

SAN ANTONIO WATER SYSTEM PURCHASING DEPARTMENT

Issued By: **D. Anthony Rubin**
BID NO.: 18-18076

Date Issued: **June 25, 2018**

FORMAL INVITATION FOR BIDS
EARLY PROCUREMENT OF PRESSURE FILTRATION SYSTEM FOR THE
CENTRAL WATER INTEGRATION PIPELINE PROJECT
ADDENDUM 2

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
Terms and Conditions of Invitation for Bids

Specifications and General Requirements
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 2** is issued to answer the following questions and issue changes to 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. Will all filter manufacturers be required to adhere exclusively to the specification with no exceptions (unless otherwise noted) specifically with regard to the arched plate underdrain, 1” or less per year media loss, local support personnel, and air & water experience requirements?
- A1. The Owner maintains the right to consider exceptions on a case-by-case basis.
- Q2. Section 1.03 – C – 2 (page 5) states that the FSS is to provide a flow schematic drawing to include, “method of support, utilities (air, water, drain, electric) line sizes, and connections”. The portion of item 2 quoted above is typically outside the scope of the filter equipment supplier. Since all piping, piping supports and utility related materials are supplied under separate contract, we respectfully request that this be changed such that the FSS only be responsible for design related to our scope of supply.
- A2. The design is provided in the bid documents. The requirement of this submittal is to verify the design and coordinate. We will remove from the specification “method of support”.
- Q3. Section 1.03 – D – 5.a (page 10) states that software licenses for the PLC and OIT are to be purchased in the Owner’s name. How many software licenses of each are we required to provide?
- A3. No licenses are required. Section 1.03 – D – 5. a. to be revised.
- Q4. Section 2.02 – D – 1 (Page 38). Specific gravel layers are not listed in the spec nor shown on the drawings. We recommend that you include the following table in the specification. The support gravels shall be placed in the tank as follows:

Layer	Depth	Size
Bottom	4" + subfill	3/4" x 1/2"
Second	4"	1/2" x 1/4"
Third	4"	1/4" x 1/8"
Top	3"	0.8 - 1.2 mm torpedo sand

- A5. Please refer to answer A3 of Addendum 1.
- Q5. Section 2.02 – D – 4 (page 38) lists a 12” of sand and 18” of anthracite, yet has a total media depth is listed at 36”. Standard is usually 30” total media depth. Which of these shall govern?
- A5. Please refer to answer A4 of Addendum 1.
- Q6. Section 2.02 D – 4 (page 38): Anthracite typically has an effective size of 0.8 – 1.0mm, the spec currently states 0.9 – 1.1mm. Will the typical size of 0.8 – 1.0mm be acceptable?
- A6. Effective size of 0.8 – 1.0mm will be acceptable. Will revise range to include low-end of 0.8 mm.
- Q7. Section 2.02 – E – 2b2 (page 40) calls out a Gardner Denver 4500 series blower. It has come to our attention that the Heliflow 514 trilobe blower will be more efficient, quieter, and cheaper. Will the engineer approve the Heliflow 514 trilobe blower as an equal?
- A7. Equal equipment will be considered during the shop drawing submittal process.

