspect and approve the surface preparation before application of prime coat.
 - d. Inspect and approve prime coat.
 - e. Inspect and approve finish coats.
 - f. VOC compliance of products used are in accordance with State regulations
 - g. Verify DFT of each coat and total DFT of each coating system are as specified using wet film and dry film gauges. DFT's shall be measured in accordance with SSPC-PA2.
 - h. For each of the inspection visits listed above, the inspection agency shall submit a letter to the Contractor citing the acceptance or non-acceptance of the work inspected. If there are non-acceptance issues the letter shall state the reasons for non-acceptance.
 5. Coating Defects:
 - a. Check coatings for film characteristics or defects that would adversely affect performance of coating systems.
 - b. Check exterior finish for film characteristics or defects that adversely affect appearance.
 - c. Check for holidays on steel immersion surfaces using a holiday detector in accordance with NACE SP0188-06.
 - d. Holidays shall be touched up by the Contractor at no additional cost to the Owner.
 6. Holiday Testing
 - a. Test interior submerged coated surfaces after the final coat has cured the minimum time recommended by the coating manufacturer using a high-voltage pulsed holiday detector in accordance with NACE SP0188 and ASTM D4787.

- b. Select and verify the test voltage in accordance with NACE SP0188, using $V=(DFT \times 125)$ volts but not less than 2500 volts nor more than 7500 volts.
 - c. Record all holiday, pinholes, or discontinuities; abrasive sand, solvent-wipe, and recoat per the manufacturer's instructions, then re-test until no holidays remain.
- B. Where coatings are to be applied at the Site, Engineer reserves the right to observe the Work. After surface has been prepared and before application of specified prime coat and each succeeding finish coat, Contractor shall provide three days notice to Engineer to allow the Engineer time to observe the Work. If notification is not provided, no credit for applied coat will be given and Contractor automatically assumes responsibility to recoat Work in question. Surfaces coated without notification shall be abrasive blast cleaned, re-prepared, and recoated at no addition cost to Owner.
- C. Examination of Work on Site by coating manufacturer's representative shall be performed when requested by Engineer.
- D. Sampling of Materials:
 - 1. Engineer reserves the right to select unopened containers of materials furnished for the Project and have the materials tested at an independent laboratory. Owner will pay for first tests.
 - 2. Retests of rejected materials and tests of replacement materials shall be paid for by Contractor.
 - 3. Remainder of contents of containers not required for testing will be returned to Contractor.
- E. Coverage:
 - 1. Before beginning Work, finish one complete room, space, surface, and item of each color scheme required, showing selected colors, finished texture, material, and workmanship. After approval, sample room, space, surface, and item shall serve as standard for similar Work.
 - 2. If coverage is not acceptable to Engineer, Engineer reserves the right to require additional application of coating at no extra cost to Owner.
- F. Refer to Section 01400 for additional information on inspections.

3.5 FINAL TOUCH-UP AND CLEANING

- A. Prior to Substantial completion, examine coated surfaces and retouch or refinish surfaces to leave in condition acceptable to Engineer.
- B. Remove masking, coatings, and other material from floors, glass, and other surfaces not scheduled to be coated.
- C. The tank interior shall be disinfected at the time of testing in accordance with AWWA Standard C652 and the requirements of Section 02676. Disinfection activities, Bac-T sampling, flushing, and any Owner-supplied water shall be coordinated with Owner prior to placing tank back into service.

3.6 COATING SCHEDULE

- A. Scheduled thickness or coverage rate is minimum as recommended by Tnemec and Sherwin-Williams. If other manufacturer is used, manufacturer's recommendations shall be followed, but in no case shall the thickness or coverage rate be less than scheduled.
- B. Coatings shall conform to the following schedule and coating manufacturer's

COATINGS SCHEDULE

System No.	Application	Tnemec Coating System	Sherwin Williams Coating System
9	Ferrous Metal, Cast Iron, Ductile Iron / Exterior Non-Submerged / Gloss	First Coat – Series 1 @ 3 mils DFT, touch-up primer prior to second coat Second Coat – Series V69 @ 5 mils DFT Third Coat – Series 1094 @ 3 mils DFT	First Coat – Macropoxy 646 @ 3 mils DFT, touch-up primer prior to second coat Second Coat – Macropoxy 646 @ 5 mils DFT Third Coat – Hi-Solids Polyurethane 250 Gloss @ 3 mils DFT
32	Steel/ Submerged P/ Interior	Interior Primer (All Surfaces): Apply 1 coat of Tnemec 91-H20 Hydro-Zinc at 2.0-3.5 mils DFT. Stripe Coat: Apply 1 additional stripe coat of V140 Pota-Pox Plus at 2.0-5.0 mils DFT. Work coating into and around all welds and erection scab marks 2nd Coat: Apply 1 coat of V140 Pota-Pox Plus at 4.0- 8.0 mils DFT. Finish Coat, All Areas: Apply 1 coat of V140 Pota-Pox Plus at 4.0-8.0 mils DFT. Total Dry Film Thickness: 10.5-15.5 mils	Primer: Corothane I Galvapac Zinc-rich Primer at 2.0-3.5 mils DFT Stripe Coat: SherPlate 600 @ 2.0-4.0 mils DFT to all weld seams, edges, crevices and corners 2nd Coat: SherPlate 600 (Beige) at 4.0-8.0 mils DFT Finish Coat: SherPlate 600 at 4.0-8.0 mils DFT. Total Dry Film Thickness: 10.5-15.5 mils

