CONTRACT DOCUMENTS
FOR THE CONSTRUCTION OF THE

GREEN MEADOWS WATER TREATMENT PLANT PIPING IMPROVEMENTS

Lee County Utilities

Prepared for the

LEE COUNTY UTILITIES
FORT MYERS, FLORIDA

VOLUME 1 OF 2
SPECIFICATIONS

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this project contact:

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JACOBS®

Project No. D3335202

DECEMBER 2021

BID DOCUMENTS

SECTION 00 01 07
SEALS PAGE

LEE COUNTY UTILITIES
FORT MYERS, FLORIDA

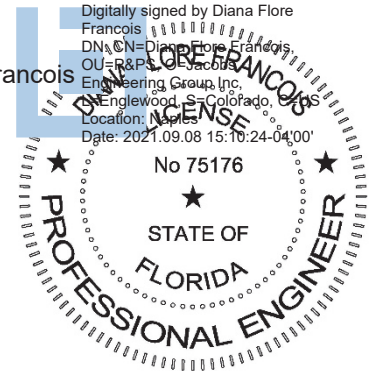
GREEN MEADOWS WATER TREATMENT PLANT
PIPING IMPROVEMENTS

TECHNICAL SPECIFICATIONS — Diana Flore Francois, P.E. No. 75176

DIVISION 01 – GENERAL REQUIREMENTS
01 11 00, 01 22 13, 01 26 00, 01 31 13,
01 31 19, 01 32 16, 01 33 00, 01 42 00,
01 42 13, 01 43 00, 01 57 00, 01 61 00,
01 74 00, 01 77 00, 01 78 23, 01 78 36,
01 79 00, 01 88 15

Diana Flore Francois

Digitally signed by Diana Flore Francois
DN: CN=Diana Flore Francois, OU=R&PS_C-Jacobs Engineering Group Inc., O=Englewood, S=Colorado, C=US
Location: Naples
Date: 2021.09.08 15:10:24-04'00'



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SECTION 00 01 07
SEALS PAGE

LEE COUNTY UTILITIES
FORT MYERS, FLORIDA

GREEN MEADOWS WATER TREATMENT PLANT
PIPING IMPROVEMENTS

TECHNICAL SPECIFICATIONS — David R. Everson, P.E. No. 80180

DIVISION 02 – EXISTING CONDITIONS
02 40 00

DIVISION 05 – METALS
05 05 19, 05 50 00

David Everson

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Reason: I agree to specified portions of this document
Date: 2021.09.08 10:54:31-04'00'

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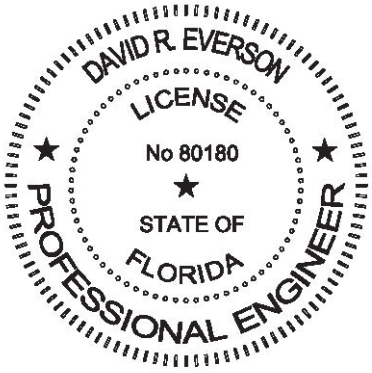


SECTION 00 01 07
SEALS PAGE

LEE COUNTY UTILITIES
FORT MYERS, FLORIDA

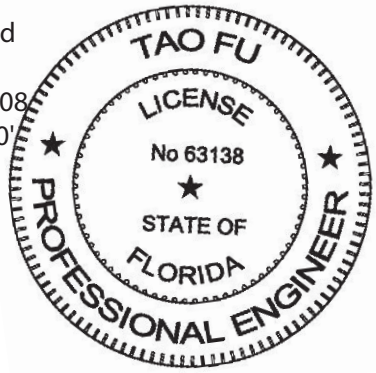
GREEN MEADOWS WATER TREATMENT PLANT
PIPING IMPROVEMENTS

TECHNICAL SPECIFICATIONS — Tao Fu, P.E. No. 63138

DIVISION 33 – UTILITIES
33 05 01.10, 33 13 00

DIVISION 40 – PROCESS INTEGRATION
40 05 15, 40 27 00.11, 40 27 01
40 27 02

Tao Fu
Digitally signed by Tao Fu
Date: 2021.09.08 10:02:34 -04'00'



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LEE COUNTY UTILITIES

FORT MYERS, FLORIDA

BIDDING REQUIREMENTS
AND
CONTRACT DOCUMENTS

for the construction of the

GREEN MEADOWS WATER TREATMENT PLANT PIPING IMPROVEMENTS

Contract No. _____

****

****

Jacobs

December 2021

Project No. D3335202 Copy No._____

TABLE OF CONTENTS

END OF SECTION

TECHNICAL SPECIFICATIONS

SECTION 01 11 00
SUMMARY OF WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Work.

B. Constraints.

C. Work by Others.

D. Contractor's Use of Site.

E. Work Sequence.

F. Owner Occupancy.

1.02 DESCRIPTION OF WORK

A. General:

The Work to be done under this Contract consists of making repairs and modifications to the existing RO Permeate (ROP) and RO Supply (ROS) pipes at the Green Meadows Water Treatment Plant. Specific work items include:

1. Furnish and Install a static mixer in the 24-inch diameter ROS Pipe.
2. Furnish and Install a static mixer in the 20-inch diameter ROP Pipe.
3. Selectively demolish concrete wall around the 20-inch diameter ROP and replace existing section of the 20-inch RO Permeate Stainless Steel Pipe with HDPE Pipe.
4. Demolish below grade concrete collar previously placed around leaking 20-inch ROP Pipe.
5. Furnish and Install a 20-inch Butterfly Valve on the ROP Pipe.
6. Furnish and install new Sulfuric Acid pipes and support.

B. Alternates: Not Applicable.

C. The Contractor must complete the work by the following durations:

1. Substantial Completion Date is on or before 120 calendar days, after the date of Notice to Proceed which requires putting into service the ROS and ROP Pipes.

2. Final Completion Date is on or before 150 calendar days, after the date of Notice to Proceed which requires obtaining acceptance by the County for all work and services under the Contract.

D. The Work includes:

1. Furnishing of all labor, material, superintendence, plant, power, light, heat, fuel, water, tools, appliances, equipment, supplies, services and other means of construction necessary or proper for performing and completing the Work.
2. Sole responsibility for adequacy of plant and equipment.
3. Maintaining the Work area and site in a clean and acceptable manner.
4. Maintaining existing facilities in service at all times except where specifically provided for otherwise herein.
5. Protection of finished and unfinished Work.
6. Repair and restoration of Work damaged during construction.
7. Furnishing as necessary proper equipment and machinery, of a sufficient capacity, to facilitate the Work and to handle all emergencies normally encountered in Work of this character.
8. Furnishing, installing, and protecting all necessary guides, track rails, bearing plates, anchor and attachment bolts, and all other appurtenances needed for the installation of the devices included in the equipment specified. Make anchor bolts of appropriate size, strength and material for the purpose intended. Furnish substantial templates and Shop Drawings for installation.

E. Implied and Normally Required Work: It is the intent of these Specifications to provide the Owner with complete operable systems, subsystems and other items of Work. Any part or item of Work which is reasonably implied or normally required to make each installation satisfactorily and completely operable is deemed to be included in the Work and the Contract Amount. All miscellaneous appurtenances and other items of Work incidental to meeting the intent of these Specifications are included in the Work and the Contract Amount even though these appurtenances may not be specifically called for in these Specifications.

F. Quality of Work: Regard the apparent silence of the Contract Documents as to any detail, or the apparent omission from them of a detailed description concerning any Work to be done and materials to be furnished as meaning that only the best general practice is to prevail and that only materials and workmanship of the best quality are to be used. Interpretation of these Specifications will be made upon this basis.

1.03 CONSTRAINTS

A. The Contract Documents are intended to allow the Contractor flexibility in construction of the Work, however, the following constraints apply:

1. Only one entire plant shutdown is allowed for the project.
2. Due to demands being higher during the months of November through April, the plant shutdown should be schedule before November 15th or after April 15th.
3. The entire plant shutdown shall be 8 hours or less.
4. Refer to Section 01 31 13, Project Coordination for suggested work sequencing.

1.04 CONTRACTOR'S USE OF SITE

A. In addition to the requirements of the General Conditions, limit use of site and premises for work and storage to allow for the following:

1. Coordination of the Work under this Contract with the Work of the other Contractors where Work under this Contract encroaches on the Work of other Contractors.
2. Owner occupancy and access to operate existing facilities.
3. Coordination of site use with Engineer.
4. Responsibility for protection and safekeeping of products under this Contract.
5. Providing additional off site storage at no additional cost to Owner as needed.

1.05 WORK SEQUENCE

A. Construct Work in stages to accommodate Owner's use of premises during construction period and in accordance with the limitations on the sequence of construction specified. Coordinate construction schedules and operations with Engineer.

B. Coordinate Work of all subcontractors.

1.06 OWNER OCCUPANCY

A. Owner will occupy premises during entire period of construction in order to maintain normal operations. Cooperate with Owner's representative in all construction operations to minimize conflict, and to facilitate Owner usage.

B. Conduct operations so as to inconvenience the general public in the least.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

A. Starting Work: Start Work within 10 days following the date stated in the Notice to Proceed and execute with such progress as may be required to prevent delay to other contractors or to the general completion of the project. Execute Work at such items and in or on such parts of the project, and with such forces, material and equipment, as to complete the Work in the time established by the Contract. At all times, schedule and direct the Work so that it provides an orderly progression to completion within the specified time for completion.

END OF SECTION

SECTION 01 22 13
MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Explanation and Definitions.

B. Measurement.

C. Payment.

D. Schedule of Values.

1.02 EXPLANATION AND DEFINITIONS

A. The following explanation of the Measurement and Payment for the bid form items is made for information and guidance. The omission of reference to any item in this description shall not, however, alter the intent of the bid form or relieve the Contractor of the necessity of furnishing such as a part of the Contract.

1.03 MEASUREMENT

A. The quantities set forth in the bid form are approximate and are given to establish a uniform basis for the comparison of bids. The Owner reserves the right to increase or decrease the quantity of any class or portion of the Work during the progress of construction in accord with the terms of the Contract.

1.04 PAYMENT

A. Payment shall be made for the items listed on the Bid Form on the basis of the Work actually performed and completed, such Work including but not limited to, the furnishing of all necessary labor, materials, equipment, transportation, clean up, restoration of disturbed areas, and all other appurtenances to complete the construction and installation of the Work as shown on the Drawings and described in the Specifications.

B. Unit prices are used as a means of computing the final figures for bid and Contract purposes, for periodic payments for work performed, for determining value of additions or deletions and wherever else reasonable.

1.05 SCHEDULE OF VALUES

A. Approval of Schedule: Submit for approval a preliminary schedule of values, in duplicate, for all of the Work. Prepare preliminary schedule in accordance with the General Conditions. Submit preliminary schedule of values within 10 calendar days after the Effective Date of the Agreement. Submit final schedule of values in accordance with the General Conditions.

B. Format: Utilize a format similar to the Table of Contents of the Project Specifications. Identify each line item with number and title of the major Specification. Identify site mobilization, bonds and insurance. Include within each line item, a direct proportional amount of Contractor's overhead profit.

C. Revisions: With each Application for Payment, revise schedule to list approved Change Orders.

1.06 APPLICATION FOR PAYMENT

A. Required Copies: Submit three copies of each application on EJCDC Form No. 1910-8-E (1990) or approved equal. Present required information in typewritten form or on electronic media printout.

B. Execute certification by signature of authorized officer.

C. Use data from approved Schedule of Values.

D. Stored Materials: When payment for materials stored is permitted, submit a separate schedule for Materials Stored showing line item, description, previous value received, value incorporated into the Work and present value.

E. Change Orders: List each authorized Change Order as an extension on continuation sheet, listing Change Order number and dollar amount as for an original item of Work.

F. Final Payment: Prepare Application for Final Payment as required in the General Conditions.

G. Submit an updated construction schedule for each Application for Payment.

PART 2 PRODUCT (NOT USED)

PART 3 EXECUTION

3.01 MEASUREMENT AND PAYMENT

A. Payment shall be made on the basis of Work actually performed completing each item in the Bid, such Work including, but not limited to, the furnishing of all necessary labor, materials, equipment, transportation, cleanup, and all other appurtenances to complete the construction and installation of the Work to the configuration and extent as shown on the Drawings and described in the Specifications. Payment for each item includes compensation for cleanup and restorations. Cleanup and surface restorations (including pavement replacement) will be considered as 10 percent of each pay item and complete payment will not be made until cleanup, restorations and as-builts are completed.

1. Item No. 1-1A: This Pay Item is for General Requirements and Conditions, General Expenses, Mobilization and Demobilization for performing preparatory work and operations in mobilizing for beginning the Work of the Project including all permit fees, but excluding material costs, which are paid under other payment items. This payment includes, but is not be limited to the submittal and required correction of all Shop Drawings for long lead materials or equipment which need to be ordered immediately; together with ordering said equipment and materials in timely fashion; those operations necessary for the movement of personnel, equipment, supplies and incidentals to the Project site; for the establishment of safety equipment and first aid supplies, sanitary and other facilities; the costs of bonds, required insurance and other preconstruction expenses and excluding the cost of materials which are paid under another bid item(s).
2. Item No. 1-1B: This Pay Item is for documenting the condition of the project site prior to the start of work. This item includes furnishing all labor, materials and equipment required for the Work. This pay item will be paid for at the contract lump sum price.
3. Item 1-1C: This Pay Item is for recording deviations from contract documents required during construction on a full size set of Drawings or electronically and for issuing Record Drawings for the project. This item includes furnishing all labor and materials required for the Work. This pay item will be paid for at the contract lump sum price.
4. Item 02-1A: This pay item is for demolishing and disposing of the below grade concrete fill previously placed around the leaking 20-inch ROP pipe, inspecting the pipe and exterior face of the concrete wall for evidence of acid exposure. This pay shall include full compensation for all labor, materials and equipment required to perform the Work. This pay item will be paid for at the contract lump sum price.

5. Item No. 02-1B: This pay item is for demolishing and disposing of the orifice plate in the 24-inch diameter Reverse Osmosis Supply (ROS) Pipe. This pay item includes dewatering and bypassing the flow in the pipe as required to do the Work. The price for demolishing and disposing of the orifice plate shall be full compensation for the completed Work, with the pipe ready for service, cleaning and testing, repairing all items and areas damaged by the construction to original or better than original conditions, including final cleanup. This pay item includes all labor, materials and equipment required perform the Work. This item will be paid for at the contract lump sum price.
6. Item No. 02-1C: This pay item is for demolishing and disposing of 16 linear feet of 20-inch diameter Reverse Osmosis Permeate (ROP) Pipe and 20-inch orifice plate, including the wall pipe. The length of demolition shall be adjusted to accommodate the length of the static mixer. This pay item includes preserving the reinforcement around the pipe at the wall penetration and protecting the wall. This pay item will be paid for at the contract lump sum price.
7. Item No. 40-1A: This Pay Item is for furnishing and installing a static mixer with sulfuric acid injection quill in the 20-inch diameter ROP Pipe located inside the RO Building. This pay item includes dewatering and bypassing the flow in the pipe as required to do the Work. The price for installing the mixer shall be full compensation for the completed Work, ready for service, cleaning and testing the static mixer; repairing all items and areas damaged by the construction to original or better than original conditions, including final cleanup. This pay item includes all labor, materials and equipment required install the mixer as well as start-up and commissioning. This item will be paid for at the unit bid price.
8. Item 40-1B: This pay item is for furnishing and installing 16 linear feet of 20-inch DIPS 13.5 HDPE ROP Pipe. This pay item includes all fittings, supports shown on the Drawings not limited to one 20-inch Flange Coupling Adapter, PTFE Expansion Joint, wall restraint system and 20-inch Flange Adapter with Stainless Steel backup ring to be used to connect to the existing 20-inch ROP pipe outside of the building. This Pay item also includes dewatering the pipe and disposing of the water in the pipe. The price for installing the pipe and fittings shall be full compensation for the completed Work, ready for service, cleaning and testing; repairing all items and areas damaged by the construction to original or better than original conditions, including final cleanup. This pay item includes all labor, materials and equipment required install the pipe. This item will be paid for at the contract lump sum price.

9. Item 40-1C: This pay item is for furnishing and installing a 20-inch Diameter Stainless Steel Butterfly Valve on the ROP Pipe. This pay item includes the price for installing the valve and supports and shall be full compensation for the completed Work, ready for service, cleaning and testing; repairing all items and areas damaged by the construction to original or better than original conditions, including final cleanup. This pay item includes all labor, materials and equipment required install the valve as well as start-up and commissioning. This item will be paid for at the unit price.
10. Item 40-1D: This pay items is for furnishing and installing 80 linear feet of 1/2-inch diameter sulfuric acid Schedule 80 CPVC pipe and associated fittings and support. The price for installing the pipe and fittings shall be full compensation for the completed Work, ready for service, cleaning and testing; repairing all items and areas damaged by the construction to original or better than original conditions, including final cleanup. This pay item includes all labor, materials and equipment required install the pipe. This item will be paid for at the price per linear foot of pipe.
11. Item No. 40-1E: This Pay Item is for furnishing and installing a static mixer with sulfuric acid injection quill in the 24-inch diameter RO Supply Pipe located inside the RO Building. This pay item also includes a 24-inch restrained Flange Coupling Adapter (RFCA), dewatering and bypassing the flow in the pipe as required to do the Work. The price for installing the mixer and RFCA shall be full compensation for the completed Work, ready for service, cleaning and testing the pipe and mixer, disinfection; repairing all items and areas damaged by the construction to original or better than original conditions, including final cleanup. This pay item includes all labor, materials and equipment required install the mixer pipe as well as start-up and commissioning. This item will be paid for at the contract lump sum price.

END OF SECTION

SECTION 01 26 00
CHANGE ORDER AND FIELD DIRECTIVE CHANGE PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Definitions.

B. Change Orders.

C. Field Directive Change.

1.02 DEFINITIONS

A. Change Order: Refer to the Change Order definition in Article 2 of the General Conditions.

B. Field Directive Change: Field Directive Change is a written directive to the Contractor issued on or after the effective date of the agreement; signed by the Owner, recommended by the Engineer ordering an addition, deletion, or revision in the Work. A Field Directive Change will subsequently be followed by the issuance of a Change Order.

C. Overhead: Overhead is defined as the cost of administration, field office and home office costs, general superintendence, office engineering and estimating costs, other required insurance, materials used in temporary structures (not including form work), additional premiums on the performance bond of the Contractor, the use of small tools, scheduling costs, and all other costs incidental to the performance of the change or the cost of doing business.

1.03 CHANGE ORDERS

A. Initiation of Proposals:

1. From time to time, the Owner or the Engineer may issue a Request for a Change Order Proposal. The Request will contain a description of the intended change with supplementary or revised Drawings and Specifications as applicable, and the projected time for accomplishing the change.
2. The Contractor may propose a change in the Work by submittal of a Change Order Request to the Engineer describing the proposed change with a statement of the reason for the change and the effect on the Contract time and price, along with supporting documentation.

B. Execution of Change Order Proposal:

1. When a Proposal is requested for changed work, submit proposal within 15 days following receipt of the Request from Owner or Engineer. State the increase or decrease, if any, in Contract Completion time and Contract Price.
2. Explain proposal in sufficient detail to permit review by Owner.
3. For Omitted Work the decrease in the Contract Price will be determined by the Engineer and will include appropriate amounts for profit and overhead.
4. The Owner and Engineer will review the Proposal and may request additional information and documentation. Provide these items upon request.
5. If the Owner decides to proceed with the change, the Owner will issue a Change Order for signature first by the Contractor and then by the Owner.
6. The Contractor will promptly complete the approved change in the Work on receipt of the executed Change Order.
    a. Failure to sign the Change Order does not relieve the Contractor from performing the Work if the Change Order is signed by the Owner.

C. Compute the cost of both additive and deductive changes in the Work in accordance with Article 11 of the General Conditions and as follows:

1. Include, the costs of labor, crew foreman and general foreman performing or directly supervising the changed Work on the site. Include travel and subsistence, but only to the extent incurred.
2. To the labor cost add all net premium for Workman's Compensation, taxes pursuant to the Federal Social Security Act, and payments required under State and Federal unemployment laws.
3. Add necessary extra materials, delivered at the site.
4. Include Subcontractor's costs, determined by items 1 through 3 in the preceding subparagraphs, including a maximum of 10 percent overhead and 10 percent profit for the first $20,000; 7-1/2 percent overhead and 7-1/2 percent profit on the next $30,000; and 5 percent overhead and 5 percent profit on balance over $50,000.
5. For all subcontract work add 5 percent overhead and 5 percent profit to the subcontractor's costs as determined in paragraph 4. For work performed by the Contractor's own forces add a maximum of 10 percent overhead and 10 percent profit for the first $20,000; 7-1/2 percent overhead and 7-1/2 percent profit on the next $30,000; and 5 percent overhead and 5 percent profit on balance over $50,000.

1.04 FIELD DIRECTIVE CHANGE

A. Initiation by Owner: Owner may issue a Field Directive Change with a Notice to Proceed without a prior Request for a Change Order Proposal or the Contractor's signature.

B. Payment Determination: The Owner will designate the method of determining the amount of compensation or credit, if any, based on one of the methods contained in Article 11 of the General Conditions.

C. Timing: Proceed with the change in the Work immediately upon receipt of the Field Directive Change.

D. Addition to Contract: The Field Directive Change will be incorporated into the Contract Documents via a Change Order at a later date.