- Q8. Section 2.02 – E – 2f6 (page 40) calls out remote speed control – is the intent to have a VFD motor to power the blower? It is noteworthy that this style of blower will not cool properly if the drive speed is reduced (IE: It is meant to operate at one specific speed).
- A8. The blower motor will be constant speed and not include a VFD.
- Q9. Section 2.02 – E – 2p1 (page 42): The sound enclosure for the blower is requested to meet 60 dba @ 1 meter from the enclosure. None of the suppliers we have spoken with are able to meet this. Standard is 83 dba. Will the standard 83 dba be acceptable?
- A9. 83 dba is acceptable.
- Q10. Section 1.03-C-614 – Please advise the seismic zone so that we can include the appropriate seismic calculations.
- A10. The following information was revised in Addendum 1:
- 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”
- Q11. How will recent metal price fluctuations be handled? IE: if steel pricing goes up significantly between bid date and order date. This was addressed in the pre-bid call, however is it feasible to provide a base bid with adders that correspond to % of steel price change on a specific steel price index?
- A11. No, the bidders need to account for the volatility in the prices for metals in their bid price. No adders.
- Q12. The system pressure is currently estimated up to 30 psi. In order that all manufacturers bid the appropriate actuators would you please advise the pressure to which you would like actuators rated? Actuators should be rated above the operating pressure and many actuators are rated at 30 psi. A 50 psi actuator would be more robust in this application. A 30 psi actuator would be less expensive and operate at its upper limit.
- A12. The actuators should be rated for 50 psi.
- Q13. In order to guarantee the backwash volume it is important for us to know the water temperature (so that we can calculate the corresponding density). Please advise the expected/seasonal temperature of the backwash water.
- A13. 75 – 90 deg F
- Q14. Will it be acceptable to deliver tanks/vessels for on-site storage as they become available?
- A14. The bid shall be based upon assumption that there will be no available space for on-site storage, and delivery of all vessels shall occur according to the Contractor installation schedule.
- Q15. Tank drawings are to be sent with the bid package, however saddle location calculations are usually completed after award. Is it acceptable to advise saddle locations with the Phase 1 Submittals?
- A15. Preliminary vessel shop drawings are requested with the bid. Final vessel shop drawings and submittal of calculations are listed as required in the Level 1 stage.
- Q16. 1.03 - C-15.c (page 27): Will the independent paint testing be paid for by the supplier, SAWS, or the contractor?
- A16. The Supplier is responsible for independent paint testing as specified in 2.03 – 3-e.

- Q17. 2.01-C (page 34): There are slight discrepancies between the filter dimensions, square footage, and loading rate – which of these shall govern the design? We are currently assuming that the loading rate governs, which results in a 51’ overall vessel length.
- A17. Refer to A2 of Addendum 1.
- Q18. Drawing D-1207, Valve Table. Is it intended that we include all valves listed with our bid at this time or only the filter operating valves, which would be #2-17, 20-51, 57-72,85-116?
- A18. The valves that are the responsibility of the Filter System Supplier are identified in Table 15100-1 under “Comments” and are REF 41 through 53. These are also called out as by the Filter System Supplier on I-1006.
- Q19. Drawing D-1207, Valve Table. Valves 2 through 17. Through further design investigation we have determined that the air release valves need to be 3” in lieu of the 2” listed and previously advised. We suggest that the spec is updated accordingly.
- A19. Agreed and revised herein.
- Q20. Drawing D-1207, Valve Table. Valves 57 through 72. Through further design investigation we have determined that the air supply valves need to be 6” in lieu of the 4” listed and previously advised. This will keep the velocity near 5,000 fpm which is an industry standard design practice. For consistency with other valve “comments” these valves should probably be noted as (motorized) in the table.
- A20. Agreed and revised herein.
- Q21. Drawing D-1207, Valve Table. Valves 87,91,95,99,103,107,111 & 115. These backwash supply valves are intended to be used as part of the backwash supply flow control loop and need to be designated as “control” valves instead of “isolation” valves.
- A21. These were revised to Control in Addendum 1.
- Q22. Please clarify that all VFD’s are provided by others.
- A22. This will be clarified.

REVISIONS TO CONTRACT DOCUMENTS AND TECHNICAL SPECIFICATIONS

SECTION 11200 – WATER FILTRATION SYSTEM

- a) Delete Section 11200 in its entirety and replace with new Section 11200 provided; all changes to this table are detailed below.
- b) Paragraph 2.03, A, 3., a. Revise to add: “All metal components inside the pressure vessel along with the interior vessel wall must be coated according to the requirements herein.”
- c) Paragraph 1.03, C, 2. Revise to: “Flow schematic drawing indicating line sizes of pipes connecting to and from pressure vessels, valving, utility (air, water, drain, electric) line sizes and connections.”
- d) Paragraph 1.03, D, 5, a). Delete “Include copies of license agreements indicating assignment of licenses to the Owner.”
- e) Paragraph 2.02, D, 4. Revise Anthracite Effective size to “0.8 to 1.1 mm”.
- f) Paragraph 2.02, E, 2. f. 6). Delete entirely.

- g) Paragraph 2.02, F, f. Revise to add: “VFD’s are to be procured by Others”.
- h) Paragraph 2.02, E, 2. p. 1) Revise to: “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 83 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.”

