SECTION 43 32 70

IRON AND MANGANESE FILTRATION SYSTEM
04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.1	(2006) Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250
ANSI B16.5	(2003) Pipe Flanges and Flanged Fittings

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C509	(2001) Resilient-Seated Gate Valves for Water Supply Service
AWWA C550	(2005; Errata 2005) Protective Interior Coatings for Valves and Hydrants

ASTM INTERNATIONAL (ASTM)

ASTM A 126	(2004) Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A 351/A 351M	(2006) Standard Specification for Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure-Containing Parts
ASTM A 536	(1984; R 2009) Standard Specification for Ductile Iron Castings
ASTM A 790	(2009) Standard Specification for Seamless and Welded Ferritic/Austenitic Stainless Steel Pipe

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2007) Standard for Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2007; AMD 1 2008) National Electrical Code - 2008 Edition

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST SP 250	(1991) Calibration Services Users Guide

1.2 DESCRIPTION

1.2.1 Iron Manganese Removal Filtration System

Contractor shall furnish and install the Iron and Manganese Removal Filtration System (Filtration System) complete and operational for the removal of iron and manganese from well water as specified herein, with all necessary instrumentation, controls, and appurtenances. Treatment equipment manufacturers who have successfully pilot tested their equipment on the District's wells may submit quotations provided the equipment meets the specifications and does not change the technical parameters from their pilot testing (e.g. maintain the same filtration rate for the installed equipment as was pilot tested.)

The District will have 12 well pumping plants available to supply water to the Perris II Desalter Facility. In order to eliminate the potential for reverse osmosis membrane filter fouling at the Desalter Facility, the District has set the target level at less than 15 Mg/L for iron and manganese entering the Desalter Facilities. The Filter System Supplier (FSS) shall furnish a Filtration System capable of removing iron and manganese from the raw well water to a level less than 15 Mg/L at all times (continuously).

Well pumping plants furnishing raw water to the Perris II Desalter Facility will start and stop automatically via the Desalter Facility Central Computer System (Plant SCADA). Prior to initiating the start signals to the well pumping plants, Plant SCADA will query the Filtration System Control Panel (MCP) to confirm that the Filtration System is ready to operate.

The Filtration System shall be simple to operate and maintain. All operating functions shall be automated including filtration, backwash, rinse (purge), and on/off control of chemical feed pump(s). Filter(s) shall automatically backwash and return to service when filter headloss reaches a preset adjustable level or a preset adjustable time (whichever occurs first). Automatic backwash shall also be capable of initiation by manual push button.

The Filtration System shall consist, as a minimum, of three (3) filter vessels, process (face) piping and appurtenances, valving assemblies; instrumentation for process monitoring and control; flow control valves and flow meters; main control panel with programmable logic controller; and air compressor and receiver for automatic valve operation. The facility shall have a capacity of 3720 gpm (1860 gpm per filter) with two filters in service and one in reserve. The facility shall be constructed for the future addition of a filter to increase the capacity of the plant to 5580 gallons per minute with three filters in service and one in reserve. The Iron and Manganese Removal Filtration System shall conform to the requirements of the California Department of Health Services.

The Contractor shall provide additional items not supplied by FSS but required by the Contract Documents to provide a complete and operable Iron and Manganese Removal Facility.

1.2.2 Hydraulically Operated Diaphragm Valves

Contractor shall furnish and install hydraulically operated diaphragm valves and all appurtenant materials, equipment, and work suitable for the services listed, complete and operable in accordance with requirements of

the Contract Documents and in conformance with the manufacturer's recommendations. Upon completion of installation, the work shall be tested to demonstrate compliance with the specifications.

1.2.2.1 Specific Project Requirements

a. Valve PCV-90101: Provide hydraulic operated 14 inch pressure sustaining valve set to hold an adjustable constant upstream pressure. Initial upstream pressure setting shall be 80 psi.

As pressure increases, the valve shall automatically open and modulate to hold the preset upstream pressure, bypassing flow as necessary. As pressure decreases, the valve shall automatically close.

Valve backpressure may be as low as 1 psi. Valve shall be equipped with anti-cavitation trim components.