PART 2 PRODUCTS (NOT USED)

PART 2 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 13
PROJECT COORDINATION

PART 1 GENERAL

1.01 WORK PROGRESS

A. Furnish personnel and equipment which will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress which will allow the completion of the Work within the time stipulated in the Bid of these Specifications. If at any time such personnel appears to the Engineer to be inefficient, inappropriate or insufficient for securing the quality of Work required or for producing the rate of progress aforesaid, he may order the Contractor to increase the efficiency, change the character or increase the personnel and equipment, and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his obligations to secure the quality of the Work and rate of progress.

1.02 WORK SEQUENCING/CONSTRAINTS

A. The following constraints shall be included in the work sequence.

1. Entire Plant Shutdown:
   a. Only one entire plant shutdown is allowed for the project.
   b. The entire plant shutdown shall be 8 hours or less.
2. Membrane Train Shutdowns:
   a. No more than two membrane train shutdowns are allowed for the project.
   b. For each shutdown, the membrane trains shall not be out of service for a duration of more than 24 hours.

B. The intent of this section is to review how construction of the proposed facility may be completed without adversely interfering with daily water treatment plant operations. The sequence of construction is not all-inclusive and is intended to provide the Contractor with suggestions on construction sequence. The Contractor shall be responsible for planning the construction sequence and presenting a detailed plan for review by Owner and meeting with Owner to receive and resolve comments. The following is a proposed sequence of construction to keep the plant operational.

1. Demolish concrete fill around the 20-inch ROP pipe. Remove pipe trench gratings and supporting beams. Install new tapping saddle on 20-inch ROP pipe. Reconnect the pressure transmitter tubing.
2. Plan for entire plant shutdown.

3. Demolish existing 20-inch ROP wall pipe and upstream stainless steel pipe.
4. Install new 20-inch ROP wall pipe, connect to the 20-inch HDPE ROP pipe and install 20-inch valve and expansion joint.
5. Plant resumes operation while membrane trains remain out of service.
6. Install 20-inch HDPE pipe and static mixer and perform concrete work around the new 20-inch ROP wall pipe.
7. Demolish 24-inch ROS pipe and install 24-inch static mixer.
8. Connect existing sulfuric acid pipes to the new injectors.
9. Perform Leak test.
10. Place membrane trains back in service.
11. Restore pipe trench gratings and supporting beams.

1.03 WORK LOCATIONS

A. Structures and pipelines shall be located substantially as indicated on the Drawings, but the Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him from laying and jointing different or additional items where required.

1.04 OPEN EXCAVATIONS

A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by the public and workmen.

1.05 MAINTENANCE OF FLOW

A. Provide for the flow of water, sewers, drains, courses interrupted during the progress of the Work, and shall immediately cart away and remove all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the Engineer well in advance of the interruption of any flow.

PART 2 PRODUCTS

2.01 PROTECTION OF CONSTRUCTION AND EQUIPMENT

A. All newly constructed work shall be carefully protected from damage in any way. No wheeling or walking or placing of heavy loads on it shall be allowed and all portions damaged shall be reconstructed by the Contractor at his own expense.

B. All structures shall be protected in a manner approved by the Engineer. Should any of the floors or other parts of the structures become heaved, cracked or otherwise damaged, all such damaged portions of the Work shall be completely repaired and made good by the Contractor at his own expense and to the satisfaction of the Engineer. If, in the final inspection of the Work, any defects, faults or omissions are found, the Contractor shall cause the same to be repaired or removed and replaced by proper materials and workmanship without extra compensation for the materials and labor required. The Contractor shall be fully responsible for the satisfactory maintenance and repair of the construction and other work undertaken herein, for at least the guarantee period described in the contract.

C. Take all necessary precautions to prevent damage to any structure due to water pressure during and after construction and until such structure is accepted and taken over by the Owner.

PART 3 EXECUTION

3.01 PROTECTION OF CONSTRUCTION AND EQUIPMENT

A. Sequence and schedule work in a manner to preclude delays and conflicts between the Work of various trades and contractors. Each trade shall keep informed as to the Work of other trades on the project and shall execute their work in a manner that will not interfere with the Work of other trades.

3.02 DIAGRAMMATIC NATURE OF DRAWINGS

A. Where layout is diagrammatic, such as pipelines, conduits, ductwork, etc., it shall be followed as closely as other work will permit. Changes from diagrams shall be made as required to conform to the construction requirements.

B. Before running lines, carefully verify locations, depths and sizes and confirm that lines can be run as contemplated without interfering with other construction. Any deviation shall be referred to the Engineer for approval before lines are run. Minor changes in location of the equipment, fixtures, piping, etc., from those shown on the Drawings, shall be made without extra charge if so directed by the Engineer before installation.

C. Determine the locations and sizes of equipment, fixtures, conduit, ducts, openings, etc., in order that there will be no interference in the installation of the Work or delay in the progress of other Work. In the event that interferences develop, the Engineer’s decision regarding relocation of Work will be final.

D. Any changes made necessary through failure to make proper arrangements to avoid interference shall not be considered as extras. Cooperate with those performing other work in preparation of interference drawings, to the extent that the location of piping, ductwork, etc., with respect to the installations of other trades shall be mutually agreed upon by those performing the Work.

3.03 COORDINATION

A. The Contractor shall be fully responsible for the coordination of his work and the Work of his employees, subcontractors, and suppliers with the Owner, and regulatory agencies, and assure compliance with schedules.

END OF SECTION

SECTION 01 31 19
PROJECT MEETINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Coordination.

B. Preconstruction Conference.

C. Progress Meetings.

1.02 COORDINATION

A. General: Coordinate scheduling, submittals, and Contract work to assure efficient and orderly sequence of installation of interdependent construction elements.

1.03 PRECONSTRUCTION CONFERENCE

A. General: Prior to commencement of the Work, in accordance with the General Conditions, the Owner will conduct a preconstruction conference to be held at a predetermined time and place.

B. Delineation of Responsibilities: The purpose of the conference is to designate responsible personnel, to establish a working relationship among the parties and to identify the responsibilities of the Owner, plant personnel and the Contractor/Vendor. Matters requiring coordination will be discussed and procedures for handling such matters, established. The agenda will include:

1. Submittal procedures.
2. Partial Payment procedures.
3. Maintenance of Records.
4. Schedules, sequences and maintenance of facility operations.
5. Safety and First Aid responsibilities.
6. Change Orders and Field Directive Changes.
7. Use of site.
8. Housekeeping.
9. Equipment delivery.

C. Attendees: The preconstruction conference is to be attended by the representatives of the Contractor/Vendor, the Owner and plant personnel that will be associated with the project. Representatives of regulatory agencies, subcontractors, and principal suppliers may also attend when appropriate.

D. Chair and Minutes: The preconstruction conference will be chaired by the Owner who will also arrange for the keeping and distribution of minutes to all attendees.

1.04 PROGRESS MEETINGS

A. Meeting Frequency and Format: Schedule progress meetings once every two weeks, to review the Work, discuss changes in schedules, maintain coordination and resolve potential problems. Invite Owner, Engineer and all Subcontractor/Vendors. Suppliers may be invited as appropriate. Minutes of the meeting will be maintained by Contractor/Vendor and reviewed by Engineer prior to distribution by the Contractor/Vendor. Distribute reviewed minutes to attendees within 7 calendar days after each meeting.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 16
PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Form of Schedules.

B. Content of Schedules: Submit for approval, a preliminary progress schedule in accordance with the General Conditions.

C. Schedule Revisions.

D. Submittal Requirements.

1.02 FORM OF SCHEDULES

A. Prepare schedules in form of a horizontal bar chart.

1. Provide separate horizontal bar for each trade or operation.
2. Utilize a horizontal time scale and identify first work day of each week.
3. Utilize scale and spacings to allow space for notations and future revisions.

B. Utilize a listing format which chronologically indicates the order of start of each item of Work.

C. Identify each listing by major Specification section numbers.

1.03 CONTENT OF SCHEDULES

A. Completion Dates: Show the beginning and ending contract dates stated in documents. Schedules showing completion prior to the contract completion date will be accepted but in no event will they be considered basis for a claim for delay against the Owner by the Contractor for the period between the early completion date and the completion date provided in the Contract Documents.

B. Show complete sequence of construction by activity.

C. Show dates for beginning and completion of each major element of construction and installation dates for major items of equipment. Elements shall include, but not be limited to, the following:

1. Shop drawing receipt from supplier/manufacturer submitted to Engineer, review and return to supplier/manufacturer.

2. Material and equipment order, manufacturer, delivery, installation, and checkouts.
3. Performance tests and supervisory services activity.
4. Demolition.
5. Piping installation.
6. Connection to existing piping.
7. Miscellaneous concrete placement.
8. Subcontractor's items of work.
9. Final cleanup.
10. Allowance for inclement weather.
11. Coordination with concurrent Work on site.

D. Show projected percentage of completion for each item as of first day of each month.

1.04 SCHEDULE REVISIONS

A. As a minimum, revise construction schedule every 15 calendar days to reflect changes in progress of Work for duration of Contract.

B. Indicate progress of each activity at date of submittal.

C. Show changes occurring since previous submittal of schedule.

1. Major change in scope.
2. Activities modified since previous submittal.
3. Revised projections of progress and completion.
4. Other identifiable changes.

D. Provide a written report as needed to define:

1. Problem areas, anticipated delays, and impact on schedule.
2. Corrective action recommended and its effect.
3. Effect of changes on schedules of other Contractors.

1.05 SUBMITTAL REQUIREMENTS

A. Schedule: Submit final progress schedule in accordance with the General Conditions.

B. For preliminary and final submittal of construction progress schedule and subsequent revisions thereof furnish three copies to Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 00
SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Requirements.

B. Submittal Procedures.

C. Specific Submittal Requirements.

D. Action on Submittals.

E. Repetitive Review.

1.02 DESCRIPTION OF REQUIREMENTS

A. This section specifies procedural requirements for Shop Drawings, product data, samples, and other miscellaneous work-related submittals.

B. Procedures concerning items such as listing of manufacturers, suppliers, subcontractors, construction progress schedule, schedule of Shop Drawing submissions, bonds, payment applications, insurance certificates, and schedule of values are specified elsewhere.

C. Work-Related Submittals:

1. Substitution or "Or Equal" Items:
   a. Must be approved by Engineer and Owner.
   b. Includes material or equipment Contractor requests Engineer to accept, after Bids are received, as substitute for items specified or described in Specifications by using name of a proprietary item or name of particular supplier.
2. Shop Drawings:
   a. Includes technical data and Drawings specially prepared for this Project, including fabrication and installation drawings, diagrams, actual performance curves, data sheets, schedules, templates, patterns, reports, instructions, design mix formulas, measurements, and similar information not in standard printed form.
   b. Standard information prepared without specific reference to the Project is not considered a Shop Drawing.

3. Product Data: Includes standard printed information on manufactured products, and systems that has not been specially prepared for this Project, including manufacturer's product specifications and installation instructions, catalog cuts, standard wiring diagrams, printed performance curves, mill reports, and standard color charts.
4. Samples:
    a. Includes both fabricated and manufactured physical examples of materials, products, and units of work, partial cuts of manufactured or fabricated work, swatches showing color, texture, and pattern, and units of work to be used for independent inspection and testing.
    b. Mock-ups are special forms of samples which are too large or otherwise inconvenient for handling in manner specified for transmittal of sample submittals.
5. Working Drawings:
    a. When used in the Contract Documents, the term “working drawings” shall be considered to mean the Contractor’s plans for temporary structures such as temporary bulkheads, support of open cut excavation, support of utilities control systems, forming and falsework for underpinning; temporary by-pass pumping and for such other work as may be required for construction but does not become an integral part of the project.
    b. Copies of working drawings shall be submitted to the Engineer at least 14 calendar days (unless otherwise specified by the Engineer) in advance of the required work.
    c. Working drawings shall be signed by a registered Professional Engineer currently licensed to practice in the State of Florida and shall convey, or be accompanied by, calculation or other sufficient information to completely explain the structure, machine, or system described and its intended manner of use.
6. Miscellaneous Submittals: Work-related submittals that do not fit in the previous categories, such as guarantees, warranties, certifications, experience records, maintenance agreements, Operating and Maintenance Manuals, workmanship bonds, survey data and reports, physical work records, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, and similar information, devices, and materials applicable to the Work.

1.03 SUBMITTAL PROCEDURES

A. Scheduling:

1. Submit for approval, a preliminary schedule of Shop Drawings and samples submittals, in duplicate, and in accordance with the General Conditions.

2. Prepare and transmit each submittal to Engineer sufficiently in advance of scheduled performance of related Work and other applicable activities.

B. Coordination:

1. Coordinate preparation and processing of submittals with performance of Work. Coordinate each submittal with other submittals and related activities such as substitution requests, testing, purchasing, fabrication, delivery, and similar activities that require sequential activity.
2. Coordinate submission of different units of interrelated work so that one submittal will not be delayed by Engineer's need to review a related submittal. Engineer may withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.

C. Submittal Preparation:

1. Stamp and sign each submittal certifying to review of submittal, verification of products, field measurement, field construction criteria, coordination of information within submittal with requirements of the Work and the Contract Documents, coordination with all trades, and verification that product will fit in space provided.
2. Transmittal Form: In the transmittal form forwarding each specific submittal to the Engineer include the following information as a minimum.
    a. Date of submittal and dates of previous submittals containing the same material.
    b. Project title and number.
    c. Submittal and transmittal number.
    d. Contract identification.
    e. Names of:
        1) Contractor.
        2) Supplier.
        3) Manufacturer.
    f. Identification of equipment and material with equipment identification numbers, model numbers, and Specification section number.
    g. Variations from Contract Documents and any limitations which may impact the Work.
    h. Drawing sheet and detail number as appropriate.

D. Resubmittal Preparation:

1. Comply with the requirements described in Submittal Preparation. In addition:
   a. Identify on transmittal form that submittal is a resubmission.
   b. Make any corrections or changes in submittals required by Engineer's notations on returned submittal.
   c. Respond to Engineer's notations:
      1) On the transmittal or on a separate page attached to Contractor's resubmission transmittal, answer or acknowledge in writing all notations or questions indicated by Engineer on Engineer's transmittal form returning review submission to Contractor.
      2) Identify each response by question or notation number established by Engineer.
      3) If Contractor does not respond to each notation or question, resubmission will be returned without action by Engineer until Contractor provides a written response to all Engineer's notations or questions.
   d. Contractor initiated revisions or variations:
      1) On transmittal form identify variations or revisions from previously reviewed submittal, other than those called for by Engineer.
      2) Engineer's responsibility for variations or revisions is established in the General Conditions.

1.04 SPECIFIC SUBMITTAL REQUIREMENTS

A. Specific submittals required for individual elements of Work are specified in the individual Specification sections. Except as otherwise indicated in Specification sections, comply with requirements specified herein for each indicated type of submittal.

B. Requests for Substitution or "Or Equal":

1. Collect data for items to be submitted for review as substitution into one submittal for each item of material or equipment in accordance with the General Conditions.
2. Submit with other scheduled submittals for the material or equipment allowing time for Engineer to evaluate the additional information required to be submitted.
3. If Contractor requests to substitute for material or equipment specified but not identified in Specifications as requiring submittals, schedule substitution submittal request in Submittal schedule and submit as scheduled.

C. Shop Drawings:

1. Check all Drawings, data and samples before submitting to the Engineer for review. Each and every copy of the Drawings and data shall bear Contractor's stamp showing that they have been so checked. Shop Drawings submitted to the Engineer without the Contractor's stamp will be returned to the Contractor for conformance with this requirement. All Shop Drawings shall be submitted through the Contractor, including those from any subcontractors.
2. Submit newly prepared information, with graphic information at accurate scale. Indicate name of manufacturer or supplier (firm name). Show dimensions and clearly note which are based on field measurement; identify materials and products which are included in the Work; identify revisions. Indicate compliance with standards and notation of coordination requirements with other Work. Highlight, encircle or otherwise indicate variations from Contract Documents or previous submittals.
3. Include on each Drawing or page:
    a. Submittal date and revision dates.
    b. Project name, division number and descriptions.
    c. Detailed Specifications section number and page number.
    d. Identification of equipment, product or material.
    e. Name of Contractor and Subcontractor.
    f. Name of Supplier and Manufacturer.
    g. Relation to adjacent structure or material.
    h. Field dimensions, clearly identified.
    i. Standards or Industry Specification references.
    j. Identification of deviations from the Contract Documents.
    k. Contractor's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
    l. Physical location and location relative to other connected or attached material at which the equipment or materials are to be installed.
4. Provide 8-inch by 3-inch blank space for Contractor and Engineer stamps.
5. Submittals:
    a. Submit three hard copies plus one PDF.
6. Distribution:
    a. Do not proceed with installation of materials, products or systems until copy of applicable product data showing only approved information is in possession of installer.
    b. Maintain one set of product data (for each submittal) at Project site.
    c. Mark five additional copies with the date of approval and forward to the Engineer for use in field and for Owner's records.

D. Product Data:

1. Preparation:
   a. Collect required data into single submittal for each element of Work or system. Where product data has been printed to include information on several similar products, some of which are not required for use on Project or are not included in submittal, mark copies to clearly show such information is not applicable.
   b. Where product data must be specially prepared for required products, materials or systems, because standard printed data are not suitable for use, submit data as a Shop Drawing and not as product data.
2. Submittals:
   a. Submittal is for information and record, and to determine that products, materials, and systems comply with Contract Documents. Submittal is final when returned by Engineer marked "Approved" or "Approved as Noted".
   b. Submit three copies.
3. Distribution:
   a. Do not proceed with installation of materials, products or systems until copy of applicable product data showing only approval information is in possession of installer.
   b. Maintain one set of product data (for each submittal) at Project site, available for reference by Engineer and others.
   c. Mark PDF copy with the date of approval and forward to the Engineer for use in field and for Owner records.
4. Submittals:
   a. At Contractor's option, and depending upon nature of anticipated response from Engineer, initial submittal of samples may be either preliminary or final submittal.
   b. A preliminary submittal, consisting of a single set of samples, is required where specifications indicate Engineer's selection of color, pattern, texture or similar characteristics from manufacturer's range of standard choices is necessary. Preliminary submittals will be reviewed and returned with Engineer's "Action" marking.
   c. Final Submittals: Submit three sets of samples in final submittal, one set will be returned.
5. Distribution:
   a. Maintain returned final set of samples at Project site, in suitable condition and available for quality control comparisons throughout course of performing Work.
   b. Returned samples intended or permitted to be incorporated in the Work are indicated in Specification sections, and shall be in undamaged condition at time of use.

E. Miscellaneous Submittals:

1. Inspection and Test Reports: Classify each inspection and test report as being either "Shop Drawings" or "product data", depending on whether report is specially prepared for Project or standard publication of workmanship control testing at point of production. Process inspection and test reports accordingly.
2. Guarantees, Warranties, Maintenance Agreements, and Workmanship Bonds:
   a. Refer to Specification sections for specific requirements. Submittal is final when returned by Engineer marked "Approved" or "Approved as Noted".
   b. In addition to copies desired for Contractor's use, furnish two executed copies. Provide two additional copies where required for maintenance data.
3. Certifications: Refer to Specification sections for specific requirement on submittal of certifications. Submit seven copies. Certifications are submitted for review of conformance with specified requirements and information. Submittal is final when returned by Engineer marked "Approved".
4. Closeout Submittals:
   a. Refer to Specification section 01 77 00 for specific requirements on submittal of closeout information, materials, tools, and similar items.
      1) Record Documents: Section 01 77 00.
      2) Materials and Tools: Spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical units to be submitted.
      3) Operating and maintenance data.

F. Operation and Maintenance Manuals: Submit Operation and Maintenance Manuals in accordance with Section 01 78 23.

G. General Distribution: Unless required elsewhere, provide distribution of submittals to subcontractors, suppliers, governing authorities, and others as necessary for proper performance of Work.

1.05 ACTION ON SUBMITTALS

A. Engineer's Action:

1. General:
   a. Except for submittals for record and similar purposes, where action and return on submittals are required or requested, Engineer will review each submittal, mark with appropriate action, and return. Where submittal must be held for coordination, Engineer will also advise Contractor without delay.

b. Engineer will stamp each submittal with uniform, self-explanatory action stamp, appropriately marked with submittal action.

B. Action Stamp:

1. Approved: Final Unrestricted Release: Where submittals are marked "Approved", Work covered by submittal may proceed PROVIDED IT COMPLIES WITH CONTRACT DOCUMENTS. Acceptance of Work will depend upon that compliance.
2. Approved As Noted: When submittals are marked "Approved as Noted", Work covered by submittal may proceed PROVIDED IT COMPLIES WITH BOTH ENGINEER'S NOTATIONS OR CORRECTIONS ON SUBMITTAL AND WITH Contract Documents. Acceptance of Work will depend on that compliance. Re-submittal is not required.
3. Comments Attached - Confirm or Resubmit:
   a. When submittals are marked "Examined and Returned for Correction", do not proceed with Work covered by submittal. Do not permit Work covered by submittal to be used at Project site or elsewhere where Work is in progress.
   b. Revise submittal or prepare new submittal in accordance with Engineer's notations in accordance with Paragraph 1.3D of this section. Resubmit submittal without delay. Repeat if necessary to obtain different action marking.

1.06 RE-SUBMITTAL REVIEW

A. Cost of Subsequent Reviews: Shop Drawings and Operation and Maintenance Manuals submitted for each item will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be performed at times convenient to the Engineer and at the Contractor's expense based on the Engineer's then prevailing rates including all direct and indirect costs and fees. Reimburse the Owner for all such fees invoiced to the Owner by the Engineer.

