SAN ANTONIO WATER SYSTEM PURCHASING DEPARTMENT

Issued By: D. Anthony Rubin **Date Issued: June 21, 2018**
BID NO.: 18-18076

FORMAL INVITATION FOR BIDS
EARLY PROCUREMENT OF PRESSURE FILTRATION SYSTEM FOR THE CENTRAL WATER INTEGRATION PIPELINE PROJECT
ADDENDUM 1

Sealed bids addressed to the Purchasing Director, San Antonio Water System, 2800 US Hwy 281 North, Administration Bldg., 5th Floor, San Antonio, TX 78212 will be received until **3:00 p.m. June 27, 2018** and then publicly opened and read aloud for furnishing materials or services as described herein below,

The San Antonio Water System Purchasing Department is willing to assist any bidder(s) in the interpretation of bid provisions or explanation of how bid forms are to be completed. Assistance may be received by visiting the Purchasing Office in the SAWS Main Office, 2800 US Hwy 281 North, San Antonio, TX 78212, or by calling (210) 233-3819.

This invitation includes the following:

Invitation for Bids	Specifications and General Requirements
Terms and Conditions of Invitation for Bids	Price Schedule

The undersigned, by his/her signature, represents that he/she is authorized to bind the Bidder to fully comply with the Specifications and General Requirements for the amount(s) shown on the accompanying bid sheet(s). By signing below, Bidder has read the entire document and agreed to the terms therein.

Signer's Name: _____ Firm Name: _____
(Please Print or Type)

Address: _____

_____
Signature of Person Authorized to Sign Bid City, State, Zip Code: _____

Email Address: _____ Telephone No.: _____

Fax No.: _____

Payment Terms are Net 30.

Please check the following blanks which apply to your company:
Ownership of firm (51% or more):
___Non-minority ____Hispanic ___African-American ____Other Minority (specify) _____
___Female Owned ___Handicapped Owned ___Small Business (less than $1 million annual receipts or 100 employees)
Indicate Status: ___Partnership ___Corporation ____Sole Proprietorship ____Other (specify) _____
Tax Identification Number:_____

To report suspected ethics violations impacting the San Antonio Water System, please call 1-800-687-1918.

This **Addendum 1** is issued to answer the following questions and issue an updated Price Schedule for the bid sent to you on June 6, 2018. All other terms and conditions of the original bid document remain unchanged.

QUESTIONS AND CLARIFICATIONS

Q1. Invite For Bid (18 pages), on page 11, the Submittals – Preliminary lists June 27, 2018 (with the bid), but Spec 11200, Part 1.03, A., 1. says Submittals – Preliminary lists June 20, 2018 (with the bid). Please clarify this date is to be June 27th.

A1. The date is to be June 27th. Specification modified accordingly.

Q2. Spec 11200, Part 2.01, C. chart lists area as though it was a rectangle based on overall centerline dimensions (ie: 12' x 50' = 600 sq. ft. area) not counting head curvatures nor where media surface area is. Thusly the filtration flow rates will be higher based on actual media surface area. Please confirm the tank diameter and length 12' Dia. x 50' Over-end) is basis of design and not the media surface area.

A2. The Filter System Supplier must be able to provide a performance guarantee for the pressure filters as defined in Part 2. 2.01. D Water Filtration Equipment performance criteria at the flow rates listed in Part 2. 2.01. C. Filtration System Equipment design criteria. If the Supplier believes that the vessel length must be increased to meet the performance criteria, please advise.

Q3. Spec 11200, Part 2.02 D. does not call out how many layers of graded gravel are required, nor the depth or size of each layer. Our standard is:

Layer & Depth	Passing Screen	Retained on Screen
Bottom 4"	3/4"	1/2"
Next 3"	1/2"	3/16"
Top 3"	3/16"	3/32"

Please confirm this will be acceptable.

A3. The Filter System Supplier must be able to provide a performance guarantee for the pressure filters as defined in Part 2. 2.01. D Water Filtration Equipment performance criteria. The layers of graded gravel required are to be determined by the Filter System Supplier.

Q4. Spec 11200, Part 2.02, D., 4. says "Filter Media Total Depth 36 inches minimum". It also says Filter Media/Sand 12 inches minimum and Filter Media/Anthracite 18 inches minimum". This equals 30 inches. Please clarify if total minimum depth is 30 or 36 inches and if 36 inches what depths of Sand and Anthracite are required.

A4. The Filter System Supplier must be able to provide a performance guarantee for the pressure filters as defined in Part 2. 2.01. D Water Filtration Equipment performance criteria. As the performance guarantee is by Filter System Supplier, the specification is intended to leave some flexibility as to what media the supplier has determined is the best to provide adequate particulate removal and solids retention time.

Q5. Plan Sheet I-1006 lists the Filter Outlet Control valves with a final digit of 4 in the tagging. All other Plan Sheets and Specs list this final digit as 3. Please confirm and correct this to a 3.

A5. Agreed, plan sheet I-1006 revised accordingly.

Q6. Spec Table 15100-1: Valve Schedule List REF 44 and 45 as Type/Style as ARV1. Page 15100-18, Part 2.02, M., 2., a. and d. shows sizes and model numbers of an air release valve, not a combination air-vacuum air release valve. The sizes shown for the filter are 2 inch and appropriate model numbers are APCO Model 144, Val-Matic Model No. 202C.2, or approved equal. Please confirm and revise.

A6. Agreed, Section 15100, Part 2.02, M., 2., a. and d. revised to APCO Model 144, Val-Matic Model No. 202C.2, or approved equal.

Q7. Spec 11200, Part 2.02, I., 1., a. says "four (4) stainless steel panels", then goes on to call them out as brushed aluminum for the material. Please advise if they are to be stainless steel or brushed aluminum panels.

A7. Spec 11200, Part 2.02, I., 1., a. revised to remove contradiction. The panels shall be stainless steel.

Q8. The following project is bidding on the 27th and the total dynamic head for the Backwash Pumps is listed "as required". Can you clarify?

A8. The Filter System Supplier is to determine the total dynamic head of the pump according to their backwash system requirements. Spec 11200 shall be revised to provide the pressure at the pump suction and the anticipated pressure losses in the piping to the pressure filters.

Q9. Under [Spec 11200, Part] 1.03, B, 6. c., calls out a guarantee of 0.3 mg/L iron (USEPA SMCL). However, in the table under 2.01 D., state Effluent total iron at < 0.15 mg/L.

A9. Section 11200, Part 1.03, B, 6. c, revised to 0.15 mg/L iron.

Q10. In the table under [Spec 11200, Part] 3.02 B. 3., item 6, calls out for a 72-hour Filter Effluent Performance Testing to be provided by Factory Representative. It then calls out one (1) Trip and 24 hours. Need clarification. Maybe they are thinking a three (3) day test period (72 hours) and the representative would be on site for three 8-hour days; i.e. 24 hours total?

A10. The 72-hour filter test is continuous and equivalent to 24-man hours on site (3 days) at 8 hours per day.

Q11. Did not see any information indicating any chemical feeds to the HPFs. May not be required if one assumes the lime softening process will oxidize the iron and basically the HPF system would be removing minimum levels of precipitated solids carryover (i.e. turbidity) from the clarifier.

A11. A filter aid polymer is injected upstream of the pressure filters.

Polymer system for pressure filter:

1. Polymer concentration: 0.1 to 1.0 mg/l
2. Emulsion polymer neat activity: 40 percent
3. Final solution feed concentration: 0.1 to 0.2 percent active

Q12. Please confirm letter from Surety that bidder is bondable to a maximum limit greater than bid price is sufficient and that no bid bond is required.

A12. Confirmed.

Q13. Please clarify page 11200-18 filter media total depth 36" minimum. Does that include support gravel as 12" sand and 18" of anthracite are specified?

A13. Please refer to A4.

Q14. Please confirm filter valves cell 1 feed, cell 2 feed, air scour 1, air scour 2, BWW cell 1 and BWW cell 2 are all above 6 ft in elevation and require remote valve control stations.

A14. Valves shown as >60-inches are (Per Filter, typ of 8):

Cell No. 1 Inlet Isolation
Cell No. 2 Inlet Isolation
Cell No. 1 Backwash Waste Isolation
Cell No. 2 Backwash Waste Isolation
Cell No. 1 Air Scour Supply Isolation
Cell No 2 Air Scour Supply Isolation

REVISIONS TO GENERAL CONDITIONS, SPECIFICATIONS, AND GENERAL REQUIREMENTS

1. Delete Item 16. PERFORMANCE DEPOSIT and renumber all remaining items.

2. Replace the first sentence of Item 19. INDEMNIFICATION as follows:

   BIDDER covenants and agrees to FULLY INDEMNIFY, DEFEND and HOLD HARMLESS, SAWS and the board members, employees, officers, directors, volunteers and representatives of SAWS, individually and collectively, from and against any and all costs, claims, liens, damages, losses, expenses, fees (including attorney's fees), fines, penalties, proceedings, actions, demands, causes of action, liability and suits of any kind and nature, including but not limited to, personal or bodily injury, death and property damage, made upon SAWS directly or indirectly arising out of, resulting from or related to BIDDER'S activities under this contract, including any acts or omissions of BIDDER, any agent, officer, director, representative, employee, consultant or subcontractor of BIDDER, and their respective officers, agents employees, directors and representatives while in the exercise of the rights or performance of the duties under this contract.

3. Replace the SCOPE and BACKGROUND as follows:

   SCOPE: The San Antonio Water System (SAWS) is soliciting bids for early procurement of a pressure filtration system in compliance with the following requirements and specifications.

   BACKGROUND: Between now and April 15, 2020, SAWS will be constructing the Central Water Integration Pipeline (CWIP) Project to integrate the Vista Ridge water supply into the existing SAWS potable water distribution system. Treatment facilities will be constructed at the point of water delivery to match the quality of the new water supply with that of Edwards Aquifer water. The purpose of this early procurement bid is to secure the price for the materials, equipment, and manufacturer's field services for the Pressure Filtration System, which will be included in the Bid Proposal of the General Construction Contract and to initiate the submittal review phase due to an accelerated project schedule. SAWS will not through this contract be contracting for the actual construction and installation of the Pressure Filtration System. The contract for the construction and installation of the Pressure Filtration System will be between the successful bidder and the General Contractor that SAWS will select to construct the Project. For purpose of clarity, through this Invitation for Bids, SAWS shall (i) select a vendor to supply the Pressure Filtration System for the Project based on the specifications provided herein (ii) obtain a cost from the successful bidder to prepare submittals for the Pressure Filtration System as provided herein, and (iii) require the successful bidder to obtain a security bond to insure that the bidder will provide the Pressure Filtration System to the General Contractor for the price bidder submits for the Pressure Filtration System as part of their bid.

REVISIONS TO STANDARD REQUIREMENTS

1. Change "Pre-Purchase" to "Early Procurement" in Paragraph 3.

2. Replace Paragraphs 5 and 6 in their entirety as follows:

   5. Security Bond: A Security Bond equal to the price of the equipment (Price Schedule – Item 1) will be required from the Filter System Supplier that should remain valid until the General Contractor executes the equipment purchase agreement with the Filter System Supplier for a price equal to, or less than, the price provided by bidder in this Invitation for Bids. Bidders must provide a letter with bid from Bonding Company stating that in the event of award, bidder will be able to

provide the requested Security Bond in the form of the Security Bond attached herein as Attachment B. This provision shall survive the termination of this Agreement.

6. **Price Security:** On or about October of 2018, SAWS will select a General Contractor to construct the Project. The General Contractor, not SAWS, will execute an equipment purchase agreement with the Filter System Supplier (the successful bidder) selected herein. The price for Item 1 on the Price Schedule from the successful bidder's bid must remain firm until the Filter System Supplier has executed a purchase agreement with the General Contractor. If the Filter System Supplier fails to execute a purchase agreement with the General Contractor within 30 calendar days of the SAWS Board Award of the contract to the General Contractor, SAWS reserves the right to allow the General Contractor to select an alternate supplier and charge the Filter System Supplier the difference between the price quoted herein and the price from the alternate supplier along with any liquidated damages related to late delivery. Any difference in cost shall be secured by the Security Bond provided in Paragraph 5 above. In addition, failure of the Filter System Supplier to provide a price for the Filter System to the General Contractor at or below the price for Item 1 on the Price Schedule agreed to in this Agreement shall constitute a material breach of this Agreement and the requirement to provide the Filter System to the General Contractor at the price for Item 1 on the Price Schedule as provided in this Agreement will be an ongoing obligation of the Filter System Supplier that shall survive the termination of this Agreement. Filter System Supplier shall be responsible for any additional cost to SAWS to procure the Filter System in the event of such breach.

3. Delete Paragraph 11 in its entirety and renumber remaining paragraphs sequentially.

4. Add Attachment B – Security Bond.

5. Replace Price Proposal as included herein.

REVISIONS TO TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

a) Page TOC-i, Appendix A - Division 1 – General Requirements, delete the following:

"01740 Warranties and Bonds"

SECTION 01300 – SUBMITTALS

a) Delete Section 01300 in its entirety and replace with new Section 01300 provided.

SECTION 01740 – WARRANTIES AND BONDS

a) Delete Section 01740 in its entirety.

SECTION 11200 – WATER FILTRATION SYSTEM

a) Delete Section 11200 in its entirety and replace with new Section 11200 provided; all changes to this section are detailed below.

b) Part 1.03, A., 1. Revised to: "Submittals – Preliminary lists June 27, 2018 (with the bid)."

c) Part 1.03, B., 6., c., revised to "c. At a minimum, Supplier guarantees that the iron will be removed to 0.15 mg/l (Fe) and turbidity will be removed to 0.61 ntu."

d) Part 1.03, C., 14., add: "c. Seismic Design Parameters:
Site Classification: B
Site coefficient (F_a): 1.0
Site coefficient (F_v) = 1.0
Mapped spectral response acceleration for short periods (S_s): 0.074 g
Mapped spectral response acceleration for 1-second period (S_1): 0.030 g"

e) Part 1. Added 1.05 in entirety: "1.05 WARRANTY

A. The manufacturer's warranty period shall be concurrent with the Contractor's for two (2) years, commencing at the time of final acceptance by the Owner which shall begin no later than April 15, 2020. Guarantee shall cover all necessary labor, equipment, materials, and replacement parts resulting from faulty or inadequate equipment design, improper assembly, defective workmanship and materials, leakage, breakage or other failure of all equipment and components furnished by the manufacturer."

f) Part 2.02, E., 3., c. revised to:

The backwash water source shall normally be the filtered supply water. The backwash system shall be sized to accommodate the range of pressures available in the filtrate header as the level in the tank fluctuates. Control shall be provided by both the VFD on the backwash supply pumps, and modulation of the backwash supply valve at each pressure vessel. The filtrate storage tank (SAWS Storage Tank) will operate at the following ranges in water level:

1. High Water Level: 1058-ft [1]
2. Low Water Level: 1014-ft [2]

[1] At high water level the backwash supply control valve will need to be modulated to burn excess suction pressure and keep the pump on the curve (up to 10 psi).
[2] Low water level based on effluent header elevation, not functional tank low elevation which is 1012-ft.

g) Part 2.02., E., 3., d. add data to end of table:

Estimated pressure loss in pump suction piping	0.13 – 1.3 psi (0.3 – 3.0 ft H2O)
Estimated pressure loss in pump discharge piping	0.4 – 3.5 psi (1.0 – 8.0 ft H2O)

h) Part 2.02., E., 3., i. revised to "Bearing housing shall be designed to maintain shaft alignment and ensure long bearing and lubricate life. Bearings shall be replaceable without disturbing the system piping and shall be regreaseable without removal of the bearings from the bearing housing. Pump bearings shall be designed and sized for 100,000 hours L10 rated bearing life at 25% BEP per ANSI/HI 1.3-2013. All bearings shall be manufactured in the United States."

i) Part 2.02., E., 3., j. revised to "Pumps shall be supplied initially with mechanical type split seals which are interchangeable with conventional packing. Mechanical seals shall be John Crane Type I. "

j) Part 2.02, I., 1., a. revised to "The Filter System Supplier shall furnish four (4) stainless steel pressure and flow monitoring panels (one for each pair of filter vessels) with minimum dimensions of 18" x 22"."

SECTION 15100 – VALVES AND APPURTENANCES

a) Delete Section 15100 in its entirety and replace with new Section 15100 provided; all changes to this section are detailed below.

b) Section 15100, Part 2.02, M., 2., revised:

1. ARV1:

   a. Valve: The combination air-vacuum-air release shall be designed to operate while the system is pressurized, allowing entrained air to escape through the air release orifice. After entrained air escapes through the air release orifice, the valve orifice shall be closed by a needle mounted on a simple level mechanism energized by a float. The main valve shall remain closed until more air accumulates and the opening cycle repeats automatically. The valve body and cover shall be manufactured of cast iron.

   b. Pressure: 150 psi.

   c. Service: Pressure Filter Service.

   d. APCO Model No. 144, Val-matic Model No. 202C or approved equal.

REVISIONS TO DRAWINGS

SHEET I-1006 – TYPICAL PRESSURE FILTER P&ID

a) Delete sheet D-1207 in its entirety and replace with new D-1207 provided.

b) Delete sheet I-1006 in its entirety and replace with new I-1006 provided.

ATTACHMENT B

SECURITY BOND

Surety Bond No. _____

STATE OF TEXAS §

KNOW ALL MEN BY THESE PRESENTS:

COUNTY OF BEXAR §

THAT WE, _____, as Principal, and hereinafter called the Principal, and _____, as Surety, and hereinafter called the Surety, are held and firmly bound unto San Antonio Water System, as Obligee, and hereinafter called the Obligee in the penal sum of $ _____, the payment of which sum well and truly to be made, the said Prinicipal and the said Surety bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally firmly by these presents.

WHEREAS, Principal has entered into an agreement (the "Agreement") with Obligee in connection with the Central Water Integration Pipeline Terminus Treatment Facility (the "Project"), under the terms of which said Principal is obligated to timely submit to the General Contractor a price proposal(s) to establish the maximum final price for the Pressure Filtration System that is in accordance with the price provided for in the Agreement and includes the specified materials, equipment, and manufacturer's field services; and

WHEREAS, upon the General Contractor's approval of the Principal's price proposal(s), and Principal's receipt thereof, Principal is obligated to execute one or more contracts with the General Contractor for the Pressure Filtration System in a timely manner, as required under the Agreement;

NOW THEREFORE, if Principal shall, in a timely manner and/or as required under the Agreement:

(i) submit one or more price proposals to the General Contractor for the Pressure Filtration System that is in the amount provided for in the Agreement; and

(ii) execute and deliver to the General Contractor, within thirty (30) calendar days after the SAWS Board Award of the contract to the General Contractor, a purchase agreement with the General Contractor for the Pressure Filtration System in the amount at or below the price provided for in the Agreement; and

(iii) if the Principal shall subsequently cure any failure on the part of said Principal to timely execute and deliver to General Contractor the foregoing price proposal(s) and purchase agreement, within ten (10) days after Obligee's written notice of such default to the Principal and Surety, then,

this obligation shall be null and void, otherwise to remain in full force and effect. Principal's failure either to perform in a timely manner or remedy any default within the cure period referenced herein shall entitle Obligee to immediate payment of the full penal sum of this Security Bond without further notice.

SIGNED, SEALED and DATED this _____day of _____, 20_____.

(SEAL)

_____

Principal

ATTEST:

By: _____

_____
(Typed Name and Title)

By: _____

_____
(Typed Name and Title)

(SEAL)

_____
Principal

ATTEST:

By: _____

_____
(Typed Name and Title)

By: _____

_____
(Typed Name and Title)

PRE-PURCHASE OF PRESSURE FILTRATION SYSTEM FOR THE CENTRAL WATER INTEGRATION PIPELINE PROJECT

SAWS Job No. 18-8616
Solicitation No. 18-18076

ADDENDUM 1
JUNE 2018

DIVISIONS 1, 11, 15

Tetra Tech, Inc.
Texas Registered Engineering Firm No. 3924
700 North Saint Mary's Street, Suite 300
San Antonio, Texas 78205

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section describes the requirements for preparing and presenting submittals that are necessary for the execution of this contract. Requirements within the following subject areas are included:

1. Definitions.
2. Procedures.
3. Product Data.
4. Shop drawings.
5. Samples.
6. Manufacturer's certificates.
7. Miscellaneous submittals.
8. Schedule of Values.
9. Quality Control Documentation (Blank Copies of Report).

1.02 DEFINITIONS

A. Product Data and Shop Drawing - General Definition

1. Drawings, diagrams, illustrations, brochures, schedules, bills of materials and other data prepared by the EARLY PROCUREMENT EQUIPMENT SUPPLIER (SUPPLIER), his subcontractors, suppliers or distributors, or equipment manufacturers and fabricators; illustrating the manufacture, fabrication, construction, or installation of the Work or a portion thereof.

B. Shop Drawings

1. Assembly and fabrication drawings, bills of materials for items shop fabricated exclusively for this project. In addition, shop drawings should show fabrication details of each part, the assembly of each part and how each part and/or assembly is integrated into the project including existing parts or assemblies.

C. Manufacturer’s Representative

1. Manufacturer’s representative shall be from the manufacturer’s plant with five (5) years of experience in the actual problems of manufacturing, installing, and operating the particular product. Sales representatives or agents of the manufacturer will not be acceptable.

D. Working Drawings

1. SUPPLIER prepared plans for temporary structures and facilities. Working drawings for elements of work that may affect the safety and health of persons or property will be certified by an engineer licensed in the State of Texas. Calculations, as necessary, will accompany working drawings.

E. Design Calculations

1. Whenever the SUPPLIER is required to submit design calculations as part of a submittal, such calculations shall bear the signature and seal of a professional engineer registered in the appropriate branch. ENGINEER reserves the right to request submittal by SUPPLIER of a hard copy of design calculations.

1.03 PROCEDURES

A. Electronic Submittal Procedures

1. All electronic submittals shall be transmitted in Portable Document Format (PDF) as generated by the Adobe Acrobat Professional Version 7.0 or higher.

2. It will be the SUPPLIER’s responsibility to scan all necessary documents or convert previously received electronic files from vendors into pdf format before uploading the files to the specific designated project site. Scanned images must be at a readable resolution. For most documents, they should be scanned at 300 dots per inch (dpi). Optical character Recognition (OCR) capture must be performed on these images so that text can be searched and copied from the generated PDF file.

3. When it is not possible to make submittals electronically, SUPPLIER may deliver submittals to OWNER using conventional mail only after securing OWNER's written approval. When electronic submittals are not possible, hard copy submissions will be made as required in this section. Submittal of a transmittal page into the contract-specific Prolog site of Portal by SUPPLIER shall still be required for recordkeeping.

4. When electronic submittal is not possible and upon securing OWNER's written approval, SUPPLIER may submit hard copies of product data and shop drawings according to the following distribution list:

   a. OWNER's designated Agent (if applicable): Three (3) copies.

   b. OWNER (if a designated Agent reviews the submittals): One (1) copy.

   c. ENGINEER: One (1) copy.

5. If regular mail delivery is approved by OWNER, the submittal transmittal form shall still be logged into the contract specific Contract and Project Management System (CPMS) by SUPPLIER for record keeping purposes.

6. All responses to a submittal by ENGINEER will be made electronically and no hard copies of the response will be sent to SUPPLIER.

B. Supplier's Responsibilities

1. Submit a list of specified submittals and identify the long lead items to the OWNER within five (5) calendar days of receipt of the Notice to Proceed (NTP).