Valve shall be equipped with a stem extension, limit switch to indicate closed position and speed controls for opening and closing.

b. Valve PRV-90102: Provide hydraulic operated 14 inch pressure relief valve set to relieve an adjustable high upstream pressure. Initial pressure shall be set at 85 psi.

As pressure increases, the valve shall automatically open and modulate to relieve pressure above set point. As pressure decreases, the valve shall automatically close.

Valve backpressure may be as low as 1 psi. Valve shall be equipped with anti-cavitation trim components.

Valve shall be equipped with a stem extension, limit switch to indicate closed position and speed controls for opening and closing.

c. Valve PRV-90610: Provide hydraulic operated 14 inch pressure reducing valve set to hold an adjustable constant downstream pressure. Initial downstream pressure shall be set at 50 psi.

Valve shall be solenoid operated and when solenoid is energized, the valve shall open and automatically modulate to hold the preset downstream pressure. As downstream pressure drops, the valve shall automatically open to maintain the preset pressure. As downstream pressure increases, the valve shall automatically close to maintain downstream pressure. The valve may close completely if downstream pressure is above the set point and there is zero flow to downstream facilities, even though the solenoid is energized open. When the solenoid valve is de-energized, the valve shall close.

Valve shall be equipped with a stem extension, limit switch to indicate closed position and speed controls for opening and closing. Solenoid coil voltage: 120 Vac, 60 Hz.

d. Valve PCV-90511: Provide hydraulic operated 14 inch pressure sustaining and pressure relief valve. Pressure sustaining valve shall be solenoid activated and valve shall automatically open and modulate to sustain a preset adjustable upstreatm pressure. Initial setting shall be 60 psi. As pressure increases, the valve shall automatically open and modulate to hold the preset upstream pressure, bypassing flow as necessary. As pressure decreases, the valve shall automatically

close to hold the preset upstream pressure. The valve may close completely if upstream pressure is below set point, even though the solenoid is energized.

When solenoid is de-energized, the valve shall close, except that the valve shall be equipped with a hydraulic-actuated high pressure relief which shall open the valve to relieve high pressure, even with solenoid de-energized. Initial relief pressure setting shall be 65 psi. As pressure increases above the set point, the valve shall open and relieve pressure. Valve shall modulate to maintain upstream maximum pressure. As pressure decreases, the valve shall automatically close.

Valve backpressure may be as low as 1 psi. Valve shall be equipped with anti-cavitation trim components. Valve shall be equipped with a stem extension, limit switch to indicate closed position, and speed controls for opening and closing. Solenoid coil voltage: 120 Vac, 60 Hz.

e. Backwash Supply Tank Fill Valves FCV-94101 and FCV-94102: Valves FCV-94101 and FCV-94102 shall be 4 inch rate of flow control valves, hydraulically controlled to hold a preset constant flow rate adjustable from 100 gpm to 400 gpm.

When the downstream isolation valve is opened, the respective valve shall open and modulate to maintain an adjustable constant flow rate based on differential pressure across the furnished orifice plate, sized by the valve manufacturer.

Valve inlet pressure will be approximately 75 psi maximum and 50 psi minimum. Downstream pressure will be as low as 5 psi. Valve shall be equipped with anti-cavitation trim components.

Each valve shall be equipped with stem extension, limit switch to indicate a closed position and speed controls for opening and closing.

f. Valve Style: Valves PCV-90101, PRV-90102, PRV-90610, and PCV-90511 shall be globe pattern equipped with reduced internal port with ANSI 150 lb flanges and shall be as manufactured by CLA-VAL Co., no substitutes.

g. High TDS Water: Due to high total dissolved solids (TDS) and hardness of the water being treated and the resulting potential for plating and calcium deposits, all valve interiors shall be factory epoxy coated. Pilot systems shall be equipped with oversized strainers and stainless steel tubing. All valves without anti-cavitation trim shall be equipped with "Dura-Kleen" stems designed with fluting to break off mineral deposits.

1.2.3 Magnetic Flow Meters

The Filtration System Supplier (FSS) shall furnish magnetic flow meters and all appurtenant materials and equipment. Magnetic flow meters shall be suitable for the services listed, complete and in accordance with requirements of the Contract Documents and in conformance with the manufacturer's recommendations.