SECTION 15100 – VALVES AND APPURTENANCES

- a) Delete Table 15100-1 in its entirety and replace with new Table 15100-1 provided; all changes to this table are detailed below.
- b) Table 15100-1, REF 48 and 49 revise Size (in) from 2 to 3.
- c) Table 15100-1 REF 52 and 53 revise Size (in) from 4 to 6.
- d) Table 15100-1 REF 56 revise “Location” to “FILTER BACKWASH SUPPLY CONTROL VALVE”.

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-1005 in its entirety and replace with new I-1005 provided.
- c) Delete sheet I-1006 in its entirety and replace with new I-1006 provided.



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

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

ADDENDUM 2
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 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 CaCO₃. 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, 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.
 - 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/ft ²	5.8
Filter loading rate at design flow rate with two filters out of operation (N-2), gpm/ft ²	6.8
Maximum clean filter pressure drop, psi	2
Maximum dirty filter pressure drop, psi	6
Filter area per filter, ft ²	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/ft ²	3 - 5, with air
Air Loading Rate, cfm/ft ²	3
Backwash restratification Rate, gpm/ft ²	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 simultaneously 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 sidsell. 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	0.8 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

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 than 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 gage galvanized perforated steel; sufficient to meet 83 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-ft¹
2. Low Water Level: 1014-ft²

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 H ₂ O)
Estimated pressure loss in pump discharge piping	0.4 – 3.5 psi (1.0 – 8.0 ft H ₂ O)

e. The pump motor shall be premium efficiency. Motor size shall not exceed 100 hp. Motor shall conform to the requirements listed below. The motor shall be inverter duty, compatible with the variable frequency drives.

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.

- 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 entirety 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 be 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. VFD's are to be procured by Others.
- 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 copies 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. All metal components inside the pressure vessel along with the interior vessel wall must be coated according to the requirements herein.
 - b. 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
 - c. Prime coating: primer to a dry mil thickness of 3-5 mils before any rust can form.

Tnemec Series N140-1255, or equal
 - d. 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
 - e. 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.
 - f. 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)} <ul style="list-style-type: none"> • 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

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
23	I-1005	30-ARV-01	1	AIR RELIEF VALVE	2		FILTER FEED HEADER	PROCESS	FLS				NONE	NONE	NO	CONTRACTOR	15100
24	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
25	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
26	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
27	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
28	I-1005	30-BPR-01	1	BACKPRESSURE VALVE	1		FILTER FEED INSTRUMENT AND SAMPLE PANEL	PANEL	FLS	PVC			NONE	NONE	NO	CONTRACTOR	15100
29	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
30	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
31	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
32	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
33	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
34	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
35	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
36	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
37	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
38	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
39	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
40	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
41	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
42	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
43	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
44	I-1005	37-BPR-09	1	BACKPRESSURE VALVE	1		FOR FUTURE TESTING	PANEL	BWS				NONE	NONE	NO	CONTRACTOR	15100
45	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
46	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
47	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
48	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	3	ARV1	FILTER CELL NO. 1	PROCESS	FLS	DUCTILE IRON	150	NPT	NONE	NONE	NO	FILTER SUPPLIER	15100
49	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	3	ARV1	FILTER CELL NO. 2	PROCESS	FLS	DUCTILE IRON	150	NPT	NONE	NONE	NO	FILTER SUPPLIER	15100
50	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
51	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
52	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
53	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
54	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
55	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
56	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 CONTROL VALVE	PROCESS	BWS	DUCTILE IRON	150	LUGGED	MOTOR	MODULATING	ON/OFF	FILTER SUPPLIER	15100 11200
57	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