2. Within 30 days after the pre-construction conference and at the same time that the initial critical path schedule is submitted, a schedule shall be submitted of the items of materials and equipment for which shop drawings are required by the specifications. For each required shop drawing, the date shall be given for intended submission of the drawing to ENGINEER for review and the date required for its return to avoid delay in any activity beyond the scheduled start date. Sufficient time shall be allowed for initial review, correction and resubmission, and final review of all shop drawings. In no case shall a schedule be acceptable which allows less than 21 days for each review by ENGINEER.

3. SUPPLIER to approve all submittals prior to submission.

4. SUPPLIER shall submit dimensional and layout drawings and product data, certified correct for construction, for review by the ENGINEER.

5. Submit shop drawings and product data in accordance with the approved submittal schedule. Also, submit shop drawings to the ENGINEER for review prior to their need in the Work, allowing sufficient time for the ENGINEER's review and the SUPPLIER response.

6. SUPPLIER shall make specific mention of those items that vary from the requirements of the Contract Documents in the letter of transmittal. The letter transmittal shall include the specification number, detail name/number, or plan sheet of the item being submitted.

7. Submit shop drawings and product data covering related items of equipment or material or integrated systems of equipment or material at the same time. Partial submissions will not be accepted.

8. All submittals, regardless of origin, shall be stamped with the approval of SUPPLIER and identified with the name and number of this contract, SUPPLIER name, and references to applicable specification paragraphs and Contract Drawings. Each submittal shall indicate the intended use of the item in the Work. When catalog pages are submitted, applicable items shall be clearly identified and inapplicable data crossed out. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.

9. SUPPLIER shall be solely responsible for the completeness of each submission. SUPPLIER stamp of approval is a representation to OWNER that SUPPLIER accepts sole responsibility for determining and verifying all quantities, dimensions, field construction criteria,

materials, catalog number, and similar data, and that SUPPLIER has reviewed and coordinated each submittal with the requirements of the Work and the Contract Documents.

10. SUPPLIER shall coordinate shop drawings and product data with drawings previously submitted, with drawings being prepared, and with drawings and data previously approved. All such coordination shall be indicated by reference.

11. SUPPLIER shall assign a sequential number to each submittal.

    a. Assignment of numbers shall be by means of a letter prefix, a sequence number, a letter suffix to indicate resubmittals and a specification number. For example, submittal SD-012C-01300 is the third re-submittal of the twelfth Shop Drawing for the Project.

    b. The sequence number shall be issued in chronological order. Resubmittals shall be followed by a letter of the alphabet to indicate the number of times a submittal has been resubmitted to the ENGINEER for processing. As an example, a shop drawing with the number SD-001 indicates that the submittal is the first shop drawing submitted for the project. Shop Drawing Number SD-002A indicates that the submittal is the second shop drawing submitted for and is being submitted for the second time. Acceptable prefixes for submittals are as follows:

        i. SD -Shop Drawing
        ii. PS – Project Schedule
        iii. RD – Record Data
        iv. OM – Operation and Maintenance Manual

    c. Correct assignment of numbers is essential as different submittal types are processed in different ways. Some submittals received do not require that any response be given for the material. SUPPLIER and ENGINEER shall both maintain a log of submissions to allow the processing of SUPPLIER's submittals to be monitored. Logs will be reviewed periodically to determine that all submittals are received and processed.

    d. Submittals shall be marked to show clearly the applicable sections of the specification and sheet number of drawings.

    e. Submittals shall be accompanied by a Submittal Transmittal Form to be provided by the OWNER. A separate form shall be used for each specific item, class of material, equipment, and items specified in separate discrete sections, etc. for which a submittal is required. Submittals for various items shall be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that they should be.

12. SUPPLIER shall not deliver to the site, storage, or incorporate into the Work, any materials or equipment for which approved submittals have not been obtained.

13. If a submittal is returned to the SUPPLIER marked “NO EXCEPTIONS NOTED”, formal revision and resubmission shall not be required. SUPPLIER may proceed to perform submittal related Work.

14. If a submittal is returned marked "EXCEPTIONS NOTED", SUPPLIER shall make the corrections on the submittal, but formal revision and resubmission shall not be required and the SUPPLIER shall proceed with the Work.

15. If a submittal is returned marked "RETURNED FOR CORRECTION," the SUPPLIER shall revise it and resubmit to the OWNER for review. Resubmittal and a grade of "NO EXCEPTIONS NOTED" or "EXCEPTIONS NOTED" is required before the SUPPLIER may proceed with the Work, unless approved in writing by the OWNER. Resubmittal of portions of multi-page or multi-drawing submittals shall not be allowed. For example, if a Shop Drawing submittal consisting of 10 drawings contains one drawing noted as "RETURNED FOR CORRECTION", the submittal as a whole is deemed "RETURNED FOR CORRECTION", and all 10 drawings are required to be resubmitted.

16. If a submittal is returned marked "NOT ACCEPTABLE," it shall mean either that the submitted material or product does not satisfy the Specification, the submittal is so incomplete that it cannot be reviewed, or it is a substitution request not in accordance with the General Conditions of the Contract. SUPPLIER shall prepare and deliver a new submittal to the ENGINEER for review.

17. Resubmittal of rejected portions of a previous submittal shall not be allowed. When resubmittals are needed, every change from a submittal to a resubmittal or from a resubmittal to a subsequent resubmittal shall be clearly identified and flagged on the resubmittal by SUPPLIER.

18. When resubmittals are needed, resubmittals shall be made within 30 days of the date on which documents to be modified or corrected were posted on CPMS by ENGINEER or its designated reviewer (electronic submittals) or of the postmark date of the letter returning the material (if a hard copy-type submittal was approved by OWNER), whichever is later. A time extension shall be considered by ENGINEER only if within the required number of days SUPPLIER submits an acceptable request for an extension of time, listing the reasons why the resubmittal cannot be completed within the stipulated time.

19. The need for more than one resubmittal, or any other delay in obtaining ENGINEER's review of submittals, shall not entitle SUPPLIER to extension of the Contract Times unless delay of the Work is the direct result of a change in the Work authorized by a Change Order or failure of OWNER to review and return any submittal to SUPPLIER within the specified review period.

20. SUPPLIER shall not deliver to the site, store, or incorporate into the Work, any materials or equipment for which approved submittals have not been obtained.

21. When electronic submittals are not possible, hard copy submissions shall be made as required in this Section. Submittal of a transmittal form into the contract-specific web-based project management system by SUPPLIER shall still be required for record keeping.

22. SUPPLIER is responsible for frequent monitoring of the web-based documents and the submittal process status.

C. ENGINEER Responsibility

1. ENGINEER will conduct a thorough review within 21 calendar days after its receipt in CPMS so as not to create delay. This review will be for general conformance, subject to the requirements of the Contract Documents, and will be an effort to assist the SUPPLIER to discover errors and omissions in submittals. ENGINEER review, approval, or other appropriate action regarding SUPPLIER submissions will be only to check conformity with the design concept of the Project and for compliance with the information contained in the Contract Documents and shall not extend to means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate component item will not indicate approval of the assembly into which the item is functionally integrated. SUPPLIER shall make corrections required by ENGINEER, and shall return the required number of corrected copies of Shop Drawings to the OWNER. SUPPLIER may be required to resubmit, as required, revised Shop Drawings or Samples for further review and approval. SUPPLIER shall direct specific attention in writing to any new revisions not specified by SUPPLIER on previous SUPPLIER submissions.

2. ENGINEER review does not relieve the SUPPLIER of the obligation and responsibility to coordinate the Work and plan the details of the Work.

3. The OWNER reserves the right to require written confirmation from the SUPPLIER that the comments placed on submittals stamped "Exceptions Noted" will actually be followed.

4. Review by the ENGINEER will not be construed as relieving the SUPPLIER of the responsibility for the accuracy, proper fit, functioning, or performance of the Work.

1.04 PRODUCT DATA

A. Product data, including materials reproduced from manufacturer’s product catalogs will not be larger than 8 ½" by 11" in size.

B. Catalog data will be explicit with regards to the name of the manufacturer and to the details of the products being furnished. It will also be complete enough to enable the OWNER to determine that the products being submitted conform to the requirements of the Specifications.

C. For submittals with more than one style or size of a product on a sheet, the SUPPLIER will clearly indicate which product is being submitted for review.

D. SUPPLIER will provide electronic submittals in .pdf format of all product data to the OWNER. Files shall be readable using Adobe Acrobat Reader Version 7.0.

1.05 SHOP DRAWINGS

A. SUPPLIER shall reasonably check and verify all field measurements and will submit to the OWNER for review and approval. These shop drawings will bear a stamp from the SUPPLIER that indicates that the SUPPLIER has reviewed the shop drawings and that the submittal is complete and in compliance with Contract Documents.

B. Substitute and “Or Approved Equal” Items: Meet requirements of Paragraph 5.12 of the General Conditions.

C. SUPPLIER will submit detailed drawings and descriptions of proposed deviations from details or component arrangement indicated on the Plans.

D. Single line drawings will not be acceptable. Copies of the Plans will not be accepted for submission as drawings, nor will catalog numbers alone of materials or equipment.

E. SUPPLIER will submit electronic copies in .pdf format of each shop drawing to the OWNER for review. Files shall be readable using Adobe Acrobat Reader 7.0.

1.06 SAMPLES

A. SUPPLIER will furnish samples of items and materials as required. Samples shall be submitted to the OWNER in duplicate. Each sample will be properly labeled and identified by providing the following:

1. Date.

2. Job name for which it is offered.

3. Specification section and paragraph.

4. SUPPLIER’s name.

5. Supplier and trade name.

6. Other data indicating conformance to the Specifications.

7. Color charts or samples with manufacturer’s number.

1.07 MANUFACTURER’S CERTIFICATES AND AFFIDAVITS

A. Where specified in the Contract Documents that a certificate and affidavit shall be submitted to the OWNER for review of a particular product, or component of a product, such submittals shall be made in accordance with the following:

1. A certificate submitted for a product, or component of a product, indicates test results proving that product, or component of a product, meets the requirements of the standard specified in the Contract Documents.

2. An affidavit consisting of a sworn statement by an official of the company manufacturing the product indicating that the information on the certificate is true and accurate shall accompany the certificate.

3. A statement from the SUPPLIER, or his subcontractors, suppliers, or other agent which indicates that a particular item of equipment, product, or component of a product, meets the

requirements of the Contract Documents shall not be considered a certificate and will not be approved.

1.08 MANUFACTURER'S REPRESENTATIVE

A. SUPPLIER will include in the Contract Price the cost of furnishing competent and experienced manufacturer's representatives who will represent the manufacturer on products finished and to assist the SUPPLIER to install the products in conformity with the Contract Documents.

1.09 MISCELLANEOUS SUBMISSIONS

A. Provide the following submissions electronically using the designated project website (to be defined during the initial construction meeting). Files shall be readable using Adobe Acrobat Reader 7.0. Provide hard copies as requested by OWNER.

1. Work plans.

2. Quality Control (QC) Plan.

    (i) QC Plan must be submitted and approved prior to commencing Work.

3. Accident reports.

4. Inspection and test reports.

5. Guarantees and warranties.

6. Operation and Maintenance Manuals.

7. Course of Action Plan (Fuel Spill or Other Substances).

    (i) SUPPLIER must submit the Course of Action Plan (Fuel Spill or Other Substances) to the OWNER prior to start of construction.

    (ii) With regard to the accidental spill of fuel, the Plan must address the procedures required by applicable regulations and laws.

8. SUPPLIER's Safety and Health Plan.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 11200

WATER FILTRATION EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. This specification describes a complete operational system to be furnished by a single responsible Filter System Supplier (FSS or Supplier) for installation by Others (Contractor).

2. The work covered in these specifications includes the design, furnishing and installation supervision of a complete filter system. The filter system will remove turbidity from potable water from the Vista Ridge Regional Supply project that is further treated with carbon dioxide and lime upstream of the filters to achieve a target calcium hardness of up to 80 mg/L as $CaCO_3$. The filter system shall have a total capacity of 35.0 MGD that will blend with up to 14.5 MGD of Vista Ridge Regional Supply untreated water.

   a. The system shall consist of eight (8) 2-cell pressure vessels, each containing the surface area and filter media as specified under herein.

   b. The system shall be capable of being expanded in the future by construction of eight (8) additional 2-cell pressure vessels.

   c. The filtrate water quantity and quality specified herein shall be met at startup and throughout the warranty period.

   d. The backwash quantity and frequency specified herein shall be met at startup and throughout the warranty period.

3. The filter system shall be furnished by one of the pre-approved Filter System Suppliers that are listed under Subsection 1.02, Quality Assurance of this Specification Section.

4. The Filter System Supplier will be selected and issued a Purchase Order by the Owner for early submittal of shop drawings prior to advertising and bidding of the Terminus Treatment Facilities Bid Package, which will be awarded to a General Contractor, referenced herein as Contractor. The Filter System Supplier shall be responsible for coordination with the construction schedule of the Contractor to ensure that equipment is delivered to the site in accordance with the Contractor's critical path schedule. The FSS shall also coordinate with the Contractor to ensure that all related systems furnished under the Contractor's scope of work will form a complete integrated operating system. The filter

system supplier for this project shall coordinate the filter system with the following equipment supplied by the Contractor, and their manufacturers:

a. Interconnecting Process Piping and Valves

b. Instrumentation and Control

c. Electrical

5. The filter system supplier shall be responsible for furnishing filtration support equipment and appurtenances as listed below and specified herein.

a. Eight two (2) cell pressure vessels

b. Backwash Supply Pumps

c. Air Scour Blowers with Sound Attenuating Enclosures

d. Four (4) Pressure and Flow Monitoring Panels

e. Two (2) Programmable Logic Controller (PLCs) Panels

f. The filter system supplier shall be responsible for engineering selection and purchasing of all motor operated valves (MOVs) and specialty control valves associated with the filter system. All valves and actuators shall be furnished in full conformance with Section 15100.

g. The filter system supplier shall be responsible for the purchase and testing of field devices related to the filter monitoring panels noted above. Field devices manufacturers and equipment models shall be coordinated with equipment furnished in other process areas by the Process Control System Integrator (PCSI). Like items of equipment shall be the product of one manufacturer to facilitate standardization of performance, operation, spare parts, maintenance and manufacturer's service.

6. The Filter System Supplier shall be responsible for coordination with the PCSI, and shall assume ultimate responsibility in providing all items required to form a complete and operable filter system whether specified herein or not.

7. The proposed filter system shall employ a state-of-the-art, fully automated control system for all normal daily operations including automated sequencing of system start-up, automated control of normal operation at steady state conditions, and automated sequencing of plant shutdowns (both emergency and operator initiated). The filter system supplier shall be responsible for providing filter process control strategies that safeguard the filter system equipment and warranties, and account for specific equipment furnished for the project. The developed control strategies shall be sufficiently detailed to allow use by the PCSI for control system coordination efforts. The filter system supplier shall be

responsible for coordination of control strategies with the PCSI throughout the control system programming effort, and shall assist the PCSI with any changes that are required during startup and testing.

B. Related Work Described Elsewhere:

1. 01600 Material and Equipment
2. 01640 Manufacturer's Field Services
3. 01730 Operation and Maintenance Data
4. 01752 Facility Startup Commissioning Requirements
5. 15000 Mechanical General Requirements
6. 15100 Valves and Appurtenances
7. 16000 Electrical – General Provisions
8. 17310 Flow Instruments
9. 17314 Pressure Instruments
10. 17325 Process Control System Control Panels
11. 17327 Panel Mounted Control Devices
12. 17328 Uninterruptible Power Supply
13. 17500 Programmable Logic Controller

1.02 QUALITY ASSURANCE

A. Backwash Waste Production

1. The Owner considers water conservation an intrinsic part of this project. Filter System Suppliers shall provide with their submittal a backwash generation calculation and guarantee.

B. Qualified Filter System Suppliers shall have experience manufacturing pressure filter vessels including simultaneous backwash systems for at least five (5) years with no less than 10 successful installations in the municipal market, of which 3 must have been 10 MGD or larger. All qualified suppliers shall provide evidence of a local field technical support crew within an eight (8) hour drive of San Antonio, TX, and be able to mobilize within 24-hour notification. Approved Suppliers are listed below, no equals will be accepted.

1. Tonka Water using Simul-Wash backwash method.

2. Loprest Division of WRT using Syncro-Cleanse backwash method.

3. WesTech using MULTIWASH backwash method.

1.03 SUBMITTALS

A. Pre-Purchase Contract Schedule: It is anticipated that this pre-purchase contract will follow the approximate schedule below:

1. Submittals – Preliminary: June 27, 2018 (with the bid)

2. SAWS Board Award: July 10, 2018

3. Purchase Order for Submittals Only: July 13, 2018

4. Submittals – Level 1: August 1, 2018

5. Submittals – Level 2: August 31, 2018

B. The filter system supplier shall submit the following with the bid:

1. Preliminary vessel shop or fabrication drawings with all dimensions indicated. Include identification and catalog cuts for purchases components and details for manufactured components.

2. Pump and Blower data including:

a. Submit catalog sheets showing pump/blower characteristics and dimensions, including the Dimensional and Layout Data:

1) Certified dimensional drawings of each item of equipment and auxiliary apparatus to be furnished.

b. Submit Manufacturer's certified rating curves for each pump, showing pump characteristics for discharge head, capacity, brake horsepower, pump efficiency at the "rated" point, pump efficiency curve for pump, and guaranteed net positive suction head required (NPSHR) over the entire range of pumping requirements. This information shall be prepared specifically for each pump provided. Catalog sheets showing a family of curves will not be acceptable.

c. Submit dry weights of pump, motor, and base plate, and weight of entire pumping unit.

d. Submit dry weights of blower, motor, and enclosure, and weight of entire blower assembly.

3. Media configuration.

4. Valve supplier and data sheets

5. Summary Table listing the make and model of all valves, actuators, instrumentation field devices, and any other appurtenances to be furnished with the Filter System.

6. Performance guarantee approved by authorized signatory that states at a minimum:

a. The backwash collection system incorporated into the provided vertical pressure filtration system will operate with media loss of one inch per year or less subject to the system being operated in accordance with operating procedures, practices and air and water flow rates required for the system as detailed in the Supplier Operation and Maintenance Manual.

b. With the backwash system incorporated into the pressure filtration system, Supplier guarantees the backwash wastewater volumes in accordance with the backwash waste volumes outlined in our proposal.

c. At a minimum, Supplier guarantees that the iron will be removed to 0.15 mg/l (Fe) and turbidity will be removed to 0.6 ntu.

C. The filter system supplier shall submit the following with Level 1 submittals (August 1, 2018):

1. Vessel shop or fabrication drawings with all dimensions indicated. Include identification and catalog cuts for purchases components and details for manufactured components. Identify materials, surface preparation, and finishes. Include ASME calculations of wall thickness for the vessel, manways and nozzles.

2. Flow schematic drawing indicating line sizes of pipes connecting to and from pressure vessels, valving, method of support, utility (air, water, drain, electric) line sizes and connections.

3. A list of any and all parameters, ratings or other characteristics where the proposed system deviates from the requirements set forth in these Specifications.

4. Backwash system sizing calculations.

5. Complete pump and blower package submittal including:

a. Submit catalog sheets showing pump/blower characteristics and dimensions, including the Dimensional and Layout Data:

1) Certified baseplate and anchor bolt plans and details.

2) Schematic electrical wiring diagram and other data as required for complete pump/blower installation.

3) Certified sectional drawing of blower / pumping unit with part numbers and material specifications.

b. Cross-sectional drawings with detailed construction of each component in the pump/blower along with the ASTM material designations.

c. Bill of materials.

d. Shaft seal drawing, shaft coupling and bill of materials.

e. Certified support and anchor bolt plans and details.

f. Electrical and instrumentation data as detailed below.

g. Performance curves.

h. Data sheets applicable to proposals, purchase, and as-built drawings.

i. Performance information.

j. Certified drawings of auxiliary systems.

k. Forces and moments analysis, along with thrust calculations at the pump feet and at the anchor bolts. Also provide certified pump support and anchor bolt plans and details.

l. Manufacturer's installation instructions.

m. Qualifications of Service Engineer.

n. Factory test procedure.

o. Schedules for factory witness testing.

p. Materials certifications for castings, impellers, shafts, and shaft sleeves.

q. Certified motor test data.

r. Spare parts recommendations and price lists.

s. Submit qualifications of pump company service Engineer to check out installation.

t. Submit blower/pump/motor coupling manufacturer, model number, AGMA 9002-A clearances and tolerances.

u. Pumps: submit hydraulic thrust and radial load calculations along with L10 bearing life of each bearing.

v. Pumps: submit shaft design calculations including deflection at impeller and at mechanical seals.

6. Complete valve submittal according to Section 15100.

7. Affidavits of compliance with referenced standards and codes.

8. Applicable certifications and ratings.

9. Shop inspection schedule.

10. Detailed drawings illustrating equipment arrangement, bill of materials, weights (dry and operating), size, and location of all anchor bolts and nuts, and plan view system drawing.

11. Piping arrangement drawings or plans and elevation drawings including details (i.e., flanged etc.) and location of all required connections to utilities and piping.

12. Unloading, storage and installation instructions.

13. List of any extra materials or supplies provided.

14. Delegated-Design Submittal: For design of seismic restraints, including analysis data signed and sealed by the qualified professional engineer in the state of Texas responsible for their preparations.

    a. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment.

    b. Structural and seismic calculations for pressure vessels, backwash pumps and blowers. Include calculations for reactions at anchor bolts and selection of the size depth and number of bolts required for use with Simpson Set Epoxy anchor system. (Supplier can assume grade 60 rebar with 4.000 psi concrete.)

    c. Seismic Design Parameters:

       Site Classification: B

       Site coefficient (F_a): 1.0

       Site coefficient (F_v) = 1.0

       Mapped spectral response acceleration for short periods (S_s): 0.074 g

       Mapped spectral response acceleration for 1-second period (S_1): 0.030 g

15. Interior Tank Lining Data:

    a. Submit a letter of certification from the manufacturer of the interior lining to verify conformance with ANSI/NSF Standard 61 requirements and compatibility of coating system with the proposed process service.

    b. The tank lining applicator shall be fully experienced in the application of tank coatings and shall be certified by the interior lining coating manufacturer.

c. Submit qualifications for an independent paint testing company to perform testing of the internal lining. At a minimum the paint testing shall include mil thickness and Holiday testing. The paint testing company shall be a NACE certified firm acceptable to the tank manufacturer and the Engineer. The paint testing company shall provide a list of previous experience with at least five (5) previous projects of equal or larger sized tanks in the last five years.

d. Submit tank testing procedures and proposed locations where testing will be performed. Included in testing procedures should be the models of proposed testing equipment and testing equipment calibration procedures.

e. Notify the Owner and Engineer at least two (2) weeks prior to testing to allow witnessing of the paint testing activities, if desired.

f. Submit results of interior tank lining testing to the Engineer prior to shipment of the tank to the job site.

D. The filter system supplier shall submit the following with Level 2 submittals (August 31, 2018):

1. Electrical/Instrumentation data including: complete electrical, instrumentation and control, and wiring diagrams in sufficient detail to allow installation of instrumentation and controls and electrical components. The following submittals shall be required:

a. The following information shall be submitted with the motor drawings for review.

1) Name of Drive

2) Horsepower of Motor

3) Phase

4) Full Load Efficiency

5) Voltage

6) Full Load Power Factor

7) Speed

8) NEMA Design Starting Torque

9) NEMA Frame and Dimensions

10) Full Load Current

11) Locked Rotor Current

12) Insulation Class

13) Temperature Rise at 1.15 SF

14) Enclosure

15) Bearing life design

16) Special features (i.e., space heater voltage/ wattage, RTDs, oversize conduit box and corrosion resistant features).