B. Time Extension: Any need for more than one resubmission, or any other delay in Engineer's review of submittals, will not entitle Contractor to extension of the Contract Time.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 42 00
REFERENCE STANDARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Abbreviations and Symbols.

B. Reference Standards.

C. Definitions.

1.02 RELATED SECTIONS

A. Information provided in this section is used where applicable in individual Specification sections, Divisions 1 through 49.

1.03 REFERENCE ABBREVIATIONS

A. Reference to a technical society, trade association or standards setting organization, may be made in the Specifications by abbreviations in accordance with the following list:

AABC	Associated Air Balance Council
AAMA	Architectural Aluminum Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ACI	American Concrete Institute
ADC	Air Diffusion Council
AFBMA	Anti-friction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AHA	Association of Home Appliance Manufacturers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association, Inc.
ANSI	American National Standards Institute
APA	American Plywood Association
ARI	American Refrigeration Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers

ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders' Hardware Manufacturers Association
BIA	Brick Institute of American
CABO	Council of American Building Officials
CAGI	Compressed Air and Gas Institute
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers Association of America
CRD	U.S. Corps of Engineers Specifications
CRSI	Concrete Reinforcing Steel Institute
CTI	Cooling Tower Institute
DHI	Door and Hardware Institute
DOH	Department of Health
DOT	Department of Transportation
Fed. Spec.	Federal Specifications
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
HMI	Hoist Manufacturing Institute
HPMA	See HPVA
HPVA	Hardwood Plywood Veneer Association
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IFI	Industrial Fasteners Institute
MIL	Military Specifications
MSS	Manufacturer's Standardization Society
NAAMM	National Association of Architectural Metal Manufacturers
NACM	National Association of Chain Manufacturers
NBS	National Bureau of Standards, See NIST
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NETA	National Electrical Testing Association
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NFPA	National Fluid Power Association
NIST	National Institute of Standards and Technology
NLMA	National Lumber Manufacturers Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Act
PCI	Prestressed Concrete Institute
PDI	Plumbing and Drainage Institute

SAE	Society of Automotive Engineers
SCPRF	Structural Clay Products Research Foundation
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SPI	Society of the Plastics Industry
SSPC	Steel Structures Painting Council
STI	Steel Tank Institute
TCA	Tile Council of American
TIMA	Thermal Insulation Manufacturers' Association
UL	Underwriters' Laboratories, Inc.
USBR	U. S. Bureau of Reclamation
USBS	U. S. Bureau of Standards, See NIST

1.04 REFERENCE STANDARDS

A. Latest Edition: Construe references to furnishing materials or testing, which conform to the standards of a particular technical society, organization, or body, to mean the latest standard, code, or specification of that body, adopted and published as of the date of bidding this Contract. Standards referred to herein are made a part of these Specifications to the extent which is indicated or intended.

B. Precedence: The duties and responsibilities of the Owner, Contractor or Engineer, or any of their consultants, agents or employees are set forth in the Contract Documents and are not changed or altered by any provision of any referenced standard specifications, manuals or code, whether such standard manual or code is or is not specifically incorporated by reference in the Contract Documents. Any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority, to undertake responsibility contrary to the powers of the Engineer as set forth in the Contract Documents cannot be assigned to the Engineer or any of the Engineer's consultants, agents or employees.

1.05 DEFINITIONS

A. In these Contract Documents the words furnish, install and provide are defined as follows:

1. Furnish (Materials): to supply and deliver to the project ready for installation and in operable condition.
2. Install (services or labor): to place in final position, complete, anchored, connected in operable condition.
3. Provide: to furnish and install complete. Includes the supply of specified services. When neither furnish, install or provide is stated, provided is implied.

1.06 LCU APPROVED MATERIALS LIST

A. The Contractor shall refer to the most resent Approved Materials List, as of the date of the advertisement for these contract documents.

B. The Approved Materials List located on LCU website constitutes a part of these contract documents.

1.07 LCU STANDARD DETAILS

A. The Contractor shall refer to the most resent LCU Standard Details, as of the date of the advertisement for these Contract Documents.

B. The Standard Details located on LCU website constitutes a part of these Contract Documents.

1.08 LCU DESIGN MANUAL

A. The Contractor shall refer to the most resent LCU Design Manual, as of the date of the advertisement for these Contract Documents.

B. The Design Manual located on LCU website constitutes a part of these Contract Documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 42 13
ABBREVIATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Abbreviations.

B. Standards for Abbreviations.

1.02 RELATED SECTIONS

A. Abbreviations provided in this section are used where applicable in individual Specification sections, Divisions 01 through 49.

1.03 ABBREVIATIONS

A. Abbreviations which may be used in Divisions 01 through 49 for units of measure are as follows:

alternating current	ac
American wire gauge	AWG
ampere(s)	amp
ampere-hour(s)	AH
annual	ann
Ampere Interrupting Capacity	AIC
atmosphere(s)	atm
average	avg
biochemical oxygen demand	BOD
Board Foot	FBM
brake horsepower	bhp
Brinell Hardness	BH
British thermal unit(s)	Btu
calorie(s)	cal
carbonaceous biochemical oxygen demand	CBOD
Celsius (centigrade)	C
Center to Center	C to C
centimeter(s)	cm
chemical oxygen demand	COD
coefficient, valve flow	C_v
cubic	cu

cubic centimeter(s)	cc
cubic feet per day	cfd
cubic feet per hour	cfh
cubic feet per minute	cfm
cubic feet per minute, standard conditions	scfm
cubic feet per second	cfs
cubic foot (feet)	cu ft
cubic inch(es)	cu in
cubic yard(s)	cu yd
decibels	dB
decibels (A scale)	dBa
degree(s)	deg
dewpoint temperature	dpt
diameter	dia
direct current	dc
dissolved oxygen	DO
dissolved solids	DS
dry-bulb temperature	dbt
efficiency	eff
elevation	el
entering water temperature	ewt
entering air temperature	eat
equivalent direct radiation	edr
face area	fa
face to face	f to f
Fahrenheit	F
feet per day	fpd
feet per hour	fph
feet per minute	fpm
feet per second	fps
foot (feet)	ft
foot-candle	fc
foot-pound	ft-lb
foot-pounds per minute	ft-lb/min
foot-pounds per second	ft-lb/sec
formazin turbidity unit(s)	FTU
frequency	freq
gallon(s)	gal
gallons per day	gpd
gallons per day per cubic foot	gpd/cu ft

gallons per day per square foot	gpd/sq ft
gallons per hour	gph
gallons per minute	gpm
gallons per second	gps
gas chromatography and mass spectrometry	GC-MS
gauge	ga
grain(s)	gr
gram(s)	g
grams per cubic centimeter	gm/cc
Heat Transfer Coefficient	U
height	hgt
Hertz	Hz
horsepower	hp
horsepower-hour	hp-hr
hour(s)	hr
humidity, relative	rh
hydrogen ion concentration	pH
inch(es)	in
inches per second	ips
inside diameter	ID
Jackson turbidity unit(s)	JTU
kelvin	K
kiloamperes	kA
kilogram(s)	kg
kilometer(s)	km
kilovar (kilovolt-amperes reactive)	kvar
kilovolt(s)	kV
kilovolt-ampere(s)	kVA
kilowatt(s)	kW
kilowatt-hour(s)	kWh
linear foot (feet)	lin ft
liter(s)	L
megavolt-ampere(s)	MVA
meter(s)	m
micrograms per liter	ug/L
miles per hour	mph
milliampere(s)	mA

milligram(s)	mg
milligrams per liter	mg/L
milliliter(s)	mL
millimeter(s)	mm
million gallons	MG
million gallons per day	mgd
millisecond(s)	ms
millivolt(s)	mV
minute(s)	min
mixed liquor suspended solids	MLSS
nephelometric turbidity unit	NTU
net positive suction head	NPSH
noise criteria	nc
noise reduction coefficient	NRC
number	no
ounce(s)	oz
outside air	oa
outside diameter	OD
parts per billion	ppb
parts per million	ppm
percent	pct
phase (electrical)	ph
pound(s)	lb
pounds per cubic foot	pcf
pounds per cubic foot per hour	pcf/hr
pounds per day	lbs/day
pounds per day per cubic foot	lbs/day/cu ft
pounds per day per square foot	lbs/day/sq ft
pounds per square foot	psf
pounds per square foot per hour	psf/hr
pounds per square inch	psi
pounds per square inch absolute	psia
pounds per square inch gauge	psig
power factor	PF
pressure drop or difference	dp
pressure, dynamic (velocity)	vp
pressure, vapor	vap pr
quart(s)	qt

Rankine	R
relative humidity	rh
resistance	res
return air	ra
revolution(s)	rev
revolutions per minute	rpm
revolutions per second	rps
root mean squared	rms
safety factor	sf
second(s)	sec
shading coefficient	SC
sludge density index	SDI
Sound Transmission Coefficient	STC
specific gravity	sp gr
specific volume	Sp Vol
sp ht at constant pressure	Cp
square	sq
square centimeter(s)	sq cm
square foot (feet)	sq ft
square inch (es)	sq in
square meter(s)	sq m
square yard(s)	sq yd
standard	std
static pressure	st pr
supply air	sa
suspended solids	SS
temperature	temp
temperature difference	TD
temperature entering	TE
temperature leaving	TL
thousand Btu per hour	Mbh
thousand circular mils	kcmil
thousand cubic feet	Mcf
threshold limit value	TLV
tons of refrigeration	tons
torque	TRQ
total dissolved solids	TDS
total dynamic head	TDH
total kjeldahl nitrogen	TKN
total oxygen demand	TOD
total pressure	TP
total solids	TS

total suspended solids	TSS
total volatile solids	TVS
vacuum	vac
viscosity	visc
volatile organic chemical	VOC
volatile solids	VS
volatile suspended solids	VSS
volt(s)	V
volts-ampere(s)	VA
volume	vol
watt(s)	W
watthour(s)	Wh
watt-hour demand	WHD
watt-hour demand meter	WHDM
week(s)	wk
weight	wt
wet-bulb	WB
wet bulb temperature	WBT
yard(s)	yd
year(s)	yr

1.04 STANDARD FOR ABBREVIATIONS

A. Use ASME Y1.1-1989, "Abbreviations for use on Drawings and in Text" for abbreviations for units of measure not included in Paragraph 1.3.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 43 00
QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Inspection Services.

C. Inspection of Materials.

D. Quality Control.

E. Costs of Inspection.

F. Acceptance Tests.

G. Failure to Comply with Contract.

1.02 RELATED SECTIONS

A. Section 01 33 00, Submittals: Specific Submittal Requirements.

1.03 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 01, General Requirements.

B. Certificate Submittals: Furnish the Engineer authoritative evidence in the form of Certificates of Manufacture that the materials and equipment to be used in the Work have been manufactured and tested in conformity with the Contract Documents. Include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product or on similar products of the manufacturer.

1.04 INSPECTION SERVICES

A. Owner's Access: At all times during the progress of the Work and until the date of final completion, afford the Owner and Engineer every reasonable, safe, and proper facility for inspecting the Work at the site. The observation and inspection of any work will not relieve the Contractor of any obligations to perform proper and satisfactory work as specified. Replace work rejected due to faulty design, inferior, or defective materials, poor workmanship, improper installation, excessive wear, or nonconformity with the requirements

of the Contract Documents, with satisfactory work at no additional cost to the Owner. Replace as directed, finished or unfinished work found not to be in strict accordance with the Contract, even though such work may have been previously approved and payment made therefor.

B. Rejection: The Owner and the Owner's Authorized Representatives have the right to reject materials and workmanship which are defective or require correction. Promptly remove rejected work and materials from the site.

C. Inferior Work Discoveries: Failure or neglect on the part of the Owner or the Owner's Authorized Representatives to condemn or reject bad or inferior work or materials does not imply an acceptance of such work or materials. Neither is it to be construed as barring the Owner or the Owner's Authorized Representatives at any subsequent time from recovering damages or a sum of money needed to build anew all portions of the Work in which inferior work or improper materials were used.

D. Removal for Examination: Should it be considered necessary or advisable by the Owner or the Owner's Authorized Representatives, at any time before final acceptance of the Work, to make examinations of portions of the Work already completed, by removing or tearing out such portions, promptly furnish all necessary facilities, labor, and material, to make such an examination. If such Work is found to be defective in any respect, defray all expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the cost of examination and restoration of the Work will be considered a change in the Work to be paid for in accordance with applicable provisions of the Contract.

E. Operation Responsibility: Assume full responsibility for the proper operation of equipment during tests and instruction periods. Make no claim for damage which may occur to equipment prior to the time when the Owner accepts the Work.

F. Rejection Prior to Warranty Expiration: If at anytime prior to the expiration of any applicable warranties or guarantees, equipment is rejected by the Owner, repay to the Owner all sums of money received for the rejected equipment on progress certificates or otherwise on account of the Contract lump sum prices, and upon the receipt of the sum of money, Owner will execute and deliver a bill of sale of all its rights, title, and interest in and to the rejected equipment. Do not remove the equipment from the premises of the Owner until the Owner obtains from other sources, equipment to take the place of that rejected. The Owner hereby agrees to obtain other equipment within a reasonable time and the Contractor agrees that the Owner may use the equipment furnished by the Contractor without rental or other charge until the other new equipment is obtained.

1.05 INSPECTION OF MATERIALS

A. Premanufacture Notification: Give notice in writing to the Engineer sufficiently in advance of the commencement of manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction. When required, notice to include a request for inspection, the date of commencement, and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, Engineer will arrange to have a representative present at such times during the manufacture or testing as may be necessary to inspect the materials, or will notify Contractor that the inspection will be made at a point other than the point of manufacture or testing, or that the inspection will be waived. Comply with these provisions before shipping any materials. Such inspection will not constitute a release from the responsibility for furnishing materials meeting the requirements of the Contract Documents.

B. Testing Standards: Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with recognized, applicable test codes except as may otherwise be stated herein.

1.06 QUALITY CONTROL

A. Testing:

1. Field and Laboratory:
    a. Provide personnel to assist the Engineer in performing the following periodic observation and associated services.
        1) Soils: Observe and test excavations, placement and compaction of soils. Determine suitability of excavated material. Observe subgrade soils and foundations.
        2) Concrete: Observe forms and reinforcement; observe concrete placement; witness air entrainment tests, facilitate concrete cylinder preparation and assist with other tests performed by Engineer.
        3) Masonry: Sample and test mortar, bricks, blocks and grout; inspect brick and block samples and sample panels; inspect placement of reinforcement and grouting.
    b. When specified in Divisions 2 through 16 of the Contract Documents, provide an independent laboratory testing facility to perform required testing. Qualify the laboratory as having performed previous satisfactory work. Prior to use, submit to the Engineer for approval.
    c. Cooperate with the Engineer and laboratory testing representatives. Provide at least 24 hours notice prior to when specified testing is required. Provide labor and materials, and necessary facilities at the site as required by the Engineer and the testing laboratory.

d. Provide an independent testing agency, a member of the National Electrical Testing Association, to perform inspections and tests specified in Division 26, Electrical of these Specifications.

2. Equipment: Coordinate and demonstrate test procedures as specified in the Contract Documents or as otherwise required during the formal tests.
3. Pipeline and Other Testing: Conform to test procedures and requirements specified in the appropriate Specification section.

B. Reports:

1. Certified Test Reports: Where transcripts or certified test reports are required by the Contract Documents, meet the following requirements:
   a. Before delivery of materials or equipment submit and obtain approval of the Engineer for all required transcripts, certified test reports, certified copies of the reports of all tests required in referenced specifications or specified in the Contract Documents. Perform all testing in an approved independent laboratory or the manufacturer's laboratory. Submit for approval reports of shop equipment tests within thirty days of testing. Transcripts or test reports are to be accompanied by a notarized certificate in the form of a letter from the manufacturer or supplier certifying that tested material or equipment meets the specified requirements and the same type, quality, manufacture and make as specified. The certificate shall be signed by an officer of the manufacturer or the manufacturer's plant manager.
2. Certificate of Compliance: At the option of the Engineer, or where not otherwise specified, submit for approval a notarized Certificate of Compliance. The Certificates may be in the form of a letter stating the following:
   a. Manufacturer has performed all required tests.
   b. Materials to be supplied meet all test requirements.
   c. Tests were performed not more than one year prior to submittal of the certificate.
   d. Materials and equipment subjected to the tests are of the same quality, manufacture and make as those specified.
   e. Identification of the materials.

1.07 COSTS OF INSPECTION

A. Owner's Obligation: Initial inspection and testing of materials furnished under this Contract will be performed by the Owner or his authorized Representatives or inspection bureaus without cost to the Contractor, unless otherwise expressly specified. If subsequent testing is necessary due to failure of the initial tests or because of rejection for noncompliance, reimburse the Owner for expenditures incurred in making such tests.

B. Contractor's Obligation: Include in the Contract Price, the cost of all shop and field tests of equipment and other tests specifically called for in the Contract Documents.

C. Reimbursements to Owner:

1. Materials and equipment submitted by the Contractor as the equivalent to those specifically named in the Contract may be tested by the Owner for compliance. Reimburse the Owner for expenditures incurred in making such tests on materials and equipment which are rejected for noncompliance.
2. Reimburse Owner for the costs of any jobsite inspection between the hours of 7:00 p.m. and 6:00 a.m.
3. Reimburse Owner for all costs associated with Witness Tests which exceed 5 Calendar Days per kind of equipment.

1.08 ACCEPTANCE TESTS

A. Preliminary Field Tests: As soon as conditions permit, furnish all labor and materials and services to perform preliminary field tests of all equipment provided under this Contract. If the preliminary field tests disclose that any equipment furnished and installed under this Contract does not meet the requirements of the Contract Documents, make all changes, adjustments and replacements required prior to the acceptance tests.

B. Final Field Tests: Upon completion of the Work and prior to final payment, subject all equipment, piping and appliances installed under this Contract to specified acceptance tests to demonstrate compliance with the Contract Documents.

1. Furnish all labor, fuel, energy, water and other materials, equipment, instruments and services necessary for all acceptance tests.
2. Conduct field tests in the presence of the Engineer. Perform the field tests to demonstrate that under all conditions of operation each equipment item:
   a. Has not been damaged by transportation or installation.
   b. Has been properly installed.
   c. Has been properly lubricated.
   d. Has no electrical or mechanical defects.
   e. Is in proper alignment.
   f. Has been properly connected.
   g. Is free of overheating of any parts.
   h. Is free of all objectionable vibration.
   i. Is free of overloading of any parts.
   j. Operates as intended.

3. Operate work or portions of work for a minimum of 100 hours or 14 days continuous service, whichever comes first. For those items of equipment which would normally operate on wastewater or sludge, plant effluent may be used if available when authorized by Engineer. If water can not properly exercise equipment, conduct 100-hour test after plant startup. Conduct test on those systems which require load produced by weather (heating or cooling) exercise only when weather will produce proper load.

C. Failure of Tests: If the acceptance tests reveal defects in material or equipment, or if the material or equipment in any way fails to comply with the requirements of the Contract Documents, then promptly correct such deficiencies. Failure or refusal to correct the deficiencies, or if the improved materials or equipment, when tested again, fail to meet the guarantees or specified requirements, the Owner, notwithstanding its partial payment for work and materials or equipment, may reject said materials or equipment and may order the Contractor to remove the defective work from the site at no addition to the Contract Price, and replace it with material or equipment which meets the Contract Documents.

1.09 FAILURE TO COMPLY WITH CONTRACT

A. Unacceptable Materials: If it is ascertained by testing or inspection that the material or equipment does not comply with the Contract, do not deliver said material or equipment, or if delivered remove it promptly from the site or from the Work and replace it with acceptable material without additional cost to the Owner. Fulfill all obligations under the terms and conditions of the Contract even though the Owner or the Owner's Authorized Representatives fail to ascertain noncompliance or notify the Contractor of noncompliance.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 57 00
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General Requirements.

B. Temporary Utilities.

C. Temporary Construction.

D. Barricades and Enclosures.

E. Fences.

F. Security.

G. Temporary Controls.

H. Traffic Regulation.

I. Field Offices and Sheds.

1.02 GENERAL REQUIREMENTS

A. Plant and Facilities: Furnish, install, maintain and remove all false work, scaffolding, ladders, hoistways, braces, pumping plants, shields, trestles, roadways, sheeting, centering forms, barricades, drains, flumes, and the like, any of which may be needed in the construction of any part of the Work and which are not herein described or specified in detail. The Contractor shall accept responsibility for the safety and efficiency of such works and for any damage that may result from their failure or from their improper construction, maintenance or operation.

B. First Aid: Maintain a readily accessible, completely equipped first aid kit at each location where work is in progress.

C. Safety Responsibility: Accept sole responsibility for safety and security at the site. Indemnify and hold harmless the Owner and the Owner's Authorized Representatives, including the Engineer, for any safety violation, or noncompliance with governing bodies and their regulations, and for accidents, deaths, injuries, or damage at the site during occupancy or partial occupancy of the site by Contractor's forces while performing any part of the Work.

D. Hazard Communication: Furnish two copies of the Contractor's Hazard Communication Program required under OSHA regulations before beginning on site activities. Furnish two copies of amendments to Hazard Communications Program as they are prepared.

1.03 TEMPORARY UTILITIES

A. Water: Provide all necessary and required water without additional cost, unless otherwise specified. If necessary, provide and lay water lines to the place of use; secure all necessary permits; pay for all taps to water mains and hydrants and for all water used at the established rates.