1.2.3.1 Project Specific Requirements

All signal converters shall be integral mounted.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation; G

Drawings containing complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will properly function as a complete system. Clearly indicate proposed layout and anchorage of all equipment, valves, piping, vessels, support systems, and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation. Provide a complete listing of all equipment and materials of construction.

SD-03 Product Data

Valves, Piping, filter vessels, flow meters, equipment; G and all appurtenances including

Complete tank fabrication details including all required calculations and certifications as required by referenced Codes and Standards and the associated vessel support structural calculations. Provide filter media product description and data sheets. Provide details including data sheets for air compressor systems, flow meters, and all control and isolation valves including valve operators, Manufacturers' descriptive data and technical literature, performance charts and curves, catalog cuts, and installation instructions. Include valve performance capabilities (flow and pressure ranges) and confirmation of valve size selection for each pressure and flow control valve application. Provide electrical schematics and instrumentation specifications, and electrical load of all components. Provide as-built drawings showing the complete system layout including instrumentation diagrams, wiring diagrams and all other applicable devices. Provide Manufacturers' application performance guarantee for each valve, tank, flowmeter, and compressor system location.

SD-05 Design Data

Seismic design calculations; G

Seismic calculations for equipment and piping supports, and tank anchorage shall be stamped and signed by a Registered Civil or Structural Engineer currently licensed in the State of California.

SD-06 Test Reports

Test reports; G

Test reports in booklet form showing all testing required by the Specifications including all field testing performed to adjust

each component and all field test performed to prove compliance with the specified performance criteria upon completion and testing of the installed system. Each test report shall indicate the final position of controls.

SD-07 Certificates

Manufacturers' and System Supplier's Representatives; G

SD-10 Operation and Maintenance Data

operation and maintenance manuals; G

At time of delivery of Filtration System to facility, Contractor shall submit three (6) copies of operation and maintenance manuals and three (3) electronic copies on CDS prepared by FSS for the Filtration System operation, including operation and maintenance manuals for all components and equipment items, for review and approval by Engineer. These manuals shall contain all illustrations, Drawings, diagrams, and instructions necessary for starting up, operating, and maintaining the Filtration System. All illustrated parts shall be numbered for identification. Manuals shall include the as-built information and as-built shop drawings. Manuals for equipment components furnished by the Contractor shall be provided by said Contractor.

If revisions are required, one (1) copy will be returned to Contractor with the required revisions indicated. The required revisions shall be promptly incorporated with the manuals. When approved, a total of three (3) complete, identical manuals shall be furnished to District. After completion of facility start up and testing, all revisions needed to make the manuals conform to the facility as finally completed shall be made and Contractor shall submit to District six (6) complete bound manuals and three (3) CDs with all manual contents in "pdf" format.

The manuals shall have a table of contents and be assembled according to the table of contents with a tab divider sheet placed before each section. Reference drawings shall be folded and placed into separate binder envelopes. The manuals shall be bound in hardback binders with the following identification inscribed on the covers: "Eastern Municipal Water District, Perris II Desalter Iron and Manganese Removal Facility, Operation and Maintenance Manual". The manuals shall be utilized by Contractor and FSS during operation and maintenance instruction of District personnel.

Operation and maintenance manuals shall include, but not be limited to, the following:

a. General facility description.

b. General process description with process schematic diagrams.

c. Design criteria, including all design parameters.

d. Step-by-step procedures for the pre-startup and safety check, startup, normal operations, abnormal operations, emergency operations, shutdown, and troubleshooting for each specific item of equipment and for the entire system as a treatment facility.

e. Recommendations for Filtration System monitoring and analysis, including:

1. Facility monitoring locations and frequencies

2. Methods of analyses and evaluation for iron, manganese, chlorine residual.

3. Sampling locations and methods, sampling times, and sample storage/preservation.

4. Analytical schedule.

5. Record keeping.

6. Required safety equipment (laboratory analysis to be performed offsite).

f. Filtration System maintenance program, including equipment inspection, equipment lubrication, equipment rotation, testing and calibration, record keeping, and routine maintenance schedule.