17) Nameplate Drawing with Information as listed herein.

18) Lugs and connectors.

b. Field Instrument Submittal

19) Submit complete documentation of all field instruments using ISA-S20 data sheet formats. Submit separate data sheets for each instrument

20) Certified calibration data for all flow metering devices

21) Refer to all other Division 17 for additional specific submittal requirements.

c. Control System Submittal

1) The Supplier shall coordinate with the Contractor to schedule all control system submittals in a timely manner, such that the plant control system programming schedule will not be delayed.

2) Control System Hardware: This submittal shall provide complete documentation of the proposed hardware (PLCs, OITs, communication equipment, cables, and peripherals). The submittal shall include the following:

a) System Block Diagram

b) Complete Bill of Materials

c) Loop Drawings

d) Control Panel Layout Drawings

e) Equipment Data Sheets

3) Filter System Control Narrative Submittal: This submittal shall provide the following information:

a. System Overview

b. Mode of Operation

c. Local Manual Control

d. Local Automatic Control

e. Remote Manual Control

f. Remote Automatic Control

g. Alarms

h. Interlocks

i. Tuning Parameters

j. Equipment Runtimes

k. Historical Recording

4) Input/Output (I/O) List Submittal: This submittal shall provide the following information:

a) Field device tag name

b) I/O tag

c) Description

d) Physical point address: rack, slot and point for each I/O point

e) Logical point address: I/O address of each point

f) I/O type: use DO - Discrete Output, DI - Discrete Input, AO - Analog Output, AI -Analog Input, PI - Pulse Input, PO – Pulse Output or Ethernet (serial DI/DO/AI/AO).

g) Range

h) Engineering unit

5) Software Package Submittal:

a) Submit details of all software packages provided with the PLC and the OIT. Indicate all standard and optional features provided. Include copies of license agreements indicating assignment of licenses to the Owner.

b) Indicate the specific software versions that will be provided for each package.

c) Submit process control narratives prepared specifically for this project.

6) Control System Standards and Conventions Submittal:

a) Submit system configuration, including network (TCP/IP) addressing. Network addressing shall be defined to enable the plant PLC system to communicate with the Filter System control system.

b) Software tag naming conventions

c) OIT Graphic display standards, including color conventions, equipment symbols, display format, and samples of each proposed type of graphic display.

d) Alarm configuration standards, including priorities, logging, and resetting

e) Security configuration standards, including user groups and privileges

f) PLC software templates, including equipment control, sequence control and equipment runtime calculations

7) Operator Interface Submittal

a) Submit all proposed graphic displays, trends, and logs.

b) Quantity of graphic displays to be submitted shall be as required to depict all monitoring and control requirements, defined herein and in the contract documents. As a minimum, the following graphic displays and types shall be submitted:

Process Overview Displays

Unit Process Displays

Alarm Summary Display

Key Performance Indicators (KPI): provide dedicated graphic displays for system key performance indicators.

Control Strategy Setup Displays

Equipment Control Pop-up Displays

System Diagnostic Displays

d. Data Transfer Address List Submittal

1) Submit a complete Data Transfer List defining all software points for communication to/from the plant SCADA.

2) The data transfer points shall be based on the Drawings, the requirements outlined in the Specifications, and coordination meetings with the Owner, Engineer, General Contractor and Process Control Systems Integrator (PCSI).

3) The data transfer list shall be submitted in both a Microsoft Excel readable electronic file format and hard copy.

4) As a minimum, the data transfer list shall include the following information:

a) TAG NAME: The identifier assigned to the software point.

b) DESCRIPTION: A description of the function of the device

c) LOGICAL POINT ADDRESS: Software address of each point.

d) POINT TYPE:

DO - Discrete Output is written to the OSHG control system by the plant PCS.

DI - Discrete Input is read from the OSHG control system by the plant PCS.

AO - Analog Output is written to the OSHG control system by the plant PCS.

AI - Analog Input is read from the OSHG control system by the plant PCS.

5) DATA FORMAT: For analog points, the data format shall be either Integer or floating point. For discrete points, the data format shall be either maintained or momentary.

6) RANGE/STATE: The range in engineering units corresponding to an analog 4-20 mA signal; or, the state at which the value of the discrete points are "1."

7) ENGINEERING UNITS: The engineering units associated with the Analog points.

E. The filter system supplier shall submit the following with Level 3 submittals:

1. The Supplier shall submit operation and maintenance data in accordance with Section 01730. Manuals shall include data for the backwash system, and include the blower, pump, and motors.

2. Submit a Manufacturer's field report, including a report of installation, inspection, testing, and observations for each pressure vessel, pumping unit, blower package and the media installation in a Letter of Certification.

3. Testing Submittals

a. Submit the procedures proposed to be followed for each test. Procedures shall include test descriptions, forms, and checklists to be used to control and document the required tests. Include sign-off forms for each testing phase or loop with signoff areas for the Manufacturer, Engineer, and Owner.

b. Preliminary documentation shall be provided at least 2 weeks prior to the various tests which shall include a Factory Acceptance Test (FAT), pressure test report and site performance test.

c. Pressure test reports and certificates of inspection for the vessel shall be in accordance with procedures for ASME pressure rating and ASME Boiler and Pressure Vessel Code. Reports shall be furnished prior to shipment of the vessels.

d. Site Performance Test shall satisfy the requirements specified herein. Included shall be the certified data guaranteeing the backwash volume generated for each pressure filter per backwash, which shall be measured during performance test.

e. Media Test Submittal: Prior to media shipment, submit signed representative Sample Analysis, (i.e. effective size, uniformity coefficient, specific gravity, acid solubility and MOH hardness for Anthracite only.). All testing shall conform to the requirements of the latest edition of AWWA B100.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. System components delivered to the site shall be stored in such a manner that they will not constitute distractions or a safety hazard.

1.05 WARRANTY

A. The manufacturer's warranty period shall be concurrent with the Contractor's for two (2) years, commencing at the time of final acceptance by the Owner which shall begin no later than April 15, 2020. Guarantee shall cover all necessary labor, equipment, materials, and replacement parts resulting from faulty or inadequate equipment design, improper assembly, defective workmanship and materials, leakage, breakage or other failure of all equipment and components furnished by the manufacturer.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials that come into contact with the water being treated or the finished water shall be ANSI/NSF Standard 61 certified for use in contact with potable water. Manufacturers shall submit an affidavit with the shop drawings indicating ANSI/NSF Standard 61 conformance for the materials used in products that come into contact with the water.

B. Water from the VRRS after lime addition will be treated through pressure filters designed in accordance with the criteria listed in this section and as identified in the construction documents. The horizontal configured Pressure Filters will remove calcium carbonate solids flocs created by polymer addition upstream of the filters and iron particulates and other suspended solids present in the VRRS supply source. A filter aid polymer system will be provided and installed by the Contractor to allow for feeding of a polymer at an injection point upstream of the filter system. The Filter System Supplier shall confirm in the shop drawing submittal if a filter aid polymer is required to achieve the performance requirements as specified herein, and shall include the chemical information and the maximum dose of any such pretreatment chemicals.

C. Filtration System Equipment design criteria shall be as detailed below:

Design rate of flow, mgd	35.0
Minimum rate of flow, mgd	6.5
Total number of filters	8
Number of cells per filter	2

Filter loading rate at design flow rate and with one filter out of operation (N-1), gpm/ft2	5.8
Filter loading rate at design flow rate with two filters out of operation (N-2), gpm/ft2	6.8
Maximum clean filter pressure drop, psi	2
Maximum dirty filter pressure drop, psi	6
Filter area per filter, ft2	600
Maximum pressure drop across filter during backwash, psi	17
Anticipated operating pressure range at inlet, psig	8 - 30
Overall Size per Filter	12' dia x 50' length
Backwash Loading Rate, gpm/ft2	3 - 5, with air
Air Loading Rate, cfm/ft2	3
Backwash restratification Rate, gpm/ft2	15 – 18 without air
Type:	Horizontal Pressure Vessel
Pressure Rating, psi:	75
Number of Cells:	2
Diameter, ft:	12
Seismic:	Current IBC requirements.

D. Water Filtration Equipment performance criteria shall be as detailed below:

Maximum feed water turbidity (95%), ntu	5
Maximum filter effluent turbidity (95%), ntu	0.6
Influent total iron, mg/L as Fe	≤ 0.3
Effluent total iron, mg/L as Fe	≤ 0.15
Maximum backwash cycle volume, gal/ vessel	67,675
Minimum filter runtime between backwashes	24 hours

1. The Filter System backwash design shall not produce greater than 0.55 million gallons of backwash waste (not including filter to waste volume) over any continuous 24-hour period when operating at the specified conditions above.

2.02 MATERIALS AND EQUIPMENT

A. Pressure Filter Vessel:

1. All pressure vessels shall conform to the Equipment Schedule and be constructed in accordance with Section VIII of the ASME code requirements for cold fired pressure vessels, and shall bear the ASME stamp. Minimum thicknesses shall be furnished in accordance with ASME code requirements. Verification of ASME code design to include calculated head and shell thicknesses. They shall be submitted with the first submittal drawing and be approved by the design engineer prior to authorization of fabrication. Vessels shall be fabricated in a facility holding a current ASME U-stamp. Facilities holding an ASME R

("repair") or other certification shall not be considered acceptable for vessel fabrication.

2. All flanges, plates, angles, channels, beams, etc., shall be joined by fillet welds, all sides continuous welded per AWS D1.1. Flanges shall be factory welded on split centers prior to shipment

B. Vessel Interior Construction:

1. Simultaneous Air/Water Backwash Collection System

a. The required number of simultaneous air/water backwash troughs shall be installed in each filter and be specifically designed to accept a sustained backwash flow of air and water simultaneously without loss of media and without inhibiting the removal of suspended solids. Sustained is defined as a single duration greater than 10 minutes at specified air and water rates while backwash water overflows the trough.

b. Simultaneous air/water backwash collection troughs shall be constructed of minimum 12-gauge Type 304/304L stainless steel. All mounting hardware shall be stainless steel.

c. The simultaneous air/water collector troughs shall be designed to simultaneous accept the design air and water backwash rates indicated previously.

d. The simultaneous air/water backwash collection troughs shall be of the overflow type without deep, overlapping baffles and shall include a quiescent zone for media/solids separation. Filter backwashing with water only, air followed by water, or combined air and water for short periods, limited by filter geometry, (freeboard combined air/water backwash using upturned elbows) shall not be acceptable or considered equal.

e. The simultaneous air/water collector troughs shall be designed with weir edges along the entire length of trough to allow for equal distribution and collection of water. Pipe collectors with submerged or semi-submerged orifice collection points shall not be acceptable due to the inherent plugging.

f. The backwash collection trough design is critical to preventing media loss during the simultaneous air/water backwash. Filter System Supplier shall guarantee media loss of less than one inch per year when backwashing in accordance with the methods described herein.

g. Alternative backwash methods that do not incorporate simultaneous air and water for a sustained duration are not acceptable. Sustained is defined as an uninterrupted duration of 10 minutes, minimum. Filter

backwashing with air followed by water, or air and water for short periods limited by filter geometry, shall not be acceptable.

2. Vessel Underdrain System

a. The underdrain shall consist of an arched plate false-bottom design. The underdrain system shall be structurally reinforced as necessary to withstand a differential pressure in either direction of 12 psig. The underdrain plate shall be fitted with openings to accept underdrain nozzles located throughout the entire cross section of the underdrain area.

b. The underdrain diffuser nozzles shall be non-metallic, self-cleaning nozzles. They shall be mounted in the underdrain plate with orifice control area of the underdrain diffuser nozzle equal to 0.3% of the total filter bed measured at the surface of the filter media. Nozzles shall be provided with openings as required to collect and distribute flow laterally. Slot openings shall be designed to prevent lodging of support gravel in the slot opening.

C. Vessel Miscellaneous Components

1. Each filter shall be equipped with four (4) 24” full opening manways with hinged covers to allow for removal without heavy lifting equipment and two (2) 6” x 8” handholes, rated for the working pressure of the vessel.

a. One full opening manway shall be placed in each cell near the top of the vessel for access into the filter for purposes of media loading, and one manway shall be placed below the underdrain plate of each cell to allow for access during painting, welding and inspection. The manways shall conform to the requirements of the ASME code for pressure vessels section VIII, Division 1. The manway weld collar shall be 6” of carbon steel. The manway cover shall be constructed of carbon steel and the wing-nut washer hinge pins shall be 304 stainless steel. Manways shall be furnished with a Buna-N material gasket.

b. Each filter shall be equipped with two (2) 6” x 8” handholes (1 per cell) for observation of backwash functions. The hand hole shall be supplied with a Buna-N gasket.

2. Each horizontal pressure vessel shall be subdivided into equal isolated filter cells. The filter feed will be divided into two (2) filter cells. When a single filter is taken offline both filter cells are taken offline as the filtrate and backwash systems are not completely isolated. Each cell wall shall be subjected to 1.5 times the differential pressure during shop testing.

3. Structural steel saddles shall be provided for support of the vessels.

4. 1/2” diameter, threaded full couplings shall be provided as shown on the Drawings for sample taps.

5. Manufacturer shall furnish anchor bolts as required per the manufacturer’s seismic design to be shipped loose with the equipment and installed by the Contractor.

6. Pipe nozzles shall be of the size as shown on the Drawings and shall consist of Sch. 40 steel pipe, projecting and terminating in a flange 6” from the outside face of the sideshell. Flanges shall be Class 150, standard ANSI pattern, welded on split centers and shall be true and plumb.

7. A 2” drain with ball valve and plug shall be provided at the bottom head center consisting of a welded threaded outlet.

8. An air release half coupling shall be provided in the top center of the shell as required per manufacturers design requirements, but shall be no less than 2-inches.

9. Gauge taps shall be furnished in the influent and effluent nozzle connections (1/2” NPT half coupling with plug).

D. Support Gravels and Filtration Media

1. The support gravel shall consist of hard rounded stones with an average specific gravity of not less than 2.5. It shall not contain more than 2% of weight of pieces in which the length is three times the width. The gravel shall be free of shale, mica, clay, sand, dirt and organic impurities.

2. The support gravels shall be placed in the tank shall be as required to meet the performance requirements specified herein.

3. The bottom layer of the screened support gravel shall be placed by hand to avoid damage to the diffuser assemblies. Each layer shall be placed and leveled before the addition of the next layer is started. A gravel-less underdrain shall not be acceptable.

4. The filter media shall be placed on top of the support gravel and shall be as required to meet the performance requirements specified herein, at a minimum:

Filter Media Total Depth	36 inches minimum
Filter Media /Sand	
Specific Gravity	2.60 minimum
Thickness Effective size	12 inches minimum
Uniformity Coefficient	0.45 to 0.55 mm
	< 1.6
Filter Media /Anthracite	

Specific Gravity	1.5 minimum
Thickness	18 inches minimum
Effective size	0.9 to 1.1 mm
Uniformity Coefficient	< 1.6

5. The support gravels and filter media shall be procured from a manufacturer that complies with AWWA B-100 standards.

6. Provide media quantities to account for skimming requirements.

7. Material shall be delivered in “SuperSacks” with bottom discharge on a flatbed truck capable of being unloaded from both sides. “SuperSacks” shall have lifting eyes suitable for use with forklifts. Division of material shall be for one (1) filter cell at a time.

8. Material shall be tested as specified in Part 1 of this section prior to shipment.

E. Water Airwash System

1. Grid

a. The airwash system shall be a header-lateral system located at the media/gravel interface for complete scouring of filtration media. Vertical penetrations of air pipe through the media will not be permitted. Air header pipes shall generally enter the filter cells at the media/gravel interface elevation.

b. Materials. The system construction shall be Sch. 80 PVC pipe and fittings with headers being supported at not greater than 4 ft. intervals using stainless steel U-bolts, steel angles, and stainless steel anchorage. Laterals shall be shop fabricated from Sch. 80 PVC, minimum 3/4” diameter and shipped loose for installation by the contractor. Laterals shall be evenly spaced at not more than 12” lateral to lateral spacing along the entire length of the header, each side. Laterals shall be supported at not greater than 2’ intervals using steel angles, vertical supports, base plates, and anchorage. Supports shall be adjustable in two directions.

c. Lateral Design. Each lateral shall be fitted with an end cap and a specially machined Sch. 80 male adapter for screwing or solvent welding into the airwash header. A specially sized air metering slot shall be placed parallel to the axis of the lateral at 6” intervals. The slot width and length shall be designed to reject all media it comes in contact with. The slots shall allow the proper range of air per square foot of area, based on operating conditions. Systems are not allowed which use clamping or other friction type fits.

d. Configuration. The system used shall be of rigid pipe construction. Systems utilizing multiple penetrations into the filter cells shall be

prohibited due to the high potential for hydraulic short circuiting. Systems utilizing flexible piping or hoses (rubber, polyethylene, polypropylene, etc.) shall be prohibited due to their inherent movement in the filtration bed and their inability to remain rigid during normal filter operation. Calculations verifying adequate air distribution design including orifice headloss calculations, shall be submitted to the design engineer for approval.

2. Airwash Blower with Sound Enclosure and Accessories

a. The Filter System Supplier shall furnish two (2) airwash blower packages.

b. Each airwash blower package shall include a rotary lobe positive displacement type.

1) Sized to deliver a minimum of 1,000 scfm of air at 6 psi.

2) Acceptable manufactures: Gardner Denver 4500 Series, Howden ROOTS-FLO, or Aerzen.

3) Housing shall be cast iron per ASTM A-48 Class 30B

4) Shaft sleeves shall be cast iron per ASTM A-48 and hardened.

5) Discharge temperature shall not exceed 200°F at the duty condition with ambient inlet air temperatures.

c. The blower motor shall not exceed 50 hp.

d. The blower and motor shall be coupled together and mounted on a common baseplate, and shall include necessary belts, sheaves, and guards.

e. The blower motor shall be TEFC, and shall be rated for continuous duty at no more than 1800 rpm nominal speed. Motors shall conform to the requirements listed below for NEMA motors.

f. Digital Monitor / Controller

Each blower will have a controller that at a minimum offers the following monitoring / control of the blower:

1) Inlet/Discharge Pressure

2) Inlet/Discharge Temperatures

3) Differential Temperature Protection

4) Excessive Enclosure Temperature Protection

5) Remote start/stop control

6) Remote speed control

g. Inlet Filter/Silencer

Each blower will have a filter/silencer with paper media that removes 99.5% of 2-micron particles and have the attenuation performance of the RIS series inlet silencer. The maximum pressure drop across the clean element shall be less than 2-inches of water column. The minimum noise reduction shall be 16 dB. The filter/silencer shall be Stoddard FH64 or equal.

h. Discharge Silencer

1) Silencers shall be of the multiple-chamber design. Silencers will have acoustically packed nozzle next to blowers operating above transition speed. Silencer shall be separate from base frame.

2) The discharge silencer shall be sized on inlet CFM. Air velocity shall be 5500 to 7000 feet per minute.

i. Flexible Joint

Each blower shall have a flexible joint located between the blower and discharge silencer to minimize vibration transmission to downstream piping. The joint's elastomer must be rated higher than the maximum expected service temperature and pressure.

j. Pressure Relief Valve

Each blower shall be protected by a spring-loaded pressure relief valve preset to start opening at half a PSIG above the PSIG listed in the Conditions of Service, be full open at not more that 10% above the set pressure, and rated for the SCFM and PSIG listed in the Conditions of Service. If the valve malfunctions it shall do so in the open condition to prevent blower damage.

k. Check Valve

Each blower shall have a discharge check valve with wafer connection, cast-iron body, cast-iron split discs and seal rated

above the maximum anticipated discharge temperature. Valve shall be shipped installed on the system.

l. Isolation Valve

Each blower shall have a discharge isolation valve. Valves less than two inches in diameter will be ball valves. Valves 2-inches and larger shall be stainless steel lugged-body butterfly type with a locking handle. Valves more than eight feet above the floor shall have a chain wheel operator. The temperature rating of the seat must exceed the maximum anticipated discharge temperature. The valve shall be shipped installed on the system.

m. Unloading Valve and Silencer

Each blower shall have an open to atmosphere, electrically actuated, unloading valve and matched dissipative silencer for noise control. The valve will automatically be closed after the motor has reached operating speed. The unloading valve shall be two pipe sizes larger than the pressure relief valve's inlet port. The unloading valve shall be equipped with a 120V single phase motor actuator.

n. Pressure Gauge

Each blower shall have a 4" diameter, pressure gauge with a 0-15 PSIG scale on systems operating up to 10 PSIG and 0-30 PSIG for higher pressures. Pressure gauges shall conform to the specifications detailed in Section 17314: Pressure Instruments.

o. Filter Restriction Gauge

Each inlet filter shall have a filter restriction gauge that progressively measures vacuum in the filter element. A visual indicator, with a manual reset, shall lock at the current vacuum when the blower is shut off.

p. Sound enclosure

1) Each blower assembly shall be furnished with a weather tight, sound attenuating enclosure. The enclosure shall be manufactured of 16 gage aluminum, and shall be lined with acoustical foam, and 20 gauge galvanized perforated steel; sufficient to meet 60 dba at one meter from any exterior surface of the enclosure. The enclosure shall have removable side

panels which will allow full access to the assembly for maintenance or repair.

2) The sound enclosure shall not interfere with accessing accessories of the blower package and shall not require disassembly of the piping or the use of tools.

3) Sound enclosure shall cover the entire blower package including the blower, drive motor, inlet silencer, and discharge silencer. The sound enclosure must be designed for inspection and maintenance of all blower package components.

4) The enclosure and the blower package must be both mounted on a skid / oil-drip pan designed for meeting environment protection standards and for easy transportation and installation provided by the Contractor.

5) A grounding strap shall be installed between the blower base and the package skid to bypass any vibration isolating mounts.

6) Quick release panels, each less than 50 lb (as mandated by MSHA) must provide access for routine maintenance of the blower and the package components. Should the panels be heavier than 50 pounds, hinged doors must be supplied, with an appropriate frame, reinforcements, and supporting elements.

7) A shaft-mounted or motor driven ventilation cooling fan for sufficient heat removal from the sound enclosure shall be provided.

8) Electrical components, instrumentation and instrument connections shall not be mounted or interface with moving panels of the sound enclosure.

3. Backwash Supply Pumps and Accessories

a. The Filter System Supplier shall furnish and install two (2) backwash pumps with accessories for installation by the Contractor.

b. The backwash pumps shall be the double suction, horizontal split case type, as manufactured by Goulds, Flowserve, Patterson, or Fairbanks Nijhuis.

c. The backwash water source shall normally be the filtered supply water. The backwash system shall be sized to accommodate the range of pressures available in the filtrate header as the level in the tank fluctuates. Control shall be provided by both the VFD on the backwash supply pumps, and modulation of the backwash supply valve at each pressure vessel. The filtrate storage tank (SAWS Storage Tank) will operate at the following ranges in water level:

1. High Water Level: 1058-ft[1]
2. Low Water Level: 1014-ft[2]

d. Pumping units shall be designed for the operating conditions as follows:

Pump Tag	37-PMP-05, 37-PMP-06
Design Point:	
Capacity	4,500 gpm
Total Design Head (TDH)	As Required
Secondary Condition	
Capacity	1,500 gpm
Total Design Head (TDH)	As Required
Maximum nominal pump speed.	1,800 rpm
Pump Control	Variable Frequency Drive
Minimum Pump Efficiency (at duty point)	80%
Pump designed for reverse rotation	No
Minimum NSPHA at rated head	40 ft
Minimum NSPHA at minimum operating head	50 ft
Maximum unfiltered vibration velocity	0.2 in/s
Pump rotation as viewed from driven end	See drawings
Minimum pump suction nozzle size	12 in
Minimum pump discharge nozzle size	10 in
Estimated pressure loss in pump suction piping	0.13 – 1.3 psi (0.3 – 3.0 ft H2O)
Estimated pressure loss in pump discharge piping	0.4 – 3.5 psi (1.0 – 8.0 ft H2O)

e. The pump motor shall be premium efficiency. Motor size shall not exceed 100 hp. Motor shall conform to the requirements listed below.