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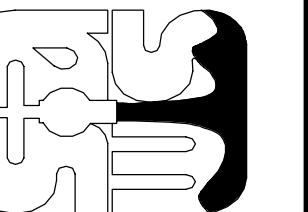
VALVE TABLE			
NUMBER	DESCRIPTION	COMMENTS	TAG NUMBER
1	2" AIR RELEASE VALVE ASSEMBLY	ABOVE GROUND PIPING TO FILTERS	30-ARV-01
2	3" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 1, CELL NO. 1	30-ARV-11
3	3" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 1, CELL NO. 2	30-ARV-12
4	3" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 2, CELL NO. 1	30-ARV-21
5	3" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 2, CELL NO. 2	30-ARV-22
6	3" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 3, CELL NO. 1	30-ARV-31
7	3" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 3, CELL NO. 2	30-ARV-32
8	3" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 4, CELL NO. 1	30-ARV-41
9	3" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 4, CELL NO. 2	30-ARV-42
10	3" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 5, CELL NO. 1	30-ARV-51
11	3" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 5, CELL NO. 2	30-ARV-52
12	3" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 6, CELL NO. 1	30-ARV-61
13	3" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 6, CELL NO. 2	30-ARV-62
14	3" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 7, CELL NO. 1	30-ARV-71
15	3" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 7, CELL NO. 2	30-ARV-72
16	3" AIR RELEASE VALVE ASSEMBLY	FILTER NO. 8, CELL NO. 1	30-ARV-81
17	3" 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-02
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	6" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	35-MOV-11
58	6" LUG BUTTERFLY VALVE	FILTER NO. 1, CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	35-MOV-12
59	6" LUG BUTTERFLY VALVE	FILTER NO. 2, CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	35-MOV-21
60	6" LUG BUTTERFLY VALVE	FILTER NO. 2, CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	35-MOV-22
61	6" LUG BUTTERFLY VALVE	FILTER NO. 3, CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	35-MOV-31
62	6" LUG BUTTERFLY VALVE	FILTER NO. 3, CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	35-MOV-32
63	6" LUG BUTTERFLY VALVE	FILTER NO. 4, CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	35-MOV-41
64	6" LUG BUTTERFLY VALVE	FILTER NO. 4, CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	35-MOV-42
65	6" LUG BUTTERFLY VALVE	FILTER NO. 5, CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	35-MOV-51
66	6" LUG BUTTERFLY VALVE	FILTER NO. 5, CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	35-MOV-52
67	6" LUG BUTTERFLY VALVE	FILTER NO. 6, CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	35-MOV-61
68	6" LUG BUTTERFLY VALVE	FILTER NO. 6, CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	35-MOV-62
69	6" LUG BUTTERFLY VALVE	FILTER NO. 7, CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	35-MOV-71
70	6" LUG BUTTERFLY VALVE	FILTER NO. 7, CELL NO. 2 AIR SCOUR SUPPLY ISOLATION	35-MOV-72
71	6" LUG BUTTERFLY VALVE	FILTER NO. 8, CELL NO. 1 AIR SCOUR SUPPLY ISOLATION	35-MOV-81
72	6" 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 SUPPLY 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. 2 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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SAN ANTONIO WATER SYSTEM

MARK	DATE	DESCRIPTION
1	6/20/18	EP-1 ADDENDUM 1
2	6/22/18	EP-1 ADDENDUM 2

SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
PRESSURE FILTERS VALVE TABLE