Overhaul instructions including directions for disassembly, inspection, repairs and reassembly of the equipment; safety precautions; and recommended tolerances, critical bolt torques, and special tools that are required. Recommended procedures for equipment adjustment, calibration, and troubleshooting.

g. Descriptive literature, including illustrations, covering the operational features of the equipment, specific for the particular installation, with all inapplicable information omitted or marked out.

h. Complete Bill of Materials.

i. As-built shop drawings for Filtration System.

j. Parts list including generic title and identification number of each component part of equipment; including manufacturer and model.

k. Spare parts list including recommended number of parts to be stored at the site and special storage precautions.

l. Certified factory calibration data sheets for instruments and devices that require set-up and calibration. Submit detailed information on future calibration procedures, frequency, and troubleshooting.

m. Startup and testing plan with test logs for each item of equipment and each system, including start/operation/shutdown sequences, alarms, control circuits, flow rates, pressures, valve positions, and other parameters.

n. Provide an Equipment Summary Form and insert after the tab sheet of each equipment section.

o. Provide a signed written certification report with the Final Operation and Maintenance Manuals, certifying that the Filtration System equipment has been properly installed, adjusted, is free of any stresses imposed by connecting piping and anchor bolts, is suitable for satisfactory full-time operation under varying operating conditions, and meets all requirements specified in the Contract Documents.

Operation and Maintenance Manuals

Operation and maintenance manuals shall be provided in accordance with the requirements of the General Conditions, Section F - Labor and Construction, and Detailed Provisions, Specification 01430.

PART 2 PRODUCTS

2.1 Design Requirements

2.1.1 Performance and Design Criteria

The Filtration System shall consist of valves, piping, filter vessels, flow meters, equipment including all related appurtenances and shall be capable of removal of iron and manganese from raw water from the 12 well pumping plants supplying water to the Perris II Desalter Facilities to levels less than 15 Mg/L. The Filtration System shall comply with the performance requirements and design criteria specified herein and in the Special Conditions.

2.1.2 Pressure Design

Unless specified otherwise, the Filtration System shall be designed and furnished suitable for a system working pressure of 100 psi and a test pressure of 150 psi.

2.1.3 Seismic Design

Seismic design calculations and anchorage details shall be stamped by a civil or structural engineer currently registered in the State of California. Design criteria shall be as stated on Drawing G-10 Structural Construction Notes. Design shall consider operation, testing, or flooded weights of the unit or part of the unit to be anchored or otherwise restrained. Calculations and anchorage details shall be submitted for the following equipment:

- Filter Vessels

Anchorage calculations shall be based on 316 stainless steel wedge anchors or epoxy anchors, and 3,000 psi concrete foundations.

2.1.4 Safety Requirements

The equipment shall comply with the applicable requirements of the Safety Orders of the Division of Industrial Safety of the State of California. Copies of the Safety Orders are available at the Printing Division, Documents Section, State of California, Sacramento, California, 95814.

2.2 GENERAL REQUIREMENTS

The Filtration System shall consist of three (3) filter vessel units (1860 gpm nominal capacity each) with auxiliary equipment and components as specified herein and shown on the Drawings. The Filtration System shall be designed as a completely automated system requiring no day to day maintenance. The Filtration System shall automatically backwash the filter vessels when either of the following conditions occur: 1) when an adjustable time period of operation has elapsed; or (2) when a pressure differential of 10 psig develops across the filter vessel. Once the system

has been backwashed it shall commence a "rinse" or "purge" cycle, and then proceed with the filtration cycle.

2.3 OPERATIONAL DESCRIPTION

The Filtration System shall be designed to treat water from any combination of the existing 12 Desalter Wells. The operational descriptions for the Filtration System, are provided in Specification Section 40 95 00, SUPPLEMENT CONTROL STRATEGIES.

2.4 FILTER VESSELS

2.4.1 General

All filter vessels shall be horizontal cylindrical tanks of identical size and construction. All vessel connections 3 inch in diameter and larger shall be flanged nozzle type connections. Unless specified otherwise, flanges shall be 150 lb. ANSI B16.5. All vessel connections smaller than 3 inch in diameter shall be threaded 3,000 lb. full or half couplings. The filter vessels and appurtenances shall be designed for outdoor installation.

Filter vessels will be set on concrete slab foundations at grade level. Anchorage shall be designed by the FSS. Anchor devices (bolts, nuts, and washers) shall be 316 stainless steel and shall be furnished with the Filtration System.