B. Light and Power: Provide without additional cost to the Owner temporary lighting and power facilities required for the proper construction and inspection of the Work. If, in the Engineer's opinion, these facilities are inadequate, do NOT proceed with any portion of the Work affected thereby. Maintain temporary lighting and power until the Work is accepted.

C. Heat: Provide temporary heat, whenever required, for work being performed during cold weather to prevent freezing of concrete, water pipes, and other damage to the Work or existing facilities.

D. Sanitary Facilities: Provide sufficient sanitary facilities for construction personnel. Prohibit and prevent nuisances on the site of the Work or on adjoining property. Discharge any employee who violates this rule. Abide by all environmental regulations or laws applicable to the Work.

E. Connections to Existing Utilities:

1. Unless otherwise specified or indicated, make all necessary connections to existing facilities including structures, drain lines, and utilities such as water, sewer, gas, telephone, and electricity. In each case, obtain permission from the Owner or the owning utility prior to undertaking connections. Protect facilities against deleterious substances and damage.
2. Thoroughly plan in advance all connections to existing facilities. Have on hand at the time of undertaking the connections, all material, labor and required equipment. Proceed continuously to complete connections in minimum time. Arrange for the operation of valves or other appurtenances on existing utilities, under the direct supervision of the owning utility.

1.04 TEMPORARY CONSTRUCTION

A. Bridges: Design and place suitable temporary bridges where necessary for the maintenance of vehicular and pedestrian traffic. Assume responsibility for the sufficiency and safety of all such temporary work or bridges and for any damage which may result from their failure or their improper construction, maintenance, or operation. Indemnify and save harmless the Owner and the Owner's representatives from all claims, suits or actions, and damages or costs of every description arising by reason of failure to comply with the above provisions.

1.05 BARRICADES AND ENCLOSURES

A. Protection of Workmen and Public: Effect and maintain at all times during the prosecution of the Work, barriers and lights necessary for the protection of Workmen and the Public. Provide suitable barricades, lights, "danger" or "caution" or "street closed" signs and watchmen at all places where the Work causes obstructions to normal traffic, excavation sites, or constitutes in any way a hazard to the public.

B. Barricades and Lights:

1. Protect all streets, roads, highways, excavations and other public thoroughfares which are closed to traffic; use effective barricades which display acceptable warning signs. Locate barricades at the nearest public highway or street on each side of the blocked section.
2. Statutory Requirements: Install and maintain all barricades, signs, lights, and other protective devices within highway rights-of-way in strict conformity with applicable statutory requirements by the authority having jurisdiction.

1.06 FENCES

A. Existing Fences: Obtain written permission from the Owner prior to relocating or dismantling fences which interfere with construction operations. Reach agreements with the fence owner as to the period the fence may be left relocated or dismantled. Install adequate gates where fencing must be maintained. Keep gates closed and locked at all times when not in use.

B. Restoration: Restore all fences to their original or better condition and to their original location on completion of the Work.

1.07 SECURITY

A. Preservation of Property:

1. Preserve from damage, all property along the line of the Work, in the vicinity of or in any way affected by the Work, the removal or destruction of which is not called for by the Drawings. Preserve from damage, public utilities, trees, lawn areas, building monuments, fences, pipe and underground structures, and public streets. Note: Normal wear and tear of streets resulting from legitimate use by the Contractor are not considered as damage. Whenever damages occur to such property, immediately restore to its original condition. Costs for such repairs are incidental to the Contract.
2. In case of failure on the part of the Contractor to restore property or make good on damage or injury, the Owner may, upon 24 hours written notice, proceed to repair, rebuild, or otherwise restore such property as may be deemed necessary, and the cost thereof will be deducted from any moneys due or which may become due the Contractor under this Contract. If removal, repair or replacement of public or private property is made necessary by alteration of grade or alignment authorized by the Owner and not contemplated by the Contract Documents, the Contractor will be compensated, in accordance with the General Conditions, provided that such property has not been damaged through fault of the Contractor or the Contractor's employees.

B. Public Utility Installations and Structures:

1. Public utility installations and structures include all poles, tracks, pipes, wires, conduits, vaults, manholes, and other appurtenances and facilities, whether owned or controlled by public bodies or privately-owned individuals, firms or corporations, used to serve the public with transportation, gas, electricity, telephone, storm and sanitary sewers, water, or other public or private utility services. Facilities appurtenant to public or private property which may be affected by the Work are deemed included hereunder.
2. The Contract Documents contain data relative to existing public utility installations and structures above and below the ground surface. Existing public utility installations and structures are indicated on the Drawings only to the extent such information was made available to, or found by, the Engineer in preparing the Drawings. These data are not guaranteed for completeness or accuracy, and the Contractor is responsible for making necessary investigations to become fully informed as to the character, condition, and extent of all public utility installations and structures that may be encountered and that may affect the construction operations.

3. Contact utility locating service sufficiently in advance of the start of construction to avoid damage to the utilities and delays to the completion date.
4. Remove, replace, relocate, repair, rebuild, and secure any public utility installations and structures damaged as a direct or indirect result of the Work under this Contract. Costs for such work are incidental to the Contract. Be responsible and liable for any consequential damages done to or suffered by any public utility installations or structures. Assume and accept responsibility for any injury, damage, or loss which may result from or be consequent to interference with, or interruption or discontinuance of, any public utility service.
5. Repair or replace any water, electric, sewer, gas, irrigation, or other service connection damaged during the Work with no addition to the Contract price.
6. At all times in performance of the Work, employ proven methods and exercise reasonable care and skill to avoid unnecessary delay, injury, damage, or destruction to public utility installations and structures. Avoid unnecessary interference with, or interruption of, public utility services. Cooperate fully with the owners thereof to that end.
7. Give written notice to the owners of all public utility installations and structures affected by proposed construction operations, sufficiently in advance of breaking ground in any area or on any unit of the Work, to obtain their permission before disrupting the lines and to allow them to take measures necessary to protect their interests. Advise the Chiefs of Police, Fire and Rescue Services of any excavation in public streets or the temporary shut-off of any water main. Provide at least 24 hours notice to all affected property owners whenever service connections are taken out of service.

C. Miscellaneous Structures: Assume and accept responsibility for all injuries or damage to culverts, building foundations and walls, retaining walls, or other structures of any kind met with during the prosecution of the Work. Assume and accept liability for damages to public or private property resulting therefrom. Adequately protect against freezing all pipes carrying liquid.

D. Protection of Trees and Lawn Areas:

1. Protect with boxes, trees and shrubs, except those ordered to be removed. Do not place excavated material so as to cause injury to such trees or shrubs. Replace trees or shrubs destroyed by accident or negligence of the Contractor or Contractor's employees with new stock of similar size and age, at the proper season, at no additional cost to the Owner.
2. Leave lawn areas in as good condition as before the start of the Work. Restore areas where sod has been removed by seeding or sodding.

1.08 TEMPORARY CONTROLS

A. During Construction:

1. Keep the site of the Work and adjacent premises free from construction materials, debris, and rubbish. Remove this material from any portion of the site if such material, debris, or rubbish constitutes a nuisance or is objectionable.
2. Remove from the site all surplus materials and temporary structures when they are no longer needed.
3. Neatly stack construction materials such as concrete forms and scaffolding when not in use. Promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids, and cleaning solutions from surfaces to prevent marring or other damage.
4. Properly store volatile wastes in covered metal containers and remove from the site daily.
5. Do not bury or burn on the site or dispose of into storm drains, sanitary sewers, streams, or waterways, any waste material. Remove all wastes from the site and dispose of in a manner complying with applicable ordinances and laws.

B. Smoke Prevention:

1. Strictly observe all air pollution control regulations.
2. Open fires will be allowed only if permitted under current ordinances.

C. Noises:

1. Maintain acceptable noise levels in the vicinity of the Work. Limit noise production to acceptable levels by using special mufflers, barriers, enclosures, equipment positioning, and other approved methods.
2. Supply written notification to the Owner sufficiently in advance of the start of any work which violates this provision. Proceed only when all applicable authorizations and variances have been obtained in writing.

D. Hours of Operation:

1. Refer to the supplemental conditions section for hours of operation.
2. Do not carry out nonemergency work, including equipment moves, on Sundays without prior written authorization by the Owner. No work shall be performed on holidays or weekends unless otherwise specified or approved.

E. Dust Control:

1. Take measures to prevent unnecessary dust. Keep earth surfaces exposed to dusting moist with water or a chemical dust suppressant. Cover materials in piles or while in transit to prevent blowing or spreading dust.
2. Adequately protect buildings or operating facilities which may be affected adversely by dust. Protect machinery, motors, instrument panels, or similar equipment by suitable dust screens. Include proper ventilation with dust screens.

F. Temporary Drainage Provisions:

1. Provide for the drainage of stormwater and any water applied or discharged on the site in performance of the Work. Provide adequate drainage facilities to prevent damage to the Work, the site, and adjacent property.
2. Supplement existing drainage channels and conduits as necessary to carry all increased runoff from construction operations. Construct dikes as necessary to divert increased runoff from entering adjacent property (except in natural channels), to protect the Owner's facilities and the Work, and to direct water to drainage channels or conduits. Provide ponding as necessary to prevent downstream flooding.
3. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

G. Pollution: Prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris, and other substances resulting from construction activities. Do not permit sanitary wastes to enter any drain or watercourse other than sanitary sewers. Do not permit sediment, debris, or other substances to enter sanitary sewers. Take reasonable measures to prevent such materials from entering any drain or watercourse.

1.09 FIELD OFFICES AND SHEDS

A. Contractor's Office: Erect, furnish, and maintain a field office with a telephone. Have an authorized agent present at this office at all times while the Work is in progress. Keep readily accessible copies of the Contract Documents, required record documents, and the latest approved Shop Drawings at this field office.

B. Material Sheds and Temporary Structures: Provide material sheds and other temporary structures of sturdy construction and neat appearance.

C. Location: Coordinate location of field offices, material sheds and temporary structures with Engineer and Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 61 00
MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description.

B. Substitutions.

C. Manufacturer's Written Instructions.

D. Transportation and Handling.

E. Storage, Protection and Maintenance.

F. Manufacturer's Field Quality Control Services.

G. Post Startup Services.

H. Special Tools and Lubricating Equipment.

I. Lubrication.

1.02 DESCRIPTION

A. Proposed Manufacturers List: Within 15 calendar days of the date of the Notice to Proceed, submit to the Engineer a list of the names of proposed manufacturers, materialmen, suppliers and subcontractors, obtain approval of this list by Owner prior to submission of any working drawings. Upon request submit evidence to Engineer that each proposed manufacturer has manufactured a similar product to the one specified and that it has previously been used for a like purpose for a sufficient length of time to demonstrate its satisfactory performance.

B. Furnish and install Material and Equipment which meets the following:

1. Conforms to applicable specifications and standards.
2. Complies with size, make, type, and quality specified or as specifically approved, in writing, by Engineer.
3. Will fit into the space provided with sufficient room for operation and maintenance access and for properly connecting piping, ducts and services, as applicable. Make the clear spaces that will be available for operation and maintenance access and connections equal to or greater than those shown and meeting all the manufacturers' requirements. Make all provisions for installing equipment furnished at no increase in Contract Price.

4. Manufactured and fabricated in accordance with the following:
    a. Design, fabricate, and assemble in accordance with best engineering and shop practices.
    b. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
    c. Provide two or more items of same kind identical, by same manufacturer.
    d. Provide materials and equipment suitable for service conditions.
    e. Adhere to equipment capabilities, sizes, and dimensions shown or specified unless variations are specifically approved, in writing, in accordance with the Contract Documents.
    f. Adapt equipment to best economy in power consumption and maintenance. Proportion parts and components for stresses that may occur during continuous or intermittent operation, and for any additional stresses that may occur during fabrication or installation.
    g. Working parts are readily accessible for inspection and repair, easily duplicated and replaced.
5. Use material or equipment only for the purpose for which it is designed or specified.

1.03 SUBSTITUTIONS

A. Substitutions:

1. Contractor's requests for changes in equipment and materials from those required by the Contract Documents are considered requests for substitutions and are subject to Contractor's representations and review provisions of the Contract Documents when one of following conditions are satisfied:
    a. Where request is directly related to an "or equal" clause or other language of same effect in Specifications.
    b. Where required equipment or material cannot be provided within Contract Time, but not as result of Contractor's failure to pursue Work promptly or to coordinate various activities properly.
    c. Where required equipment or material cannot be provided in manner compatible with other materials of Work, or cannot be properly coordinated therewith.
2. Contractor's Options:
    a. Where more than one choice is available as options for Contractor's selection of equipment or material, select option compatible with other equipment and materials already selected (which may have been from among options for other equipment and materials).

b. Where compliance with specified standard, code or regulation is required, select from among products which comply with requirements of those standards, codes, and regulations.
c. "Or Equal": For equipment or materials specified by naming one or more equipment manufacturer and "or equal", submit request for substitution for any equipment or manufacturer not specifically named.

B. Conditions Which are Not Substitution:

1. Requirements for substitutions do not apply to Contractor options on materials and equipment provided for in the Specifications.
2. Revisions to Contract Documents, where requested by Owner or Engineer, are "changes" not "substitutions".
3. Contractor's determination of and compliance with governing regulations and orders issued by governing authorities do not constitute substitutions and do not constitute basis for a Change Order, except as provided for in Contract Documents.

1.04 MANUFACTURER'S WRITTEN INSTRUCTIONS

A. Instruction Distribution: When the Contract Documents require that installation, storage, maintenance and handling of equipment and materials comply with manufacturer's written instruction's, obtain and distribute printed copies of such instructions to parties involved in installation, including six copies to Engineer.

1. Maintain one set of complete instructions at jobsite during storage and installation, and until completion of work.

B. Manufacturer's Requirements: Store, maintain, handle, install, connect, clean, condition, and adjust products in accordance with manufacturer's written instructions and in conformity with Specifications.

1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult Engineer for further instructions.
2. Do not proceed with work without written instructions.

C. Performance Procedures: Perform work in accordance with manufacturer's written instructions. Do not omit preparatory steps or installation procedures, unless specifically modified or exempted by Contract Documents.

1.05 TRANSPORTATION AND HANDLING

A. Coordination with Schedule: Arrange deliveries of materials and equipment in accordance with Construction Progress Schedules. Coordinate to avoid conflict with work and conditions at site.

1. Deliver materials and equipment in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
2. Protect bright machined surfaces, such as shafts and valve faces, with a heavy coat of grease prior to shipment.
3. Immediately upon delivery, inspect shipments to determine compliance with requirements of Contract Documents and approved submittals and that material and equipment are protected and undamaged.

B. Handling: Provide equipment and personnel to handle material and equipment by methods recommended by manufacturer to prevent soiling or damage to materials and equipment or packaging.

1.06 STORAGE, PROTECTION, AND MAINTENANCE

A. On-site storage areas and buildings:

1. Conform storage buildings to requirements of Section 01 57 00, Construction Facilities and Temporary Controls.
2. Coordinate location of storage areas with Engineer and Owner.
3. Arrange on site storage areas for proper protection and segregation of stored materials and equipment with proper drainage. Provide for safe travel around storage areas and safe access to stored materials and equipment.
4. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
5. Store materials such as pipe, reinforcing and structural steel, and equipment on pallets, blocks or racks, off ground.
6. PVC Pipe may be damaged by prolonged exposure to direct sunlight and the Contractor shall take necessary precautions during storage and installation to avoid this damage. Pipe shall be stored under cover and installed with sufficient backfill to shield it from the sun.
7. Store fabricated materials and equipment above ground, on blocking or skids, to prevent soiling or staining. Cover materials and equipment which are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.

B. Interior Storage:

1. Store materials and equipment in accordance with manufacturer's instructions, with seals and labels intact and legible.
2. Store materials and equipment, subject to damage by elements, in weathertight enclosures.
3. Maintain temperature and humidity within ranges required by manufacturer's instructions.

C. Accessible Storage: Arrange storage in a manner to provide easy access for inspection and inventory. Make periodic inspections of stored materials or equipment to assure that materials or equipment are maintained under specified conditions and free from damage or deterioration.

1. Perform maintenance on stored materials of equipment in accordance with manufacturer's instructions, in presence of Owner or Engineer.
2. Submit a report of completed maintenance to Engineer with each Application for Payment.
3. Failure to perform maintenance, to notify Engineer of intent to perform maintenance or to submit maintenance report may result in rejection of material or equipment.

D. Owner's Responsibility: Owner assumes no responsibility for materials or equipment stored in buildings or on-site. Contractor assumes full responsibility for damage due to storage of materials or equipment.

E. Contractor's Responsibility: Contractor assumes full responsibility for protection of completed construction. Repair and restore damage to completed Work equal to its original condition.

F. Special Equipment: Use only rubber-tired wheelbarrows, buggies, trucks, or dollies to wheel loads over finished floors, regardless if the floor has been protected or not. This applies to finished floors and to exposed concrete floors as well as those covered with composition tile or other applied surfacing.

G. Surface Damage: Where structural concrete is also the finished surface, take care to avoid marking or damaging surface.

1.07 MANUFACTURER'S FIELD QUALITY CONTROL SERVICES

A. General:

1. Provide manufacturer's field services in accordance with this subsection for those tasks specified in other sections.
2. Include and pay all costs for suppliers' and manufacturers' services, including, but not limited to, those specified.

B. Installation Instruction: Provide instruction by competent and experienced technical representatives of equipment manufacturers or system suppliers as necessary to resolve assembly or installation procedures which are attributable to, or associated with, the equipment furnished.

C. Installation Inspection, Adjustments and Startup Participation:

1. Provide competent and experienced technical representatives of equipment manufacturers or system suppliers to inspect the completed installation as follows.
    a. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or for other conditions which may cause damage.
    b. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
    c. Verify that wiring and support components for equipment are complete.
    d. Verify that equipment or system is installed in accordance with the manufacturer's recommendations, approved shop drawings and the Contract Documents.
    e. Verify that nothing in the installation voids any warranty.
2. Provide manufacturer's representatives to perform initial equipment and system adjustment and calibration conforming to the manufacturer's recommendations and instructions, approved shop drawings and the Contract Documents.
3. Obtain Engineer's approval before start-up of equipment. Execute start-up under supervision of applicable manufacturer's representative in accordance with manufacturers' instructions.
4. Furnish Engineer with three copies of the following. When training is specified, furnish the copies at least 24 hours prior to training.
    a. "Certificate of Installation, Inspection and Start-up Services" by manufacturers' representatives for each piece of equipment and each system specified, certifying:
        1) That equipment is installed in accordance with the manufacturers' recommendations, approved shop drawings and the Contract Documents.
        2) That nothing in the installation voids any warranty.
        3) That equipment has been operated in the presence of the manufacturer's representative.
        4) That equipment, as installed, is ready to be operated by others.

b. Detailed report by manufacturers' representatives, for review by Engineer of the installation, inspection and start-up services performed, including:
   1) Description of calibration and adjustments if made; if not in Operation and Maintenance Manuals, attach copy.
   2) Description of any parts replaced and why replaced.
   3) Type, brand name, and quantity of lubrication used, if any.
   4) General condition of equipment.
   5) Description of problems encountered, and corrective action taken.
   6) Any special instructions left with Contractor or Engineer.

D. Field Test Participation: Provide competent and experienced technical representatives of all equipment manufacturers and system suppliers as necessary to participate in field testing of the equipment specified in Section 01 43 00, Quality Control.

E. Trouble-Free Operation: Provide competent and experienced technical representatives of all equipment manufacturers and system suppliers as necessary to place the equipment in trouble-free operation after completion of start-up and field tests.

1.08 POST START-UP SERVICES

A. General: Provide Post Start-up Services in accordance with this subsection for equipment specified in other sections.

B. Site Visit: Provide the services of an authorized service representative for each equipment manufacturer or system supplier to make a final site visit after the equipment or system has been in operation for at least 6 months, but no longer than 11 months. Furnish assistance to Owner's operating personnel in making adjustments and calibrations required to determine that the equipment and system is operating in conformance with design, manufacturer's, and specification requirements. Instruct the personnel in a review of proper operation and maintenance procedures.

C. Certificate: Furnish "Certificate of Post Start-up Services" cosigned by Engineer and the manufacturer's representative, certifying that this service has been performed. Use form provided in this section, and furnish Owner with three copies.

1.09 SPECIAL TOOLS AND LUBRICATING EQUIPMENT

A. General: Furnish, per manufacturer's recommendations, special tools required for checking, testing, parts replacement, and maintenance. (Special tools are those which have been specially designed or adapted for use on parts of the equipment, and which are not customarily and routinely carried by maintenance mechanics.)

B. Time of Delivery: Deliver special tools and lubricating equipment to Owner when unit is placed into operation and after operating personnel have been properly instructed in operation, repair, and maintenance of equipment.

C. Quality: Provide tools and lubricating equipment of a quality meeting equipment manufacturer's requirements.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 74 00
CLEANING

PART 1 GENERAL

1.01 SECTION INCLUDES:

A. General Requirements.

B. Disposal Requirements.

1.02 GENERAL REQUIREMENTS

A. Execute cleaning during progress of the Work and at completion of the Work.

1.03 DISPOSAL REQUIREMENTS

A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 DURING CONSTRUCTION

A. Execute daily cleaning to keep the Work, the site, and adjacent properties free from accumulations of waste materials, rubbish, and windblown debris, resulting from construction operations.

B. Provide onsite containers for the collection of waste materials, debris and rubbish. All waste materials including containers, food debris and other miscellaneous materials must be disposed of daily in onsite containers.

C. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

3.02 FINAL CLEANING

A. Requirements: At the completion of Work and immediately prior to final inspection, clean the entire project as follows:

B. Thoroughly clean, sweep, wash, and polish all work and equipment provided under the Contract, including finishes. Leave the structures and site in a complete and finished condition to the satisfaction of the Engineer.

1. Direct all subcontractors to similarly perform, at the same time, an equivalent thorough cleaning of all work and equipment provided under their contracts.

2. Remove all temporary structures and all debris, including dirt, sand, gravel, rubbish and waste material.
3. Should the Contractor not remove rubbish or debris or not clean the buildings and site as specified above, the Owner reserves the right to have the cleaning done at the expense of the Contractor.

C. Employ experienced workers, or professional cleaners, for final cleaning.

D. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

E. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

F. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces. Polish surfaces so designated to shine finish.

G. Repair, patch, and touch up marred surfaces to specified finish, to match adjacent surfaces.

H. Replace air-handling filters if units were operated during construction.

I. Clean ducts, blowers, and coils, if air-handling units were operated without filters during construction.

J. Vacuum clean all interior spaces, including inside cabinets.

K. Handle materials in a controlled manner with as few handlings as possible. Do not drop or throw materials from heights.

L. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly-painted surfaces.

M. Clean interior of all panel cabinets, pull boxes, and other equipment enclosures.

N. Wash and wipe clean all lighting fixtures, lamps, and other electrical equipment which may have become soiled during installation.

O. Perform touch-up painting.

P. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.

Q. Remove erection plant, tools, temporary structures and other materials.

R. Remove and dispose of all water, dirt, rubbish or any other foreign substances.

3.03 FINAL INSPECTION

A. After cleaning is complete the final inspection may be scheduled. The inspection will be done with the Owner and Engineer.

END OF SECTION

SECTION 01 77 00
CONTRACT CLOSE OUT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Warranties and Bonds.

B. Record Drawings.

C. Special Tools.

1.02 WARRANTIES AND BONDS

A. Prior to final payment deliver to the Owner the original and one copy of all bonds, warranties, guarantees and similar documents, including those customarily provided by manufacturers and suppliers which cover a period greater than the 1 year correction period. Show Owner as beneficiary of these documents.

1.03 RECORD DRAWINGS

A. At the site keep and maintain one record copy of all Contract Documents, reference documents and all technical documents submitted in good order. As the work progresses the Contractor shall record on one set of reproducible drawings all changes and deviations from the original Plans and provide to the Engineer. He shall record the exact location of all changes in vertical and horizontal alignment by offsets and ties at each; sewer, water, electric, gas, communication and other services by off-set distance to permanent improvements such as building and curbs.

B. Prior to acceptance of the project and before final payment is made, the Engineer shall submit one set of reproducible drawings, two sets of blueline or blackline prints, all marked "Drawings of Record". These Record Drawings must be certified by the Florida Registered Professional Engineer, who prepared the plans and signs and seals these plan, and submits AutoCAD compatible diskette copy of the drawings, and other applicable related records to the Department of Lee County Utilities.

C. These Record Drawings must be certified by the Florida Registered Professional Engineer, who prepared the plans and signs and seals these plans. The Record Drawings shall include vertical and horizontal alignment of all water, sewer, and effluent reuse lines, valves, tees, bends, reducers, hydrants, pump stations, service connections, meter boxes and/or pads, and other pertinent structures. Pipeline runs in excess of 152.4m, (500 feet), without fittings shall include vertical alignment information at 152.4m, (500 feet) intervals. Said alignment shall be tied to permanent improvements, such as roadway and/or railroad centerlines and rights-of-way, building and property corners, and shall be certified by a Professional Land Surveyor, licensed in the State of Florida. The Professional Land Surveyor can coordinate with the Contractor to install the necessary appurtenances on buried utilities to facilitate the survey after construction is completed. In addition, property strap numbers and street names shall be shown on the plan.

D. On a case by case basis, Lee County Utilities may waive the requirement for certification by a Professional Land Surveyor, licensed in the State of Florida. However, prior consent must first be obtained from Lee County Utilities. The County shall withhold final acceptance of the project until the requirement for record drawings and related records has been met. Record Drawings without detailed field verified horizontal and vertical locations of all facilities shown will be rejected.

1.04 SPECIAL TOOLS

A. Special tools are considered to be those tools which, because of their limited use, are not normally available but which are necessary for maintenance of particular equipment.

B. For each type of equipment provided under this Contract, furnish a complete set of all special tools including grease guns and other lubricating devices, which may be needed for the adjustment, operation, maintenance, and disassembly of such equipment. Furnish only tools of high grade, smooth forged alloy tool steel. Manufacture grease guns of the lever type.

C. Furnish and erect one or more neat and substantial steel wall cases or cabinets with flat key locks and clips or hooks to hold each special tool in a convenient arrangement.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 23
OPERATION AND MAINTENANCE MANUALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description.

B. Quality Assurance.

C. Submittals.

D. Format and Contents.

1.02 DESCRIPTION

A. Scope: Furnish to the Engineer three copies and a PDF of an Operation and Maintenance Manual for all equipment and associated control systems furnished and installed.

1.03 QUALITY ASSURANCE

A. Reference Codes and Specifications: No current government or commercial specifications or documents apply.

1.04 SUBMITTALS

A. Prior to the Work Reaching 50 Percent Completion, submit to the Engineer for approval two copies of the manual with all specified material. Submit the approval copies with the partial payment request for the specified completion. Within 30 days after the Engineer's approval of the two-copy submittal, furnish to the Engineer the remaining eight copies of the manual. Provide space in the manual for additional material. Submit any missing material for the manual prior to requesting certification of substantial completion.

1.05 FORMAT AND CONTENTS

A. Prepare and arrange each copy of the manual as follows:

1. One copy of an equipment data summary (see sample form) for each item of equipment.
2. One copy of an equipment preventive maintenance data summary (see sample form) for each item of equipment.

3. One copy of the manufacturer's operating and maintenance instructions. Operating instructions include equipment start-up, normal operation, shutdown, emergency operation and troubleshooting. Maintenance instructions include equipment installation, calibration and adjustment, preventive and repair maintenance, lubrication, troubleshooting, parts list and recommended spare parts.
4. List of electrical relay settings and control and alarm contact settings.
5. Electrical interconnection wiring diagram for equipment furnished including all control and lighting systems.
6. One valve schedule giving valve number, location, fluid, and fluid destination for each valve installed. Group all valves in same piping systems together in the schedule. Obtain a sample of the valve numbering system from the ENGINEER.
7. Furnish all O&M Manual material on 8-1/2 by 11 commercially printed or typed forms or an acceptable alternative format.

B. Organize each manual into sections paralleling the equipment specifications. Identify each section using heavy section dividers with reinforced holes and numbered plastic index tabs. Use 3-ring, hard-back binders Type No. VS11 as manufactured by K&M Company, Torrence, CA, or equal. Punch all loose data for binding. Arrange composition and printing so that punching does not obliterate any data. Print on the cover and binding edge of each manual the project title, and manual title, as furnished and approved by the Engineer.

C. Leave all operating and maintenance material that comes bound by the equipment manufacturer in its original bound state. Cross-reference the appropriate sections of the Contractor's O&M manual to the manufacturers' bound manuals.

D. Label binders Volume 1, 2, and so on, where more than one binder is required. Include the table of contents for the entire set, identified by volume number, in each binder.

1.06 SUPPLEMENTS

A. The supplements listed below, following “End of Section,” are part of this Specification.

1. Equipment Data Summary.
2. Preventive Maintenance Summary.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

GREEN MEADOWS WATER TREATMENT PLANT PIPING MODIFICATIONS

Lee County Utilities

Equipment Data Summary

Equipment Name: _____ Specification Reference: _____

Manufacturer: _____

Name: _____

Address: _____

_____

Telephone: _____

Number Supplied: _____ Location/Service: _____

Model No: _____ Serial No: _____

Type: _____

Size/Speed/Capacity/Range (as applicable): _____

Power Requirement (Phase/Volts/Hertz): _____

Local Representative: _____

Name: _____

Address: _____

Telephone: _____

NOTES:

GREEN MEADOWS WATER TREATMENT PLANT PIPING MODIFICATIONS

Lee County Utilities

_____

Preventive Maintenance Summary

Equipment Name: _____ Specification Reference: _____

Manufacturer: _____

Name: _____

Address: _____

_____

Telephone: _____

Number Supplied: _____ Location/Service: _____

Model No: _____ Serial No: _____

Maintenance Task	Lubricant/Part	D W M Q SA A	O&M Manual Reference

NOTES:

*D-Daily W-Weekly M-Monthly Q-Quarterly SA-Semi-Annual A-Annual

SECTION 01 78 36
WARRANTIES AND BONDS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Compile specified warranties and bonds, as in Articles 6 and 13 of the General Conditions.

B. Co-execute submittals when so specified.

C. Review submittals to verify compliance with Contract Documents.

D. Submit to the Engineer for review and transmittal to Owner.

1.02 SUBMITTAL REQUIREMENTS

A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.

B. Two original signed copies are required.

C. Table of Contents. Neatly typed in orderly sequence. Provide complete information for each items.

1. Product or work item.
2. Firm, with name of principal, address and telephone number.
3. Scope.
4. Date of beginning warranty, bond or service and maintenance contract.
5. Duration of warranty, bond or service maintenance contract.
6. Provide information for Owner’s personnel:
    a. Proper procedure in case of failure.
    b. Instances which might affect the validity of warranty or bond.
7. Contractor, name of responsible principal, address and telephone number.

1.03 FORM OF SUBMITTALS

A. Prepare in duplicate packets.

B. Format:

1. Size: 8-1/2-inch by 11-inch, punch sheets for standard 3-post binder. Fold larger sheets to fit into binders.

2. Cover: Identify each packet with typed or printed title “WARRANTIES AND BONDS” list:
   a. Title of Project.
   b. Name of Contractor.

C. Binders: Commercial quality, three-post binder, with durable and cleanable plastic covers and maximum post width of 2 inches.

1.04 WARRANTY SUBMITTAL REQUIREMENTS

A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer’s warranty period shall be concurrent with the Contractor’s for one year, unless otherwise specified, commencing at the time of substantial completion.

B. The Contractor shall be responsible for obtaining certificates for equipment warranty for all major equipment specified under Divisions 11, 13, 14, 15, and 16 and which has a 1 HP motor or which lists for more than $1,000. The Engineer reserves the right to request warranties for equipment not classified as major. The Contractor shall still warrant equipment not considered to be “major” in the Contractor’s 1-year warranty period even though certificates of warranty may not be required.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 79 00
TRAINING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Training.

1.02 TRAINING

A. Training: Provide the services of knowledgeable, technically competent, factory trained specialists to instruct (Plant) (Pump Station) personnel in the operation and maintenance of the equipment and system components listed in Paragraph B. The Owner will furnish training classroom space.

1. Coordinate services with the Owner, with a minimum of 30 days prior notice.
2. Provide a combination of classroom and "hands-on" instruction designed to completely familiarize operating and maintenance personnel with the systems theory, standard operating procedures, safety features and emergency procedures, and general maintenance of all components.
3. Conduct all training at the (Plant) (Pump Station) during regular hours on weekdays.

B. Provide training for the following:

SPECIFICATION	EQUIPMENT NAME	MINIMUM HOURS
40 27 01	Static Mixer	8
40 27 02	Valves	8

A. Length of Training: The minimum lengths of training sessions are listed in Paragraph B. above.

B. Credentials: Submit for approval, credentials of equipment manufacturer representatives who are to be course instructors at least 14 days prior to a proposed training session.

C. Scheduling: Submit training outline and other information described in paragraphs G through K for approval at least 14 days prior to the proposed date for the training sessions. Verify scheduling with the Owner at least 14 days prior to the training sessions.

D. Number of Copies: For each training class, provide instructional material for at least ten attendees plus five extra copies, plus duplicate copies of all audio-visual aids utilized during each training course.

E. Training Outline Submission: Provide a proposed training outline including the topics presented in Paragraph K. Identify specific components and procedures in the proposed training outline.

F. Training Topic Detail: Detail specific training topics. Describe "hands-on" demonstrations planned for the training. Reference training aids to be utilized in the training (i.e. video tapes, slides, transparencies) and attach where applicable.

G. Training Handouts: Attach training handouts to the proposed training outline.

H. Training Segment Duration: Indicate the duration of each training segment.

I. Training Outline:

1. Equipment Operation:
    a. Describe equipment's operating (process) function.
    b. Describe equipment's fundamental operating principles and dynamics.
    c. Identify equipment's mechanical, electrical and electronic components and features.
    d. Identify all support equipment associated with the operation of the subject equipment.
    e. Detailed Component Description.
    f. Identify and describe in detail each component's function.
    g. Where applicable, group related components into subsystems.
    h. Identify, and describe in detail, equipment safety features and control interlocks.
2. Equipment Preventive Maintenance:
    a. Describe preventive maintenance inspection procedures required to perform and inspect the equipment in operation, and spot potential trouble symptoms (anticipate breakdowns).
    b. Outline recommended routine lubrication and adjustments (preventive maintenance).
3. Equipment Troubleshooting:
    a. Define recommended systematic troubleshooting procedures.
    b. Provide component specific troubleshooting checklists.
    c. Describe applicable equipment testing and diagnostic procedures to facilitate troubleshooting.
4. Equipment Corrective Maintenance:
    a. Describe recommended equipment preparation requirements.
    b. Identify and describe the use of special tools required for maintenance of the equipment.

c. Describe component removal/installation and disassembly/ assembly procedures.
d. Perform at least two "hands-on" demonstrations of common corrective maintenance repairs.
e. Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.
f. Define recommended torquing, mounting, calibration, and alignment procedures and settings, as appropriate.
g. Describe recommended procedures to check/test equipment following corrective repair.

J. Certificate: Provide "Certificate of Instructional Services" signed by Engineer and equipment representative, verifying that training has been accomplished to satisfaction of all parties. Use form provided in this section, and furnish Engineer with three copies.

K. Substantial Completion: Training provided by manufacturers' representative, Engineer and Owner does not constitute substantial completion.

L. Equipment Use: Use of equipment for training will not void manufacturers' or contract warranties.

4.02 SUPPLEMENTS

A. The supplement listed below, following “End of Section,” is part of this Specification.

1. Certificate of Instructional Services.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

CERTIFICATE OF INSTRUCTIONAL SERVICES

Project_____

Equipment_____

Specification.Section_____

Contract_____

I hereby certify the equipment Manufacturers' Representative has instructed OWNER's personnel in startup operation and maintenance of this equipment as required in the Contract Documents.

MANUFACTURER'S REPRESENTATIVE

Signature _____

Name: (print) _____

Title: _____

Representing _____

CONTRACTOR

Signature _____ Date _____

Name (print) _____

Title _____

ENGINEER

Signature _____ Date _____

Name (print) _____

Title _____

COMMENTS:

Complete and submit three copies of this form to ENGINEER upon completion of training as required by Specification Section 01 79 00.

SECTION 01 88 15
ANCHORAGE AND BRACING

PART 1 GENERAL

1.01 SUMMARY

A. This section covers requirements for anchorage and bracing of equipment, distribution systems, and other nonstructural components required in accordance with the ICC 2018 International Building Code (IBC), for wind, gravity, soil, and operational loads.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Institute of Steel Construction (AISC) 360, Specification for Structural Steel Buildings.
2. American Society of Civil Engineers (ASCE): ASCE 7, Minimum Design Loads for Buildings and Other Structures.
3. International Code Council (ICC): International Building Code (IBC).

1.03 DEFINITIONS

A. Authority Having Jurisdiction (AHJ): Permitting building agency; may be a federal, state, local, or other regional department, or individual including building official, fire chief, fire marshal, chief of a fire prevention bureau, labor department, or health department, electrical inspector; or others having statutory authority. AHJ may be Owner when authorized to be self-permitting by governmental permitting agency or when no governmental agency has authority.

B. Component Important Factor:

1. Ip greater than 1.0, unless noted otherwise.
2. Ip shall be taken as 1.5 if any of the following conditions apply:
   a. Component contains hazardous materials.
   b. Component is in or attached to Risk Category IV structure and is needed for continued operation of facility or its failure could impair continued operation of facility.

1.04 DESIGN AND PERFORMANCE REQUIREMENTS

A. General:

1. Anchorage and bracing systems shall be designed by a qualified professional engineer registered in the State of Florida.

2. Design anchorage into concrete including embedment in accordance with ACI 318-14; Chapter 17 (or other industry standard approved by Engineer), and Project Specifications.
    a. Unless otherwise noted, design for cracked concrete condition.
3. Design anchorage and bracing of architectural, mechanical, and electrical components and systems in accordance with this section, unless a design is specifically provided within Contract Documents or where exempted hereinafter.
4. Design attachments, braces, and anchors for equipment, components, and distribution systems to structure for gravity, wind, and operational loading.
5. Anchor and brace piping and ductwork, whether exempt or not exempt for this section, so that lateral or vertical displacement does not result in damage or failure to essential architectural, mechanical, or electrical equipment.
6. Provide supplementary framing where required to transfer anchorage and bracing loads to structure.
7. Adjust equipment pad sizes or provide additional anchorage confinement reinforcing to provide required anchorage capacities.
8. For components exempted from design requirements of this section, provide bolted, welded, or otherwise positively fastened attachments to supporting structure.

B. Design Loads:

1. Gravity: Design anchorage and bracing for self-weight and superimposed loads on components and equipment.
2. Wind: Design anchorage and bracing for wind criteria provided on General Structural Notes on Drawings for exposed architectural components and exterior and wind-exposed mechanical and electrical equipment. Alternately, manufacturer certification may be provided for components such as roofing and flashing to verify attachments meet Project-specific design criteria.
3. Operational:
    a. For loading supplied by equipment manufacturer for IBC required load cases.
    b. Loads may include equipment vibration, torque, thermal effects, effects of internal contents (weight and sloshing), water hammer, and other load-inducing conditions.
    c. Locate braces to minimize vibration to or movement of structure.
    d. For vibrating loads, use anchors meeting requirements of Section 05 50 00, Metal Fabrications or Section 05 05 19, Post-Installed Anchors**,** for anchors with designated capacities for vibratory loading per manufacturer’s ICC-ES report.

1.05 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. List of architectural, mechanical, and electrical equipment requiring Contractor-designed anchorage and bracing, unless specifically exempted.
   b. Manufacturers' engineered hardware product data.
   c. Attachment assemblies' drawings; include connection hardware, braces, and anchors or anchor bolts for nonexempt components, equipment, and systems.
   d. Submittal will be rejected if proposed anchorage method would create excessive stress to supporting member. Revise anchorages and strengthen structural support to eliminate overstressed condition.

B. Informational Submittals:

1. Anchorage and Bracing Calculations: For attachments, braces, and anchorages, include IBC and Project-specific criteria as noted on General Structural Notes on Drawings, in addition to manufacturer's specific criteria used for design; sealed by a civil or structural engineer registered in the State of Florida.
2. Manufacturer's hardware installation requirements.

1.06 SOURCE QUALITY CONTROL

A. Provide all other specified, regulatory required, or required repair verification inspection and testing in accordance with Section 01 43 00, Quality Control.

B. Provide Source Quality Control for welding and hot-dip galvanizing of anchors in accordance with Section 05 50 00, Metal Fabrications.

PART 2 PRODUCTS

2.01 GENERAL

A. Design and construct attachments and supports transferring loads to structure of materials and products suitable for application and in accordance with design criteria shown on Drawings and nationally recognized standards.

B. Provide anchor bolts for anchorage of equipment to concrete or masonry in accordance with Section 05 50 00, Metal Fabrications. Provide anchor bolts of the size, minimum embedment, and spacing designated in calculations submitted by Contractor and accepted by Engineer.

C. Provide post-installed concrete and masonry anchors for anchorage of equipment to concrete or masonry in accordance with Section 05 05 19, Post-Installed Anchors. Provide post-installed anchors of the size, minimum embedment, and spacing designated in calculations submitted by Contractor and accepted by Engineer.

D. Do not use expansion anchors, other than undercut anchors, for nonvibration isolated mechanical equipment rated over 10 horsepower.

PART 3 EXECUTION

3.01 GENERAL

A. Make attachments, bracing, and anchorage in such a manner that component lateral force is transferred to lateral force resisting system of structure through a complete load path.

B. Provide snubbers in each horizontal direction and vertical restraints for components mounted on vibration isolation systems where required to resist overturning.

C. Calculations shall limit anchor bolt concrete edge distance to a maximum of 4 inches or as required to provide sufficient anchor bolt capacity to resist the applied loads.

D. Provide piping anchorage that maintains design flexibility and expansion capabilities at flexible connections and expansion joints.

E. Anchor tall and narrow equipment such as motor control centers and telemetry equipment at base and within 12 inches from top of equipment, unless approved otherwise by Engineer.

3.02 INSTALLATION

A. Do not install components or their anchorages or restraints prior to review and acceptance by Engineer and AHJ.

3.03 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

A. In accordance with Section 05 50 00, Metal Fabrications and Section 05 05 19, Post-Installed Anchors**.**

B. Provide any other specified, regulatory required, or required repair verification inspection and testing in accordance with Section 01 43 00, Quality Control.

END OF SECTION

SECTION 02 40 00
DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: All Work necessary for the removal and disposal of buildings, structures, foundations, piping, equipment and roadways, or any part thereof including masonry, steel, reinforced concrete, plain concrete, electrical facilities, and any other material or equipment shown or specified to be removed.

B. Basic Procedures and Schedule: Carry out demolition so that adjacent structures, which are to remain, are not endangered. Schedule the Work so as not to interfere with the day to day operation of the existing facilities. Do not block doorways or passageways in existing facilities.