END OF SECTION

SECTION 13110

CATHODIC PROTECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Automatically controlled impressed current cathodic protection system including anodes, wiring, buoyancy floats, suspension rope, mounting brackets, anodes, and appurtenances for internal submerged surfaces of water storage tanks
2. Magnetic Flux Leakage (MFL) and Ultrasonic Thickness (UT) testing

1.2 REFERENCES

A. The latest revision of the following minimum standards shall apply to the materials and installation included in this Specification. In case of conflict, the most stringent requirements shall apply:

1. American Water Works Association (AWWA):
 - a. D104 – Automatically Controlled, Impressed Current Cathodic Protection for the Interior Submerged Surfaces of Steel Water Storage Tanks
2. National Sanitation Foundation / American National Standards Institute (NSF/ANSI):
 - a. Standard 61 – Drinking Water System Components – Health Effects
3. American Society for Testing and Materials (ASTM):
 - a. D 1248, Class C, Grade 5 – Polyethylene Plastics Extrusion Materials for Wire and Cable
4. National Association of Corrosion Engineer’s International (NACE):
 - a. Standard Practice SP0169 – Control of External Corrosion on Underground or Submerged Metallic Piping Systems.
 - b. Standard Practice SP0388 – Impressed Current Cathodic Protection of Internal Submerged Surfaces of Carbon Steel Water Storage Tanks
5. Insulated Cable Engineers Association (ICEA):
 - a. S-19-81 - Rubber Insulated Wire and Cable.
 - b. S-61-402 - Thermoplastic Insulated Wire and Cable.
 - c. S-66-524 - Cross-Linked-Thermoplastic-Polyethylene Insulated Wire and Cable
6. National Electric Manufacturers Association (NEMA):
 - a. Enclosures - Type 3, 3R, 3X, 4, and 4X
 - b. MR-20 - Cathodic Protection Rectifier Units
 - c. TC2 - Electrical Polyethylene Chloride (PVC) Conduit
 - d. TC3 - Polyvinyl Chloride (PVC) Fittings
7. National Electrical Code (NEC)
8. Underwriters Laboratory (UL)
9. American Petroleum Institute (API):
 - a. API 653 – Aboveground Storage Tank Inspector

1.3 DEFINITIONS

- A. Cathodic Protection: The electrical method of reducing or eliminating corrosion by making previous anodic areas on the structure surface a cathode by creating a DC current flow to the structure by use of a cathodic protection system
- B. Cathodic Protection Criteria: Conform to NACE SP0169
- C. Cathodic Protection Systems:
 - 1. Impressed current system: Utilizes an outside power source, usually a rectifier (that converts AC to DC current), and forces (impresses) current from a number of anodes (or grounded) through the environment to the structure to be protected
- D. Cathodic Protection Station (CPS): An impressed current cathodic protection installation location consisting of rectifier, anode(s), and leads.
- E. Electrical Isolation: The condition of being electrically isolated from other metallic structures and the environment as defined in NACE RP0286
- F. Ferrous or Metallic Structure: Pipe or structure made of steel or iron alloys and pipe or structure containing steel or iron as a principal structural material (such as steel, ductile iron, and cast iron)
- G. Foreign-Owned: Buried pipe or cable not specifically owned or operated by the Client
- H. Functional and Performance Testing:
 - 1. Testing that is necessary to demonstrate that the installed equipment and systems function as specified and operate in the manner intended
 - 2. Functional testing is a prerequisite to performance testing for equipment and systems that are specified to have a performance test
- I. Lead, Lead Wires, and Cable: Insulated copper conductor; the same as wire
- J. Magnetic Flux Leakage (MFL): An electromagnetic non-destructive testing technique used to detect corrosion and pitting
- K. Manufacturer's Representative: An employee of the manufacturer who is factory trained and knowledgeable in the technical aspects of their products and systems
- L. Raceways: Conduit, plastic or metal pipe, or electrical metallic conduit (EMT) for the casing of electrical or cathodic protection cables
- M. Structure-to-Reference Electrode Potential (also Structure-to-Reference Electrode Voltage): The difference in voltage (potential) between the subject metallic structure and the electrolyte in which it is buried or submerged, as measured to the standard specified reference electrode placed in contact with the electrolyte
- N. Ultrasonic Thickness (UT): A measuring instrument for non-destructive investigation of a material's thickness using ultrasonic waves