[1] At high water level the backwash supply control valve will need to be modulated to burn excess suction pressure and keep the pump on the curve (up to 10 psi).
[2] Low water level based on effluent header elevation, not functional tank low elevation which is 1012-ft.

The motor shall be inverter duty, compatible with the variable frequency drives.

f. The pump motor shall be TEFC. Motors shall conform to the requirements listed below for NEMA motors.

g. The pumps shall be long coupled, base mounted, single stage, double suction, horizontally split case design. The pump internals shall be capable of being serviced without disturbing piping connections or electrical motor connections.

h. Taps and plugs: Casings shall be tapped for drains, vents, priming, water seal, and pressure gages. All taps shall be shipped with brass plugs. Plugs will be removed in the field, as necessary, to make connections for the miscellaneous piping and appurtenances. Provide a ¾" tap in the top of the volute for an air release valve.

i. Bearing housing shall be designed to maintain shaft alignment and ensure long bearing and lubricate life. Bearings shall be replaceable without disturbing the system piping and shall be regreaseable without removal of the bearings from the bearing housing. Pump bearings shall be designed and sized for 100,000 hours L10 rated bearing life at 25% BEP per ANSI/HI 1.3-2013. All bearings shall be manufactured in the United States.

j. Pumps shall be supplied initially with mechanical type split seals which are interchangeable with conventional packing. Mechanical seals shall be John Crane Type I.

k. Seal glands shall have a flush connection at the top and along the vertical centerline or at 30 to 45 degrees from the horizontal centerline. Seal must consist of assemblies which fit together over a shaft to form a self-setting and aligning cartridge seal design. The seal must eliminate the need for shims or dimensions to be taken for proper installation.

l. Shafts, where exposed to water or passing through glands and stuffing boxes, shall be protected by renewable (removable) sleeves. Stuffing boxes shall have hardware constructed of corrosion-resistant metals. Materials of construction for shafts shall be 410 or 416 stainless steel, 350 Brinell hardness.

m. Provide seal water flushing per API Plan 11 with stainless steel seal water tubing, with stainless steel hand valve, from the pump casing to the gland flush connection. The hand valve shall be tagged with a stainless steel warning tag indicating the valve is to be open at all times during operation.

n. Any additional equipment required, such as pressure relief valve, flow switch, or flow indicator shall be provided by Filter System Supplier at

no additional cost to the Owner. Any instrumentation required for these devices shall be provided by the Filter System Supplier.

o. Impeller shall be of the enclosed double suction type made of entirely of ANSI Stainless Steel Type 316.

p. Statically and dynamically balanced to prevent whipping and vibration throughout the operating range, from shutoff head to run out. Perform a precision balance of each impeller to ISO Grade G2.5 and provide the balance certificate in the quality control section of the O&M Manual.

q. Pump/Motor Couplings shall be heavy-duty flexible type, keyed, and locked to the shaft. The drive shaft coupling gear shall be gear type and all metal. Lubrication shall be oil or grease. Coupling guards shall be enclosed type. Bolts and nuts on the exterior surfaces shall be Grade 5 or 8 fasteners. Baseplates shall be cast iron or fabricated steel.

r. Pump casing shall be of a cast iron conforming to ASTM A48 axially-split design with flanges drilled for 125 PSI ANSI companion flanges working pressures and mounting feet integral cast into the bottom half of the casing. Suction and discharge flanges shall be on a common centerline in both the horizontal and vertical planes, and the volute shall include Martensitic Stainless Steel, Brinell 300+ Casing Wear Rings, priming port, gauge ports at nozzles, and vent and drain ports. The upper half casing shall be capable of being removed without disturbing piping connections or electrical motor connections.

s. Pump and motors shall be factory aligned, and shall be realigned after installation by the manufacturer’s representative. Pump characteristics shall be such that the head of the pump under varying conditions shall not exceed the rated horsepower of the drive motor.

t. Base plate shall be of cast iron, structural steel or fabricated steel channel with fully enclosed sides and ends, and securely welded cross members. Grouting area shall be fully open. The combined pump and motor base plate shall be sufficiently stiff as to limit the susceptibility of vibration. The minimum base plate stiffness shall conform to ANSI/HI Pump standards.

u. The pump NPSH shall conform to the ANSI/HI 9.6.1- 2017 standards for Centrifugal and Vertical Pumps for NPSH Margin.

v. Pumping equipment shall be provided with all necessary equipment appurtenances to make the pumping units functional.

w. Metal equipment guards shall be provided on all equipment driven by open shafts. Guards shall be designed to enclose the drive mechanism completely and be easily removable.

x. Nameplate shall be 16-gauge stainless steel with ¼-inch die-stamped equipment tag number securely mounted in a readily visible location. Nameplate shall clearly show pump information and complete performance data, including:

1) Manufacturer's name.
2) Pump size, type, and model number.
3) Serial number.
4) Speed.
5) Impeller diameter.
6) Capacity and head rating.
7) Bearing identification, name, and number.
8) Pump weight, motor weight.
9) Date of manufacture.

y. Factory Pre-mounting and Alignment. Pumps with their job motors shall be pre-mounted and pre-aligned. Mounting holes shall be drilled and tapped at Pump Manufacturer's factory. Factory alignment data shall be furnished to the Contractor. Pump Manufacturer shall drill pump and motor feet only for dowels. Do not drill base plate or install dowels at factory; ship loose.

z. Testing: Each pumping unit shall by hydrostatically tested in accordance with the Hydraulic Institute Standards.

1) Hydrostatic Tests: Pump casings tested at 150 percent of shutoff head. Test pressure maintained for not less than 30 minutes.

2) Factory Test Report: Include performance curve test results, performance test logs, noise and vibration test results, for review prior to shipment.

3) Functional Test (in the field): Perform 3-hour continuous run test on equipment. Perform Manufacturer's standard tests, including vibration test, as follows:

a) Dynamically balance rotating parts of each pump and its driving unit before final assembly.

b) Limits:

Driving Unit Alone: Less than 95 percent of NEMA MG 1 limits.

Complete Rotating Assembly Including Coupling, Drive Unit, and Motor.

4) Performance Test (in the field):

a) Conduct on each pump including motor at full speed. All tests and test reports shall be made in conformity with the

requirements and recommendations of the Hydraulic Institute Standards. Acceptance testing shall be Table 14.6.3.4 Grade 1B.

b) Tests over full range of design operating conditions specified shall include the following: Head, capacity and wire-to-water efficiency.

c) Test for a continuous 3-hour period at rated pumping capacity and total dynamic head without malfunction.

d) Test Log: Record the following:

Total Head.

Flow capacity measured by factory instrumentation and storage volumes.

Power requirements.

Average difference in elevation of water surface in suction well to pump discharge centerline for duration of test.

Pump suction and discharge pressure converted to feet of liquid pumped and corrected to pump discharge centerline.

Pump speed.

Water temperature.

Elevation of test stand.

F.F.T. vibration plots of amplitude versus time out to 150,000 cycles/min at twelve points (three points per bearing, x, y, z). Vibration levels on test stand shall meet the specified vibration limits at the factory. Field vibration analysis shall be performed by an independent testing laboratory on installed pump unit.

Perform noise test based on the A-weighted scale at 3 feet, when measured in accordance with IEEE Std. 85 shall not exceed 85 dBA.

e) Adjust, realign, or modify units and retest in accordance with Hydraulic Institute Standards, if necessary.

F. NEMA Frame Induction Motors

a. Motor voltage shall be TEFC enclosure design, 3-phase, single voltage, as shown on the Drawings, and in compliance with IEEE 841.

b. Motors shall have NEMA standard Class "F" insulation with a maximum temperature rise of 90 Deg C above a 40 Deg C ambient, on a continuous operation or intermittent duty, at nameplate horsepower.

c. Motors shall have non-hygroscopic encapsulated windings. Motor leads shall be Class F rated, with permanent identification.

d. Motor rotors and assembly, shall be dynamically balanced.

e. Motors shall be NEMA Premium Efficiency.

f. The motor insulation system for motors controlled with VFD's shall be inverter duty rated and have full capability to handle the common mode voltage conditions imposed by the VFD. Motor insulation system shall conform to all of the requirements of the latest version of NEMA MG1, Part 31 for peak voltage withstand capability.

g. All motors controlled with VFD's shall have minimum 1600 Volt insulation system.

h. The critical speed of the shaft and rotor assembly shall exceed the operating speed by a minimum of 10 percent.

i. The no-load sound pressure level, based on the A-weighted scale at 3 feet, when measured in accordance with IEEE Std. 85 shall not exceed 85 dBA.

j. Vibration limits shall not exceed 0.2-in/sec at any frequency.

k. Motors shall have a minimum of one grounding pad on each motor frame.

l. Bearings

1) Motors larger than 5 HP shall have oil or grease-lubricated antifriction ball- bearings with L10 lifetime of 50,000 HRS.

2) Vertical motor thrust and guide bearings shall conform to AFBMA standards and shall have L10 lifetime ratings as specified for ball-bearings of the same horsepower range. Down thrust information shall be provided to the motor manufacturer by the equipment supplier.

3) Anti-friction motor bearings shall be designed to be regreasable and initially shall be filled with grease suitable for the motor ambient temperature specified.

4) Grease lubricated bearings, except those specified to be factory sealed and lubricated, shall be fitted with easily accessible grease supply, flush, drain and relief fittings. Extension tubes shall be used when necessary. Grease supply fittings shall be standard hydraulic type as manufactured by the Alemite Division of the Stewart Warner Corporation.

5) Sealed bearings shall be contact seal (lip) or non-contact labyrinth type.

6) Motors controlled by VFD's shall have the opposite drive and bearing insulated and a shaft grounding brush installed on the drive end bearing.

m. Space Heaters

1) Space heaters shall be supplied with all outdoor, 3-phase motors, 10hp and above and shall conform to the following:

Heaters shall be of the cartridge or flexible wrap around type installed within the motor enclosure adjacent to core iron. Heaters shall be rated for 120 V, single phase with wattage as required. The heater wattage and voltage shall be embossed on the motor nameplate. Power leads for heaters shall be brought out at the motor accessory lead junction box.

n. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:

1) General Electric

2) U.S. Motors

G. Facepiping

1. Filter facepiping will be supplied and installed by the Contractor. The Filter System Supplier shall confirm all connecting facepiping diameters and locations on the vessel, and note any necessary deviations from the Contract Documents in shop drawing submittals for coordination with the Contractor.

H. Process Valves

1. The Filter System Supplier shall furnish all valves as called for in these specifications, or as required for proper operation of the equipment in all operating modes, including rinse to waste. The valve manufacturer shall furnish

detailed technical information as required by the Engineer for evaluating the quality of the valves and as required by the Supplier for proper valve installation. The technical information shall include complete dimensions, weights, and material lists. No valve will be approved for installation until the required information has been received and reviewed.

2. The Filter System Supplier shall furnish all incidental materials necessary for installation of the valves such as flange gaskets, flange bolts and nuts, and all other materials required for the complete installation.

3. Remote control stations shall be provided for all valve actuators located more than 60-inches above the finished floor.

4. Filter function valves shall be shipped loose for installation by the Contractor.

5. All filter function valves shall be as detailed in Section 15100: Process Valves and Appurtenances.

6. Where specified on plans and in Section 15100, an electric motor operator shall be supplied on butterfly valves.

I. Instrumentation

1. Pressure and Flow Monitoring Panel

a. The Filter System Supplier shall furnish four (4) stainless steel pressure and flow monitoring panels (one for each pair of filter vessels) with minimum dimensions of 18” x 22”.

b. Pressure gauges shall conform to the specifications detailed in Section 17314: Pressure Instruments. The gauge panel shall have the following flush-mounted gauges:

Four (4) Inlet header (0-60 psi). One (1) per filter cell.

Two (2) Effluent header (0-60 psi). One (1) per filter vessel.

c. Pressure transmitters shall conform to the specifications detailed in Section 17314: Pressure Instruments. The pressure and flow panel shall have the following flush-mounted gauges:

Two (2) Loss of head - between influent and effluent headers (0-10 psi differential pressure transmitter with local indication). One (1) per filter vessel.

d. Each panel shall be equipped with the following components:

Two (2) local flow indicator for the Filtrate magnetic flow meter. One (1) per filter vessel.

Six (6) flush mounted sample taps for influent and effluent locations as shown on the Drawings.

e. Each panel shall conform to the specifications in Section 17327: Panel Mounted Control Devices.

f. Filter System Supplier shall furnish mounting hardware (brackets, U-bolts, nuts, washers, etc.) for affixing to facepiping. Installation of panel shall be by Contractor.

2. Flow Meters

a. Eight (8) flanged in-line magnetic flow meters shall be used to measure Filtrate of each vessel. Size and location shall be as shown on the Drawings and provided by Filter System Supplier.

b. The flow meters shall be as specified in Section 17310.

J. Automatic Filter Controls

1. General: The Filter System Supplier shall furnish an automatic control system consisting of a PLC-based control panel with operator interface terminal (OIT), necessary hardware, components, timers, OIT, enclosure, relays, switches, alarms, I/O, and other items necessary for a complete operational system. The automatic filter control system shall be essentially as described below.

2. The automatic filter control system shall provide control and monitoring of all equipment indicating on the Drawings, including the monitoring of the Filter Feed Panel, the control and monitoring of the Backwash Supply Pumps and the Air Scour Blowers and full valve control.

3. The automatic filter control system shall be provided in two (2) PLC cabinets, 30-CP-01 AND 30-CP-02, as shown on the Drawings which shall accept the I/O for half of the system in each cabinet.

4. The Filter System Supplier shall schedule and administer a minimum of two (2) mandatory Coordination Meetings. The Filter System Supplier shall plan and schedule coordination meetings; prepare agendas and distribute copes to participants at least one (1) week before schedule meetings. The meetings shall be held at Owner’s Offices and shall include, as a minimum, attendance by the Owner’s Engineer and the Application Services Provider’s (ASP) Project Engineer.

a. The first coordination meeting shall be held in advance of the Supplier shop drawing submittals for Data Transfer List and Control Narratives. The purpose of the meeting shall be for the Supplier to:

Summarize their understanding of the project.

Provide a forum for the Supplier and Owner to coordinate hardware and software related issues.

Request any additional information required from the Owner and/or Engineer.

b. The second coordination meeting shall be held after the Field Instruments, Control Panel Layout Drawing/Wiring Diagrams, Data Transfer List and Control Narratives Submittal packages have been reviewed by the Engineer and returned to the Supplier. The purpose of the second meeting shall be to discuss:

Review comments made on the submittal packages.

Provide a forum for additional coordination.

5. The PLC for the Pressure Filter System provides supervisory control and monitoring for all of the pressure vessels, the backwash system, as well as providing the interface for control and monitoring by the plant SCADA system. A plant SCADA network may be connected to the PLC through available network protocols and will be able to access designated read and write data. Additionally the PLC and HMI will optionally be accessible through a remote connection for the purpose of monitoring logic and making online changes.

6. Control Architecture

a) System level control will include the following functionality:

1) Pressure Filter Start-up and Shut down commands
2) Management of Pressure Filter backwash priorities and number of Pressure Filters required to be in service based on flow and target requirements
3) Provide System monitoring and operator control functions through a panel mounted operator interface
4) Detect and respond to System level fault conditions including alarm annunciations at the HMI as well as to the Plant SCADA System
5) Provide System interface to the Plant PLC via the SCADA connection

7. Control Modes

a) There are two modes of System control that can be selected via the HMI: “Auto” and “Manual”. The Operator must enter a password on the Operator Interface Terminal to change System mode.

1) Remote: With the System in “Remote” mode, Start Up and Shut Down requests are initiated by the Plant via SCADA commands.

2) Local: With the UV System in “Local” mode, all plant control SCADA commands are disabled. The Pressure Filters can be operated in “Manual” or “Automatic” mode, selectable via the HMI. Pressure Filters may be manually given start-up and shutdown requests.

3) Off: With the System in “Off” mode, all the Pressure Filters will be placed into “Off” mode. The system will not be functional in “Off” mode. All valves, pumps and blowers will be de-energized. Only local controls at the devices will be operational.

8. Control States and Transitions

a) Each filter can be in one of three different states; “Online”, “Backwash” or “Shutdown”. The entire filter system can be in one of two different state; “Online” or “Out of Service”.

b) Start Up Sequence

1) System is in “Automatic” mode and in the “Offline” state.

2) System receives a start request as determined from Plant SCADA system. Start shall be selectable at the Plant SCADA HMI.

3) PLC will request to open the filtrate isolation valve, backwash waste flow control valve, and filter supply valves.

4) Individual requests will be sent to all required pressure vessels and they will begin their normal start-up sequences.

5) After all required vessels valve open signals are active and the backwash waste turbidity is below an operator adjustable setpoint ([x.x] ntu) the system will be “Online”.

6) PLC will request to open the filtrate flow control valve. Once closed signal is inactive, the PLC will request to close the backwash waste control valve and place the filtrate flow control valve into PID flow control.

7) During normal operation feed water is diverted to each cell in the vessel where it flows through the dual media system, gravel and into the filtrate collection chamber. The filtrate collection chamber is shared by all cells in the vessel. The filtrate line is flow controlled to maintain a calculated setpoint based on the raw water feed to the plant and the number of vessels online.

c) Shut Down Sequence

1) The System is in the “Online” state.

2) A shutdown request has been made at the SCADA, PLC or a Critical alarm condition occurs.

3) The System status will change to the “Shutdown” state.

4) PLC will request to shutdown all pumps and blowers, and close all filter header valves except the filtrate isolation valve and the backwash waste flow control valve.

5) Once all vessels have transitioned to a “Offline” states, the System will changes from “Shutdown” to “Out of Service” if a critical alarm has triggered the shutdown.

d) Backwash Sequence

1) Filter vessels can issue a backwash request based on a differential pressure setpoint, a run time, or a scheduler that selects which day of the week and time each vessel is to be backwashed.

2) The pressure vessel will begin a backwash sequence when no other backwash sequences are active and the Backwash Recovery Basin has the capacity to receive an entire backwash sequence. If multiple vessels request a backwash they will be placed into a queue which is prioritized based on the differential pressure of the vessel. Vessels will continue to operate while in the backwash queue.

3) The backwash sequence will be as determined by the Filter System Supplier to provide a successful simultaneous air-water backwash with the maximum backwash volume produced as required herein. The backwash shall include drain, fill, backwash with air scour and a restratification steps. The backwash pump PID flow rate controller shall be set to a setpoint of either 1,500 gpm (during backwash) or 4,500 gpm (during restratification). The pump shall be called to a minimum speed setpoint during the fill step. The backwash supply valve will be modulating and will be called to a set position according to the backpressure requirements of the pump as determined during startup.

9. Communications Heartbeat

a) A Communications Heartbeat will be utilized to ensure communications is active between the Filter PLC and Plant SCADA. This will be accomplished by monitoring a SCADA signal with its value automatically changing. Should the value received from Plant SCADA stay the same value for a period of time, communications will be deemed

lost and an alarm will be generated locally as well as possible control actions as determined and stated earlier in this document.

10. Hardware

a. PLC. The automatic control panel shall be PLC-based as specified in Section 17500: Programmable Logic Controllers for Field PLC processor.

b. The automatic control panel shall conform to the requirements specified in 17325: Process Control System Control Panels.

c. The automatic control panel shall be provided with uninterruptible power supply as specified in Section 17328.

d. Network and Communications. The automatic control panel shall be provided with the following devices and equipment for proper communication:

1) Fiber Optic Patch Panel for use in PLC control panel enclosures shall be the Wall-mountable Interconnect Center (WIC) type, LANscape series, as manufactured by Corning Incorporated.

a) All fiber cables shall be terminated to a patch panel with a fanout kit. The model shall be as recommended by the cable manufacturer.

2) Industrial Ethernet Media Converter.
a) Power Supply: 24 VDC
b) Microprocessor based managed type
c) DIN rail mountable
d) Functional Performance
e) Per port status LED indication
f) Wire Speed switching
g) 10/100BaseT ports with RJ-45 connectors for Category 6 cabling, provide with PoE as shown on the Drawings.
h) ST or SC type Fiber Optic Connectors for 100BaseFX, 1000BaseLX for Single-Mode fiber as shown on the Drawings.

2.03 PAINTING

A. Pressure Vessels

1. The tank shall be leak tested and all welding operations completed before preparation of the tank interior to receive the lining. All welded and machined edges shall be ground smooth to a minimum 1/8 inch radius to facilitate application of the lining. All interior surfaces shall be blasted to a SSPC-SP5/NACE 1 white metal blast grade.

2. Surface preparation:

   a. Interior - Sandblast to near white blast cleaning (SSPC-SP10).

   b. Exterior - Sandblast to commercial blast cleaning (SSPC-SP6).

3. Interior Coating (factory applied):

   a. Stripe coating: hand-apply one coat to all welds and hard to reach areas (i.e. interior ribbing, interior pipe nozzle, etc) using high quality natural or synthetic bristle brush, to a dry film thickness of 3-5 mils.

      Tnemec Series N140-15BL, or equal

   b. Prime coating: primer to a dry mil thickness of 3-5 mils before any rust can form.

      Tnemec Series N140-1255, or equal

   c. Finish coating: to a dry mil thickness of 4-6 mils for a total dry film thickness of 7-11 mils.

      Tnemec Series N140-15BL, or equal

   d. The interior lining shall be applied only by an experienced applicator who shall demonstrate previous experience with the application of the specified coating. The interior lining shall extend into all tank nozzles. The intermediate and final coats shall be performed in strict compliance with the coating manufacturer's recommendations.

   e. The internal lining shall be tested for dry film millage and holidays by the approved independent paint testing company. Testing of the internal lining for dry film thickness shall at a minimum be performed at five (5) equally spaced locations along the length of the tank, including each end and the center of the tank straight shell. Each location shall include testing of 12 locations along the interior perimeter of the tank starting at the top and equally spaced at increments of 30-degrees. The tank manufacturer shall retain sample coupons from the shell for use by the paint testing firm for calibration of the testing equipment. The testing shall be performed using a wet sponge type electric holiday tester and magnetic dry film thickness gauge, both of acceptable manufacturer by the Engineer. The tank manufacturer shall repair all holidays and low millage areas in strict accordance with the lining manufacturer's established repair procedures. The tank shall then be retested to determine if all lining defects have been successfully repaired.

4. Exterior Coating

a. The exterior surface shall be blasted to a SSPC-SP6/NACE 3 commercial blast grade and one coat of shop applied epoxy primer.

b. Prime Coat (factory applied): Two component, cross-linked epoxy primer.

Tnemec Series 69 epoxy primer.

c. Finish coating: The exterior finish coat shall be field applied by the Contractor upon installation.

5. The total exterior coating system shall be the product of and be applied in accordance with the recommendations of one manufacturer. Alternate coating systems must be pre-approved by Engineer.