2.4.2 Fabrication

Filter vessels shall be single compartment, horizontal cylindrical vessels with dished heads, fabricated of carbon steel, and designed and tested in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1. Vessels shall have a minimum working pressure rating of 100 psig and test pressure rating of 150 psig. Each vessel shall have a permanently attached nameplate bearing the ASME pressure vessel label. All members shall be fully seal welded to prevent moisture between abutted member surfaces.

2.4.3 Filter External Appurtenances

As a minimum, each filter vessel shall be provided with the following external appurtenances:

1. Inlet Nozzle: One (1) 12 inch (minimum) diameter, flanged, end mounted.

2. Outlet Nozzle: One (1) 12 inch (minimum) diameter, flanged, end mounted

3. Two (2) structural steel saddle support legs (minimum) fully welded to the vessel and suitable for mounting to a reinforced concrete foundation. Support saddles shall be of adequate height to provide a minimum of 6 inch clearance beneath the vessel.
4. Two (2) lifting lugs.

5. Access Manways: Two (2) 14 inch x 18 inch (minimum) elliptical, side mounted. One (1) 24 inch (minimum) diameter hinged, end mounted.

6. Drain Outlet: One (1) 4 inch diameter, flanged, bottom mounted.

7. Air/Vacuum Release Valve Outlets: Two (2) 2 inch diameter, threaded, top mounted.

8. Pressure Gauge/Sample Cock/Differential Pressure Switch at Inlet: One (1) 3/4 inch diameter, threaded, at side of inlet nozzle.

9. Pressure Gauge/Sample Cock/Differential Pressure Switch at Outlet: One (1) 3/4 inch diameter, threaded, at side of outlet nozzle.

10. Pipe Support Brackets: Four (4) 3 inch x 3 inch x 1/4 inch thick steel angles (6 inch long) welded along vessel springline and 45 degrees above spring line for air valve vent piping support attachments.

11. Solenoid Panel Support Brackets: Four (4) steel angels welded near vessel springline at inlet/outlet end of vessel for support of the NEMA 4x Panel containing the solenoid valves for the automatic butterfly valves.

12. Anchors for Concrete Sub-Fill: Hooks shall be welded to the shell bottom to anchor concrete sub-fill to assist in a positive distribution of water flow. Contractor will install the concrete sub-fill and rebar and/or wire mesh in the bottom of the vessel. A sealing joint at the top perimeter of the concrete and vessel wall shall be constructed using an elastomeric polyurethane sealant. Contractor will be responsible for furnishing and installing concrete, rebar, wire mesh, and sealant. Shop drawings and erection instructions shall clearly show the work required.

13. Face Piping, Fittings, and Automatic Butterfly Valves: All filter vessel face piping, fittings, and automatic butterfly valves connected to the inlet and outlet of the vessel shall be provided as shown on the Drawings. Face piping, fittings, and automatic butterfly valves shall be provided in accordance with the requirements specified herein.

Drain and air/vacuum release valve connections shall be provided with isolation valves. The drain isolation valve shall be furnished with a blind flange.

2.4.4 Filter Internal Appurtenances

As a minimum, each filter vessel shall be provided with the following internal appurtenances:

1. Inlet Distributor: One (1) full length header and lateral inlet distributor/backwash collector system, constructed of corrosion resistant material. The distributing system shall be designed for uniform distribution of inlet water over the entire filter bed and for the uniform collection of backwash water during the backwash operation.

2. Underdrain System: One (1) full length header and lateral underdrain system, constructed of corrosion resistant material. The underdrain system shall be designed to uniformly distribute backwash water and for collection of filtered water.

All couplings, support braces, retaining screens, and hardware used for construction of the internal components shall be stainless steel.

2.4.5 Coatings

1. General: All filter vessel interior and exterior surfaces shall be cleaned and finished to remove all weld splatter or surface irregularities. All sharp edges and corners shall be ground and finished to provide a minimum 1/8 inch radius. All coating materials shall be applied in strict accordance with the coating manufacturer's printed instructions.