1.4 SYSTEM DESCRIPTION

- A. Design Requirements: Materials and equipment shall be new and the manufacturer's latest standard design that complies with the specification requirements conforming to NACE standards
- B. Performance Requirements:
 - 1. Show evidence of UL approval where UL standards exist, and product listings are available
 - 2. Conform to the National Electrical Code (NEC) and applicable federal, state, and local laws, codes, and regulations

1.5 SUBMITTALS

- A. Quality Assurance:
 - 1. Contractor's Qualifications:
 - a. Contractor shall have a minimum of ten (10) years of experience installing and servicing the type of system specified
 - b. Provide five (5) comparable projects completed in the last five (5) years for review and approval
 - 2. Cathodic Protection Specialist Qualifications:
 - a. Currently certified by NACE as a CP4 or Corrosion Specialist
 - b. Provide oversight of all activities to include observation and testing services during installation of cathodic protection system components associated with the project
 - 3. Welding Qualifications:
 - a. Welder's certifications shall be submitted in accordance with AWWA D100
 - b. All welders must have five (5) or more years of experience with tank welding and fabrication
 - c. Provide the qualified welding procedure in accordance with ASME Section IX for the processes and positions utilized
 - 4. Manufacturer's Qualifications:
 - a. Regularly engaged on a full-time basis in the manufacture of products in this Section for a minimum of 5 years
 - b. Manufacturer's catalog cuts for all materials. Cross-out or delete irrelevant data
 - c. Include manufacturer's name and provide sufficient information to show that materials meet the requirements of the Drawings and Specifications
 - d. Include manufacturer procedures and installation instructions applicable to each installed component
 - 5. Magnetic Flux Leakage (MFL) and Ultrasonic Thickness (UT) Qualifications:
 - a. Currently certified as an API 653 Aboveground Storage Tank Inspector.
 - b. Completed 40-hour MFL equipment training course meeting API 653 Annex G and SNT TC1A standards.
 - c. UT Technician must be certified to a Level II or higher.
 - 6. Field Supervision:
 - a. Provide a superintendent or foreman to supervise the construction site
 - b. Currently certified by NACE as a CP1 or higher
 - c. Minimum of 2 years of experience in corrosion control
 - 7. Shop Drawings:

- a. Indicate wiring diagrams, connection and anode details, location of anodes and floats, rectifier wiring based on design requirements of project
- 8. Project Record Documents:
 - a. Provide test plan for functional and performance testing of each installed CPS
 - b. Copies of field-collected data, including:
 - 1) As-built and record drawings of installation and construction of CPS; show accurate location and type of anodes, wires, conduits, AC service drop, rectifier, pipe connections, and junction boxes.
 - 2) Functional and performance testing results
 - c. Operation and Maintenance Data:
 - 1) Provide manufacturer details and procedures for periodic testing, operation, and maintenance of each installed CPS

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Coil the anode wires and secure and package the anode in crates as required to prevent damage during shipping.
- B. Ensure that the wire is not damaged and that the anodes or lead connection at the anode end are not physically stressed.
- C. If anode or wires are damaged, replace the complete anode.
- D. Cathodic Protection Material:
 - 1. Store off the ground
 - 2. Protect against weather, condensation, and mechanical damage
 - 3. Handle with care. Do not sharply bend or tightly coil the wire
 - 4. Replace equipment or materials damaged in shipment or installation
 - 5. Immediately remove damaged materials from the project site
 - 6. Reference electrodes:
 - a. Do not allow to freeze
 - b. Store in a protected area
 - c. Utilize before shelf life expires

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Use of the manufacturer's name and model or catalog number is for the purpose of establishing a standard of quality and the general configuration desired.
- B. Substitutions: As approved by engineer.

2.2 SUPPLIERS

- A. Supplier: Farwest Corrosion Control, Denver, CO.
- B. Submit alternate suppliers for approval by engineer.

2.3 MATERIALS

A. IR-Free Auto Potential Controlled Rectifier:

1. Sources: IR-Free “W” series Water Tank Line by Universal Rectifier
2. Mount a permanent means of identification such as an engraved name plate on the interior
 - a. List the manufacturer’s name, model number, year manufactured, serial number, and AC and DC electrical input and output electrical outlet ratings
3. Description:
 - a. IR-Free auto potential with secondary manual control to provide adjustable current output to maintain tank to water potential within +/- 25 mV of set potential
 - b. NEMA 4x enclosure with UV protection
 - c. Single phase, bridge type with silicon stack, capable of operation at 110% of the rated input/output without damage to the components
4. Provide:
 - a. AC input of 120 volts, single phase, 60Hz and a suitably sized magnetic type circuit breaker on the front of the panel.
 - b. Capable of varying the output from 1 (1%) to 100 percent (100%) of its rated capacity. Fine and course secondary taps with output controlled by a minimum of 18 evenly divided transformer tap settings; arrange in consecutive order.
 - 1) If dual anode circuit, provide rectifier with separate circuit (P2, P3 ...) for each anode ring controlled by a 22 ohm, 50 Watt rheostat
 - c. Meters for volts, amps, and potential
 - d. Analogue dial to set IR-Free potential
 - e. Provide separate reference cell terminals with toggle switches for each electrode installed within the tank
 - f. Lighting protection devices on both AC output and DC output
 - g. Proper sized pedestal for mounting
 - h. Lockable
 - i. Rectifier sizing:

Location	Volts	Amps
Cherokee 4MG Tank	12	10

5. Rectifier transformer:
 - a. Separate and secondary type
 - b. Minimum efficiency: 95%
 - c. Meet the requirements of NEMA and UL
 - d. Transformer insulation: Rated for a minimum of temperature 130°C with the actual hottest spot temperature at the rated conditions not to exceed 100°C
6. Meters and shunt:
 - a. Meters:
 - 1) Combination DC voltage current
 - 2) D’Varsonal movement type
 - 3) Accurate to within 2% of actual voltage and current output
 - 4) Tested and calibrated at the factory
 - 5) Test in the field for accuracy

- 6) Have inaccurate meters replaced by the manufacturer
 - 7) Able to measure the rectifier output plus 25%
 - b. Shunt:
 - 1) Internal panel mounted
 - 2) Holloway type
 - 3) In series with ammeter
 - 4) Clearly identify shunt voltage and amperage
 - 5) Provide individual shunts for each anode circuit (P1, P2 ...) and a total AC output shunt
 - 7. Rectifier panel board:
 - a. Mount rectifier meters, shunt, AC circuit breaker, taps, AC and DC fuses, and DC output terminals
 - b. Non-metallic
 - c. Construct of sufficient thickness to withstand shipping and operational stresses
 - d. Locate at the front of the rectifier to allow access for testing and adjustment
 - 8. Rectifier DC terminals: Solderless lug type
 - 9. Tap studs, tap bars, nuts, and washers: Suitably sized brass, bronze, nickel, or tin-plated copper
 - 10. Clearly engrave or identify the polarity of the rectifier DC terminals, fine and course transformer tap numbering, meters, terminal connections, and fuses with a permanent marking system on the rectifier panel; stick on labels or tape are not acceptable
 - 11. Provide an enclosure for the transformer, AC circuit breaker, rectifier stacks, lighting arrestors, DC output meters, and wiring connections:
 - a. Material: Diamond Shield with double UV protection
 - b. Air-cooled
 - c. Meet the requirements of NEMA 4x
 - d. Suitable ventilation for adequate cooling of the rectifier by natural air convection
 - e. Provide:
 - 1) Hinged door on the front to allow access
 - 2) Stainless steel latches and a hasp for padlocking
- B. Remote Monitoring Units:
- 1. Sources: Pipeline Watchdog Product Line by Elecsys
 - 2. Remote Monitoring Units for internal CP system on tank:
 - a. Watchdog VIPx
 - b. Confirm telemetry with manufacturer if a satellite or cellular unit is required
 - c. Include systems installation accessory kit from manufacturer
 - d. Provide AC step down transformer and jumper cables
 - 3. Remote Monitoring Units for external CP system on tank:
 - a. Watchdog Scout Remote Monitoring with interruption
 - b. Confirm telemetry with manufacturer if a satellite or cellular unit is required
 - c. Include systems installation accessory kit from manufacturer
 - d. Provide AC step down transformer and jumper cables
- C. AC Power Service: To be provided by others
- D. Impressed Current Anodes

1. Material: Mixed metal oxide of $\text{IrO}_2/\text{Ta}_2\text{O}_5$ coated titanium wire of diameter 0.062 in with a resistance of $75,527 \mu\Omega/\text{ft}$
 2. Twenty (20) year design life
- E. Pressure Entrance Fitting:
1. Minimum 1-inch NPT, 3,000 psi steel coupling
 2. Sized to accommodate anode and reference lead wires at the base of the tank
 3. Manufactured to prevent leakage through the fitting and prevent water migration through the wire insulation
- F. Reference Electrodes:
1. Sources: GMC Electrical Staperm, Model CU-2-FW
 2. Minimum No. 14 AWG 7 strand, copper conductor with RHW / USE-2 insulation (yellow)
 3. Copper-Copper Sulfate electrode with minimum service life of 20 years
 4. Electrode to lead wire connection to be encapsulated to prevent water migration
- G. Anode Suspension System:
1. Rope: 5/16" Polyester Braided Rope
 2. Anchors: 3/8" carbon steel rolled anchors
- H. Grounding lugs and clamps: Burndy
- I. Thermite Weld Materials: Erico Cadweld Plus
- J. Thermite Weld Caps: Royston Handy-Caps IP
- K. Paints and Coating: Obtain approval from Owner on acceptable systems
- L. Conduit, Locknuts, and Straps:
1. Install above-grade conduit, fittings, and wires in rigid hot-dipped galvanized steel conduit, flexible liquid-tight metallic conduit, or UV rated polyvinyl chloride conduit, as indicated on Drawings.
 2. Use intermediate threaded metal conduit, including couplings, elbows, nipples, and other fittings, hot-dipped galvanized that meet the requirements of UL and the NEC.
 3. Heavy wall, rigid, PVC conduit:
 - a. Schedule 40
 - b. UL listed for concrete encasement, underground direct burial, concealed, and direct sunlight exposed usage.
 - c. Use conduits, couplings, elbows, nipples, and other fittings that meet the requirements for NEMA TC2 and TC3, Federal Specification W-C-1094, UL, NEC, and ASTM specified tests for intended use.
 4. Flexible metal conduit:
 - a. UL listed.
 - b. Liquid-tight flexible metal conduit consisting of galvanized steel flexible conduit covered with an extruded PVC jacket and terminated with nylon bushings with steel or malleable iron body and insulated throat and sealing O-ring.
 5. Locknuts, two-hole straps, and other miscellaneous hardware: Hot-dipped galvanized in accordance with ASTM A153.