C. Additional Requirements: Provide dust control and make provisions for safety.

1.02 SUBMITTALS

A. Provide all submittals, including the following, as specified in Division 01, General Requirements.

B. Site Inspection: Visit the site and inspect all existing structures. Observe and record any defects which may exist in buildings or structures adjacent to but not directly affected by the demolition work. Provide the Owner with a copy of this inspection record and obtain the (Engineer's) (Owner's) approval prior to commencing the demolition.

1.03 QUALITY ASSURANCE

A. Limits: Exercise care to break concrete sufficiently for removal in reasonably small masses. Where only parts of a structure are to be removed, cut the concrete along limiting lines with a suitable saw so that damage to the remaining structure is held to a minimum.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

3.01 EXAMINATION OF EXISTING DRAWINGS

A. Drawings of existing structures and equipment will be available for inspection at the office of the (Engineer) (Owner).

3.02 PROTECTION

A. General Safety: Provide warning signs, protective barriers, and warning lights as necessary adjacent to the Work as approved or required. Maintain these items during the demolition period.

B. Existing Services: Undertake no demolition work until all mechanical and electrical services affected by the Work have been properly disconnected. Cap, reroute or reconnect interconnecting piping or electrical services that are to remain in service either permanently or temporarily in a manner that will not interfere with the operation of the remaining facilities.

C. Hazards: Perform testing and air purging where the presence of hazardous chemicals, gases, flammable materials or other dangerous substances is apparent or suspected, and eliminate the hazard before demolition is started.

3.03 DEMOLITION REQUIREMENTS

A. Explosives: The use of explosives will not be permitted.

B. Protection: Carefully protect all mechanical and electrical equipment against dust and debris.

C. Removal: Remove all debris from the structures during demolition and do not allow debris to accumulate in piles.

D. Access: Provide safe access to and egress from all working areas at all times with adequate protection from falling material.

E. Protection: Provide adequate scaffolding, shoring, bracing railings, toe boards and protective covering during demolition to protect personnel and equipment against injury or damage. Cover floor openings not used for material drops with material substantial enough to support any loads placed on it. Properly secure the covers to prevent accidental movement.

F. Lighting: Provide adequate lighting at all times during demolition.

G. Closed Areas: Close areas below demolition work to anyone while removal is in progress.

H. Material Drops: Do not drop any material to any point lying outside the exterior walls of the structure unless the area is effectively protected.

3.04 DISPOSAL OF MATERIALS

A. Final Removal: Remove all debris, rubbish, scrap pieces, equipment, and materials resulting from the demolition unless otherwise indicated. Take title to all demolished materials and remove such items from the site.

B. Owner's Property: In addition to any items which may be shown, the following items remain the property of the Owner. Remove carefully, without damage, all items listed or shown, and stockpile as directed.

END OF SECTION

SECTION 05 05 19
POST-INSTALLED ANCHORS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Concrete Institute (ACI):
   a. 318, Building Code Requirements for Structural Concrete.
   b. 355.2, Qualification of Post-Installed Mechanical Anchors in Concrete.
   c. 355.4, Qualification of Post-Installed Adhesive Anchors in Concrete.
2. American Iron and Steel Institute (AISI): Stainless Steel Type 316.
3. American National Standards Institute (ANSI).
4. ASTM International (ASTM):
   a. A193/A193M, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications.
   b. A194/A194M, Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
   c. A380/A380M, Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
   d. A563, Standard Specification for Carbon and Alloy Steel Nuts.
   e. A967/A967M, Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts.
   f. E488/E488M, Standard Test Methods for Strength of Anchors in Concrete Elements.
   g. F436/F436M, Standard Specification for Hardened Steel Washers.
   h. F468, Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Socket Head Cap Screws, and Studs for General Use.
   i. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
   j. F594, Standard Specification for Stainless Steel Nuts.
   k. F1554, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
5. International Association of Plumbing and Mechanical Officials Uniform ES (IAPMO-UES): Evaluation Reports for Concrete and Masonry Anchors.

6. International Code Council Evaluation Service (ICC-ES):
    a. Evaluation Reports for Concrete and Masonry Anchors.
    b. AC70, Acceptance Criteria for Fasteners Power-driven into Concrete, Steel and Masonry Elements.
    c. AC193, Acceptance Criteria for Mechanical Anchors in Concrete Elements.
    d. AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements. Evaluation Reports for Concrete and Masonry Anchors.
7. Specialty Steel Industry of North America (SSINA):
    a. Specifications for Stainless Steel.
    b. Design Guidelines for the Selection and Use of Stainless Steel.
    c. Stainless Steel Fabrication.
    d. Stainless Steel Fasteners.

1.02 DEFINITIONS

A. Corrosive Area: Containment area or area exposed to delivery, storage, transfer, or use of chemicals.

B. Exterior Area: Location not protected from weather by a building or other enclosed structure to include buried roof structures.

C. Interior Dry Area: Location inside building or structure where floor is not subject to liquid spills or wash down, and where wall or roof slab is not common to a water-holding or earth-retaining structure.

D. Interior Wet Area: Location inside building or structure where floor is sloped to floor drains or gutters and is subject to liquid spills or wash down, or where wall, floor, or roof slab is common to a water-holding or earth-retaining structure.

E. Submerged: Location at or below top of wall of open water-holding structure, such as a basin or channel, or wall, ceiling, or floor surface inside a covered water-holding structure, or exterior belowgrade wall or roof surface of water-holding structure, open or covered.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings: Specific instructions for concrete anchor installation, including drilled hole size and depth, preparation, placement, procedures, and instructions for safe handling of anchoring systems.

B. Informational Submittals:

1. Concrete Anchors:
   a. Manufacturer's product description and installation instructions.
   b. Current ICC-ES or IAPMO-UES Report for each type of post-installed anchor to be used.
   c. Adhesive Anchor Installer Certification.
2. Passivation method for stainless steel members.

1.04 QUALITY ASSURANCE

A. Qualifications: Installers of adhesive anchors horizontally or upwardly inclined to support sustained tension loads shall be certified by an applicable certification program. Certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Installer Certification Program or equivalent.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package stainless steel items in a manner to provide protection from carbon impregnation.

PART 2 PRODUCTS

2.01 GENERAL

A. Unless otherwise indicated, meet the following requirements:

Item	ASTM Reference
Stainless Steel:	
Threaded Rods	F593, AISI Type 316, Condition CW
Nuts*	F594, AISI Type 316, Condition CW
*Nuts of other grades and styles having specified proof load stresses greater than specified grade and style are also suitable. Nuts must have specified proof load stresses equal to or greater than minimum tensile strength of specified threaded rod.	

B. Bolts, Washers, and Nuts: Use stainless steel, and zinc-plated steel material types as indicated in Fastener Schedule at end of this section.

2.02 POST-INSTALLED CONCRETE ANCHORS

A. General:

1. AISI Type 316 stainless as shown in Fastener Schedule at end of this section.

2. Post-installed anchor systems used in concrete shall be approved by ICC Evaluation Services Report or equivalent for use in cracked concrete and for short-term and long-term loads including wind and earthquake.
3. Mechanical Anchors: Comply with the requirements of ICC-ES AC193 or ACI 355.2.
4. Adhesive Anchors: Comply with the requirements of ICC-ES AC308 or ACI 355.4.

B. Torque-Controlled Expansion Anchors (Wedge Anchors):

1. Manufacturers and Products:
   a. Hilti, Inc., Tulsa, OK; Kwik-Bolt –TZ (KB-TZ) Anchors (ESR-1917).
   b. DeWalt/Powers Fasteners, Brewster, NY; Power-Stud +SD1, +SD2, +SD4, or +SD6 Anchors (ESR-2502 and ESR-2818).
   c. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Strong-Bolt 2 Anchors (ESR-1771 and ESR-3037).

C. Adhesive Anchors:

1. Threaded Rod:
   a. Diameter as shown on Drawings.
   b. Length as required to provide minimum depth of embedment indicated and thread projection required.
   c. Clean and free of grease, oil, or other deleterious material.
2. Adhesive:
   a. Two-component, insensitive to moisture, designed to be used in adverse freeze/thaw environments.
   b. Cure Temperature, Pot Life, and Workability: Compatible for intended use and anticipated environmental conditions.
3. Packaging and Storage:
   a. Disposable, self-contained system capable of dispensing both components in proper mixing ratio and fitting into a manually or pneumatically operated caulking gun.
   b. Store adhesive on pallets or shelving in a covered storage area.
   c. Package Markings: Include manufacturer’s name, product name, batch number, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.
   d. Dispose of When:
      1) Shelf life has expired.
      2) Stored other than in accordance with manufacturer’s instructions.
4. Manufacturers and Products:
   a. Hilti, Inc., Tulsa, OK; HIT Doweling Anchor System, HIT RE 500 V3 (ESR-3814).

b. Simpson Strong-Tie Co., Inc., Pleasanton, CA; SET-3G Epoxy Adhesive Anchors. (ESR-4057).
c. DeWalt/Powers Fasteners, Brewster NY; Pure 110+ Epoxy adhesive anchor system (ESR-3298).

D. Adhesive Threaded Inserts:

1. Type 316 stainless steel, internally threaded inserts.
2. Manufacturer and Product: Hilti, Inc., Tulsa, OK; HIS-RN Insert with HIT-RE 500-V3 or HIT-HY 200 adhesive.

PART 3 EXECUTION

3.01 CONCRETE ANCHORS

A. Begin installation only after concrete to receive anchors is a minimum of 21 days old or has attained design strength whichever requires a longer duration.

B. Locate existing reinforcing with Ground Penetrating Radar or other method approved by Engineer prior to drilling. Coordinate with Engineer to adjust anchor locations where installation would result in hitting reinforcing.

C. Install in accordance with written manufacturer's instructions.

D. Provide minimum embedment, edge distance, and spacing as indicated on Drawings.

E. Use only drill type and bit type and diameter recommended by anchor manufacturer. Use rotary hammer drill unless otherwise approved by Engineer. Core drilling may only be used if specifically allowed by the Engineer.

F. Clean hole of debris and dust per manufacturer's requirements.

G. When unidentified embedded steel, rebar, or other obstruction is encountered in drill path, slant drill to clear obstruction. If drill must be slanted more than indicated in manufacturer's installation instructions to clear obstruction, notify Engineer for direction on how to proceed.

H. Adhesive Anchors:

1. Unless otherwise approved by Engineer and adhesive manufacturer:
   a. Do not install adhesive anchors when temperature of concrete is below 40 degrees F or above 100 degrees F.
   b. Do not install prior to concrete attaining an age of 21 days.

c. Remove any standing water from hole with oil-free compressed air. Inside surface of hole shall be dry.
d. Do not disturb anchor during recommended curing time.
e. Do not exceed maximum torque as specified in manufacturer's instructions.

3.02 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

A. Contractor-Furnished Quality Control: Inspection and testing as required in Section 01 43 00, Quality Control.

3.03 MANUFACTURER'S SERVICES

A. Adhesive Anchors: Conduct Site training of installation personnel for proper installation, handling, and storage of adhesive anchor system. Notify Engineer of time and place for sessions.

3.04 FASTENER SCHEDULE

A. Unless indicated otherwise on Drawings, provide fasteners as follows:

Service Use and Location	Product	Remarks
1. Post-Installed Anchors for Metal Components to Cast-in-Place Concrete (such as, Ladders, Handrail Posts, Electrical Panels, Platforms, and Equipment)		
All Areas	Stainless steel anchors	Verify product acceptability and manufacturer's requirements if anchor installation will occur in an overhead application

B. Antiseizing Lubricant: Use on all stainless steel threads.

C. Do not use adhesive anchors to support fire-resistive construction or where ambient temperature will exceed 120 degrees F.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. The Aluminum Association, Inc. (AA): The Aluminum Design Manual.
2. American Galvanizers Association (AGA):
   a. Inspection of Hot-Dip Galvanized Steel Products.
   b. Quality Assurance Manual.
3. American Institute of Steel Construction (AISC):
   a. 201, Certification Program for Structural Steel Fabricators.
   b. 206, Certification Program for Structural Steel Erectors Standard for Structural Steel Erectors.
   c. 325, Steel Construction Manual.
   d. 326, Detailing for Steel Construction.
   e. 360, Specification for Structural Steel Buildings.
   f. 420, Certification Standard for Shop Application of Complex Protective Coating Systems.
4. American Iron and Steel Institute (AISI): Stainless Steel Types.
5. American National Standards Institute (ANSI).
6. American Society of Safety Engineers (ASSE): A10.11, Safety Requirements for Personnel and Debris Nets.
7. American Welding Society (AWS):
   a. D1.1/D1.1M, Structural Welding Code - Steel.
   b. D1.2/D1.2M, Structural Welding Code - Aluminum.
   c. D1.6/D1.6M, Structural Welding Code - Stainless Steel.
8. ASTM International (ASTM):
   a. A36/A36M, Standard Specification for Carbon Structural Steel.
   b. A48/A48M, Specification for Gray Iron Castings.
   c. A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   d. A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
   e. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   f. A143/A143M, Standard for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
   g. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

h. A193/A193M, Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
i. A194/A194M, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
j. A240/A240M, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
k. A276, Standard Specification for Stainless Steel Bars and Shapes.
l. A283/A283M, Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
m. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
n. A380, Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
o. A384/A384M, Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.
p. A385/A385M, Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
q. A489, Standard Specification for Carbon Steel Lifting Eyes.
r. A500/A500M, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
s. A501, Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
t. A563, Standard Specification for Carbon and Alloy Steel Nuts.
u. A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
v. A780/A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
w. A786/A786M, Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
x. A793, Standard Specification for Rolled Floor Plate, Stainless Steel.
y. A967, Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts.
z. A992/A992M, Standard Specification for Structural Steel Shapes.
aa. A1085, Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS).
bb. B209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

cc. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
dd. B308/B308M, Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
ee. B429/B429M, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
ff. B632/B632M, Standard Specification for Aluminum-Alloy Rolled Tread Plate.
gg. C881/C881M, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
hh. D1056, Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
ii. F436, Standard Specification for Hardened Steel Washers.
jj. F468, Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use.
kk. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
ll. F594, Standard Specification for Stainless Steel Nuts.
mm. F844, Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.
nn. F1554, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
oo. F3125, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

9. Occupational Safety and Health Administration (OSHA):
   a. 29 CFR 1910.23, Ladders.
   b. 29 CFR 1910.28, Duty to Have Fall Protection and Falling Object Protection.
   c. 29 CFR 1910.29, Fall Protection Systems and Falling Object Protection-Criteria and Practices.
   d. 29 CFR 1926.105, Safety Nets.
   e. 29 CFR 1926.502, Fall Protections Systems Criteria and Practices.
10. Specialty Steel Industry of North America (SSINA):
   a. Specifications for Stainless Steel.
   b. Design Guidelines for the Selection and Use of Stainless Steel.
   c. Stainless Steel Fabrication.
   d. Stainless Steel Fasteners.

1.02 DEFINITIONS

A. Anchor Bolt: Cast-in-place anchor; concrete or masonry.

B. Corrosive Area: Containment area or area exposed to delivery, storage, transfer, or use of chemicals.

C. Exterior Area: Location not protected from weather by building or other enclosed structure.

D. Interior Dry Area: Location inside building or structure where floor is not subject to liquid spills or washdown, nor where wall or roof slab is common to a water-holding or earth-retaining structure.

E. Interior Wet Area: Location inside building or structure where floor is sloped to floor drains or gutters and is subject to liquid spills or washdown, or where wall, floor, or roof slab is common to a water-holding or earth-retaining structure.

F. Submerged: Location at or below top of wall of open water-holding structure, such as basin or channel, or wall, ceiling or floor surface inside a covered water-holding structure, or exterior belowgrade wall or roof surface of water-holding structure, open or covered.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings: Metal fabrications, including welding and fastener information.
2. Samples: Color samples of abrasive stair nosings.

B. Informational Submittals:

1. Passivation method for stainless steel members.
2. Galvanized coating applicator qualifications.
3. Hot-Dip Galvanizing: Certificate of compliance signed by galvanizer, with description of material processed and ASTM standard used for coating.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Galvanized Coating Applicator: Company specializing in hot-dip galvanizing after fabrication and following procedures of Quality Assurance Manual of the American Galvanizers Association.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Insofar as practical, factory assemble specified items. Package assemblies, which have to be shipped unassembled to protect materials from damage and tag to facilitate identification and field assembly.

B. Package stainless steel items to provide protection from carbon impregnation.

C. Protect painted coatings and hot-dip galvanized finishes from damage as a result of metal banding and rough handling. Use padded slings and straps.

D. Store fabricated items in dry area, not in direct contact with ground.

PART 2 PRODUCTS

2.01 GENERAL

A. For hot-dip galvanized steel that is exposed to view and does not receive paint, limit the combined phosphorus and silicon content to 0.04 percent. For steels that require a minimum of 0.15 percent silicon (such as plates over 1.5 inches thick for ASTM A36/A36M steel), limit maximum silicon content to 0.21 percent and phosphorous content to 0.03 percent.

B. Unless otherwise indicated, meet the following requirements:

Item	ASTM Reference
Steel Wide Flange Shapes	A992/992M
Other Steel Shapes and Plates	A36/A36M or A572/A572M, Grade 50 or A992/A992M for other steel shapes
Steel Pipe	A500, Grade B
Hollow Structural Sections (HSS)	A500/A500M, Grade C
Aluminum:	
Aluminum Plates	B209, Alloy y6061-T6
Aluminum Structural Shapes	ASTM B221/B221M, Alloy 6061-T6
Stainless Steel:	
Bars and Angles	A276, AISI Type 316 (316L for welded connections)
Shapes	A276, AISI Type 304 (304L for welded connections)
Steel Plate, Sheet, and Strip	A240/A240M, AISI Type 316 (316L for welded connections)
Bolts, Threaded Rods, Anchor Bolts, and Anchor Studs	F593, AISI Type 316, Group 2, Condition SH
Nuts	F594, AISI Type 316, Condition CW

Item	ASTM Reference
Steel Bolts and Nuts:	
Carbon Steel	A307 bolts, with A563 nuts
High-Strength	F3125, Type 1 bolts, with A563 nuts
Anchor Bolts and Rods	F1554, Grade 36, with weldability supplement S1.
Eyebolts	A489
Threaded Rods	A36/A36M
Flat Washers (Unhardened)	F844
Flat and Beveled Washers (Hardened)	F436
Thrust Ties for Steel Pipe:	
Threaded Rods	A193/A193M, Grade B7
Nuts	A194/A194M, Grade 2H
Plate	A283/A283M, Grade D
Welded Anchor Studs	A108, Grades C-1010 through C-1020
Aluminum Bolts and Nuts	F468, Alloy 2024-T4
Cast Iron	A48/A48M, Class 35

C. Bolts, Washers, and Nuts: Use stainless steel and aluminum material types as indicated in Fastener Schedule at end of this section.

2.02 ANCHOR BOLTS AND ANCHOR BOLT SLEEVES

A. Cast-In-Place Anchor Bolts:

1. Headed type, unless otherwise shown on Drawings.
2. Material type and protective coating as shown in Fastener Schedule at end of this section.

B. Anchor Bolt Sleeves:

1. Plastic:
   a. Single unit construction with corrugated sleeve.
   b. Top of sleeve shall be self-threading to provide adjustment of threaded anchor bolt projection.
   c. Material: High-density polyethylene.
2. Fabricated Steel: ASTM A36/A36M.

2.03 POST-INSTALLED CONCRETE ANCHORS

A. See Section 05 05 19, Post-Installed Anchors.

2.04 ACCESSORIES

A. Antiseizing Lubricant for Stainless Steel Threaded Connections:

1. Suitable for potable water supply.
2. Resists washout.
3. Manufacturers and Products:
   a. Bostik, Middleton, MA; Neverseez.
   b. Saf-T-Eze Div., STL Corp., Lombard, IL; Anti-Seize.

2.05 FABRICATION

A. General:

1. Finish exposed surfaces smooth, sharp, and to well-defined lines.
2. Furnish necessary rabbets, lugs, and brackets so work can be assembled in neat, substantial manner.
3. Conceal fastenings where practical; where exposed, flush countersink.
4. Drill metalwork and countersink holes as required for attaching hardware or other materials.
5. Grind cut edges smooth and straight. Round sharp edges to small uniform radius. Grind burrs, jagged edges, and surface defects smooth.
6. Fit and assemble in largest practical sections for delivery to Site.

B. Materials:

1. Use steel shapes, unless otherwise noted.
2. Steel to be hot-dip galvanized: Limit silicon content to less than 0.04 percent or to between 0.15 percent and 0.25 percent.
3. Fabricate aluminum in accordance with AA Specifications for Aluminum Structures–Allowable Stress Design.
4. Stainless Steel Built-up Shapes: Fabricate built-up shapes in accordance with ASTM A1069/A1069M.

C. Welding:

1. Weld connections and grind exposed welds smooth. When required to be watertight, make welds continuous.
2. Welded fabrications shall be free from twisting or distortion caused by improper welding techniques.
3. Steel: Meet fabrication requirements of AWS D1.1/D1.1M, Section 5.
4. Aluminum: Meet requirements of AWS D1.2/D1.2M.

5. Stainless Steel: Meet requirements of AWS D1.6/D1.6M.
6. Welded Anchor Studs: Prepare surface to be welded and weld with stud welding gun in accordance with AWS D1.1/D1.1M, Section 7, and manufacturer's instructions.
7. Complete welding before applying finish.