Surface preparation (sandblast) and application of each coat of the coating systems shall be inspected by an independent third party NACE licensed coating inspector. All costs for third party inspection shall be paid by the FSS. Thickness and holiday testing shall be performed as well as required corrective work. Certified inspection test reports shall be submitted to the District for approval a minimum of two weeks prior to equipment shipment. District shall be able to communicate directly with the coating inspector.

Precautions shall be taken during shipping and handling to protect coatings. Filtration System shall be covered with tarps to prevent coating damage and road film accumulation during shipping.

2. Interior: All filter vessels, shall have interiors (including vessel internal ferrous components) coated as specified herein.

All interior surfaces shall be sandblasted in conformance with SSPC-SP10 (near-white blast cleaning) to achieve a 1.5 to 2.5 mil (40-60 micron) blast profile. Interior coating system shall be certified by the National Sanitation Foundation to be in accordance with ANSI/NSF Standard 61 for potable water.

The coating system shall consist of at least two coats of a high solids epoxy, as manufactured by Tnemec, Carboline, Keysite, or equal. The prime coat shall have a minimum dry film thickness (MDFT) of 6.0 mils. The finish coat shall have a MDFT of 6.0 mils. The total dry film thickness of the complete system shall be 12.0 mils, minimum.

FSS shall submit color charts to District. Colors for interior of vessel shall be selected by the District

3. Exterior: All exterior surfaces shall be sandblasted in conformance with SSPC-6 (commercial blast cleaning).

The coating system shall consist of one (1) prime coat of a two-component zinc-rich primer, Tnemec 90-97, or equal. The prime coat shall have a MDFT of 2.5 mils.

2.4.6 Shop Assembly

The Filtration System, including filter vessels shall be shop assembled.

The remaining filter vessel internal components, media, valves, meters, analyzers, control panel, and system ancillary equipment shall be shipped loose to the project site for installation by the Contractor.

2.5 FILTER MEDIA

The FSS shall provide one (1) complete load, plus an additional 5 percent of each type of media, including supporting layers. FSS shall design media

and supporting layers to provide performance specified herein. Media and supporting layers shall not decompose over time. FSS shall ensure that no material from the media or supporting layers escapes from the filters and passes to the downstream Desalter Facilities, including reverse osmosis membranes. Media and any supporting layers shall be compliant with the National Sanitary Foundation, ANSI/NSF Standard 61 for potable water contact.

The filter media shall not be loaded until the filtration equipment has been completely installed, pressure tested, readied for operation, and certified by the FSS. Filter media loading shall be performed by the Contractor with onsite technical assistance by the FSS's service personnel.

All media, gravel, and anthracite shall be pre-processed prior to bagging to ensure proper size gradation and quality. The extra amount of filter media, anthracite, and gravel material (5 percent of the total filter vessel amounts required) shall be furnished to the District in sealed containers.

2.6 MAIN CONTROL SYSTEM

FSS shall furnish the Filtration System Main Control Panel (MCP), including programmable logic controller (PLC) and programming as required to provide operation of Plant facilities as described herein. The MCP shall interface with the District's existing Desalter Facilities (Plant SCADA).

The MCP shall control the operation of all Iron and Manganese Removal Facilities, including equipment systems not furnished by the FSS. Equipment systems to be controlled by the MCP, but not furnished by the FSS, include: the backwash supply tank and pump system, backwash waste tank and recycle pump system, sodium hypochlorite feed systems, sodium bisulfite feed system, and various control valves. The MCP shall be furnished in accordance with Specification Section 40 95 00, SUPPLEMENT CONTROL STRATEGIES.

2.6.1 General

1. Provide a complete PLC-based control sysytem for the IRON AND MAGANESE REMOVAL FILTRATION in accordance with requirements in Section 40 99 90, PACKAGE CONTROL SYSTEMS. Provide Operator Interface Terminal (OIT) for system monitoring, alarms, and control.

2. System Supplier shall provide complete control software, fully functional and debugged, as required for system operation.

3. Equip PLC with Ethernet TCP/IP interface for connectivity with plant-wide process control data network system.

4. Deliver system with fully debugged and annotated application software, for both PLC and OIT. Software application to be delivered in electronic file format compatible with plant programming software.