6. Conduit bushings: Threaded plastic or plastic-throated galvanized steel fittings.
7. Plastic Conduit for Buried Cathodic Protection Cables:
 - a. Diameter: Sized to match application
 - b. Schedule 40 polyethylene (PE) or polyvinyl chloride (PVC) plastic pipe

M. Wire:

1. Conform to the applicable requirements of ICEA S-19-81, ICEA S-61-402, and S-66-524
2. Cathodic protection wires and cables: Insulated stranded copper wire
3. Wire size, type, and insulation type: As specified in this Section and as depicted on Drawings
4. Anode Lead Wires:
 - a. Minimum No. 10 AWG 7 strand, copper conductor with RHW/XLP insulation (black)
 - b. Length: Sufficient to reach the pressure entrance fitting or rectifier without splicing additional wire
 - c. For single anode circuits, attach a lead wire to each end of the anode wire and encapsulate splice in waterproof seal or encasement
 - d. For multiple anode circuits, attach a single lead wire to one end of each anode wire and encapsulate splice in waterproof seal or encasement
5. Reference Lead Wires:
 - a. Minimum No. 14 AWG 7 strand, copper conductor with RHW/XLP insulation (yellow)
 - b. Length: Sufficient to reach the pressure entrance fitting or rectifier without splicing additional wire
 - c. Label each reference lead wire based on location within the tank
6. Structure Lead Wires:
 - a. Minimum No. 8 AWG 7 strand, copper conductor with HMWPE insulation (blue)
 - b. Length: Sufficient to reach the rectifier without splicing additional wire
 - c. Install a minimum of two (2) structure leads with one routed to the negative terminal of the rectifier and the second lead routed to the structure terminal on the IR-Free Auto Potential Controller
7. AC wire to supply power to rectifier:
 - a. Single conductor, soft drawn copper
 - b. Minimum No. 10 AWG or larger as sized in accordance with (NEC) to match the maximum rated rectifier power requirement
8. Compression Connectors for Splicing:
 - a. "C" taps made of conductive wrought copper
 - b. Sized to fit the wires being spliced
 - c. Apply compression connectors the proper crimp tool and die recommended by the manufacturer for the wire and the tap connector size; in-line "butt" type wire splice connectors are not acceptable
9. Wire Splice Insulation Kits:
 - a. Tap Splice insulating kit for wire insulation repair; 3M Company Scotchcast 90-B1
 - b. In-line splice insulating kit for insulation repair: 3M Company Scotchcast 82-A1
10. Electrical Splicing Tape:
 - a. Sources: Scotch 130C and Scotch 33+ tape as manufactured by 3M Products.

- b. 30 mil linerless rubber high voltage splicing tape and 7 mil vinyl electrical tape suitable for moist or wet environments.

PART 3 EXECUTION

3.1 GENERAL

- A. Notify Engineer 48 hours prior to the installation of the cathodic protection system. Engineer or Owner must visually review installation of the cathodic protection system unless otherwise authorized
- B. Contractor is responsible for providing confined space entry, lighting, temporary AC power, ventilation (forced air), atmospheric hazard testing and monitoring, scaffolding, ladder safety, fall protection, and all other mechanisms required to safely complete this work
- C. Owner will coordinate and complete tank outage, hatch opening / removal, and installation of AC power to rectifier units
- D. Complete anode assembly, wire connections, splices, anode placement, electrode installations, and working operations during daylight conditions
- E. All components of the cathodic protection system to be installed in the manner and at the locations shown on the drawings unless otherwise directed
- F. Welding, cutting, and coating shall be in accordance with AWWA Standards D100, D102, and D105
- G. Welding of steel coupling and anchors for horizontal anode suspension and rectifier mounting bracket to be performed prior to coating of tank surfaces
- H. Perform MFL testing and UT thickness testing of tank bottom.
- I. Inspect materials and equipment prior to installation. Replace defective materials and equipment.
- J. Do not Cadweld or utilize open flame or torches in areas of flammable vapors or airborne particles where a fire or explosion could result.
- K. Install and work around above grade and buried AC power lines and pipelines with extreme care; follow the minimum separation distances in accordance with company requirements and regulations.