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

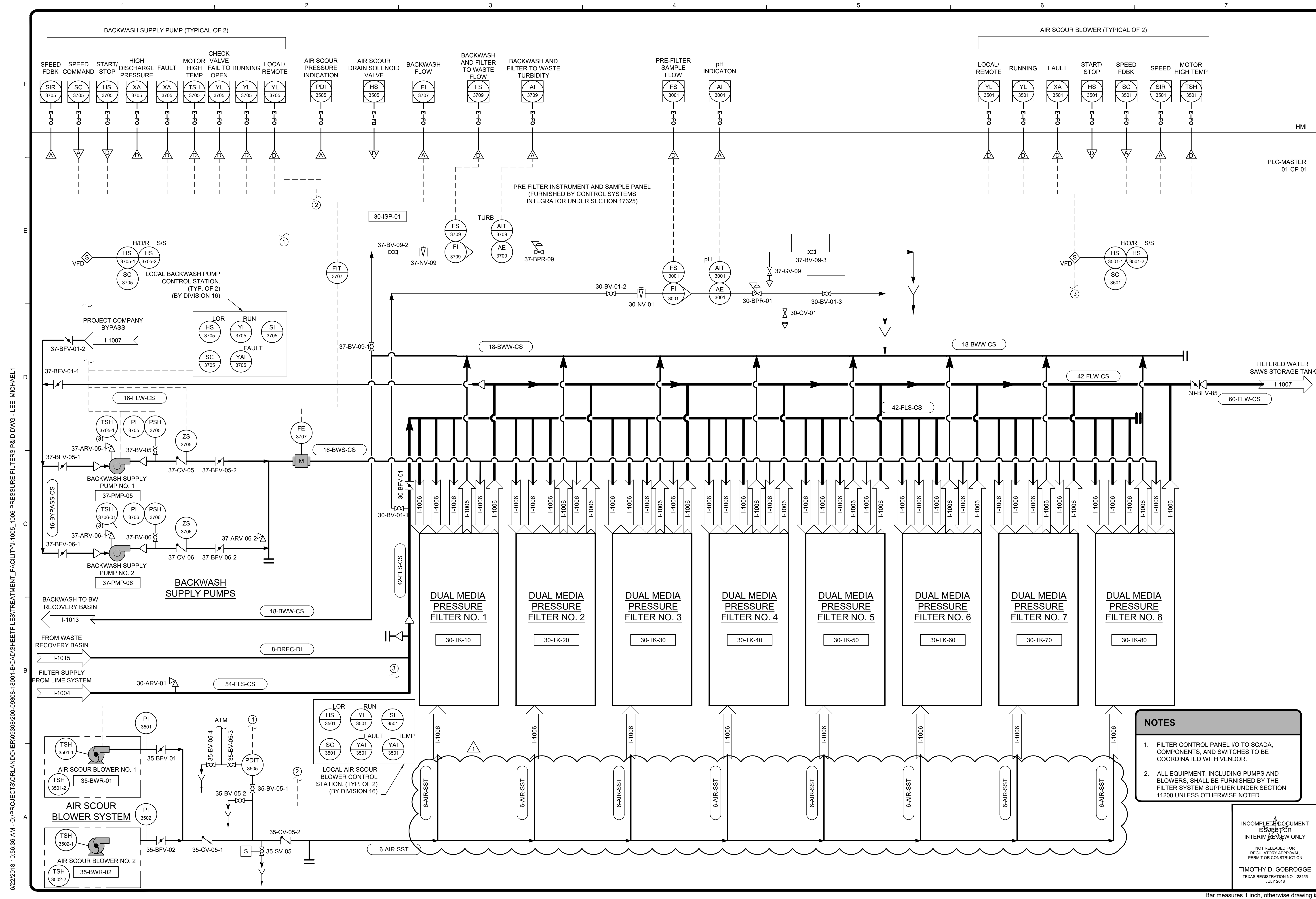
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JARRETT K. KINSLAW, P.E.
TEXAS REGISTRATION NO. 121441
JULY 2018

Bar measures 1 inch, otherwise drawing is not to scale



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NOTES

- FILTER CONTROL PANEL I/O TO SCADA, COMPONENTS, AND SWITCHES TO BE COORDINATED WITH VENDOR.
- ALL EQUIPMENT, INCLUDING PUMPS AND BLOWERS, SHALL BE FURNISHED BY THE FILTER SYSTEM SUPPLIER UNDER SECTION 11200 UNLESS OTHERWISE NOTED.

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SAN ANTONIO WATER SYSTEM

MARK	DATE	DESCRIPTION	BY
1	6/22/18	EP-1 ADDENDUM 2	AST

SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
**PRESSURE FILTERS
OVERALL P&ID**