B. Backwash Pumps

1. Interior Finish for Casings

a. Coat interior of pump casings with ceramic epoxy coating to enhance pump efficiency. Prepare and shop-prime in accordance specified herein.

b. Materials: Prime and Finish Coating: Minimum of 25 mils DFT of Belzona 1341N coating for potable water (ceramic epoxy coating) or fusion bonded epoxy.

c. Procedure:

Surface Preparation: As recommended by coatings Manufacturer, minimum blast clean to near white SSPC-SP-10.

Application (prime and finish coating): Apply 25 mils DFT of Belzona coating or fusion bonded epoxy.

Testing: Perform Holiday Test.

Touchup: After testing is complete and prior to shipment, touch up surfaces. Provide touch up kit for contractors use during installation. If holiday test is required, perform at shop prior to shipment and provide certification.

2. Exterior Finish

a. Exterior of pumps, motors, frames, base plates, and appurtenances shall be painted prior to shipment from factory. Pump units shall be prepared and shop-primed in accordance specified herein.

b. Units shall receive finish coating in the field by the Contractor.

PART 3 - EXECUTION

3.01 FACTORY SERVICES AND START-UP

A. Factory Acceptance Test of Control Panels shall be completed prior to shipment according to specifications in Section 17302: Process Control System Testing.

B. Factory Acceptance Test of Pumping Units and Blowers shall be completed prior to shipment according to specifications herein.

C. System Start-Up and Training

1. The Contractor will verify that the project is ready for manufacturer's field services.

2. The Filter System Supplier shall provide the services of a factory representative during start-up of the equipment. At a minimum, the Filter System Supplier's technician shall perform the following start-up functions:

a. Inspect the final installation to assure proper installation, connection and wiring of all equipment of the Filter System Supplier's scope of supply.

b. Start-up of the equipment in the presence of the Contractor and Owner's operating personnel.

c. Training of Owner's operating personnel in proper operation and maintenance procedures, start-up/shutdown procedures, response to emergency conditions, and troubleshooting. The responsibility of the Contractor and the factory service representative with regard to startup shall be fulfilled when the start-up is complete, the equipment is functioning properly, operating personnel have been trained and the equipment has been accepted by the Owner.

3.02 MANUFACTURER'S FIELD SERVICES

A. Provide under provisions of Section 01640.

B. Services of Manufacturer's Representative:

1. Provide services of Filter System Supplier factory service Engineer specifically trained in the installation, operation, and maintenance of pumping units as specified herein. The services of the Filter System Suppliers's Representative shall be made available during the installation period for assistance to the Contractor for adjusting and checking equipment.

2. Man-hour requirements tabulated below are exclusive of travel time and do not relieve the Filter System Supplier of obligation to provide sufficient service to place equipment in satisfactory operation.

3. At a minimum, factory representatives(s) shall be provided for trips and durations as shown below.

	Services to be Provided by Factory Representative	**Minimum Number of Trips[a]**	**Minimum Time on Site Per Trip (hours)**
1	Supervise Unloading and Setting of First Two Filter Vessels[b]	1	8
2	Supervise Installation of Backwash Pumps and Check Leveling and Pre-Alignment[c]	1	8
3	Inspect Final Pump Alignments[d]	1	4
4	Supervise Installation of Blowers	1	4
5	Supervise Media Loading Operations for First Two Filters	1	24
6	Supervise Startup and Initial Run to Demonstrate Successful Operation[e][f] • Perform 72-hour Filter Effluent Performance Testing. • Verify Proper Installation and Operation of Combined Air/Water Backwash System.	1	24
7	Instruct Engineer and Owner's Reps in Proper Operation and Maintenance of Filters, Backwash System, Actuated Valves and Process Control System.[g]	1	24
8	Additional Trips for Troubleshooting Following Installation.[h]	-	-

(a) Representative(s) shall be present at frequent enough intervals to ensure proper installation, testing, and initial operation of the equipment.

(b) This assumes first two filter vessels are shipped together. An additional trip shall be included if two shipments.

(c) Before grouting and piping connection.

(d) After grouting and piping connection.

(e) The Manufacturer's representative shall provide to the Engineer a written certification that each component of the filters and air/water backwash system has been installed in accordance with the Manufacturer's recommendations.

(f) In the event the services of the Manufacturer's Representative are needed and requested by the Contractor for periods longer than indicated in these Contract Documents, payment for such services shall be made by the Contractor. No payment from the Owner shall be due for time spent by the Representative due to faulty design, fabrication or installation of the equipment.

(g) Instruction may be given upon completion of Item 6, provided that the field testing by the Owner's independent testing laboratory is successful and the OM Manuals have been submitted to and accepted by the Engineer.

(h) Representative(s) shall be present as necessary to operate successfully following start-up, at no additional cost to the Owner.

C. Table for "Combined Air/Water Backwash Process Verification

1. For filter optimization, the backwash process shall incorporate simultaneous air and water to provide effective solids separation and removal with minimal total backwash waste water generated. These specifications incorporate the backwash flow rates in order to minimize the backwash production and maximize the cleaning of the filter bed.

2. Visual inspection of air and backwash distribution shall be performed during Backwash Process Verification.

3. Supplier shall provide certification following start-up that the system will be run within accepted backwash volume ranges during backwash, as defined in the Water Filtration Equipment design and performance criteria listed above. A representative of the Owner/Design Engineer will witness and verify in writing that the system is operating according to specified rates at the time start-up is completed, and that they have been trained in this operation. A copy of the start-up report containing this verification shall be provided to the Owner/Design Engineer.

D. Manufacturer's Instructions. Installation shall be as shown on the Drawings and in accordance with the manufacturer's recommendations, installation instructions and assembly drawings. Manufacturer's installation instructions and assembly drawings shall be submitted and approved by the design engineer prior to shipment of equipment. Installation of the filtration system shall be in strict accordance with the details shown on the drawings and in complete conformance to manufacturer's instructions and procedures.

E. Filter Effluent Performance Testing (72 hours)

1. A detailed filter system performance test shall be prepared by the Filter System Supplier and submitted as specified in Part 1 of this section.

2. During start-up, the Filter System Supplier's representative shall perform feed water and filtered effluent field turbidity and iron tests to confirm performance of the equipment.

3. Analytical methods employed for field testing shall be performed by a digital colorimeter.

4. Sampling for conformance shall be taken during the middle of a filter run.

END OF SECTION

SECTION 15100

VALVES AND APPURTENANCES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Furnish all labor, materials, equipment and incidentals required to install complete and ready for operation all valves and appurtenances as shown on the Drawings as specified herein.

2. The equipment shall include, but not be limited to the following:

a. Butterfly Valves
b. Ball Valves
c. Plug Valves
d. Check Valves
e. Gate Valves
f. Pressure Relief Valve
g. Backpressure Sustaining Valve
i. Isolation Valve
j. Solenoid Valves
k. Valve Operators
l. Air Release Valves
m. Expansion Joints
n. Vacuum Relief Valves
o. Strainers

B. Related Work Described Elsewhere:

1. Section 09900 – Painting and Coating
2. Section 15014 – Pressure Testing of Piping
3. Section 15015 – Identification for Process Piping and Valves
4. Section 15111 – Pipe Hangers and Supports for Process Piping
5. Section 15120 – Control Valves
6. Section 15141 – Coupling, Connectors and Adaptors
7. Division 16: Electrical
8. Division 17: Instrumentation

C. General Design:

1. All of the equipment and materials specified herein are intended to be standard for use in controlling the flow of water, air, chemicals, etc., depending on the applications.

1.02 QUALITY ASSURANCE

A. All of the types of valves and appurtenances shall be products of well established reputable firms who are fully experienced, reputable and qualified in the manufacture of the particular equipment to be furnished. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these specifications as applicable.

1.03 SUBMITTALS

A. Submit to the Engineer within 30 days after execution of the contract a schedule of valves to be furnished. The valve schedule shall include valve tags organized by process with the valve manufacturer, supplier, and the date of delivery to the site.

B. Complete shop drawings of all valves and appurtenances shall be submitted to the Engineer for approval in accordance with the requirements of Section 01300 and the General Requirements. In addition, valve manufacturer shall certify in writing that valve design and materials of construction are suitable for the intended service.

C. Quality Control Submittals:

1. Certificate of Compliance for:

   a. Electric operators; full compliance with AWWA C540.

   b. AWWA service butterfly valves; full compliance with AWWA C504.

2. Tests and inspection data.

3. Manufacturer's Certificate of Proper Installation.

4. Operation and Maintenance Manual.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled, shipped and stored in accordance with Section 01600: Material and Equipment.

1.05 WARRANTY AND GUARANTEES

A. Provide equipment warranty in accordance with Sections 01740: Warranties and Bonds.

1.06 SPARE PARTS

A. Provide one (1) replacement set of valve stem packing or seals as applicable for every five valves supplied. No less than one (1) set shall be provided for each type and model of valve supplied.

B. Provide one (1) full set of gaskets as applicable for each valve supplied.

C. Special tools, if required for normal operation and maintenance shall be supplied with the equipment.

D. Provide three (3) handheld actuator programming devices for electric motor actuators supplied.

PART 2 - PRODUCTS

2.01 GENERAL

A. Valves shall include operator, actuator, handwheel, chain wheel, extension stem, floor stand, worm and gear operator, operating nut, chain, wrench, and accessories as required for a complete and operable installation.

B. All valves and appurtenances shall be of the size shown on the Drawings and all equipment of the same type shall be from one manufacturer.

C. All valves and appurtenances shall have the name of the manufacturer and the working pressure for which they are designed cast in raised letters upon some appropriate part of the body.

D. Unless specified otherwise, all hardware on the valve and actuator including bolts, washers, and nuts shall be at a minimum Type 304 stainless steel for valves with ferrous body materials and Type 316 stainless steel for valves with stainless steel or thermoplastic body materials, except for acid service valves which shall be provided with Hastelloy C-276 hardware.

E. Factory Finishing:

1. Epoxy Lining and Coating:

    a. NSF approved and in accordance with AWWA C550 unless otherwise specified.

    b. Either two-part liquid material or heat-activated (fusion) material except only heat-activated material if specified as "fusion" or "fusion bonded" epoxy.

    c. Minimum 7-mil dry film thickness except where limited by valve operating tolerances.

2. Exposed Valves:

    a. In accordance with Section 09900: Painting and Coating.

b. Safety isolation valves and lockout valves with handles, handwheels, or chain wheels "safety yellow."

3. Stainless Steel Valves:

a. Pickling & Passivation shall be provided for all stainless steel valves to provide a bright, uniform finish of the valve body interior and exterior surfaces, including the valve trim, and hardware.

2.02 MATERIALS AND EQUIPMENT

A. Approved Materials:

1. All materials that come into contact with the water being treated or the finished water shall be on either the EPA or NSF lists of products approved for use in contact with potable water. Manufacturers shall submit an affidavit with the shop drawings indicating approval by the EPA or NSF for the materials used in products that come into contact with the water, in accordance with Texas Administrative Code (TAC).

2. Brass and bronze valve components and accessories that have surfaces in contact with water to be alloys containing less than 16 percent zinc and 2 percent aluminum.

3. Approved alloys are of the following ASTM designations:

a. B61, B62, B98 (Alloy UNS No. C65100, C65500, or C66100), B139 (Alloy UNS No. C51000), B584 (Alloy UNS No. C90300 or C94700), B164, B194, and B127.

b. Stainless steel Alloy 18-8 may be substituted for bronze.

B. Butterfly Valves:

1. General:

a. Valves shall be bubble tight in either direction at the rated pressure and shall be suitable for throttling and/or operation after long periods of inactivity.

b. Valves shall be furnished with position indication as shown on the drawings.

2. BFV1:

a. Valve: Butterfly valve shall be lug style, ductile iron fully rubber lined body ASTM A536 with a solid 316 stainless steel shaft. Disc shall be

316 stainless steel with TFE coated stainless steel bearings and EPDM resilient seat. Seals shall be EPDM or PTFE.

b. Operator: Per Valve Schedule.

c. Pressure: 150 psi.

d. Service: Filter Feed, Filter Effluent, Backwash Supply, Backwash Waste.

e. Bray Control Series 31, Pratt MK2, or DeZurik Model BRS. No equals will be considered.

2. BFV2:

a. Valve: Butterfly valve shall be flanged style, cast or ductile iron fully rubber lined body ASTM A126. Disc shall be ductile iron ATM A536 Grade 65-42-132 with 316 stainless steel disc edge, and EPDM seat. Seals shall be EPDM or PTFE.

b. Operator: Per Valve Schedule.

c. Pressure: 75 psi.

d. Service: Filter Feed, Bypass (large diameter, above ground)

e. DeZurik AWWA or Pratt TRITON XR-70. No equals will be considered.

4. BFV3:

a. Valve: Butterfly valve shall be flanged style cast or ductile iron body ASTM A126 Class B with a 316 stainless steel shaft. Disc shall be 316 stainless steel ASTM A351, Grade CF8M. Interior of valve body shall have a resilient EPDM seat and lining vulcanized to the valve body. Valves shall be fully rubber lined beyond the point of pipe insertion or flange connection. Valve shall have PTFE seals and adjustable packing.

b. Operator: Per Valve Schedule.

c. Pressure: 150 psi.

d. Service: Carbonated Water, pH adjusted with CO_2

e. DeZurik AWWA or Pratt Groundhog.

7. BFV4:

a. Valve: Butterfly valve shall be mechanical joint of flanged body (per the Drawings). Materials of construction shall be cast or ductile iron body ASTM A126 Class B with a 304 stainless steel shaft ASTM A276. Disc shall be cast iron ASTM A48 Class 40C with an EPDM resilient seat and PTFE seals and adjustable packing. Seat ring shall be 316 stainless steel.

b. Operator: Per Valve Schedule.

c. Pressure: 150 psi.

d. Service: Finished Water.

e. DeZurik AWWA or Pratt Groundhog.

8. BFV5:

a. Valve: Butterfly valve shall be lug style, 316 stainless steel body ASTM A351, Grade CF8M with a solid 316 stainless steel shaft ASTM A479. Disc shall be 316 stainless steel with PTFE resilient seat. Seals shall be PTFE.

b. Operator: Per Valve Schedule.

c. Pressure: 150 psi.

d. Service: Compressed air

e. Dezurik Model BHP, or Pratt HP series. No equals will be considered.

C. Ball Valve

1. BV1:

a. Valve: Ball valves for general process service shall be manufactured of Grade I, Type I, PVC with Teflon seats. Seals shall be EPDM except for when used with acidic and oxidizing process services, which shall be furnished with Viton seals. Valve shall be provided with double unions and ball blocking feature.

b. Operator: Handle.

c. Pressure: 150 psi @ 73°F.

d. Service: Finished Water, Raw Water, Drain

e. Plast-O-Matic True Blue or Asahi/America Type 21 Ball Valve.

2. BV2:

a. Valve: Ball valves shall be manufactured of Grade I, Type I, PVC with Teflon seats. Seals shall be Viton. Valve shall be provided with double unions and ball blocking feature.

b. Operator: Handle.

c. Pressure: 150 psi @ 73°F.

d. Service: Sodium Hypochlorite

e. Plast-O-Matic True Blue or Asahi/America Type 21 Ball Valve.

3. BV3:

a. Valve: Ball valves in sizes 1/4”-3” for Feed Water and high pressure process services shall be 2-piece body ball valves with standard ports and threaded end connections. Valves shall be manufactured of CF8M stainless steel body and wetted internals conforming to ASTM A351 Grade CF8M and ANSI B16 with a solid 316 stainless steel ball and stem. RPTFE seat and seal.

b. Operator: Handle with Safety Lockout Feature.

c. Pressure: 300 psi.

d. Service: Instrument isolation.

e. Apollo Series 76F-100-A

E. Plug Valves:

1. General:

a. Plug valves shall be the non-lubricated eccentric type for use in wastewater service with flanged or mechanical joint ends as specified herein. Valves shall open by turning to the left (counter-clockwise), when viewed from the stem. Port area of the valves shall be a minimum of 80 percent of full pipe area. Valves shall be capable of providing drip-tight shutoff to the full valve rating with the pressure in either direction.

b. Plug valves shall be tested in accordance with AWWA C504-80 Section 5. Each valve shall be performance tested in accordance with 5.2 and shall be given leakage test and hydrostatic test as described in paragraph 5.3 and 5.4. The leakage test shall be applied to the face of

the plug tending to unseat the valve. The leakage test shall be performed at valve rating pressure as specified in B above. The manufacturer shall furnish certified copies of reports covering proof of design testing as described in Section 5.5.

c. All interior ferrous surfaces of the valve that will have contact with wastewater shall be coated with a factory applied, thermally bonded epoxy coating in accordance with AWWA C550, latest revision. Surfaces shall be clean, dry and free from rust, oil, grease before coating. Exterior surfaces of valve shall be coated as specified hereinafter.

d. Valve joints. All plug valves installed above-ground, in valve vaults or on flanged piping shall have flanged ends. Flanges shall comply with facing, drilling and thickness of ANSI Standards for Class 125 dimensions. Nuts and bolts for flanged connections in valve vaults or corrosive atmospheres shall be Type 304 stainless steel in accordance with ASTM A320, Class 2. Nuts and bolts for above-ground installations or non-corrosive atmospheres shall be carbon steel in accordance with ASTM A307,Grade B. All buried plug valves shall have mechanical joint ends with dimensions, bolting patterns and assembly in strict accordance with ANSI/AWWA C111 latest revision. Tee head bolts and nuts for mechanical joints shall be manufactured of CORTEN-A, high strength, low alloy, corrosion resistant steel as manufactured by NSS Industries, Plymouth, Michigan or an equal approved by the Engineer.

e. Plug valves 4-inch in size buried underground, and all plug valves 6-inch in size and larger installed above-ground, buried or in valve vaults shall be furnished with mechanical gear actuators. Gear actuators shall be furnished with AWWA Standard 2-inch square operating nuts for buried valves, or handwheel, chainwheel or 2-inch square nut operators for above-ground or valve vault installation, as shown on the drawings. Gear actuator shall be sized for the maximum pressure differential across the valve, equal to the pressure rating of the valve. All gearing shall be enclosed in a high strength cast iron housing, suitable for running in a lubricant.

2. PV1:

a. Valve: Valve bodies shall be constructed of high strength cast iron conforming to ASTM A126, Class B and AWWA C504, latest revisions. Valve bodies shall be cast with raised eccentric seats which have a corrosion resistant welded-in overlay of not less than 90 percent pure nickel on all surfaces contacting the plug face. Valve seats shall be in accordance with AWWA C504 and AWWA C507, latest revisions. Valves shall be furnished with resilient faced plugs and Neoprene facing, suitable for use with wastewater. Valves shall be furnished with replaceable, permanently lubricated, stainless steel, sleeve-type bearings

in the upper and lower plug stem journals. Plug stem bearings shall comply with AWWA C504 and C507, latest revisions. Valves shall be bolted bonnet design. Valves shaft seals shall be designed so that they can be repacked without removing the bonnet and the packing shall be adjustable. Packing material shall be Buna-Vee type packing. Valve shaft seals shall be in accordance with AWWA C504 and AWWA C507, latest revisions. All exposed valve nuts, bolts, springs, washers and the like shall be Type 304 stainless steel.

b. Operator: 4" and below – Lever, 6" and above – Weatherproof Handwheel.

c. Pressure Rating: ANSI B16.1-1967:

i. 12 inch and less: 175 psi

ii. 14 inch through 54 inch: 150 psi

d. Service: Wastewater

e. DeZurik Fig. 118.

3. PV2:

a. Valve: Valve bodies shall be constructed of high strength cast iron conforming to ASTM A126, Class B and AWWA C504, latest revisions. Valve bodies shall be cast with raised eccentric seats which have a corrosion resistant welded-in overlay of not less than 90 percent pure nickel on all surfaces contacting the plug face. Valve seats shall be in accordance with AWWA C504 and AWWA C507, latest revisions. Valves shall be furnished with resilient faced plugs and Viton facing, suitable for use with chlorinated water. Valves shall be furnished with replaceable, permanently lubricated, stainless steel, sleeve-type bearings in the upper and lower plug stem journals. Plug stem bearings shall comply with AWWA C504 and C507, latest revisions. Valves shall be bolted bonnet design. Valves shaft seals shall be designed so that they can be repacked without removing the bonnet and the packing shall be adjustable. Packing material shall be PTFE type packing. Valve shaft seals shall be in accordance with AWWA C504 and AWWA C507, latest revisions. All exposed valve nuts, bolts, springs, washers and the like shall be Type 316 stainless steel.

b. Operator: 4" and below – Lever, 6" and above – Weatherproof Handwheel.

c. Pressure Rating: ANSI B16.1-1967:

i. 12 inch and less: 175 psi

ii. 14 inch through 54 inch: 150 psi

d. Service: Chlorinated Water

e. DeZurik Fig. 118.

F. Check Valves:

1. General:

a. Check valves for cast iron and ductile iron pipelines 2-inch through 12-inch shall be swing type and shall conform to the material requirement of AWWA Specification C508.

b. Prior to shipment from the factory, the interior ferrous surfaces of the valve, except for finished or bearing surfaces, shall be coated with a two-part thermosetting epoxy coating in accordance with AWWA C550, latest revision. Surfaces shall be clean, dry and free from rust and grease before coating.

4. CV1:

a. Valve: Check valves shall be the double door type, fully lugged or wafer style body per the valve schedule, with ductile iron body, ASTM A536 Grade 65-45-12. The stainless steel doors shall be castings of Type 304 stainless steel, ASTM A351 Grade CF3. The hinge pin, stop pin, pin retainers, spring, and lifting eye bolt shall be Type 316 stainless steel ASTM A276 S31600. The seat material shall be EPDM.

b. Pressure: 150 psi.

c. Service: Backwash Supply, Backwash Waste, Finished Water, Potable Water.

d. APCO Series 9000, Mueller Steam 72I, or Titan Flow Control CV41-DI.

7. CV2:

a. Valve: Check valves shall be the double door type, fully lugged style body, with Type 316 stainless steel body and trim. The stainless steel body and doors shall be castings of ASTM A351 Grade CF8M. The hinge pin, stop pin, pin retainers, spring, and lifting eye bolt shall be T316 stainless steel ASTM A276 S31600. The seat material shall be EPDM.

b. Pressure: 150 psi

c. Service: Air.

d. APCO Series 9000, Mueller Steam 72H, or Titan Flow Control CV42L-SS. No equals will be considered.

8. CV3:

a. Valve: Double-door check valves shall be manufactured of Type I, Grade 1 PVC with Viton seals, and designed for equal effectiveness when installed in any position.

b. Pressure: 100 psi @ 70°F.

c. Service: Water.

d. Techno Corporation Technocheck Seatless Check Valve.

9. CV4:

a. Valve: Ball check valve shall be manufactured of Type 316 stainless steel, with Viton seals, and designed for horizontal or vertical installation with equal effectiveness. Valves installed on threaded piping 3-inches in diameter and less shall be provided with FNPT connections and a minimum of 1 union on the adjacent piping to allow for maintenance and removal. Valves installed on stainless tubing with compression fittings shall be compression fitting type.

b. Pressure: 300 psi.

c. Service: Calcium Hydroxide, Calcium Chloride

d. Swagelok, Apollo, or NUPRO.