3.2 MFL AND UT TESTING

- A. Testing agencies
 1. Premier NDT Services LLC., Farmington, NM
 2. Mistras Group, Longmont, CO
 3. Submit alternate firms for approval by Engineer

- B. Prepare tank bottom for MFL scanning and UT follow-up testing.
 - 1. Remove standing water, sludge, sand, dirt, debris, loose coating, etc. The dirtier and rougher the tank bottom surface, the more background ‘noise’ that is generated which can interfere with the MFL and UT testing.
 - a. If the existing coating is disbonded, peeling, missing, or not in a suitable condition to perform the MFL and UT testing, the existing coating system shall be removed prior to conducting any testing. This includes cleaning and removing any media leftover from sandblasting or other items that could interfere with the MFL and UT testing.
 - b. If coating is tightly bonded and still intact, the MFL and UT testing may be performed before the existing coating system is removed. Remnants of tightly adhered coating will not interfere with the scan.
 - 1) Of the two methods listed above, it is preferred that the coating system be fully removed from the tank bottom and at all welds to conduct a more thorough inspection. The Engineer will inspect the condition of the tank bottom and determine if coating is to be removed prior to testing.
 - 2. A door sheet opening may be required to transport testing equipment into the tank.
 - 3. Cover all pipe openings or other fall hazards and ensure no water, dirt, debris, etc. can enter the tank and interfere with the MFL and UT testing.
 - 4. Provide proper lighting and ventilation.
 - 5. If confined space requirements apply, provide attendant and other requirements as needed.
- C. Perform MFL scan of entire tank bottom and determine areas requiring UT testing follow-up.
- D. Conduct UT testing based on MFL indications. Obtain a minimum of 5 UT readings per bottom plate to verify nominal thickness. Mark locations with wall loss readings and affected area.
- E. Visually inspect and collect dimensions of bottom components and welds. Document inspection with high resolution photographs.
- F. Provide CAD drawings of tank bottom showing bottom plates, nozzles, roof supports, etc.
 - 1. Differentiate wall loss between soil side or product side as needed.
- G. Provide a final report in PDF format.
 - 1. Detail bottom plate deficiencies with remaining plate thickness. Clearly identify minimal and nominal plate thicknesses based on inspection results.
 - 2. Provide estimated remaining life of tank bottom and critical zone (within 3” of shell) and corresponding rate of corrosion before any repairs.
 - 3. Provide up to three (3) minimum remaining thickness calculations based on Engineer provided inspection intervals along with repair recommendations to meet these intervals.

3.3 INSTALLATION

- A. All electrical work in accordance to National Electrical Code

- B. Install lead wires to prevent damage for abrasion
- C. Lead wires and connections shall be waterproof. Test system to ensure there are no short circuits between positive lead wire and the tank structure.
- D. Provide only one (1) electrical splice within the tank for each reference electrode
- E. Coordinate mounting location of rectifier at a convenient (eye-level) height above grade with Owner
- F. All anode-to-header cable connections to be sealed using epoxy sealing kits around the anode/cable splices to prevent water migration
- G. All cord to cord connections shall be tied and encapsulated
- H. All exterior wiring to be insulated and run within conduit
- I. Rectifier:
 - 1. Provide rectifier, entrance, switch, and electrical hardware
 - 2. Conform to NEC electrical codes, local utility company requirements, permitting agencies, and applicable codes and standards
 - 3. Installation and locations as shown on Drawings
 - 4. Mounted to allow unobstructed access to and full opening of rectifier access doors for testing, maintenance, and repair
 - 5. Submit location adjustments for review
 - 6. Install level and plumb
 - 7. Install rectifier cables in rigid galvanized steel conduit or PVC
 - 8. Terminate conduits with plastic-throated conduit bushings
 - 9. Identify with a stamped identification tag permanently attached in a visible location on the outside of the rectifier housing
 - 10. Clearly identify anode, reference, and structure leads in the rectifier case and boxes
 - 11. Install insulated bushings and insulating throat connectors on the ends of rigid metallic conduit that terminate in remote monitors and rectifier cabinets
- J. Remote Monitoring Units:
 - 1. Provide remote monitoring unit, terminals, wiring, transformers, and mounting hardware
 - 2. Conform to NEC electrical codes, local utility company requirements, permitting agencies, and applicable codes and standards
 - 3. Installation and locations as shown on Drawings
 - 4. Mounted to allow unobstructed access to and full opening of access doors for testing, maintenance, and repair
 - 5. Submit location adjustments for review
 - 6. Install level and plumb
 - 7. Install RMU cables in rigid galvanized steel conduit or PVC
 - 8. Terminate conduits with plastic-throated conduit bushings
 - 9. Clearly identify volts, amps, reference, and AC power leads in the RMU case
 - 10. Install insulated bushings and insulating throat connectors on the ends of rigid metallic conduit that terminate in remote monitors and rectifier cabinets