D. Galvanizing:

1. Fabricate steel to be galvanized in accordance with ASTM A143/A143M, ASTM A384/A384M, and ASTM A385/A385M. Avoid fabrication techniques that could cause distortion or embrittlement of the steel.
2. Provide venting and drain holes for tubular members and fabricated assemblies in accordance with ASTM A385/A385M.
3. Remove welding slag, splatter, burrs, grease, oil, paint, lacquer, and other deleterious material prior to delivery for galvanizing.
4. Remove by blast cleaning or other methods surface contaminants and coatings not removable by normal chemical cleaning process in the galvanizing operation.
5. Hot-dip galvanize steel members, fabrications, and assemblies after fabrication in accordance with ASTM A123/A123M.
6. Hot-dip galvanize bolts, nuts, washers, and hardware components in accordance with ASTM A153/A153M. Oversize holes to allow for zinc alloy growth. Shop assemble bolts and nuts.
7. Galvanized steel sheets in accordance with ASTM A653/A653M.
8. Galvanize components of bolted assemblies separately before assembly. Galvanizing of tapped holes is not required.

E. Fitting: Where movement of fabrications is required or shown, cut, fit, and align items for smooth operation. Make corners square and opposite sides parallel.

F. Accessories: Furnish as required for a complete installation. Fasten by welding or with stainless steel bolts or screws.

2.06 SOURCE QUALITY CONTROL

A. Visually inspect all fabrication welds and correct deficiencies.

1. Steel: AWS D1.1/D1.1M, Section 6 and Table 6.1, Visual Inspection Acceptance Criteria.
2. Aluminum: AWS D1.2/D1.2M.
3. Stainless Steel: AWS D1.6/D1.6M.

PART 3 EXECUTION

3.01 INSTALLATION OF METAL FABRICATIONS

A. General:

1. Install metal fabrications plumb and level, accurately fitted, free from distortion or defects.
2. Install rigid, substantial, and neat in appearance.
3. Install manufactured products in accordance with manufacturer's recommendations.
4. Obtain Engineer approval prior to field cutting steel members or making adjustments not scheduled.
5. Do not remove mill markings from concealed surfaces.
6. Remove inked or painted identification marks on exposed surfaces not otherwise coated after installed material has been inspected and approved.
7. Snug-tighten bolts, unless otherwise specified.

B. Steel:

1. Fabrication, erection, connections, bolted and welded construction shall be in accordance with AISC Steel Construction Manual and AWS D1.1.

C. Stainless Steel:

1. Fabrication, erection, connections, bolted and welded construction shall be in accordance with AWS D1.6 and the following SSINA standards:
   a. Specifications for Stainless Steel.
   b. Stainless Steel Fabrication.
   c. Stainless Steel Fasteners.
2. Do not field weld unless approved by Engineer in writing.

D. Aluminum:

1. Do not remove mill markings from concealed surfaces.
2. Remove inked or painted identification marks on exposed surfaces not otherwise coated after installed material has been inspected and approved.
3. Fabrication, mechanical connections, and bolted construction shall be in accordance with the AA Aluminum Design Manual.

3.02 CAST-IN-PLACE ANCHOR BOLTS

A. Locate and hold anchor bolts in place with templates at time concrete is placed.

B. Use anchor bolt sleeves for location adjustment and provide two nuts and one washer per bolt of same material as bolt.

C. Minimum Bolt Size: 1/2-inch diameter by 12 inches long, unless otherwise shown.

3.03 ELECTROLYTIC PROTECTION

A. Aluminum and Galvanized Steel:

1. Coat surfaces of galvanized steel and aluminum fabricated items to be in direct contact with concrete, grout, masonry, or dissimilar metals.
2. Do not apply protective coating to galvanized steel anchor bolts or galvanized steel welded anchor studs, unless indicated otherwise.
3. Allow coating to dry before installation of the material.
4. Protect coated surfaces during installation.
5. Should coating become marred, prepare and touch up in accordance with paint manufacturer's written instructions.

B. Titanium: Where titanium equipment is in contact with concrete or dissimilar metal, provide full-face neoprene insulation gasket, 3/32-inch minimum thickness and 70-durometer hardness.

C. Stainless Steel:

1. During handling and installation, take necessary precautions to prevent carbon impregnation of stainless steel members.
2. After installation, visually inspect stainless steel surfaces for evidence of iron rust, oil, paint, and other forms of contamination.
3. Remove contamination using cleaning and passivation methods in accordance with requirements of ASTM A380 and ASTM A967.
4. Brushes used to remove foreign substances shall utilize only stainless steel or nonmetallic bristles.
5. After treatment, visually inspect surfaces for compliance.

3.04 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

A. Contractor-Furnished Quality Control:

1. Inspection and testing required in Section 01 43 00, Quality Control.
2. Manufacturer's Certificate of Compliance per Section 01 61 00, Material and Equipment, for test results, or calculations, or Drawings that ensure material and equipment design and design criteria meet requirements of Section 01 61 00, Material and Equipment and Section 01 88 15, Anchorage and Bracing.

3.05 FASTENER SCHEDULE

A. Unless indicated otherwise on Drawings, provide fasteners as follows:

Service Use and Location	Product	Remarks
1. Anchor Bolts Cast Into Concrete for Structural Steel, Metal Fabrications and Castings		
All Areas	Stainless steel headed anchor bolts	
2. Anchor Bolts Cast Into Concrete for Equipment Bases		
All Areas	Stainless steel headed anchor bolts with fusion bonded coating, unless otherwise specified with equipment	
3. Post-Installed Anchors: See Section 05 05 19, Post-Installed Anchors		
4. Connections for Structural Steel Framing		
Exterior and Interior Wet and Dry Areas	High-strength steel bolted connections	Use hot-dipped galvanized high-strength bolted connections for galvanized steel framing members.
5. Connections of Aluminum Components		
Submerged, Exterior and Interior Wet and Dry Areas	Stainless steel bolted connections, unless otherwise specified with equipment	
6. All Others		
Exterior and Interior Wet and Dry Areas	Stainless steel fasteners	

B. Antiseizing Lubricant: Use on stainless steel threads.

END OF SECTION

SECTION 33 05 01.10
HIGH-DENSITY POLYETHYLENE (HDPE) PRESSURE PIPE AND FITTINGS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. American Society of Mechanical Engineer's (ASME):
   a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125, and 250).
   b. B18.2.2, Square and Hex Nuts (Inch Series).
2. American Water Works Association (AWWA):
   a. C906, Polyethylene (PE) Pressure Piping and Fittings, 4 in. through 63 in., for Water Distribution and Transmission.
   b. Manual M55, PE Pipe - Design and Installation.
3. ASTM International (ASTM):
   a. A193/A193M, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications.
   b. A194/A194M, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
   c. A240/A240M, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
   d. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
   e. A536, Standard Specification for Ductile Iron Castings.
   f. A563, Standard Specification for Carbon and Alloy Steel Nuts.
   g. D638, Standard Test Method for Tensile Properties of Plastics.
   h. D3350, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
   i. F714, Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
   j. F2164, Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure.
   k. F2620, Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.
4. Code of Federal Regulations (CFR): Title 49 Part 192.285, Plastic Pipe: Qualifying Persons to Make Joints.
5. NSF International (NSF): 61, Drinking Water System Components - Health Effects.

6. Plastics Pipe Institute (PPI):
    a. Handbook of Polyethylene Pipe.
    b. Technical Note 38, Bolt Torque for Polyethylene Flanged Joints.
    c. TR-33, Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe.

1.02 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
    a. Catalog information confirming pipe, fittings, and other materials conform to requirements of this section.
    b. Drawings of specific connection details.

B. Informational Submittals:

1. Manufacturer's Certificate of Compliance, in accordance with Section 01 43 33, Manufacturers' Field Services.
2. Infrared temperature gun product data.
3. Certificates of qualification for persons to be fusing HDPE pipe. Experience and training record of persons to be fusing HDPE pipe.
4. Testing Plan: Submit at least 15 days prior to testing and include the following as a minimum:
    a. Testing dates.
    b. Piping systems and section(s) to be tested.
    c. Method of isolation.
    d. Method of conveying water from source to system being tested.
5. Certifications of Calibration: Approved testing laboratory certificate if pressure gauge for hydrostatic test has been previously used. If pressure gauge is new, no certificate is required.
6. Test report documentation.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Pipe Manufacturer: Listed with Plastic Pipe Institute.
2. Persons fusing HDPE pipe shall be certified under 49 CFR § 192.285 and have minimum of 1 year of experience with fusing HDPE pipe and shall have received a minimum of 20 hours of training for fusing HDPE pipe from pipe supplier or fusing equipment supplier.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Shipping: Do not cut, kink, or otherwise damage pipe during transportation.

B. Storage:

1. Limit stacking of pipe to a height that will not cause excessive deformation of bottom layers of pipes under anticipated temperature conditions.
2. Where necessary, because of ground conditions, store pipe on wooden sleepers, spaced suitably and of such widths as not to allow deformation of pipe at point of contact with sleeper or between supports.
3. Keep pipe shaded from direct sunlight prior to installation in trench.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pipe and Fittings:

1. Conform to requirements of AWWA C906.
2. In compliance with NSF 61.
3. Resin: Polyethylene resin shall meet or exceed requirements of ASTM D3350 for PE 4710 material. Pressure rating shall be based on hydrostatic design stress of 800 psi at 73.4 degrees F.
4. Pressure Rating: 160 psi and nominal SDR of 13.5.
5. Outside Diameter Basis: IPS.
6. Pipe lengths, fittings, and flanged connections to be joined by thermal butt-fusion shall be of a compatible resin mix for the fusion process.
7. Fittings:
   a. Sizes 6 Inches and Smaller: Molded and fabricated from polyethylene pipe.
   b. Sizes 8 Inches and Larger: Use thermal butt-fusion.
   c. Polyethylene fittings shall have same or higher pressure rating as pipe.

B. Backup Rings:

1. Convoluted for Flanged Connections:
   a. ASTM A240/A240M, Type 316 stainless steel.
   b. Complete with one-piece, molded polyethylene flange adapters.
   c. Flanged Connections: Same or greater pressure rating as pipe.

C. Gaskets: Material, size, and thickness shall be as recommended by pipe or flange manufacturer, and in accordance with PPI Technical Note 38.

D. Joints: Thermal butt-fusion or electrofusion, except where connecting to unions, valves, and equipment with flanged or threaded connections that may require future disassembly.

E. Bolts, Nuts, Washers:

1. Type 316 stainless steel, ASTM A193/A193M, Grade B8 hex head bolts; and ASTM A194/A194M, Grade 8 hex head nuts.
2. Bolts: Fabricated in accordance with ASME B18.2.2 and provided with washers of same material as bolts.

F. Electrofusion Flex Restraint:

1. Material: HDPE.
2. Method of Attachment: Electrofusion.
3. Designed for restraining movement of HDPE pipe.
4. Manufacturers:
   a. Central Plastics Company.
   b. ISCO Industries.

G. Products that restrain HDPE pipe with wedges, machined serrations, or clamps are not acceptable.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:

1. Install polyethylene pipe in conformance with AWWA M55, PPI TR-33, ASTM F2620, and pipe manufacturer's recommendations.
2. Joining: Butt-fuse pipes and fittings in accordance with pipe manufacturer's recommendations. Depending on Site conditions, perform butt-fusion joining in or outside of excavation.
3. Connect HDPE pipe to auxiliary equipment such as valves, pumps, tanks, and other piping systems with flanged connections as follows:
   a. Polyethylene flange adapter, thermally butt-fused to end of pipe. Flange "stub ends" are not allowed.
   b. Convoluted backing flange, as specified.
   c. Bolt and nut of sufficient length to show a minimum of three complete threads when joint is made and tightened to manufacturer's standard.
   d. Follow requirements of PPI Technical Note 38 including mandatory 4-hour bolt re-torquing.

4. Special Precautions at Flanges: Support polyethylene pipe connected to heavy fittings, manholes, and rigid structures in such a manner that no subsequent relative movement between polyethylene pipe at flanged joint and rigid structures is possible.
5. Minimum Long-Term Field Bending Radius: Restricted to limits recommended by AWWA M55, Table 8-2.

3.02 FIELD QUALITY CONTROL

A. Pipeline Hydrostatic Test:

1. General:
   a. Notify Engineer in writing 7 days in advance of testing. Perform testing in presence of Engineer.
   b. Furnish testing equipment and perform tests in manner satisfactory to Engineer. Testing equipment shall provide observable and accurate measurements of initial service leak and allowable make-up water volume under specified conditions.
   c. Test newly installed pipelines.
   d. Isolate new pipelines that are connected to existing pipelines.
   e. Using water as test medium, pipes shall successfully pass a hydrostatic test prior to acceptance.
   f. Conduct field hydrostatic test on buried piping after trench has been completely backfilled. Testing may, as approved by Engineer, be done prior to placement of asphaltic concrete or roadway structural section.
   g. Contractor may, if field conditions permit and as determined by Engineer, partially backfill trench and leave joints open for inspection and conduct initial service leak test. Final field hydrostatic test shall not be conducted until backfilling has been completed as specified above.
   h. Supply of temporary water shall be as stated in Section 01 50 00, Temporary Facilities and Controls.
   i. Dispose of water used in testing in accordance with federal, state, and local requirements.
2. Preparation:
   a. Install temporary thrust blocking or other restraint as necessary to prevent movement of pipe and protect adjacent piping or equipment. Make necessary taps in piping prior to testing.
   b. Prior to test, remove or suitably isolate appurtenant instruments or devices that could be damaged by pressure testing.
   c. New Piping Connected to Existing Piping: Isolate new piping with grooved-end pipe caps, blind flanges, or other means as acceptable to Engineer.

3. Procedure:
    a. Test pressure shall be 150 percent of system operating pressure based on pressure as measured at lowest point in pipeline.
    b. Maximum filling velocity shall not exceed 0.25 feet per second, calculated based on full area of the pipe.
    c. Expel air from pipe system during filling.
    d. Test procedure shall be in accordance with ASTM F2164.
        1) Initial Expansion Phase: Add water as required to maintain test pressure for 4 hours.
        2) Test Phase: Reduce pressure by 10 psi and start pressure test.
        3) Test is successful if pressure says within 5 percent of initial value for 1 hour.
    e. If test is not completed because of leakage, equipment failure, or other reasons, depressurize test section and allow it to relax for at least 8 hours before retesting.
    f. If there is leakage, repair defective pipe section and repeat hydrostatic test.

END OF SECTION

SECTION 33 13 00
DISINFECTION OF WATER UTILITY DISTRIBUTION FACILITIES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor is responsible of disinfection, sampling, and testing of all pipelines, valves, tanks, pumps, and all other components of the water treatment and distributions facilities.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Water Works Association (AWWA):
   a. B300, Hypochlorites.
   b. B301, Liquid Chlorine.
   c. B302, Ammonium Sulfate.
   d. B303, Sodium Chlorite.
   e. C651, Disinfecting Water Mains.
   f. C652, Disinfection of Water Storage Facilities.
   g. C653, Disinfection of Water Treatment Plants.
2. NSF International (NSF):
   a. NSF/ANSI 61, Drinking Water System Components - Health Effects.
   b. NSF/ANSI 372, Drinking Water System Components - Lead Content.
3. Standard Methods for the Examination of Water and Wastewater, as published by American Public Health Association, American Water Works Association, and the Water Environment Federation.

1.03 SUBMITTALS

A. Informational Submittals:

1. Plan describing and illustrating conformance to appropriate AWWA standards and this Specification.
2. Procedure and plan for cleaning system.
3. Procedures and plans for disinfection and testing.
4. Proposed locations within system where Samples will be taken.
5. Type of disinfecting solution and method of preparation.
6. Certification that employees working with concentrated chlorine solutions or gas have received appropriate safety training.
7. Method of disposal for highly chlorinated disinfecting water.

8. Independent Testing Agency: Certification that testing agency is qualified to perform chlorine concentration testing and bacteriological testing in accordance with AWWA standards, agency requirements, and this Specification.
9. Certified Bacteriological Test Results:
    a. Facility tested is free from coliform bacteria contamination.
    b. Forward results directly to Owner.

1.04 QUALITY ASSURANCE

A. Independent Testing Agency: Certified in the State of Florida, with 10 years' experience in field of water sampling and testing. Agency shall use calibrated testing instruments and equipment, and documented standard procedures for performing specified testing.

1.05 SEQUENCING

A. Commence disinfection after completion of following:

1. Completion and acceptance of internal painting of system(s).
2. Hydrostatic and pneumatic testing, pressure testing, functional and performance testing and acceptance of pipelines, pumping systems, structures, and equipment.

PART 2 PRODUCTS

2.01 GENERAL

A. Components and Materials in Contact with Water for Human Consumption: Comply with the requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements. Provide certification by manufacturer or an accredited certification organization recognized by the Authority Having Jurisdiction that components and materials comply with the maximum lead content standard in accordance with NSF/ANSI 61 and NSF/ANSI 372.

1. Use or reuse of components and materials without a traceable certification is prohibited.

2.02 WATER FOR DISINFECTION

A. Clean, uncontaminated, and potable.

B. Make arrangements for water supply and convey water in disinfected pipelines or containers.

2.03 DISINFECTANT

A. The following disinfectant product(s) shall not be used: Chlorine gas.

PART 3 EXECUTION

3.01 GENERAL

A. Conform to AWWA C651 for pipes and pipelines, AWWA C652 for tanks and reservoirs and AWWA C653 for water treatment plants and filters, except as modified in these Specifications.

B. Contractor's Equipment:

1. Furnish chemicals and equipment, such as pumps and hoses, to accomplish disinfection.
2. Water used to fill pipeline may be supplied using a temporary connection to existing distribution system. Provide protection against cross-connections as required by AWWA C651.

C. Disinfect the following items installed or modified under this Project, intended to hold, transport, or otherwise contact potable water:

1. Pumps.
2. Tanks and wet wells.
3. Sand Strainers and Cartridge Filters. Piping, RO Skids, Valves, Plumbing and Pipelines. Disinfect new pipelines that connect to existing pipelines up to point of connection.
4. Disinfect surfaces of materials that will contact finished water, both during and following construction, using one of the methods described in AWWA C652 and AWWA C653. Disinfect prior to contact with finished water. Take care to avoid recontamination following disinfection.

D. Prior to application of disinfectants, clean all equipment, valve and pipes of loose and suspended material.

E. Allow freshwater and disinfectant solution to flow into pipe or vessel at a measured rate so chlorine-water solution is at specified strength. Do not place concentrated liquid commercial disinfectant in pipeline or other facilities to be disinfected before it is filled with water.

3.02 TURBIDITY

A. Cleaning of equipment and facilities shall include removal of materials that result in a turbidity exceeding limits stated in Article Testing.

3.03 PIPING

A. Cleaning:

1. Before disinfecting, clean foreign matter from pipe in accordance with AWWA C651.
2. If continuous feed method or slug method of disinfection, as described in AWWA C651, are used flush pipelines with potable water until clear of suspended solids and color. Provide hoses, temporary pipes, ditches, and other conduits as needed to dispose of flushing water without damage to adjacent properties.
3. Flush service connections and hydrants. Flush distribution lines prior to flushing hydrants and service connections. Operate valves during flushing process at least twice during each flush.
4. Flush pipe through flushing branches and remove branches after flushing is completed.
5. Drain pipes after flushing. Still water is not allowed in stainless steel pipes.

B. Disinfecting Procedure: In accordance with AWWA C651, unless herein modified. Drain all stainless steel pipes and equipment immediately following hydrotesting and disinfection.

3.04 DISPOSAL OF CHLORINATED WATER

A. Do not allow flow into a waterway without neutralizing disinfectant residual.

B. See appendix of AWWA C653 for acceptable neutralization methods.

3.05 TESTING

A. The CM shall be responsible for collection of samples:

1. Coordinate activities to allow Samples to be taken in accordance with this Specification.
2. Provide valves at sampling points.
3. Provide access to sampling points.

B. Test Equipment:

1. Clean containers and equipment used in sampling and make sure they are free of contamination.
2. Obtain sampling bottles with instructions for handling from an independent testing laboratory.

C. Chlorine Concentration Sampling and Analysis: Collect and analyze Samples in accordance with AWWA Standards**.**

D. After all equipment, valves and pipelines have been cleaned, disinfected, and refilled with potable water, the independent laboratory will take water Samples and have them analyzed for conformance to bacterial limitations for public drinking water supplies.

1. Collect Samples in accordance with applicable AWWA Standard.
2. Analyze Samples for coliform concentrations in accordance with latest edition of Standard Methods for the Examination of Water and Wastewater.

E. If minimum Samples required above are bacterially positive, disinfecting procedures and bacteriological testing shall be repeated until bacterial limits are met.

END OF SECTION

SECTION 40 05 15
PIPING SUPPORT SYSTEMS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Society of Civil Engineers (ASCE): 7, Minimum Design Loads for Buildings and Other Structures.
2. American Society of Mechanical Engineers (ASME): B31.1, Power Piping.
3. ASTM International (ASTM):
   a. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   b. A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
   c. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
4. Manufacturers' Standardization Society (MSS):
   a. SP 58, Pipe Hangers and Supports—Materials, Design and Manufacture.
   b. SP 127, Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, and Application.

1.02 DEFINITIONS

A. Wetted or Submerged: Submerged, less than 1 foot above liquid surface, below top of channel wall, under cover or slab of channel or tank, or in other damp locations.

1.03 SUBMITTALS

A. Action Submittals:

1. Catalog information and drawings of piping support system, locating each support, sway brace, seismic brace, hanger, guide, component, and anchor for piping 6 inches and larger and 4 inches and smaller. Identify support, hanger, guide, and anchor type by catalog number and Shop Drawing detail number.
2. Calculations for each type of pipe support, attachment and anchor.
3. Revisions to support systems resulting from changes in related piping system layout or addition of flexible joints.