G. Gate Valves:

1. General:

a. Gate valves shall have a clear waterway equal to the nominal diameter of the pipe when fully open.

b. Operating nut or wheel shall have an arrow cast in the metal indicating the direction of opening. Each valve shall have the manufacturer's distinctive marking, pressure rating and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by applying to it a hydrostatic pressure equal to twice the specified working pressure.

c. Hydrostatic and leakage test shall be conducted in strict accordance with ANSI/AWWA C500, latest revision or ANSI/AWWA C509, latest revision whichever is applicable.

d. All gate valves which are installed on pipe sizes greater than 3" shall have mechanical joint or flanged ends to fit the pipe run in which they are to be used. Flanged valves shall be faced and drilled to ANSI 125/150 pound standard. Mechanical joint ends shall be to the AWWA Standard C111-72. Gate valves installed on pipes 3" and smaller shall have slip on joints or screwed ends. Screwed ends shall be to the NPT standard.

e. Gate valves shall open left or counter-clockwise when viewed from the stem.

f. Buried gate valves shall be furnished with 2-inch square AWWA standard nut operators with a valve box and cover. Gate valves located above ground or inside structures shall be furnished with hand wheel operators and shall have a suitable indicator arrow to give valve position from fully open to fully closed.

2. GV1:

a. Valve: Gate valves with nominal sizes from 2 to 3 inches shall conform to ANSI/AWWA C500, latest revision. Valves shall be iron body, bronze mounted, double disc, parallel seat, non-rising stem type with O-ring stem seals. Interior ferrous surfaces of valve, except for finished or bearing surfaces, shall be coated with a two-part thermosetting epoxy coating in accordance with AWWA C550, latest revision. Surfaces shall be clean, dry and free from rust and grease before coating. Exterior surfaces of valve shall be as specified hereinafter.

b. Operator: Handwheel, lever, or 2-inch Square Nut as required.

c. Pressure: 150 psi.

d. Service: Water.

e. Mueller Co. AWWA Gate Valve, American Valve and Hydrant Co. or approved equal.

3. GV2:

a. Valve: Gate valves with nominal sizes from 4 to 12 inches shall conform to ANSI/AWWA C509, latest revision. Valves shall be iron body, resilient seat type with non-rising stem and O-ring stem seals. The valve stem, stem nut, glands and bushings shall be bronze. Valve disc shall be constructed to assure uniform seating pressure between disc seat

ring and body seating surface. Body seating surface shall be machined. Resilient seat of valve shall be formed by replaceable resilient seat ring seals made from internally reinforced molded rubber which are attached to the disc ring with stainless steel screws, or by a special corrosion resistant, synthetic elastomer which is permanently bonded to and completely encapsulates a cast iron valve disc. Interior to valve body and valve disc shall be coated with a two-part thermosetting epoxy coating in accordance with AWWA C550, latest revision. Surfaces shall be clean, dry and free from rust and grease before coating. Exterior surfaces of valve shall be coated as specified hereinafter.

b. Operator: 2-inch Square Nut.

c. Pressure: 150 psi.

d. Service: Water.

e. Mueller Co. AWWA Gate Valve, American Valve and Hydrant Co. CRS-80 or approved equal.

4. GV3:

a. Tapping Valves: Tapping valves shall conform to ANSI/AWWA C500 or C509, latest revision and shall be designed for a minimum working pressure of 150 psi.

i. Tapping valves 3 to 12 inches in size shall be resilient seat type gate valves as specified hereinabove for gate valves 3 to 12 inches in size. Resilient seat type tapping valves shall be furnished with a raised guide ring cast integrally on the flanged end which is designed to match the groove in the tapping sleeve. The purpose of this guide ring shall be to ensure true alignment of the valve with the tapping sleeve.

ii. Tapping valves larger than 12 inches shall be iron body, bronze mounted gate valves, with double disc, parallel seat and non-rising stem. Stem shall be bronze and sealed by two "O" rings. Stem nut shall be bronze and cast integrally into the top wedge. The valve disc seating mechanism shall be bottom wedging, hook and wedge type, with disc hooks and wedges as separate interacting parts. Valve shall be designed for vertical mounting in approximately level setting on buried water lines. Valve ends shall be flanged American Standard Class 125 pound steam pressure rating on one side of the valve and mechanical joint on the other side for use with the class and type of pipe to be installed from the tapping valve. Tapping valves 12 inches and larger shall be furnished with a raised guide ring cast integrally on the flanged end as specified above for resilient seat type

tapping valves. Interior ferrous surfaces of the valve, except for finished and bearing surfaces, shall be coated with a two-part thermosetting epoxy coating in accordance with AWWA C550, latest revision. Surfaces shall be clean, dry and free from rust and grease before coating. Exterior surfaces of valve shall be coated as specified hereinafter. The valve shall open left or counterclockwise when viewed from the stem. The valve shall be furnished with a 2-inch square AWWA standard nut operator with a valve box and cover.

b. Tapping Sleeves: Shall be cast iron, mechanical joint type, with working pressure rating of 200 psi for sizes 4 inches through 12 inches and 150 psi for sizes 14 inches and larger, and shall conform to the applicable Sections of AWWA Standard C110 of latest revision. Sleeve and glands shall be split type for assembly on pipe, and sleeve and mechanical joint glands and gaskets shall be sized for use with the class and type of pipe being tapped. Sleeve and glands shall be Standard Bituminous Coated, and shall be furnished complete with all accessories. Outlet flange shall be Class 125 Standard. Contractor shall obtain approval from the Engineer for drilling machine used prior to tapping operations.

c. Operator: 2-inch Square Nut.

d. Pressure: 150 psi.

e. Service: Water.

f. Mueller Co., American Valve and Hydrant Co., Kennedy Valve, or approved equal.

5. GV4

a. Valve: Thermoplastic gate valves (sizes 1-1/2 through 8 inches) shall be constructed of high impact PVC with ANSI 150 Class flanged connections molded into the valve body. The valve shall be designed to have no metal to media contact, and the gate shall be a tapered cylindrical plug design with CPVC-lined SBR elastomeric plug to provide bubble tight seal. PVC shall conform to ASTM D1784 Cell Classification 12454-A. The valve shall have a non-rising stem and shall be furnished with a sealed position indicator and clean-out plug as standard. Valve seals shall be Viton.

b. Operator: Handwheel

c. Pressure: 150 psi

d. Service: Wastewater

e. Asahi Type P, Chemline Plastics CGA Series, or Engineer approved equal.

H. Pressure Relief Valves:

1. PRV1:

a. Valve: Pressure relief valve shall be of the angle pattern design and manufactured of Grade 1, Type 1, PVC with a EPDM seal. Valve shall be provided with threaded-end connections.

b. Operator: Adjusting screw

c. Pressure: 100 psi

d. Service: Sodium Hypochlorite.

e. Plast-O-Matic, Blacoh, or Simtech.

2.. PRV2:

1) Valve: The pressure relief valve shall be used for either back pressure sustaining or safety pressure relief, as indicated on the drawings.

For backpressure sustaining valves: if upstream pressure drops below valve setting, the valve will close.

For pressure relief valves: if upstream pressure increases greater than valve setting, the valve will open.

Valve shall be of the in-line pattern design and manufactured of PVC with Teflon wetted diaphragm, stainless steel spring, and HDPE adjusting screw. Valve shall be supplied with 316 stainless steel hardware.

2) Valve Body: PVC

3) O-Ring Material: EPDM

4) Adjusting bolt and locknut: Stainless Steel

5) Fasteners: Stainless steel

6) Control spring: Galvanized steel.

7) Control spring housing: PVC

8) Pressure: 150 psi

9) Service: Sample.

10) Plast-O-Matic Series RVDT, Chemline Plastics Type SB12.

I. Backpressure Valve, BPV:

1. BPV1

a. Valve: The back pressure sustaining valve shall throttle to maintain a pre-set pressure on the upstream side of the valve. If upstream pressure drops below valve setting, the valve will close. Turning clockwise on the sustaining pilot handwheel will increase the setting and turning counterclockwise will decrease the setting. Backpressure valve shall be of the in-line pattern design and manufactured of PVC with Teflon wetted diaphragm, stainless steel spring, and HDPE adjusting screw. Valve shall be supplied with 316 stainless steel hardware.

b. Operator: Adjusting screw

c. Pressure: 150 psi

d. Service: Sodium Hypochlorite.

e. Plast-O-Matic, Blacoh, or Simtech.

J. Solenoid Valves:

1. SV1:

a. Valve: Solenoid valve shall be normally closed equipped with a manual override operator. Valve shall be bronze body, resilient seated, general purpose.

b. Operator: Solenoid,120 volt service.

c. Pressure: 100 psi.

d. Service: Potable Water.

e. ASCO Red-Hat or approved equal.

2. SV2:

a. Valve: Solenoid valve shall be normally open (fail safe) equipped with a manual override operator. Valve shall be stainless steel with PTFE seals.

b. Operator: Solenoid,120 volt service.

c. Pressure: 150 psi.

d. Service: Process Samples, Backwash Air Drain.

e. Asco 8210 or approved equal.

K. Needle Valve

1. NV

a. Valve: Needle valves shall be constructed of Type 316 stainless steel, ASTM A182 body with Type 316 stainless steel internals and trim. Needle valves shall be used for fine flow control of process analyzer streams, and valve sizing, flow rate, and pressure requirements shall be confirmed by the instrument supplier. The valve body pattern shall be angle pattern or straight pattern as required for the proposed manner of installation and plumbing configuration (panel mounted or directly located on process piping). Valve end connections shall be NPT threaded or tubing compression fitting type based on the connecting plumbing type. The valve handle shall be Type 316 stainless steel bar. Valve seals shall be Viton.

a. Pressure: 300 psi

b. Service: Process Instrument Sample.

c. Swagelok Integral-Bonnet Needle Valves, Tylok Ty-Flo Needle Valves or Engineer approved equal.

L. Sample Valve

1. S

a. Sample valves shall be mounted to the panel fronts or located directly on process piping as shown in the Contract Documents. Each valve shall be fitted with a 1/4-inch 316 SS tubing discharge spout, to prevent splashing.

b. Sample valves shall be Type 316 stainless steel, 1/4 turn plug valves, 1/4-inch size, as manufactured by Swagelok, NUPRO or Ham-Let.

c. Tubing and tubing connectors shall be Type 316 stainless steel, 1/4-inch steel design, with plastic tube inserts, Swagelok or engineer approved equal.

M. Air Release Valve:

1. ARV1:

a. Valve: The combination air-vacuum-air release shall be designed to operate while the system is pressurized, allowing entrained air to escape through the air release orifice. After entrained air escapes through the air release orifice, the valve orifice shall be closed by a needle mounted on a simple level mechanism energized by a float. The main valve shall remain closed until more air accumulates and the opening cycle repeats automatically. The valve body and cover shall be manufactured of cast iron.

b. Pressure: 150 psi.

c. Service: Pressure Filter Service.

d. APCO Model No. 144, Val-matic Model No. 202C or approved equal.

1. ARV2:

a. Valve: The combination air-vacuum-air release shall be designed to operate while the system is pressurized, allowing entrained air to escape through the air release orifice. After entrained air escapes through the air release orifice, the valve orifice shall be closed by a needle mounted on a simple level mechanism energized by a float. The main valve shall remain closed until more air accumulates and the opening cycle repeats automatically. The valve body and cover shall be manufactured of cast iron. With the exception of the Buna-N seat, the linkage mechanism, float and all other internal trim shall be of stainless steel. The valve shall be furnished with a 3/4 inch shutoff valve and have a 3/4 inch inlet and 1/8 inch discharge orifice. The discharge from the air release valve shall be piped to direct the discharge to the concrete slab.

b. Pressure: 150 psi.

c. Service: Potable Water.

d. APCO Model No. 65, Val-matic Model No. 25 or approved equal.

O. Reduced Pressure Backflow Preventers

1. RPBP-1 (Potable Water Service)

a. Reduced pressure backflow preventers for potable water service shall meet the requirements of AWWA C511 and shall be as specified in Section 15445: Domestic Water Piping Specialties.

P. Valve Operators:

1. General:

    a. Size all operators to operate the valve at 150% of the valve's full-rated pressure.

    b. Valve operators, handwheels or levers shall open by turning counter-clockwise.

    c. Non-buried (exposed) valve operators shall be furnished with chainwheel operators, geared operators, extension stems, floor stands, and other elements to permit operation from the normal operating level. Valves located in process piping trenches, vaults, clearwells, wetwells, sumps and similar confined spaces shall be furnished with all necessary appurtenances to allow valve operation from the finished floor or above-grade level.

    d. Ferrous materials of construction may be used on valve operators where permitted within the specifications. Operators for valves used in corrosive services (e.g. process valves made of stainless steel or thermoplastic construction) shall be fully protected from corrosion due to leaks, sprays, and fumes from the process water and from high humidity, condensation, and moist/damp environmental conditions. Fusion bonded epoxy coating systems shall be used to encapsulate all ferrous components from such conditions. Components subject to wear from mechanical operation shall be stainless steel of suitable grade to resist corrosion from the environment. Soley using galvanized treatment of ferrous materials is not considered acceptable to meeting these requirements.

2. Manual Operators:

    a. Manual operators include handwheel, chainwheel, lever and handle type operators. When the maximum force to operate a valve under full operating head exceeds 40 pounds, gear reduction operators shall be provided.

    b. Lever Operator:

        i. Lever shall be fabricated steel. They shall include a set screw and grease lubricated.

        ii. Operator shall be capable of being locked in any position and shall be provided within adjustable memory stop.

    c. Handwheel:

        i. Gate operators shall be selected so that no more than 40 pounds (lb) effort on the operator will be required to pen or close a gate.

Gate operators shall be located at a maximum height of 42-inches above the structure. When the normal yoke elevation is above 42-inches above structure, the geared lift shall be coupled to a 90 degree bevel gear box by means of a floating shaft and lovejoy couplings. This gearbox shall be mounted on the edge of the self-contained yoke. All shafts and couplings shall be Type 304 stainless steel and aligned to acceptable coupling tolerance. All cast iron gearbox housings shall be epoxy coated in accordance with Section 09900: Painting.

ii. All operators shall be geared and shall have a weatherproof case iron housing or pedestal with a bronze operating nut. An effective gear ratio of at least 2:1 is required.

iii. Operator shall include position indicator and self-locking feature to prevent the disc or plug from creeping.

iv. Gear operators shall be totally enclosed and lubricated. Operators shall be grease lubricated and provided with grease fittings.

v. Handwheel operators supplied with floorstands and benchstands shall be self-locking at any position of stem travel. Cranks and handwheels shall be cast iron and hot dip galvanized after fabrication. Cranks shall be no less than 12-inches long and shall be keyed to the operating nut. Handwheels shall not have a diameter greater than 30-inches.

vi. Self-locking gear shall be a one-piece design of gear bronze material (ASTM B 427), accurately machine cut. The sector gear shall be hardened alloy steel (ASTM A 322), grade G41500 or ASTM-A 148, Grade 105-85, with thread ground and polished. The reduction gearing shall run in a proper lubricant.

c. Chainwheel:

i. Where valve location is not accessible from a standing position at a walkway or slab floor, Chainwheel operators shall be provided. Gearboxes shall be as specified for handwheel operators above, only with a chainwheel and chain guide assembly.

ii. Chain shall be type 304 stainless steel for ferrous valves, and type 316 stainless steel for stainless steel and thermoplastic valves and for valves located in chemical or corrosive process areas.

d. Buried Operators:

i. Buried service operators on valves larger than 2-1/2 inches shall have a 2-inch AWWA operating nut. Buried operators on valves 2-inches and smaller shall have cross handle for operation for forked key. All moving parts of the valve and operators shall be enclosed in a housing to prevent contact with the soil.

ii. Buried service operators for quarter-turn valves shall be designed to withstand 450 foot-pounds of input torque at the fully open or fully closed positions without damage to the valve or operator and shall be grease packed and gasketed to withstand a submersion in water to 10 psi.

iii. Valves shall be installed with extension stems, as required, and valve boxes.

3. Electric Motor Operated Valve Actuators:

a. General:

i. The actuators shall be suitable for use on a nominal 480 volt three-phase 60 Hertz power supply and are to incorporate motor, integral reversing starter, local control facilities, and terminals for remote control and indication connections.

ii. The actuator shall include a device to ensure that the motor runs with the correct rotation for the required direction of valve travel with either phase sequence of the three-phase power supply connected to the actuator.

iii. It shall be possible to carry out the setting of the torque, turns, and configuration of the indication contacts without the necessity to remove any electrical compartment covers.

b. Actuator Sizing:

i. The actuator shall be sized to guarantee valve closure at the specified differential pressure. The safety margin of motor power available for seating and unseating the valve shall be sufficient to ensure torque switch trip at maximum valve torque with the supply voltage 10% below nominal. The operating speed shall be such as to give valve closing and opening at approximately 10-12 inches per minute.

c. Ambient Temperature:

i. The actuator shall be capable of functioning in an ambient temperature ranging from minus 22 °F (-30°C) to + 158°F (+70°C).

d. Motor:

i. The electric motor shall be Class F insulated with a time rating of at least 15 minutes at 104°F (40°C) or twice the valve stroking time, whichever is the longer, at an average load of at least 33% of maximum valve torque.

ii. Electrical and mechanical disconnection of the motor should be possible without draining the lubricant from the actuator gear case.

e. Motor Protection:

i. Protection shall be provided for the motor as follows:

(a) The motor shall be de-energized in the event of stall when attempting to unseat a jammed valve.
(b) Motor temperature shall be sensed by a thermostat to protect against overheating.
(c) Single phasing protection.

f. Gearing:

i. The actuator gearing shall be totally enclosed in an oil-filled gear case suitable for operation at any angle. All main drive gearing must be of metal construction. Where the actuator operates gate valves or large diameter ball or plug valves, the drive shall incorporate a lost-motion hammerblow feature. For rising spindle valve s, the output shaft shall be hollow to accept a rising stem and incorporate thrust bearings of the ball or roller type at the base of the actuator, and the design should be such as to permit the gear case to be opened for inspection or disassembled without releasing the stem thrust or taking the valve out of service.

ii. Gear lubricant shall be as specified and warranted by the actuator manufacturer.

g. Hand Operation:

i. A handwheel shall be provided for emergency operation engaged when the motor is declutched by a lever or similar means; the drive being restored to power automatically by starting the motor. The hand/auto selection lever should be

padlockable in both "Hand" and "Auto" positions. It should be possible to select hand operation while the actuator is running or start the actuator motor while the hand/auto selection lever is locked in "Hand" without damage to the drive train.

ii. The handwheel drive must be mechanically independent of the motor drive, and any gearing should be such as to permit emergency manual operation in a reasonable time. Clockwise operation of the handwheel shall give closing movement of the valve.

h. Drive Bushing:

i. The actuator shall be furnished with a drive bushing easily detachable for machining to suit the valve stem or gearbox input shaft. Normally the drive bushing shall be positioned in a detachable base of the actuator. Thrust bearings, when housed in a separate thrust base, should be of the sealed-for-life type.

i. Torque and Turns Limitations:

i. Torque and turns limitation to be adjustable as follows:

(a) Position setting range: 2.5 to 100,000 turns, with resolution to 7.5° of actuator output.
(b) Torque setting: 40% to 100% rated torque.
(c) Torque sensing must be affected directly electrically or electronically.
(d) “Latching" to be provided for the torque sensing system to inhibit torque off during unseating or during starting in mid-travel against high inertia loads.

ii. The electric circuit diagram of the actuator should not vary with valve type remaining identical regardless of whether the valve is to open or close on torque or position limit. An inexpensive setting tool is required for non-intrusive calibration and interrogation of the actuator. This setting tool will provide speedy interrogation capabilities as well as security in a non-intrusive intrinsically safe watertight casing.

j. Remote Valve Position/Actuator Status Indication:

i. Four contacts shall be provided which can be selected to indicate any position of the valve with each contact externally selectable as normally open or normally closed. The contacts shall be rated at 5A, 250V AC, 30V DC.

ii. As an alternative to providing valve position, any of the four above contacts shall be selectable to signal one of the following:

(a) Valve Opening or Closing
(b) Valve Moving (Continuous or Pulsing)
(c) Local Stop Selected
(d) Local Selected
(e) Remote Selected
(f) Open or Close Interlock Active
(g) ESD Active
(h) Motor Tripped on Torque in Mid-Travel
(i) Motor Tripped on Torque Going Open
(j) Motor Tripped on Torque Going Closed
(k) Pre-Set Torque Exceeded
(l) Valve Jammed
(m) Actuator Being Operated by Handwheel
(n) Lost Main Power Phase
(o) Customer 24V DC or 120V AC Supply Lost
(p) Internal Failure Detected
(q) Thermostat Tripped

iii. Provision shall be made in the design for the addition of a contact-less transmitter to give a 4-20mA analog signal corresponding to valve travel for remote indication when required.

k. Local Position Indication:

i. The actuator must provide a local display of the position of the valve. The display shall be able to be rotated in 90 degree increments so as to provide easy viewing regardless of mounting position.

ii. The actuator shall include a digital position indicator with a display from fully open to fully closed in 1% increments. Red, green, and yellow lights corresponding to Open, Closed, and Intermediate positions shall be included on the actuator. The digital display shall be maintained even when the power to the actuator is isolated.

iii. The local display should be large enough to be viewed from a distance of six feet (6') when the actuator is powered up.

l. Integral Starter and Transformer:

i. The reversing starter, control transformer, and local controls shall be integral with the valve actuator, suitably housed to prevent breathing and condensation buildup. For ON/OFF

service, this starter shall be an electromechanical type suitable for 60 starts per hour and of rating appropriate to motor size. For modulating duty, the starter shall be suitable for up to a maximum of 1,200 starts per hour. The controls supply transformer shall be fed from two of the incoming three phases. It shall have the necessary tapings and be adequately rated to provide power for the following functions:

ii. 120V AC energization of the contactor coils

(a) 24V DC output where required for remote controls
(b) Supply for all the internal electrical circuits
(c) The primary and secondary windings shall be protected by easily replaceable fuses.

m. Integral Push Buttons and Selector:

i. Integral to the actuator shall be local controls for Open, Close, and Stop, and a local/remote selector Switch, padlockable in any one of the following three positions:

(a) Local Control Only
(b) Off (No Electrical Operation)
(c) Remote Control plus Local Stop Only

ii. It shall be possible to select maintained or non-maintained local control.

iii. The local controls shall be arranged so that the direction of valve travel can be reversed without the necessity of stopping the actuator.

n. Control Facilities:

i. The necessary wiring and terminals shall be provided in the actuator for the following control functions:

ii. Removable links for substitution by external interlocks to inhibit valve opening and/or closing.

iii. Connections for external remote controls fed from an internal 24V DC supply and/or from an external supply of (min. 12V, max. 120V) to be suitable for any one or more of the following methods of control:

(a) Open, Close, and Stop
(b) Open and Close

(c) Overriding Emergency, Shutdown to Close (or Open) Valve from a "Make" Contact.