2.6.2 Control Panel

1. Panel number: MCP-900.

2. Enclosure: NEMA Type 4X, 316 stainless steel.

3. Features:

a. Main power disconnect.

b. PLC system including power supply, processor, communication modules, and input/output modules for discrete and analog signals.

c. OIT mounted on front of panel, hinged pad lockable protective cover.

d. Operate from FSS UPS, to power PLC and communication equipment for 5 minutes for proper PLC shut down.

e. Enclosure mounted air conditioner.

4. System control logic provided by PLC, where operating parameters are measured, scaled, reported, and controlled. Safety functions shall be fail-safe and hard-wired.

2.6.3 Operator Controls and Indicators

1. Power ON indicator light.

2. Display process measurements on digital panel indicators.

3. Display operating parameters, modes, status, and alarm conditions on a color graphic OIT mounted on front door of panel. OIT to be touch-screen type, or include membrane keypad.

2.6.4 External Interfaces

1. Provide an Ethernet network switch for interconnection of PLC, OIT, and plant network, and to allow connection of programming equipment. Interface to plant network shall be by multi-mode fiber optic cable. Provide fiber patch panel and fiber network port on Ethernet switch for plant network connection.

2. Coordinate IP addresses with Owner and plant control system programmer to ensure compatibility with other control system network.

3. Make available, through the Ethernet communication network, key process parameters, status and alarm conditions for monitoring by a separate plant control system.

4. Provide parameters stored in an array format, or in a single user-defined data structure, to allow data to be read by a single message request. For each parameter, document data type (Boolean, integer, floating point), scale range and engineering units, and active state.

2.6.5 Functional Requirements

1. Refer to Section 40 95 00, PROCESS CONTROL, SUPPLEMENT CONTROL STRATEGIES for detailed description of functional requirements. Coordinate controls with Plant Control system to ensure orderly operation.

2.6.6 Power Requirements

1. Control Panel Power Supply: 120 V ac, single-phase,

uninterruptible power supply (UPS) located in MCP.

2.6.7 Special Requirements

1. Software shall include security measures to prevent anauthorized modification of PLC code or parameters. Provide passwords and other security system logon requirement upon completion of system commissioning.

2.7 AUXILIARY EQUIPMENT, MATERIALS, AND COMPONENTS

The FSS shall furnish the following auxiliary equipment and components of the Filtration System, as a minimum. A complete and operable Filtration System may require additional components that may not be listed in this section. The FSS shall furnish all components necessary to provide a complete and operable Filtration System in accordance with the Contract Documents.

Required components not specified hereafter, shall be provided in accordance with applicable Detailed Provisions (Technical Specifications) included in the Contract Documents.

2.7.1 Compressed Air System

The compressed air system shall be designed to supply air to automatic valves for operation of the Filtration System. Design of compressor and receiver tank shall be such that actual compressor run time will not exceed 8 hours per day for a system capable of treating 5,580 gpm of raw water (3 filter vessels). As a minimum, the air supply system shall be capable of providing not less than 6.5 cfm of clean, oil free, dry air, compressed at 125 psig pressure under standard atmospheric conditions of 14.7 psi pressure, 68 degrees F temperature, and 30 percent relative humidity. The air supply system shall consist of a two-stage, duplex air compressor with air filter, 80 gallon (minimum) receiver, refrigerated air dryer pressure regulators, low oil level shutdown switch, low air pressure switch, and gauges and air compressor unit sound enclosure suitable for outdoors location. All controls and electrical controls as necessary to automatically start and stop the compressor at the appropriate air pressures shall be provided in a unit mounted control panel as specified herein. The control system shall automatically alternate the operation of each compressor. In no case shall the control system permit both compressors to operate simultaneously. FSS shall obtain a California Division of Occupational Safety and Health (DOSH) permit to operate on behalf of the District for the compressed air system as specified herein and in accordance with California Code of Regulations, Title 8, Chapter 4, Subchapters 1 and 2. FSS shall coordinate permit inspection(s) with Contractor and pay all costs for said inspection(s) and permit fee.

The compressed air supply systems shall be as manufactured by Gardner Denver, Ingersoll-Rand, Saylor-Beall, or equal.