K. Conduits and Junction Boxes:

1. Wires Installed Above Grade:
 - a. Install in rigid hot-dipped galvanized steel conduit, rigid PVC, or flexible liquid-tight steel conduit and fittings
 - b. Secure with double hole conduit straps with wood screws on wood bolts and expansion shields on concrete or brick, toggle bolts on hollow masonry units, and machine screws or welded, threaded studs on steelwork
2. Wires Installed Below Grade: Install in rigid PVC conduit and fittings
3. Mount boxes and exposed conduit plumb and level
4. Install in a secure, substantial manner by attachment to the appropriate steel post, channel, service pole, building structure, or structural member
5. Threaded studs driven in by powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields
6. Secure conduits entering cabinets, junction, or terminal boxes with double galvanized locknuts, one on the inside and one on the outside of the box and with bushings
7. Size conduit in accordance with appropriate codes and such that conductors may be drawn in without injury or excessive strain
8. Open no more knockouts in box than required
9. Seal unused openings
10. Install to prevent water from entering the conduit or the box
11. Install insulated bushings and insulating throat connectors on the ends of rigid metallic conduit that terminate in test stations, junction or terminal boxes, and rectifier cabinets
12. Make conduits watertight and free of obstructions
13. Ream conduits, remove burrs, and clean the conduit interior before introducing cables or pull wires
14. For plastic conduits, use factory made elbows for bends 30° or larger
15. Make no bends in flexible conduit that exceed the allowable bending radius of the cable to be installed or that significantly restricts conduit flexibility
16. Solvent weld plastic conduit joints with solvent that is recommended by the conduit manufacturer
17. Follow the manufacturer's written instructions and provide watertight joints
18. Provide expansion joints as required or as recommended by the conduit manufacturer
19. Use acceptable plastic terminal adapters and female adapters when joining plastic conduit to metallic fittings or conduit

L. Buried Conductors:

1. Install structure wires from the rectifier directly to the tank via a grounding lug/clamp or thermite weld as shown on Drawings
2. Install anode positive wires and reference leads from the rectifier to the pressure entrance fitting as shown on Drawings
3. Apply red electrical tape to the positive lead wire a maximum of 3 inches from the positive rectifier connection for identification purposes
4. Bury cathodic protection cables and wires a minimum of 18 inches below finished grade
5. Only splices shown on Drawings or approved by the Engineer are permitted on rectifier leads and anode header wires
6. Insulation on wires shall be free of cut or abraded areas

7. Avoid damage to existing structures, pipelines, and utilities during the trenching process
8. Cathodic protection cable trenches:
 - a. In a general location and route as shown on the Drawings
 - b. Modify location to minimize possible damage to existing structures; obtain approval for modification
 - c. Uniform depth and width, level, smooth, and free of any sharp objects
 - d. Hand trenching may be required in some areas to avoid damage to existing structures
9. Warning Tape:
 - a. Bury approximately 6 to 12 inches above underground cathodic protection cable
 - b. Align parallel to and within 2 inches of centerline of conduit or cable run

M. Conductors in Boxes:

1. Do not damage wire, insulation, or conduit during the installation process
2. Route and maintain sufficient slack in cables and wires to prevent the conductor from being unduly stressed, damaged, or broken during installation or backfill operations
3. Do not exceed the cable manufacturer's recommendations for maximum pulling tensions and minimum bending radii
4. Where a pulling compound is used, use only a UL listed compound compatible with cable outer insulation and the conduit type involved
5. Wires:
 - a. Installed in continuous length, free of splices, except those approved by Engineer or as depicted on Drawings
 - b. Insulation: Free of cut, damaged, or abraded areas
 - c. If field conditions dictate that a splice is required or wire is damaged, repair splices or damage to wire insulation at the discretion of the Engineer
 - d. Replace wire and insulation with major damage
 - e. Splice and wire insulation repair must be approved
6. Arrange wiring neatly in the rectifier, conduit, and the junction or terminal box; cut to proper length; remove surplus wire; and attach the terminal or connect to the rectifier terminal as specified
7. Provide cathodic protection cables and reference electrode wires with sufficient slack and looped or coiled at the pipeline and the boxes to prevent wire from being unduly stressed or broken during backfilling operations

N. Welding:

1. Only certified and pre-approved welding procedures are allowed
2. All new materials must match the original thickness and type of tank materials
3. The edges or surfaces of the pieces to be joined by welding shall be prepared by flame cutting, plasma arc cutting, arc gouging, machining, shearing, grinding or chipping and shall be cleaned of detrimental oil, grease, scale and rust. The edges of the pieces may have a protective coating applied to them which need not be removed before they are welded unless specifically prohibited by the welding procedure
4. Field and shop welding may be done by the shielded metal arc welding process, the gas metal arc welding process, and the flux core arc welding process
5. Plates and component members of the tank shall be assembled and welded following erection methods which result in a minimum of distortion from weld shrinkage.