(d) Two-Wire Control, Energize to Close (or Open), De-Energize to Open (or Close)

iv. Selection of maintained or push-to-run control for modes (a) and (b) above shall be provided and it shall be possible to reverse valve travel without the necessity of stopping the actuator. The starter contactors shall be protected from excessive current surges during travel reversal by an automatic time delay on energization of approximately 300 ms.

v. Provision shall be made for connectivity with field bus control systems via a plug-in card.

vi. The internal circuits associated with the remote control and monitoring functions are to be designed to withstand simulated lightning impulses of up to 2.0 kV.

o. Monitoring and Diagnostics Facilities:

i. Facilities shall be provided for monitoring actuator operation and availability as follows:

ii. Monitor (availability) relay, having one change-over contact, the relay being energized from the control transformer only when the Local/Off/Remote selector is in the "Remote" position to indicate that the actuator is available for remote (control room) operation.

iii. Where required, it shall be possible to provide indication of thermostat trip and "Remote" selected as discreet signals.

iv. A non-intrusive hand-held computer must be available, capable of duplex communication for uploading and downloading all variables for the actuator as well as performing detailed diagnostics.

v. Actuators shall include a diagnostic module, which will store and enable download of historical actuator data to permit analysis of changes in actuator or valve performance. A software tool shall be provided to allow configuration and diagnostic information to be reviewed and analyzed and reconfigured.

vi. Diagnostic status screens must be provided to show multiple functions simultaneously so troubleshooting can be affected rapidly and efficiently. All diagnostic information should be

contained on no more than eight (8) screens so multiple functions can be checked simultaneously.

vii. Provision shall be made to display valve torque demand as a percent of rated actuator torque and position simultaneously, so as to facilitate valve troubleshooting and diagnostics.

p. Wiring and Terminals:

i. Internal wiring shall be of tropical grade PVC insulated stranded cable of appropriate size for the control and three-phase power. Each wire shall be clearly identified at each end.

ii. The terminals shall be embedded in a terminal block of high tracking resistance compound.

iii. The terminal compartment shall be separated from the inner electrical components of the actuator by means of a watertight seal.

iv. The terminal compartment of the actuator shall be provided with a minimum of three threaded cable entries. When required, a forth cable entry shall be provided.

v. All wiring supplied as part of the actuator to be contained within the main enclosure for physical and environmental protection. External conduit connections between components are not acceptable.

vi. Control logic circuit boards and relay boards must be mounted on plastic mounts to comply with double insulated standards. No more than a single primary size fuse shall be provided to minimize the need to remove single covers for replacement.

vii. A durable terminal identification card showing plan of terminals shall be provided attached to the inside of the terminal box cover indicating:

(a) Serial Number
(b) External Voltage Values
(c) Wiring Diagram Number
(d) Terminal Layout

viii. This must be suitable for the contractor to inscribe cable core identification beside terminal numbers.

q. Enclosure:

i. Actuators shall be 'O' ring sealed, watertight to NEMA 6, and shall at the same time have an inner watertight and dustproof 'O' ring seal between the terminal compartment and the internal electrical elements of the actuator fully protecting the motor and all other internal electrical elements of the actuator from ingress of moisture and dust when the terminal cover is removed on site for cabling.

ii. Enclosure must allow for temporary site storage without the need for electrical supply connection.

iii. All external fasteners should be of stainless steel.

iv. Actuators for explosion/hazardous applications shall in addition be certified flameproof for Zones 1 and 2 (Divisions 1 and 2) Group gases.

r. Startup Kit:

i. Each actuator shall be supplied with a startup kit comprising installation instruction, electrical wiring diagram, and sufficient spare cover screws and seals to make good any site losses during the commissioning period.

s. Performance Test Certificate:

i. Each actuator must be performance tested and individual test certificates shall be supplied free-of-charge. The test equipment should simulate a typical valve load and the following parameters should be recorded:

(a) Current at maximum torque setting
(b) Torque at maximum torque setting
(c) Flash Test Voltage
(d) Actuator Output Speed or Operating Time

ii. In addition, the test certificate should record details of specification, such as gear ratios for both manual and automatic drive, closing direction, and wiring diagram code number.

t. Warranty:

i. Provide equipment warranty in accordance with Sections 01740: Warranties and Bonds.

u. Experience:

i. All technologies and devices used in the actuator must have a minimum of five years' of commercial operating experience for that specific manufacturer, including torque and position sensing, lubrication, and electrical compartment design.

v. Acceptable Manufacturers:

i. Emerson EIM™
ii. Limitorque Valve Controls
iii. No equals will be considered

4. Valve Operator Accessories:

a. Valve boxes for Buried Service Valves:

i. Valve boxes shall be two-piece sliding type cast iron with extension shafts. Units shall be Mueller H-10364, Clow Figure F-2452, or approved equal.

ii. Extension pipe shall be cast iron cut to fit finished grade. Coat buried cast iron pieces with coal tar epoxy.

b. Extension Stems for Buried Valve Operators:

i. Where the depth of the valve is such that its centerline is more than four feet below grade, provide operating extension stems to bring the operating nut to a point of six inches below the surface of the ground and/or box cover.

ii. Extension stems shall be steel and shall be complete with a two-inch operating nut.

iii. Where the location of the valve is such that it is located directly below another pipe, install the gear reducing operator on the side of the valve with the operating nut in the vertical position to provide easy access to the operator.

c. Valve Tags:

i. Each valve operator shall be provided with a 1-1/2-inch minimum diameter stainless steel tag. Each tag shall bear the valve number shown on the Drawings. The tags shall be attached to the operator with stainless steel key rings so that ring and tag cannot be removed. The numbers and letters shall be of block type, with 1/4-inch high numbers and letters stamped thereon.

2.03 ACCESSORIES

A. Strainers:

1. Strainers shall be installed as shown on the Drawings and shall be of the "Y" type. Strainers for water service shall have bronze bodies with a removable bronze screen.

B. Unions:

1. Unions on ferrous pipe 2 inches in diameter and smaller shall be 150 pounds malleable iron, zinc-coated. Unions on water piping 2-1/2 inches in diameter and larger shall be flange pattern, 125-pound class, zinc-coated. Gaskets for flanged unions shall be of the best quality fiber, plastic, or leather. Unions shall not be concealed in walls, ceilings, or partitions.

C. T-Handled Operating Wrench:

1. One each galvanized operating wrenches, 4 feet long.

2. Manufacturers and Products:

a. Mueller; No. A-224610.

b. Clow No.; F-2520.

D. Extension Bonnet for Valve Operator: Complete with stem and accessories for valve and operator.

1. Manufacturers and Products:

a. Pratt.

b. DeZurik

2.04 QUALITY CONTROL

A. Contractor shall follow Manufacturer's and Supplier's recommended product quality control specifics as required for this project.

PART 3 - EXECUTION

3.01 PREPARATION

A. All exterior surfaces of iron body valves shall be clean, dry and free from rust and grease before coating.

B. For valves installed underground or in valve vaults, all exterior ferrous parts or valve and actuator shall be coated at the factory with a thermally bonded epoxy coating in

accordance with AWWA C550, latest revision, or with coal tar epoxy. Coal tar epoxy shall be applied in two 8 mil dry film thickness coats for a minimum total finish dry film thickness of 16 mils. Prior to backfilling, all uncoated nuts, bolts, glands, rods and other part of joints shall be coated in the field with coal tar epoxy. The coal tar epoxy shall be Carboline Bitumastic No. 300-M, Amercoat No. 78, or approved equal.

C. For above-ground service, the exterior ferrous parts of all valves shall be coated as follows:

1. Prior to shipment from the factory, valves shall be coated with a thermally bonded epoxy coating in accordance with AWWA C550, latest revision, or shall be shop painted with one coat, 1.5 mils dry film thickness, of a combination lead and chromate primer with rust-inhibitive pigments and synthetic resins.

2. Following installation in the field, valves shall be painted with one coat, 1.5 mils dry film thickness, of a combination lead and chromate primer with rust-inhibitive pigments and synthetic resins. Valves shall be finish painted with two coats, 1.5 mils dry film thickness each coat, of a medium to long oil alkyd resin coating. Field applied coatings shall be as manufactured by the Carboline or an equal approved by the Engineer. The color of the finish coats shall be in accordance with the piping color code in the painting schedule.

D. All exterior surfaces of stainless steel valves shall be clean, dry and free from rust and surface contaminants. Stainless steel castings shall be of a smooth, bright, pitt-free appearance. Fabricated stainless steel valve bodies shall be pickled and passivated following the fabrication process to remove surface contaminants.

3.02 INSTALLATION

A. All valves and appurtenances shall be installed in the locations shown, true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the Engineer before they are installed.

B. After installation, all valves and appurtenances shall be tested at least 2 hours at the working pressure corresponding to the class of pipe, unless a different test pressure is specified. If any joint proves to be defective, it shall be repaired to the satisfaction of the Engineer.

C. Install all floor boxes, brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings that are in masonry floors or walls, and install concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting these items, the Contractor shall check all plans and figures which have a direct bearing on their location and he shall be responsible for the proper location of these valves and appurtenances during the construction of the structures.

D. Pipe for use with flexible couplings shall have plain ends as specified in the respective pipe sections in Division 15.

E. Flanged joints shall be made with bright finish Type 316 stainless steel bolts, nuts and washers. Mechanical joints shall be made with mild corrosion resistant alloy steel bolts and nuts. All exposed bolts shall be painted the same color as the pipe. All buried bolts and nuts shall be heavily coated with two (2) coats of bituminous paint comparable to Inertol No. 66 Special Heavy.

F. Pressure gauges shall not be installed until after the substantial completion date unless otherwise requested by the Owner.

G. Valve boxes with concrete bases shall be installed for each buried valve as shown on the Drawings. The valve box shall be centered accurately over the operating nut and the entire assembly shall be plumb. The tops of valve boxes shall be adjusted to the proper elevation as specified below and as shown on the Drawings.

1. In paved areas, top of valve box covers shall be set flush with pavement. Following paving operations, a 30-inch square shall be neatly cut in the pavement around the box and the paving removed. The top of the box shall then be adjusted to the proper elevation and a 30-inch square by 6-inch thick concrete pad poured around the box cover. Concrete pads in traffic areas shall be reinforced with No. 4 reinforcement bars as shown on the drawings. Concrete for the pad shall be 3,000 psi compressive strength.

2. In unpaved areas, tops of valve box covers shall be at least 0.20 foot above finished grade. After the top of the box is set to the proper elevation, a 30-inch square by 6-inch thick concrete pad shall be poured around the box cover. Concrete for the pad shall be 3,000 psi compressive strength.

3. The concrete pad for the valve box cover shall have a 2-inch diameter, bronze disc embedded in the surface as shown on the Drawings. The bronze disc shall have the following information neatly stamped on it: the size of the valve; the number of turns to open; the direction to open; and the year of installation.

H. Valve Orientation:

1. Install operating stem vertical when valve is installed in horizontal runs of pipe having centerline elevations 4 feet inches or less above finished floor, unless otherwise shown.

2. Install operating stem horizontal in horizontal runs of pipe having centerline elevations between 4 feet 6 inches and 6 feet 9 inches above finish floor, unless otherwise shown.

3. If no plug valve seat position is shown, locate as follows:

a. Horizontal Flow: The flow shall produce an "unseating" pressure, and the plug shall open into the top half of valve.

b. Vertical Flow: Install seat in the highest portion of the valve.

I. Install a line size ball valve and union upstream of each solenoid valve, in-line flow switch, or the in-line electrical device, excluding magnetic flowmeters, for isolation during maintenance.

J. Locate valve to provide accessibility for control and maintenance. Install access doors in finished walls and plaster ceilings for valve access.

K. Floor Box and Stem: Steel extension stem length shall locate operating nut in floor box.

3.03 INSPECTION AND TESTING

A. Completed pipe shall be subjected to hydrostatic pressure test for 4 hours at full working pressure. All leaks shall be repaired and lines retested as approved by the Engineer. Prior to testing, the gravity pipelines shall be supported in an approved manner to prevent movement during tests.

3.04 START-UP AND INSTRUCTION

A. Provide in accordance with Sections 01752: Facility Startup Commissioning Requirements.

Table 15100-1: Valve Schedule

REF	DWG NO.	TAG No.	QTY	Description	Size (in)	Type / Style	Location	Mount: Process or Panel	Fluid	Body Material	CLASS / Pressure	Connection Type	Operator	Actuation	Limit Switch?	Comments	Spec Section
19	I-1005	30-ARV-01	1	AIR RELIEF VALVE	2		FILTER FEED HEADER	PROCESS	FLS				NONE	NONE	NO	CONTRACTOR	15100
20	I-1005	30-BFV-01	1	BUTTERFLY VALVE	42	BFV2	FILTER FEED HEADER	PROCESS	FLS	DUCTILE IRON	150	FLANGED	HANDLE	NONE	NO	CONTRACTOR	15100 11200
21	I-1005	30-BV-01-1	1	BALL VALVE	1	BV1	FILTER FEED INSTRUMENT AND SAMPLE PANEL FEED LINE	PROCESS	FLS	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
22	I-1005	30-BV-01-2, 30-BV-01-3	2	BALL VALVE	1	BV1	FILTER FEED INSTRUMENT AND SAMPLE PANEL	PANEL	FLS	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
23	I-1005	30-NV-01	1	NEEDLE VALVE	1	NV	FILTER FEED INSTRUMENT AND SAMPLE PANEL	PANEL	FLS	316SS	300	NPT	HANDLE	NONE	NO	CONTRACTOR	15100
24	I-1005	30-BPR-01	1	BACKPRESSURE VALVE	1		FILTER FEED INSTRUMENT AND SAMPLE PANEL	PANEL	FLS	PVC			NONE	NONE	NO	CONTRACTOR	15100
25	I-1005	30-GV-01	1	SAMPLE VALVE	1	S	FILTER FEED INSTRUMENT AND SAMPLE PANEL	PANEL	FLS	316 SS		TUBE	HANDLE	NONE	NO	CONTRACTOR	15100
26	I-1005	30-BFV-85	1	BUTTERFLY VALVE	42	BFV3	FILTER DISCHARGE HEADER	PROCESS	FLW	DUCTILE IRON	150	FLANGED	HANDLE	NONE	NO	CONTRACTOR	15100 11200
27	I-1005	35-BFV-01, 35-BFV-02	2	BUTTERFLY VALVE	6	BFV5	AIR SCOUR BLOWER SYSTEM	PROCESS	AIR	CF8M	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100
28	I-1005	35-CV-05-1, 35-CV-05-2	2	CHECK VALVE	6	CV2	AIR SCOUR BLOWER SYSTEM	PROCESS	AIR	CF8M	150	LUGGED	NONE	NONE	NO	CONTRACTOR	15100
29	I-1005	35-BV-05-1, 35-BV-05-2, 35-BV-05-3, 35-BV-05-4	4	BALL VALVE		BV3	AIR SCOUR BLOWER SYSTEM	PROCESS	AIR	CF8M	150	FLANGED	HANDLE	NONE	NO	CONTRACTOR	15100
30	I-1005	35-SV-05	1	SOLENOID BALL VALVE	1	SV2	AIR SCOUR BLOWER SYSTEM	PROCESS	AIR	304 SS	150	NPT	SOLENOID	ON/OFF	NO	CONTRACTOR	15100 11200
31	I-1005	37-BFV-01-1	1	BUTTERFLY VALVE	16	BFV3	BACKWASH SUPPLY FROM BYPASS	PROCESS	BYPASS	DUCTILE IRON	150	FLANGED	VALVE BOX	NONE	NO	CONTRACTOR	15100 11200
32	I-1005	37-BFV-01-2	1	BUTTERFLY VALVE	16	BFV3	BACKWASH SUPPLY FROM FILTERS	PROCESS	FLW	DUCTILE IRON	150	FLANGED	VALVE BOX	NONE	NO	CONTRACTOR	15100 11200
33	I-1005	37-BFV-05-1, 37-BFV-05-2, 37-BFV-06-1, 37-BFV-06-2	4	BUTTERFLY VALVE	16	BFV1	BACKWASH SUPPLY PUMPS	PROCESS	BWS	DUCTILE IRON	150	LUGGED	HANDLE	NONE	NO	CONTRACTOR	15100 11200
34	I-1005	37-ARV-05-1, 37-ARV-05-2, 37-ARV-06-1, 37-ARV-06-2	4	AIR RELIEF VALVE	2	ARV1	BACKWASH SUPPLY PUMPS	PROCESS	BWS	DUCTILE IRON	150	NPT	NONE	NONE	NO	CONTRACTOR	15100
35	I-1005	37-BV-05, 37-BV-06	2	BALL VALVE	1/2	BV3	PIT ISOLATION	PROCESS	BWS	CF8M	300	NPT	NONE	NONE	NO	CONTRACTOR	15100 11200
36	I-1005	37-CV-05, 37-CV-06	2	CHECK VALVE	16	CV1	BACKWASH SUPPLY	PROCESS	BWS	DUCTILE IRON	150	LUGGED	NONE	NONE	NO	CONTRACTOR	15100 11200
37	I-1005	37-BV-09-1	1	BALL VALVE	1	BV1	BACKWASH SUPPLY INSTRUMENT AND SAMPLE PANEL FEED LINE	PROCESS	BWS	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
38	I-1005	37-BV-09-2, 37-BV-09-3	2	BALL VALVE	1	BV1	BACKWASH SUPPLY INSTRUMENT AND SAMPLE PANEL	PANEL	BWS	PVC	150	TRUE UNION	HANDLE	NONE	NO	CONTRACTOR	15100
39	I-1005	37-NV-09	1	NEEDLE VALVE	1	NV	BACKWASH SUPPLY INSTRUMENT AND SAMPLE PANEL	PANEL	BWS	316SS	300	NPT	HANDLE	NONE	NO	CONTRACTOR	15100
40	I-1005	37-BPR-09	1	BACKPRESSURE VALVE	1		FOR FUTURE TESTING	PANEL	BWS				NONE	NONE	NO	CONTRACTOR	15100
41	I-1006	30-MOV-11, 30-MOV-21, 30-MOV-31, 30-MOV-41, 30-MOV-51, 30-MOV-61, 30-MOV-71, 30-MOV-81	8	BUTTERFLY VALVE	16	BFV1	FILTER CELL NO. 1 FEED ISOLATION	PROCESS	FLS	DUCTILE IRON	150	LUGGED	MOTOR	ON/OFF	ON/OFF	FILTER SUPPLIER	15100 11200

Table 15100-1: Valve Schedule

REF	DWG NO.	TAG No.	QTY	Description	Size (in)	Type / Style	Location	Mount: Process or Panel	Fluid	Body Material	CLASS / Pressure	Connection Type	Operator	Actuation	Limit Switch?	Comments	Spec Section
42	I-1006	30-MOV-12, 30-MOV-22, 30-MOV-32, 30-MOV-42, 30-MOV-52, 30-MOV-62, 30-MOV-72, 30-MOV-82	8	BUTTERFLY VALVE	16	BFV1	FILTER CELL NO. 2 INLET ISOLATION	PROCESS	FLS	DUCTILE IRON	150	LUGGED	MOTOR	ON/OFF	ON/OFF	FILTER SUPPLIER	15100 11200
43	I-1006	30-MOV-13, 30-MOV-23, 30-MOV-33, 30-MOV-43, 30-MOV-53, 30-MOV-63, 30-MOV-73, 30-MOV-83	8	BUTTERFLY VALVE	16	BFV1	FILTER CONTROL VALVE	PROCESS	FLW	DUCTILE IRON	150	LUGGED	MOTOR	MODULATING	ON/OFF	FILTER SUPPLIER	15100 11200
44	I-1006	30-ARV-11, 30-ARV-21, 30-ARV-31, 30-ARV-41, 30-ARV-51, 30-ARV-61, 30-ARV-71, 30-ARV-81	8	AIR RELIEF VALVE	2	ARV1	FILTER CELL NO. 1	PROCESS	FLS	DUCTILE IRON	150	NPT	NONE	NONE	NO	FILTER SUPPLIER	15100
45	I-1006	30-ARV-12, 30-ARV-22, 30-ARV-32, 30-ARV-42, 30-ARV-52, 30-ARV-62, 30-ARV-72, 30-ARV-82	8	AIR RELIEF VALVE	2	ARV1	FILTER CELL NO. 2	PROCESS	FLS	DUCTILE IRON	150	NPT	NONE	NONE	NO	FILTER SUPPLIER	15100
46	I-1006	30-BV-10-1, 30-BV-10-2, 30-BV-20-1, 30-BV-20-2, 30-BV-30-1, 30-BV-30-2, 30-BV-40-1, 30-BV-40-2, 30-BV-50-1, 30-BV-50-2, 30-BV-60-1, 30-BV-60-2, 30-BV-70-1, 30-BV-70-2, 30-BV-80-1, 30-BV-80-2	16	BALL VALVE	1/2	BV3	FILTER CELL NO. 1 DPIT ISOLATION	PROCESS	FLS	CF8M	300	NPT	HANDLE	NONE	NO	FILTER SUPPLIER	15100 11200
47	I-1006	30-BV-10-3, 30-BV-10-4, 30-BV-20-3, 30-BV-20-4, 30-BV-30-3, 30-BV-30-4, 30-BV-40-3, 30-BV-40-4, 30-BV-50-3, 30-BV-50-4, 30-BV-60-3, 30-BV-60-4, 30-BV-70-3, 30-BV-70-4, 30-BV-80-3, 30-BV-80-4	16	BALL VALVE	1/2	BV3	FILTER CELL NO. 2 DPIT ISOLATION	PROCESS	FLS	CF8M	300	NPT	HANDLE	NONE	NO	FILTER SUPPLIER	15100 11200

Table 15100-1: Valve Schedule

REF	DWG NO.	TAG No.	QTY	Description	Size (in)	Type / Style	Location	Mount: Process or Panel	Fluid	Body Material	CLASS / Pressure	Connection Type	Operator	Actuation	Limit Switch?	Comments	Spec Section
48	I-1006	35-MOV-11, 35-MOV-21, 35-MOV-31, 35-MOV-41, 35-MOV-51, 35-MOV-61, 35-MOV-71, 35-MOV-81	8	BUTTERFLY VALVE	4	BFV5	FILTER CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	PROCESS	AIR	CF8M	150	LUGGED	MOTOR	ON/OFF	ON/OFF	FILTER SUPPLIER	15100 11200
49	I-1006	35-MOV-12, 35-MOV-22, 35-MOV-32, 35-MOV-42, 35-MOV-52, 35-MOV-62, 35-MOV-72, 35-MOV-82	8	BUTTERFLY VALVE	4	BFV5	FILTER CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	PROCESS	AIR	CF8M	150	LUGGED	MOTOR	ON/OFF	ON/OFF	FILTER SUPPLIER	15100 11200
50	I-1006	37-MOV-11, 37-MOV-21, 37-MOV-31, 37-MOV-41, 37-MOV-51, 37-MOV-61, 37-MOV-71, 37-MOV-81	8	BUTTERFLY VALVE	16	BFV1	FILTER CELL NO. 1 BACKWASH WASTE ISOLATION	PROCESS	FLS	DUCTILE IRON	150	LUGGED	MOTOR	ON/OFF	ON/OFF	FILTER SUPPLIER	15100 11200
51	I-1006	37-MOV-12, 37-MOV-22, 37-MOV-32, 37-MOV-42, 37-MOV-52, 37-MOV-62, 37-MOV-72, 37-MOV-82	8	BUTTERFLY VALVE	16	BFV1	FILTER CELL NO. 2 BACKWASH WASTE ISOLATION	PROCESS	FLS	DUCTILE IRON	150	LUGGED	MOTOR	ON/OFF	ON/OFF	FILTER SUPPLIER	15100 11200
52	I-1006	37-MOV-13, 37-MOV-23, 37-MOV-33, 37-MOV-43, 37-MOV-53, 37-MOV-63, 37-MOV-73, 37-MOV-83	8	BUTTERFLY VALVE	14	BFV1	FILTER BACKWASH SUPPLY ISOLATION	PROCESS	BWS	DUCTILE IRON	150	LUGGED	MOTOR	MODULATING	ON/OFF	FILTER SUPPLIER	15100 11200
53	I-1006	37-MOV-14, 37-MOV-24, 37-MOV-34, 37-MOV-44, 37-MOV-54, 37-MOV-64, 37-MOV-74, 37-MOV-84	8	BUTTERFLY VALVE	14	BFV1	FILTER BACKWASH WASTE CONTROL VALVE	PROCESS	FLW	DUCTILE IRON	150	LUGGED	MOTOR	MODULATING	ON/OFF	FILTER SUPPLIER	15100 11200