PROJ: 200-09308-18001
DES: BRW
DRW: JTE
CHKD: TG

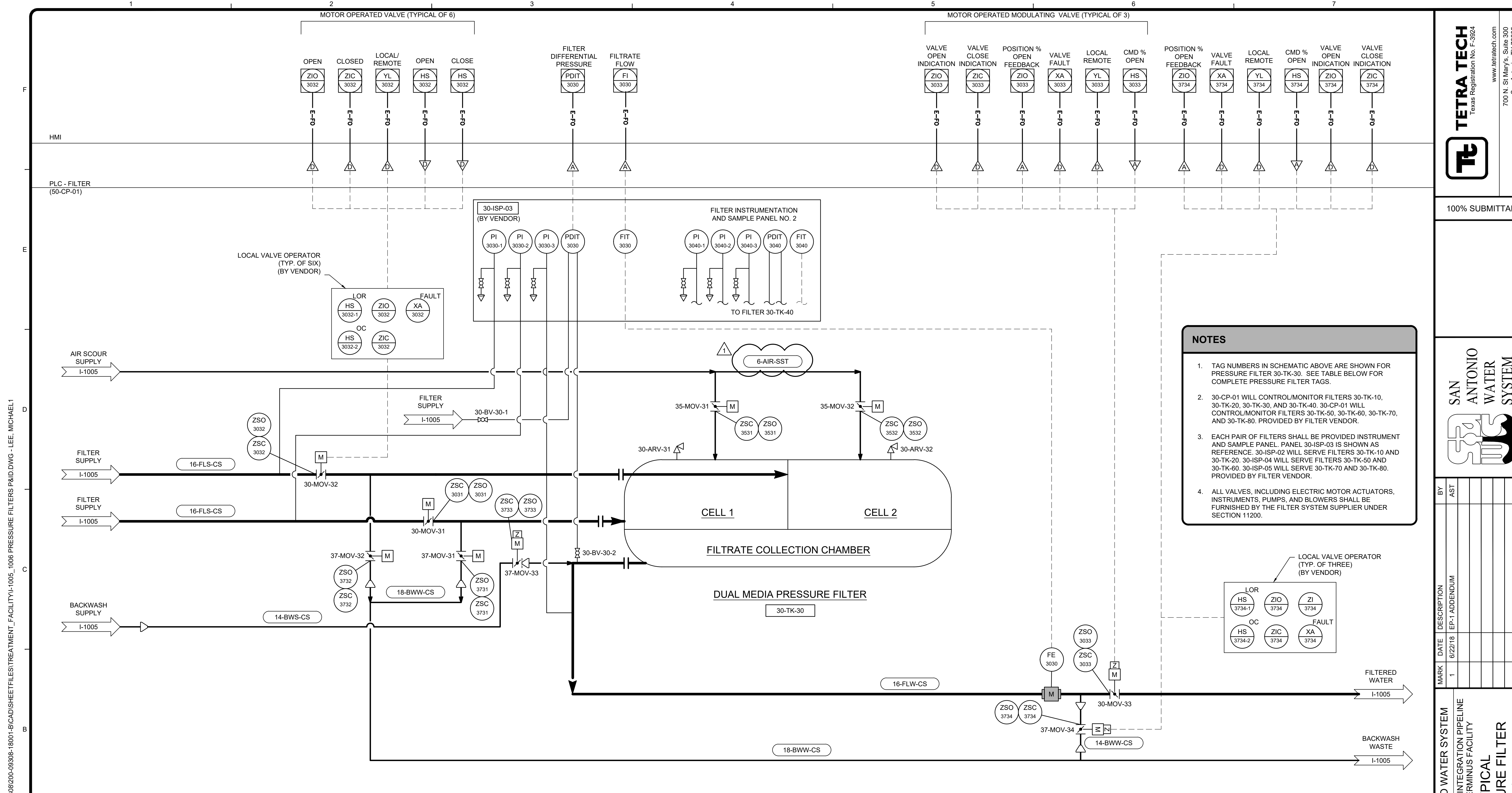
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TIMOTHY D. GOBROGGE
TEXAS REGISTRATION NO. 128455
JULY 2018

I-1005

Bar measures 1 inch, otherwise drawing is not to scale



- NOTES**
- TAG NUMBERS IN SCHEMATIC ABOVE ARE SHOWN FOR PRESSURE FILTER 30-TK-30. SEE TABLE BELOW FOR COMPLETE PRESSURE FILTER TAGS.
 - 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.
 - 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.
 - 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 DIFFERENTIAL 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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SAN ANTONIO WATER SYSTEM

MARK	DATE	DESCRIPTION	BY
1	6/22/18	EP-1 ADDENDUM	AST

SAN ANTONIO WATER SYSTEM
CENTRAL WATER INTEGRATION PIPELINE
PROJECT TERMINUS FACILITY
TYPICAL FILTER PRESSURE FILTER P&ID

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TIMOTHY D. GOBROGGE
TEXAS REGISTRATION NO. 128455
JULY 2018

PROJ:	200-09308-18001
DESN:	BRW
DRWN:	JTE
CHKD:	TG

I-1006

Bar measures 1 inch, otherwise drawing is not to scale