Surfaces to be welded shall be free from loose scale, slag, heavy rust, grease, paint and other foreign material

6. The contractor shall remove weld of slag, spatter, burrs and other sharp or rough projections. The surface of the weld shall be suitable for subsequent cleaning and painting operations
7. Full penetration butt-welded joints shall be inspected using the radiographic examination method. The number and location of the radiographs and the acceptance criteria shall be as required by AWWA D100 or per Owner requirements
8. In order to assist in the maximization of the paint's lifecycle, all welds on the tank exterior shall be ground smooth and blended to a NACE-D profile. All welds on the tank interior shall be ground smooth and blended to a NACE-D profile. Welds on the interior dry support column can remain in an as-welded condition but must have a profile adequate for the specified paint system. Engineer and/or Owner reserves the right to provide third-party inspection to ensure compliance to all welding requirements

O. Re-coating and Touch-ups:

1. Coating systems shall match original color and specifications for each tank
2. Fast cure (<48 hrs) coating systems shall be applied to tank interiors to allow tank to be returned to service without substantial delay if required
3. Field Surface Preparation: After erection and prior to field touch-up priming, all surfaces shall be spot cleaned as required to remove all surface contamination including oil, grease, dust, dirt and foreign matter. Weld slag, weld spatter and other sharp or rough projections shall be removed. All rusted, abraded and unpainted areas shall be hand tool cleaned in accordance with SSPC SP-2
4. Irregular surfaces, including weld seams, bolt heads and nuts, corners and edges, shall be stripe coated by brush or roller after the field spot prime coat has been applied and prior to application of the first full field coat.
5. The total DFT range of each paint system shall be 8.0 to 12.0 mils minimum

3.4 FIELD QUALITY CONTROL

- A. Installation is not complete until AC and DC wiring is complete and the rectifier is capable of operating at the full rated capacity
- B. Leave AC to the rectifiers off at all times and all rectifiers turned off at all times during the installation of cathodic protection system
- C. Keep AC power, entrance switches, and rectifier enclosures secured with padlocks and safely turned off, until operation tests are performed with the Engineer
- D. Preservation, restoration, and cleanup:
 1. Keep the site neat and orderly at all times
 2. Remove excess equipment and materials daily when required by prevailing conditions
 3. Confine operations to tank and facility easements
 4. Restore the site to a condition equivalent to the original condition to the satisfaction of the Engineer and the Owner
 5. Upon completion of Work, remove materials, scraps and debris from the premises and from the interior and exterior of devices and equipment

6. Touch up scratches, scrapes, and chips in the interior and exterior surfaces of devices and equipment with finishes matching as nearly as possible the type, color, consistency, and type of surface of the original finish
7. If extensive damage is done to equipment paint surfaces, completely refinish to equal or better than factory finish
8. If subsequent trench or undercrossing settlement, cracking, subsidence, or other indication of failure occurs within the warranty period, promptly repair or replace at the CONTRACTOR's sole expense

E. Testing:

1. Following installation energize, test, and adjust as required
2. Field test system by conducting IR drop-free potential measurements. The instant-off measurement is the most commonly used measurement for this test.
3. Correct all Work found to be defective or incorrectly installed at the sole expense of the Contractor
4. Functional Testing:
 - a. When construction is complete, notify the Engineer and provide a minimum of 2 weeks' notice that the installation is ready to be turned on
 - b. Testing to be overseen by the CONTRACTOR's Cathodic Protection Specialist
 - c. Energize installation
 - d. Operating Test: Conduct to demonstrate that equipment and material are installed correctly and operating properly for initial approval
 - e. Demonstrate operation of the rectifier from 0% to 100% of the rated capacity
 - f. Test across terminals and shunts to confirm all portions of CPS are functioning correctly
 - g. For IR-Free auto potential rectifiers, use a potential set point of -0.950 V to a copper-copper sulfate reference electrode (CSE) in contact with stored water and submerged tank surface
 - h. Obtain native and polarized CP readings at each reference electrode
 - i. Document all readings and rectifier settings and provide in the final submittals as per Section 1.5 of this specification
5. Performance Testing:
 - a. Final testing shall not be conducted until the system has had time to polarize
 - b. When construction is complete, notify the Engineer and provide a minimum of 2 weeks' notice that the installation is ready to be turned on
 - c. Contractor to develop a representative potential profile to verify the cathodic protection system has maintained the polarized tank-to-water potential at least as negative (-) as -0.850 V to a copper-copper sulfate reference electrode (CSE) in contact with stored water and submerged tank surface
 - 1) Drop-cell testing at 5 foot intervals may be required to verify the CP potentials within the tank
 - d. Make adjustments in the output of the system; conduct sufficient testing throughout the network of protected structures and piping to ensure proper installation
 - e. Provide a final chronological installation and testing report.
 - 1) Include:

- a) Locations of testing and reference points
- b) Changes, modifications, and alterations from plans
- c) Comments relative to the Project
- d) Failures and defects
- e) Retesting information

END OF SECTION