VALVE TABLE

NUMBER	DESCRIPTION	COMMENTS	TAG NUMBER
1	2" AIR RELEASE VALVE ASSEMBLY	ABOVE GROUND PIPING TO FILTERS	30-ARV-01
2	2" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 1, CELL NO. 1	30-ARV-11
3	2" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 1, CELL NO. 2	30-ARV-12
4	2" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 2, CELL NO. 1	30-ARV-21
5	2" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 2, CELL NO. 2	30-ARV-22
6	2" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 3, CELL NO. 1	30-ARV-31
7	2" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 3, CELL NO. 2	30-ARV-32
8	2" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 4, CELL NO. 1	30-ARV-41
9	2" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 4, CELL NO. 2	30-ARV-42
10	2" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 5, CELL NO. 1	30-ARV-51
11	2" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 5, CELL NO. 2	30-ARV-52
12	2" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 6, CELL NO. 1	30-ARV-61
13	2" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 6, CELL NO. 2	30-ARV-62
14	2" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 7, CELL NO. 1	30-ARV-71
15	2" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 7, CELL NO. 2	30-ARV-72
16	2" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 8, CELL NO. 1	30-ARV-81
17	2" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 8, CELL NO. 2	30-ARV-82
18	42" FLG BUTTERFLY VALVE	PRESSURE FILTER SYSTEM INLET ISOLATION	30-BFV-01
19	42" FLG BUTTERFLY VALVE	PRESSURE FILTER SYSTEM OUTLET ISOLATION	30-BFV-85
20	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 1 FEED ISOLATION (MOTORIZED)	30-MOV-11
21	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 2 INLET ISOLATION (MOTORIZED)	30-MOV-12
23	16" LUG BUTTERFLY VALVE	FILTER NO. 1 CONTROL VALVE (MOTORIZED)	30-MOV-13
24	16" LUG BUTTERFLY VALVE	FILTER NO. 2, CELL NO. 1 FEED ISOLATION (MOTORIZED)	30-MOV-21
25	16" LUG BUTTERFLY VALVE	FILTER NO. 2, CELL NO. 2 INLET ISOLATION (MOTORIZED)	30-MOV-22
27	16" LUG BUTTERFLY VALVE	FILTER NO. 2 CONTROL VALVE (MOTORIZED)	30-MOV-23
28	16" LUG BUTTERFLY VALVE	FILTER NO. 3, CELL NO. 1 FEED ISOLATION (MOTORIZED)	30-MOV-31
29	16" LUG BUTTERFLY VALVE	FILTER NO. 3, CELL NO. 2 INLET ISOLATION (MOTORIZED)	30-MOV-32
31	16" LUG BUTTERFLY VALVE	FILTER NO. 3 CONTROL VALVE (MOTORIZED)	30-MOV-33
32	16" LUG BUTTERFLY VALVE	FILTER NO. 4, CELL NO. 1 FEED ISOLATION (MOTORIZED)	30-MOV-41
33	16" LUG BUTTERFLY VALVE	FILTER NO. 4, CELL NO. 2 INLET ISOLATION (MOTORIZED)	30-MOV-42
35	16" LUG BUTTERFLY VALVE	FILTER NO. 4 CONTROL VALVE (MOTORIZED)	30-MOV-43
36	16" LUG BUTTERFLY VALVE	FILTER NO. 5, CELL NO. 1 FEED ISOLATION (MOTORIZED)	30-MOV-51
37	16" LUG BUTTERFLY VALVE	FILTER NO. 5, CELL NO. 2 INLET ISOLATION (MOTORIZED)	30-MOV-52
39	16" LUG BUTTERFLY VALVE	FILTER NO. 5 CONTROL VALVE (MOTORIZED)	30-MOV-53
40	16" LUG BUTTERFLY VALVE	FILTER NO. 6, CELL NO. 1 FEED ISOLATION (MOTORIZED)	30-MOV-61
41	16" LUG BUTTERFLY VALVE	FILTER NO. 6, CELL NO. 2 INLET ISOLATION (MOTORIZED)	30-MOV-62
43	16" LUG BUTTERFLY VALVE	FILTER NO. 6 CONTROL VALVE (MOTORIZED)	30-MOV-63
44	16" LUG BUTTERFLY VALVE	FILTER NO. 7, CELL NO. 1 FEED ISOLATION (MOTORIZED)	30-MOV-71
45	16" LUG BUTTERFLY VALVE	FILTER NO. 7, CELL NO. 2 INLET ISOLATION (MOTORIZED)	30-MOV-72
47	16" LUG BUTTERFLY VALVE	FILTER NO. 7 CONTROL VALVE (MOTORIZED)	30-MOV-73
48	16" LUG BUTTERFLY VALVE	FILTER NO. 8, CELL NO. 1 FEED ISOLATION (MOTORIZED)	30-MOV-81
49	16" LUG BUTTERFLY VALVE	FILTER NO. 8, CELL NO. 2 INLET ISOLATION (MOTORIZED)	30-MOV-82
51	16" LUG BUTTERFLY VALVE	FILTER NO. 8 CONTROL VALVE (MOTORIZED)	30-MOV-83
52	1" SOLENOID BLOW-OFF VALVE	COMPRESSED AIR PIPE HEADER	35-SV-05
53	6" LUG BUTTERFLY VALVE	AIR SCOUR BLOWER NO. 1 DISCHARGE ISOLATION	35-BFV-01
54	6" LUG BUTTERFLY VALVE	AIR SCOUR BLOWER NO. 2 DISCHARGE ISOLATION	35-BFV-02
55	6" LUG DUAL DISC CHECK VALVE	AIR SCOUR SYSTEM DISCHARGE	35-CV-05-1
56	6" LUG DUAL DISC CHECK VALVE	FILTER SYSTEM AIR FEED HEADER	35-CV-05-2
57	4" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	35-MOV-11
58	4" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	35-MOV-12
59	4" LUG BUTTERFLY VALVE	FILTER NO. 2, CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	35-MOV-21
60	4" LUG BUTTERFLY VALVE	FILTER NO. 2, CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	35-MOV-22
61	4" LUG BUTTERFLY VALVE	FILTER NO. 3, CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	35-MOV-31
62	4" LUG BUTTERFLY VALVE	FILTER NO. 3, CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	35-MOV-32
63	4" LUG BUTTERFLY VALVE	FILTER NO. 4, CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	35-MOV-41
64	4" LUG BUTTERFLY VALVE	FILTER NO. 4, CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	35-MOV-42
65	4" LUG BUTTERFLY VALVE	FILTER NO. 5, CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	35-MOV-51
66	4" LUG BUTTERFLY VALVE	FILTER NO. 5, CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	35-MOV-52
67	4" LUG BUTTERFLY VALVE	FILTER NO. 6, CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	35-MOV-61
68	4" LUG BUTTERFLY VALVE	FILTER NO. 6, CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	35-MOV-62
69	4" LUG BUTTERFLY VALVE	FILTER NO. 7, CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	35-MOV-71
70	4" LUG BUTTERFLY VALVE	FILTER NO. 7, CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	35-MOV-72
71	4" LUG BUTTERFLY VALVE	FILTER NO. 8, CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	35-MOV-81
72	4" LUG BUTTERFLY VALVE	FILTER NO. 8, CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	35-MOV-82
73	2" AIR RELEASE VALVE ASSEMBLY	BACKWASH SUPPLY PUMP NO. 1	37-ARV-05-1

VALVE TABLE

NUMBER	DESCRIPTION	COMMENTS	TAG NUMBER
75	2" AIR RELEASE VALVE ASSEMBLY	BACKWASH SUPPLY PUMP NO. 2	37-ARV-06-1
76	2" AIR RELEASE VALVE ASSEMBLY	BACKWASH SUPPLY PUMP NO. 2	37-ARV-06-2
77	16" FLG BUTTERFLY VALVE W/ VALVE BOX	BACKWASH SUPPLY FROM FLW	37-BFV-01-1
78	16" FLG BUTTERFLY VALVE W/ VALVE BOX	BACKWASH SUPPLY FROM BYPASS	37-BFV-01-2
79	16" FLG BUTTERFLY VALVE	BACKWASH SUPPLY PUMP NO. 1 SUCTION ISOLATION	37-BFV-05-1
80	16" FLG BUTTERFLY VALVE	BACKWASH SUPPLY PUMP NO. 1 DISCHARGE ISOLATION	37-BFV-05-2
81	16" FLG BUTTERFLY VALVE	BACKWASH SUPPLY PUMP NO. 2 SUCTION ISOLATION	37-BFV-06-1
82	16" FLG BUTTERFLY VALVE	BACKWASH SUPPLY PUMP NO. 2 DISCHARGE ISOLATION	37-BFV-06-2
83	16" LUG DUAL DISC CHECK VALVE	BACKWASH SUPPLY PUMP NO. 1 DISCHARGE	37-CV-05
84	16" LUG DUAL DISC CHECK VALVE	BACKWASH SUPPLY PUMP NO. 2 DISCHARGE	37-CV-06
85	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 1 BACKWASH WASTE ISOLATION (MOTORIZED)	37-MOV-11
86	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 2 BACKWASH WASTE ISOLATION (MOTORIZED)	37-MOV-12
87	14" LUG BUTTERFLY VALVE	FILTER NO. 1 BACKWASH SUPPLY CONTROL (MOTORIZED)	37-MOV-13
88	14" LUG BUTTERFLY VALVE	FILTER NO. 1 FILTER-TO-WASTE CONTROL VALVE (MORTORIZED)	37-MOV-14
89	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 1 BACKWASH WASTE ISOLATION (MOTORIZED)	37-MOV-21
90	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 2 BACKWASH WASTE ISOLATION (MOTORIZED)	37-MOV-22
91	14" LUG BUTTERFLY VALVE	FILTER NO. 2 BACKWASH SUPPLY CONTROL (MOTORIZED)	37-MOV-23
92	14" LUG BUTTERFLY VALVE	FILTER NO. 2 FILTER-TO-WASTE CONTROL VALVE (MORTORIZED)	37-MOV-24
93	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 1 BACKWASH WASTE ISOLATION (MOTORIZED)	37-MOV-31
94	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 2 BACKWASH WASTE ISOLATION (MOTORIZED)	37-MOV-32
95	14" LUG BUTTERFLY VALVE	FILTER NO. 3 BACKWASH SUPPL CONTROL (MOTORIZED)	37-MOV-33
96	14" LUG BUTTERFLY VALVE	FILTER NO. 3 FILTER-TO-WASTE CONTROL VALVE (MORTORIZED)	37-MOV-34
97	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 1 BACKWASH WASTE ISOLATION (MOTORIZED)	37-MOV-41
98	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 2 BACKWASH WASTE ISOLATION (MOTORIZED)	37-MOV-42
99	14" LUG BUTTERFLY VALVE	FILTER NO. 4 BACKWASH SUPPLY CONTROL (MOTORIZED)	37-MOV-43
100	14" LUG BUTTERFLY VALVE	FILTER NO. 4 FILTER-TO-WASTE CONTROL VALVE (MORTORIZED)	37-MOV-44
101	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 1 BACKWASH WASTE ISOLATION (MOTORIZED)	37-MOV-51
102	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 2 BACKWASH WASTE ISOLATION (MOTORIZED)	37-MOV-52
103	14" LUG BUTTERFLY VALVE	FILTER NO. 5 BACKWASH SUPPLY CONTROL (MOTORIZED)	37-MOV-53
104	14" LUG BUTTERFLY VALVE	FILTER NO. 5 FILTER-TO-WASTE CONTROL VALVE (MORTORIZED)	37-MOV-54
105	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 1 BACKWASH WASTE ISOLATION (MOTORIZED)	37-MOV-61
106	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 2 BACKWASH WASTE ISOLATION (MOTORIZED)	37-MOV-62
107	14" LUG BUTTERFLY VALVE	FILTER NO. 6 BACKWASH SUPPLY CONTROL (MOTORIZED)	37-MOV-63
108	14" LUG BUTTERFLY VALVE	FILTER NO. 6 FILTER-TO-WASTE CONTROL VALVE (MORTORIZED)	37-MOV-64
109	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 1 BACKWASH WASTE ISOLATION (MOTORIZED)	37-MOV-71
110	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 2 BACKWASH WASTE ISOLATION (MOTORIZED)	37-MOV-72
111	14" LUG BUTTERFLY VALVE	FILTER NO. 7 BACKWASH SUPPLY CONTROL (MOTORIZED)	37-MOV-73
112	14" LUG BUTTERFLY VALVE	FILTER NO. 7 FILTER-TO-WASTE CONTROL VALVE (MORTORIZED)	37-MOV-74
113	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 1 BACKWASH WASTE ISOLATION (MOTORIZED)	37-MOV-81
114	16" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 2 BACKWASH WASTE ISOLATION (MOTORIZED)	37-MOV-82
115	14" LUG BUTTERFLY VALVE	FILTER NO. 8 BACKWASH SUPPLY CONTROL (MOTORIZED)	37-MOV-83
116	14" LUG BUTTERFLY VALVE	FILTER NO. 8 FILTER-TO-WASTE CONTROL VALVE (MORTORIZED)	37-MOV-84
117	42" FLG BUTTERFLY VALVE	ABOVE GROUND PIPING TO GST	40-MOV-10-1
118	16" FLG V-PORT BALL VALVE	ABOVE GROUND PIPING TO GST	40-MOV-10-2
119	2" AIR RELEASE VALVE ASSEMBLY	ABOVE GROUND PIPING TO GST	40-ARV-30
120	60" FLG BUTTERFLY VALVE W/ VALVE BOX	GST BYPASS ISOLATION	40-BFV-30-1
121	60" FLG BUTTERFLY VALVE W/ VALVE BOX	GST INLET ISOLATION	40-BFV-30-2
122	54" FLG BUTTERFLY VALVE W/ VALVE BOX	TREATMENT FACILITY BYPASS ISOLATION	40-BFV-30-3

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100% SUBMITTAL

SAN ANTONIO WATER SYSTEM

MARK	DATE	DESCRIPTION	BY
1	6/20/18	EP-1 ADDENDUM	AST

SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY

PRESSURE FILTERS VALVE TABLE

INCOMPLETE DOCUMENT
ISSUED FOR
INTERIM REVIEW ONLY

NOT RELEASED FOR
REGULATORY APPROVAL,
PERMIT OR CONSTRUCTION

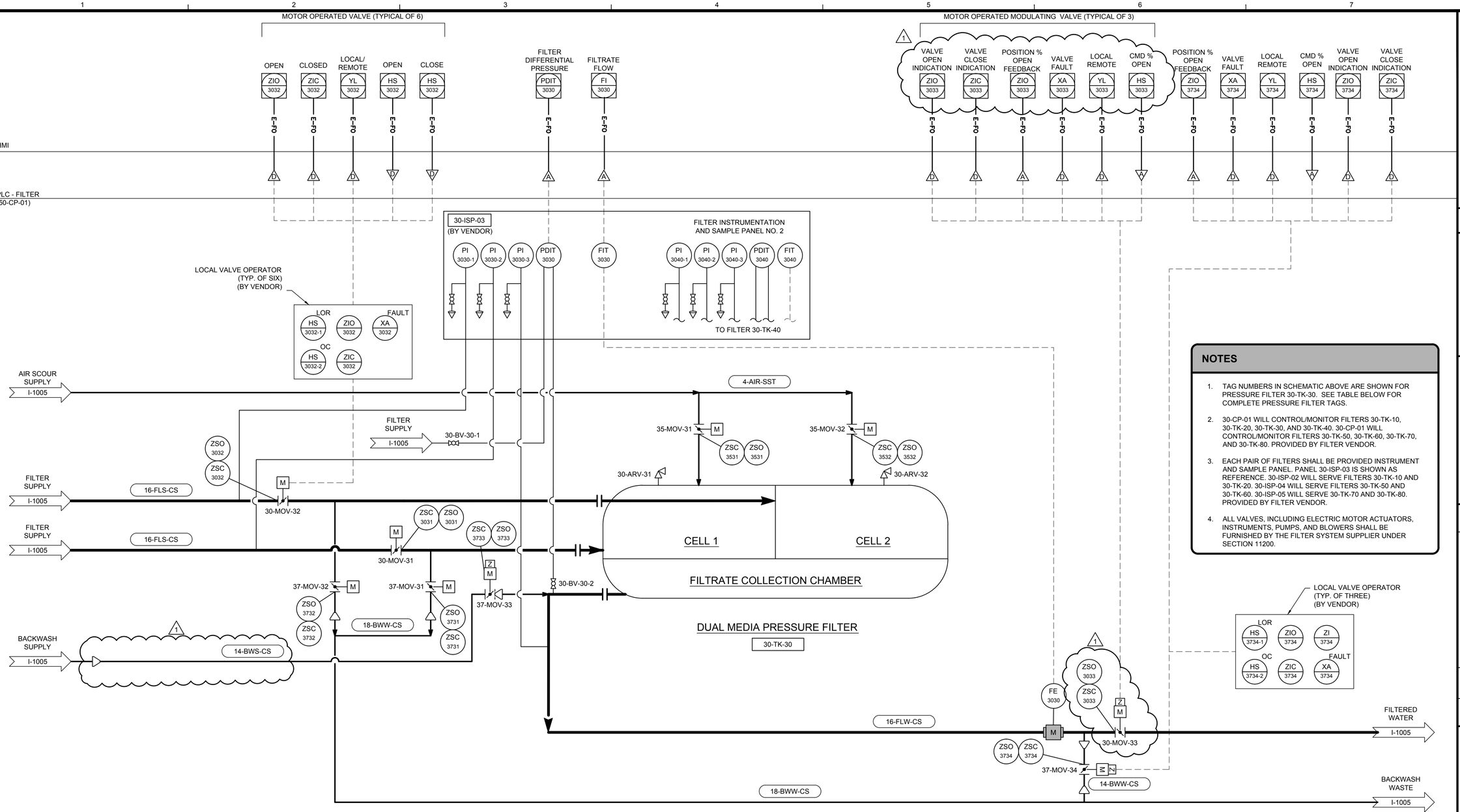
JARRETT K. KINSLOW, P.E.
TEXAS REGISTRATION NO. 121441
JULY 2018

PROJ:	200-09308-18001
DESN:	AST
DRWN:	JTE
CHKD:	JKK

D-1207

Bar measures 1 inch, otherwise drawing is not to scale

6/20/2018 10:47:08 AM BIM 360://200-09308-18001 CWIPP/09308-01-02-FILTBL-D-2017.rvt



NOTES

1. TAG NUMBERS IN SCHEMATIC ABOVE ARE SHOWN FOR PRESSURE FILTER 30-TK-30. SEE TABLE BELOW FOR COMPLETE PRESSURE FILTER TAGS.
2. 30-CP-01 WILL CONTROL/MONITOR FILTERS 30-TK-10, 30-TK-20, 30-TK-30, AND 30-TK-40. 30-CP-01 WILL CONTROL/MONITOR FILTERS 30-TK-50, 30-TK-60, 30-TK-70, AND 30-TK-80. PROVIDED BY FILTER VENDOR.
3. EACH PAIR OF FILTERS SHALL BE PROVIDED INSTRUMENT AND SAMPLE PANEL. PANEL 30-ISP-03 IS SHOWN AS REFERENCE. 30-ISP-02 WILL SERVE FILTERS 30-TK-10 AND 30-TK-20. 30-ISP-04 WILL SERVE FILTERS 30-TK-50 AND 30-TK-60. 30-ISP-05 WILL SERVE 30-TK-70 AND 30-TK-80. PROVIDED BY FILTER VENDOR.
4. ALL VALVES, INCLUDING ELECTRIC MOTOR ACTUATORS, INSTRUMENTS, PUMPS, AND BLOWERS SHALL BE FURNISHED BY THE FILTER SYSTEM SUPPLIER UNDER SECTION 11200.

FILTER	FILTER CELL NO. 1 FEED	FILTER CELL NO. 2 FEED	FILTER OUTLET CONTROL VALVE	FILTER OUTLET FLOW METER	AIR SCOUR CELL NO. 1	AIR SCOUR CELL NO. 2	BACKWASH WASTE CELL NO. 1	BACKWASH WASTE CELL NO. 2	BACKWASH SUPPLY	RINSE TO WASTE	CELL NO. 1 SAMPLE ISOLATION BALL VALVE	CELL NO. 2 SAMPLE ISOLATION BALL VALVE	PRESSURE DIFFERENATIAL ISOLATION BALL VALVE (BOTTOM)	PRESSURE DIFFERENTIAL ISOLATION BALL VALVE (TOP)	CELL NO. 1 ARV ASSEMBLY	CELL NO. 2 ARV ASSEMBLY
30-TK-10	30-MOV-11	30-MOV-12	30-MOV-13	FE 3010	35-MOV-11	35-MOV-12	37-MOV-11	37-MOV-12	37-MOV-13	37-MOV-14	30-BV-10-1	30-BV-10-2	30-BV-10-3	30-BV-10-4	30-ARV-11	30-ARV-12
30-TK-20	30-MOV-21	30-MOV-22	30-MOV-23	FE 3020	35-MOV-21	35-MOV-22	37-MOV-21	37-MOV-22	37-MOV-23	37-MOV-24	30-BV-20-1	30-BV-20-2	30-BV-20-3	30-BV-20-4	30-ARV-21	30-ARV-22
30-TK-30	30-MOV-31	30-MOV-32	30-MOV-33	FE 3030	35-MOV-31	35-MOV-32	37-MOV-31	37-MOV-32	37-MOV-33	37-MOV-34	30-BV-30-1	30-BV-30-2	30-BV-30-3	30-BV-30-4	30-ARV-31	30-ARV-32
30-TK-40	30-MOV-41	30-MOV-42	30-MOV-43	FE 3040	35-MOV-41	35-MOV-42	37-MOV-41	37-MOV-42	37-MOV-43	37-MOV-44	30-BV-40-1	30-BV-40-2	30-BV-40-3	30-BV-40-4	30-ARV-41	30-ARV-42
30-TK-50	30-MOV-51	30-MOV-52	30-MOV-53	FE 3050	35-MOV-51	35-MOV-52	37-MOV-51	37-MOV-52	37-MOV-53	37-MOV-54	30-BV-50-1	30-BV-50-2	30-BV-50-3	30-BV-50-4	30-ARV-51	30-ARV-52
30-TK-60	30-MOV-61	30-MOV-62	30-MOV-63	FE 3060	35-MOV-61	35-MOV-62	37-MOV-61	37-MOV-62	37-MOV-63	37-MOV-64	30-BV-60-1	30-BV-60-2	30-BV-60-3	30-BV-60-4	30-ARV-61	30-ARV-62
30-TK-70	30-MOV-71	30-MOV-72	30-MOV-73	FE 3070	35-MOV-71	35-MOV-72	37-MOV-71	37-MOV-72	37-MOV-73	37-MOV-74	30-BV-70-1	30-BV-70-2	30-BV-70-3	30-BV-70-4	30-ARV-71	30-ARV-72
30-TK-80	30-MOV-81	30-MOV-82	30-MOV-83	FE 3080	35-MOV-81	35-MOV-82	37-MOV-81	37-MOV-82	37-MOV-83	37-MOV-84	30-BV-80-1	30-BV-80-2	30-BV-80-3	30-BV-80-4	30-ARV-81	30-ARV-82

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EP-1 BID SET

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MARK	DATE	DESCRIPTION
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CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY

TYPICAL PRESSURE FILTER P&ID

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TIMOTHY D. GOBROGGE
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