1.04 QUALIFICATIONS

A. Piping support systems shall be designed and Shop Drawings prepared and sealed by a Registered Professional Engineer in the state where the Work is to be installed.

1.05 DESIGN REQUIREMENTS

A. General:

1. Design, size, and locate piping support systems throughout facility, whether shown or not.
2. Piping Smaller than 30 Inches: Supports are shown only where specific types and locations are required; additional pipe supports may be required.
3. Meet requirements of MSS SP 58 and ASME B31.1 or as modified by this section.

B. Pipe Support Systems: Design pipe support systems for gravity and thrust loads imposed by weight of pipes or internal pressures, including insulation and weight of fluid in pipes.

C. Anchoring Devices: Design, size, and space support anchoring devices, including anchor bolts, inserts, and other devices used to anchor support, to withstand shear and pullout loads imposed by loading and spacing on each particular support.

D. Existing Support Systems: Use existing supports systems to support new piping only if Contractor can show they are adequate for additional load, or if they are strengthened to support additional load.

PART 2 PRODUCTS

2.01 GENERAL

A. When specified items are not available, fabricate pipe supports of correct material and to general configuration indicated.

B. Special support and hanger details may be required for cases where standard catalog supports are not applicable.

C. Materials: Type 316 Stainless Steel.

2.02 PIPE SADDLES

A. Provide 90-degree to 120-degree pipe saddle for pipe 6 inches and larger with baseplates drilled for anchors bolts.

1. In accordance with Standard Detail 4005-515.
2. Sizes 20 inches though 60 inches, Piping Technology & Products, Inc.; Fig. 2000.

B. Saddle Supports, Pedestal Type:

1. Minimum standard weight pipe stanchion, saddle, and anchoring flange.
2. Adjustable Saddle: MSS SP 58, Type 38 without clamp.
   a. Anvil; Figure 264, sizes 2-1/2 inches through 36 inches with Figure 62C base.
   b. B-Line; Figure B3092, sizes 3/4 inch through 36 inches with Figure B3088S base.

2.03 CHANNEL TYPE SUPPORT SYSTEMS

A. Channel Size: 12-gauge, 1-5/8-inch wide minimum steel, or 1-1/2-inch wide, minimum FRP.

B. Members and Connections: Design for loads using one-half of manufacturer's allowable loads.

C. Fasteners: Vinyl ester fiber, polyurethane base composite nuts and bolts, or encapsulated steel fasteners.

D. Manufacturers and Products:

1. B-Line; Strut System.
2. Unistrut.
3. Anvil; Power-Strut.
4. Aickinstrut (FRP System).
5. Enduro-Durostrut (FRP Systems).

2.04 PIPE CLAMPS

A. Riser Clamp: MSS SP 58, Type 8.

1. Anvil; Figure 261, sizes 3/4 inch through 24 inches.
2. B-Line; Figure B3373, sizes 1/2 inch through 30 inches.

2.05 ACCESSORIES

A. Anchor Bolts:

1. Size and Material: Sized by Contractor for required loads, 1/2-inch minimum diameter, and as specified in Section 05 50 00, Metal Fabrications.
2. Bolt Length (Extension Above Top of Nut):
   a. Minimum Length: Flush with top of nut preferred. If not flush, shall be no more than one thread recessed below top of nut.
   b. Maximum Length: No more than a full nut depth above top of nut.

EXECUTION

3.01 INSTALLATION

A. General:

1. Install support systems in accordance with MSS SP 58, unless shown otherwise.
2. Install pipe hanger rods plumb, within 4 degrees of vertical during shut down, start up or operations.
3. Support piping connections to equipment by pipe support and not by equipment.
4. Support large or heavy valves, fittings, and appurtenances independently of connected piping.
5. Support no pipe from pipe above it.
6. Support pipe at changes in direction or in elevation, adjacent to flexible joints and couplings, and where shown.
7. Do not use adhesive anchors for attachment of supports to ceiling or walls.
8. Do not install pipe supports and hangers in equipment access areas or bridge crane runs.
9. Brace hanging pipes against horizontal movement by both longitudinal and lateral sway bracing and to reduce movement after startup.
10. Install lateral supports for seismic loads at changes in direction.
11. Install pipe anchors where required to withstand expansion thrust loads and to direct and control thermal expansion.
12. Repair mounting surfaces to original condition after attachments are completed.

B. Standard Pipe Supports:

1. Horizontal Piping Supported from Floors:
   a. Saddle Supports:
      1) Pedestal Type, elbow and flange.
      2) Provide minimum 1-1/2-inch grout beneath baseplate.

b. Floor Mounted Channel Supports:
   1) Use for pipe smaller than 3-inch running along floors and in trenches at pipe elevations lower than can be accommodated using pedestal pipe supports.
   2) Attach channel framing to floors with baseplate on minimum 1-1/2-inch nonshrink grout and with anchor bolts.
   3) Attach pipe to channel with clips or pipe clamps.

END OF SECTION

SECTION 40 27 00.11 CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPE AND FITTINGS		
Item	**Size**	**Description**
Pipe	All	Schedule 80 CPVC: Type IV, Grade I or Class 23447-B conforming to ASTM D1784 and ASTM F441. Pipe shall be manufactured with titanium dioxide for ultraviolet protection. Threaded nipples shall be Schedule 80.
Fittings	All	Schedule to Match Pipe Above: Conforming to the requirements of ASTM F439 for socket weld type and Schedule 80 ASTM F437 for threaded type. Fittings shall be manufactured with titanium dioxide for ultraviolet protection.
Joints	All	Solvent socket weld, except where connection to threaded equipment may require future disassembly.
Solvent Cement	All	All socket type joints shall be made employing primer and solvent cements that meet or exceed the requirements of ASTM F493 and primers that meet or exceed the requirements of ASTM F656 and as recommended by the pipe and fitting manufacturer. Solvent cement and primer shall be listed by NSF for use with potable water. For Sulfuric Acid Service: Only Oatey EP42 CPVC Heavy Duty Orange Industrial Cement is allowed.
Thread Lubricant	All	Teflon tape.

END OF SECTION

SECTION 40 27 01
PROCESS PIPING SPECIALTIES

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Society of Mechanical Engineers (ASME):
   a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125, and 250).
   b. B16.5, Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.
2. American Water Works Association (AWWA):
   a. C110/A21.10, Ductile-Iron and Gray-Iron Fittings.
   b. C153/A21.53, Ductile-Iron Compact Fittings for Water Service.
   c. C210, Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
   d. C213, Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
   e. C219, Bolted, Sleeve-Type Couplings for Plain-End Pipe.
   f. Manual M11, Steel Pipe—A Guide for Design and Installation.
3. ASTM International (ASTM):
   a. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   b. A276, Standard Specification for Stainless Steel Bars and Shapes.
4. National Fire Protection Association (NFPA): 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
5. NSF International (NSF): NSF 61, Drinking Water System Components—Health Effects.

1.02 SUBMITTALS

A. Action Submittals: Manufacturer’s data on materials, construction, end connections, ratings, overall lengths, and live lengths (as applicable).

PART 2 PRODUCTS

2.01 CONNECTORS

A. PTFE Expansion Joints:

1. Expansion joints shall be a rubber spool type of a single, open wide arch design. Joint construction shall consist of an EPDM tube and cover with an integral PTFE liner. Joints shall be designed to meet the design pressure of 150 psi and temperature of 120 degree F.

2. Expansion joints ends shall be flanges drilled to 150# class standards, and be full rubber faced and integral to the body. Split flange backing rings of Type 316 Stainless steel shall be provided.
3. Provide Type 316 stainless steel control rods.
4. Expansion joints shall be Flexicraft Industries, Model Tefspool, or Engineer and Owner Approved Equal.

B. HDPE Transition Adapters:

1. Adapters designed for transitions between HDPE and ductile iron pipe size (DIPS) or stainless steel (iron pipe size) pipe and fittings shall meet the following requirements:
   a. Adapter Design: Design to adapt between HDPE fusion end style joint connection and ductile iron pipe mechanical joint connections or ductile iron and stainless steel flange end connections. Adapter SDR to match SDR of mating pipe. Adapter joint to be fully restrained for the test pressure of 50 psi.
   b. Testing certifications: Adapters certified by manufacturer to meet:
      1) Hydraulic Burst Pressure Test per ASTM D1599.
      2) Sustained Pressure Test per ASTM D1598 for 134 psi (170 hours minimum).
      3) Cyclic Pressure Test from 0 to 240 psi (3 million cycles).
2. Type 316 stainless steel bolts, nuts and washer accessories.
3. Adapter shall be manufactured by ISCO, Drisco, Performance Piping Inc. or Engineer and Owner Approved equal.

2.02 COUPLINGS

A. General:

1. Coupling linings for use in potable water systems shall be in conformance with NSF 61.
2. Couplings shall be rated for working pressure not less than indicated in Piping Schedule for the service and not less than 150 psi.
3. Couplings shall be lined and coated with fusion-bonded epoxy in accordance with AWWA C213.
4. Unless thrust restraint is provided by other means, couplings shall be harnessed in accordance with requirements of AWWA Manual M11 or as shown on the Drawings.
5. Sleeve type couplings shall conform to AWWA C219 and shall be hydraulically expanded beyond minimum yield for accurate sizing and proofing of tensile strength.

B. Flange Coupling Adapter:

1. Manufacturers and Products:
   a. Stainless Steel Pipe: Type 316 stainless steel body, flanges, follower, bolts, and nuts. EPDM gaskets.
      1) Dresser Piping Specialties; Style Style 128W (Type 316 stainless steel).
      2) Or Engineer and Owner Approved equal.

2.03 SERVICE SADDLES

A. Type 316 Stainless Steel (For Stainless Steel Pipes):

1. Pressure Rating: Capable of withstanding 150 psi internal pressure without leakage or over-stressing.
2. Run diameter: compatible with outside diameter of pipe on which saddle is installed.
3. Material: Body, clamps and nuts; Type 316 stainless steel; Seal; Buna-N.
4. Manufacturers and Products: JCM Industries, Style 438; or Engineer and Owner Approved equal.

2.04 CHEMICAL INJECTOR SYSTEM

A. Chemical Injectors shall be high corrosion resistance retractable injection quill, with integrated spring loaded check valve, suitable for 93 percent sulfuric acid applications.

1. Materials: Isolation and check valves: Alloy 20; Valve Seal: FKM; Solution Tube with Bevel Tip: Alloy C276.
2. Manufacturer and Model: Saf-T-Flo, HC-100

B. Support System: Stainless steel Unistrut or FRP Aickenstrut.

C. Connectors: Provided on static mixers.

2.05 MISCELLANEOUS SPECIALTIES

A. Wafer Type Static Mixers, 20 Inches and 24 Inches.

1. Type: In-line plate mixer with integral injection port. No moving parts. Same size as pipe.
2. Material: Hastelloy.
3. Manufacturer s and Products: Westfall, 2800 Series with 0.8 beta ratio; or Engineer and Owner Approved Equal.

PART 3 EXECUTION

3.01 GENERAL

A. Provide accessibility to piping specialties for control and maintenance.

3.02 CONNECTORS AND COUPLINGS

A. General:

1. Install in accordance with manufacturer's written instructions.
2. Before coupling, clean pipe holdback area of oil, scale, rust, and dirt.
3. Do not remove pipe coating. If damaged, repair before joint is made.

3.03 CHEMICAL INJECTOR SYSTEM

A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 40 27 02
PROCESS VALVES AND OPERATORS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Gas Association (AGA): 3-88, Orifice Metering of Natural Gas.
2. American National Standards Institute (ANSI): Z21.15, Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves.
3. American Society of Mechanical Engineers (ASME):
   a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125, and 250).
   b. B16.44, Manually Operated Metallic Gas Valves for Use in Aboveground Piping Systems up to 5 PSI.
4. American Society of Sanitary Engineers (ASSE): 1011, Performance Requirements for Hose Connection Vacuum Breakers.
5. ASTM International (ASTM):
   a. A276, Standard Specification for Stainless Steel Bars and Shapes.
   b. A351/A351M, Standard Specification for Castings, Austenitic, for Pressure-Containing Parts.
   c. A564/A564M, Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes.
   d. B61, Standard Specification for Steam or Valve Bronze Castings.
   e. B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
   f. B98/B98M, Standard Specification for Copper-Silicon Alloy Rod, Bar, and Shapes.
   g. B127, Standard Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip.
   h. B139, Standard Specification for Phosphor Bronze Rod, Bar and Shapes.
   i. B164, Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire.
   j. B194, Standard Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar.
   k. B584, Standard Specification for Copper Alloy Sand Castings for General Applications.
   l. D429, Standard Test Methods for Rubber Property-Adhesion to Rigid Substrates.
   m. D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

6. Canadian Gas Association, Inc. (CGA): 9.1, Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves.
7. FM Global (FM).
8. Food and Drug Administration (FDA).
9. International Association of Plumbing and Mechanical Officials (IAPMO).
10. Manufacturers Standardization Society (MSS):
    a. SP-80, Bronze Gate, Globe, Angle and Check Valves.
    b. SP-81, Stainless Steel, Bonnetless, Flanged Knife Gate Valves.
    c. SP-85, Gray Iron Globe & Angle Valves, Flanged and Threaded Ends.
    d. SP-88, Diaphragm Valves.
    e. SP-110, Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
11. NSF International (NSF): 61, Drinking Water System Components—Health Effects.
12. Underwriters Laboratories (UL).
13. USC Foundation for Cross-Connection Control and Hydraulic Research.

1.02 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
    a. Product data sheets for each make and model.
    b. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.

B. Informational Submittals: Certification for compliance to NSF 61 for valves used for drinking water service.

PART 2 PRODUCTS

2.01 GENERAL

A. Valves to include operator, actuator, hand wheel, chain wheel, extension stem, floor stand, operating nut, chain, wrench, and accessories to allow a complete operation from the intended operating level. Contractor shall coordinate with the valve manufacturers on the available space for all valves, actuators, and operators, and if needed, provide all modifications to the ensure that they fit in the space shown and function properly.

B. Valve to be suitable for intended service. Renewable parts not to be of a lower quality than specified.

C. Valve same size as adjoining pipe, unless otherwise called out on Drawings or in Supplements.

D. Valve ends to suit adjacent piping.

E. Resilient seated valves shall have no leakage (drip-tight) in either direction at valve rated design pressure. All other valves shall have no leakage (drip-tight) in either direction at valve rated design pressure, unless otherwise allowed for in this section or in stated valve standard.

F. Size operators and actuators to operate valve for the full range of pressures and velocities.

G. Valve to open by turning counterclockwise, unless otherwise specified.

H. Factory mount operator, actuator, and accessories.

2.02 MATERIALS

A. Valve materials in contact with or intended for drinking water service to meet the following requirements:

1. Comply with requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements.
2. Coatings materials to be formulated from materials deemed acceptable to NSF 61.
3. Furnish certification that product is certified as suitable for contact with drinking water by an accredited certification organization in accordance with NSF 61 and NSF 372. Provide certification for each valve type used for drinking water service.
4. Components and Materials in Contact with Water for Human Consumption: Comply with the requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements. Provide certification by manufacturer or an accredited certification organization recognized by the authority having jurisdiction that components and materials comply with the maximum lead content standard in accordance with NSF/ANSI 61 and NSF 372. Use or reuse of components and materials without a traceable certification is prohibited.

2.03 VALVES

A. Ball Valves:

1. Type V335 CPVC Ball Valve 2 Inches and Smaller:
   a. Rated 150 psi at 100 degrees F, 80 psi at 140 degrees, with ASTM D1784, Type IV, Grade 1 chlorinated polyvinyl chloride (CPVC) body, ball, and stem, end entry, double union design, with solvent-weld socket ends or single union ball with flanged ends drilled to ASME B16.1, replaceable Teflon seat, Viton or Teflon O-ring stem seals, to block flow in both directions. For sodium hypochlorite service, provide pressure relief hole drilled on upstream side of ball.

b. Manufacturers and Products:
   1) Nibco; Chemtrol Tru-Bloc.
   2) ASAHI/America; Type 21.
   3) Spears; True Union.

B. Butterfly Valves:

1. General:
   a. In full compliance with AWWA C504 and following requirements:
      1) Suitable for throttling operations and infrequent operation after periods of inactivity.
      2) Elastomer seats which are bonded or vulcanized to the body shall have adhesive integrity of bond between seat and body assured by testing, with minimum 75-pound pull in accordance with ASTM D429, Method B.
      3) Bubble-tight with rated pressure applied from either side. Test valves with pressure applied in both directions.
      4) No travel stops for disc on interior of body.
      5) Self-adjusting V-type or O-ring shaft seals.
      6) Isolate metal-to-metal thrust bearing surfaces from flowstream.
      7) Provide traveling nut or worm gear actuator with hand wheel. Valve actuators to meet the requirements of AWWA C504.
      8) Buried service operators shall withstand 450 foot-pounds of input torque at fully open and fully closed positions.
      9) Provide linings and coatings per AWWA, unless otherwise indicated on the Drawings or specified herein.
      10) Valves to be in full compliance with NSF 61. Provide NSF 61 certificate for each valve.
      11) The notch plates shall be of Type 304 or Type 316 stainless steel.
   b. Non-AWWA butterfly valves to meet the following actuator requirements:
      1) For above ground installations, provide handle and notch plate for valves 6 inches and smaller and heavy-duty, totally enclosed gearbox type operators with hand wheel, position indicator and travel stops for valves 8 inches and larger, unless otherwise indicated on Drawings or specified herein.
2. Type V518 PTFE Lined Butterfly Valve:
   a. Two-piece lug style butterfly valve, rated for 150 psi operating pressure.
      1) Body shall be PTFE lined stainless steel, body bolts shall be Type 316 Stainless Steel.

2) PTFE impregnated steel bearing shall be provided in the upper and lower valve journal for precision alignment of the upper and lower stem.
3) Reinforced PTFE gaskets shall be placed between body halves to eliminate potential leak path and contamination from environmental conditions.
4) PTFE discs shall have 1/8 inch minimum thickness of encapsulated over the 17-4 PH Stainless Steel.
5) No part of the stem shall be wetted.
6) Seat materials shall be PTFE or UHMWPE with 1/8 inch minimum thickness.

b. Manufacturer and Model: Bray Series 23, or Equal.

2.04 OPERATORS AND ACTUATORS

A. Manual Operators:

1. General:
   a. For AWWA valves, operator force not to exceed requirements of the applicable valve standard. Provide gear reduction operator when force exceeds requirements.
   b. For non-AWWA valves, operator force not to exceed applicable industry standard or 80 pounds, whichever is less, under any operating condition, including initial breakaway. Provide gear reduction operator when force exceeds requirements.
   c. Operator self-locking type or equipped with self-locking device.
   d. Position indicator on quarter-turn valves.
   e. Worm and gear operators one-piece design, worm-gears of gear bronze material. Worm of hardened alloy steel with thread ground and polished. Traveling nut type operator's threaded steel reach rod with internally threaded bronze or ductile iron nut.
2. Exposed Operator:
   a. Galvanized and painted hand wheel, minimum 16-inch diameter.
   b. Cranks on gear type operator.
   c. Chain wheel operator with tieback, extension stem, floor stand, and other accessories to permit operation from normal operation level.
   d. Valve handles to take a padlock, and wheels a chain and padlock.
   e. Use of SPX actuators is not allowed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Flange Ends:

1. Flanged valve bolt holes shall straddle vertical centerline of pipe.
2. Clean flanged faces, insert gasket and bolts, and tighten nuts progressively and uniformly.

B. PVC and CPVC Valves: Install using solvents approved for valve service conditions.

C. Valve Installation and Orientation:

1. General:
   a. Install valves so handles operate from fully open to fully closed without encountering obstructions.
   b. Install valves in location for easy access for routine operation and maintenance.
   c. Install valves per manufacturer's recommendations.
2. Ball Valves:
   a. Install operating stem vertical when valve is installed in horizontal runs of pipe having centerline elevations 4 feet 6 inches or less above finished floor, unless otherwise shown.
   b. Install operating stem horizontal in horizontal runs of pipe having centerline elevations greater than 4 feet 6 inches above finish floor, unless otherwise shown.
3. Butterfly Valves:
   a. Unless otherwise restricted or shown on Drawings, install valve a minimum of 8 diameters downstream of a horizontal elbow or branch tee with shaft in horizontal position.
   b. For vertical elbow or branch tee immediately upstream of valve, install valve with shaft in vertical position.
   c. For horizontal elbow or branch tee immediately upstream of valve, install valve with shaft in horizontal position.
   d. When installed immediately downstream of a swing check, install valve with shaft perpendicular to swing check shaft.
   e. For free inlet or discharge into basins and tanks, install valve with shaft in vertical position.

D. Extension Stem for Operator: Where the depth of the valve operating nut is 3 feet or greater below finish grade, furnish an operating extension stem with 2-inch operating nut to bring operating nut to a point within 6 inches of finish grade.

3.02 TESTS AND INSPECTION

A. Valve may be either tested while testing pipelines, or as a separate step.

B. Test that valves open and close smoothly under operating pressure conditions. Test that two-way valves open and close smoothly under operating pressure conditions from both directions.

C. Count and record number of turns to open and close valve; account for any discrepancies with manufacturer's data.

D. Set, verify, and record set pressures for relief and regulating valves.

END OF SECTION

DRAWINGS
(BOUND SEPARATELY)