1. Compressor: The compressor shall be a single acting reciprocating unit, capable of operating unattended for a period of eight hours at rated speed, capacity, and pressure. All parts subject to wear or service shall be field serviceable, and the compressor shall require only minimum maintenance. Cover plates for access openings shall be oil-and dust-tight. The compressor shall be air cooled or liquid cooled. The cylinder cooling area shall be adequate to prevent excessive heating. Air passages shall be unrestricted. The crankcase or

oil pump shall be provided with means for filling and draining oil and for checking the level of the oil except when sealed anti-friction bearings are used. Pressure lubricated compressors shall be provided with an oil pressure gauge mounted on the front of the compressor. The compressor and the motor shall be mounted on a substantial, single, unified frame assembly. Cylinder arrangement shall be vertical or V-type. Pistons shall be of the automotive type, equipped with piston rings of which at least one shall be an oil ring. The compressor shall be mounted on the receiver tank.

The compressor shall be provided with a low oil level shutoff switch and inlet filter/silencer. The filter shall be of the dry type, with replaceable element. The air filter/silencer shall be readily removable for cleaning.

2. Receiver: The air receiver shall be constructed in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Pressure Vessels, and shall carry the official ASME code symbol stamp. The air receiver tank shall be 80 gallon size (minimum), horizontal, with a minimum working pressure rating of 200 psig. Unless otherwise specified, the volume of the receiver, in cubic feet, or gallons shall be manufacturer's standard size for compressor requested. The receiver tank shall be furnished with a top mounted steel plate support for the compressor and air dryer, and shall be provided with support legs and vibration isolation pads suitable for anchoring directly to a concrete pad.

The receiver shall be equipped with an ASME spring-loaded safety valve, air pressure gauge, line shutoff valve, and solenoid type automatic drain trap valve with manual bypass. The air pressure gauge shall have a pressure range of 0 to 200 psi.

3. Electric Motor and Drive: The electric motor shall be 3 hp, maximum, TEFC with a 1.15 service factor, premium efficiency and suitable for operation on 480 volt, 3 phase, 60 hertz power. The motor shall conform to NEMA MG 1. The motor shall have a horsepower nameplate rating at least equal to the horsepower required for continuous operation of the compressor at full load, service factor shall not be used for load. Unless otherwise specified, starter shall be furnished with capacity and electrical characteristics suitable for the motor according to NFPA 70.

The compressor shall be driven by a single or multi-V-belt with belt guard. Belt guards shall be OSHA approved.

4. Air Dryer: The air dryer shall be refrigerated cycling type with automatic temperature control utilizing a thermostatic valve in conjunction with a heat sink to cycle the refrigeration system in response to any load fluctuations over the full capacity of compressor without any chance of freeze up. The dryer shall not use a hot gas bypass valve, nor capillary tubes and shall have a solenoid type automatic drain trap. The dryer shall be provided with on-off power switch. The air dryer shall be furnished separate for installation by Contractor. Power for air dryer shall be supplied by the CCP.

5. Electrical Equipment and Controls: The Compressor Control Panel (CCP) shall consist of a combination starter for the compressor motor, ON-OFF switch, alarm reset push button, elapsed time meter, alarm relays and lights, and control voltage transformer suitably sized for

all control wiring. The CCP shall be provided with a steel support frame and shall be factory mounted to the compressor assembly. All switches, push-buttons, and lights shall be oil tight and dust-tight. The CCP enclosure shall be NEMA 4X, 316 stainless steel. All switches, push-buttons, lights, and elapsed time meters shall be mounted to the CCP door. As a minimum, the CCP shall be provided with alarm relays and lights for "low oil level shutoff" and "low system air pressure".

Compressed air system shall only require main power to be fully operational. Electrical power furnished to the CCP shall be 3 phase, 60 hertz, 480 volts, maintained within industry standards. Voltage tolerance shall be plus or minus 10 percent.

Differential and single setpoint pressure switches shall be provided for start-stop control of the compressor motor and for sensing low pressure in the air system.

When the ON-OFF switch is in the "ON" position, a unit mounted differential pressure switch shall provide start-stop control to automatically start the unit when the air receiver pressure drops to an adjustable minimum setting and to stop the operation when an adjustable maximum pressure setting is reached. Start stop pressure settings for the compressed air system shall be determined by the FSS for the proposed equipment.

When the unit mounted single setpoint pressure switch is activated on falling pressure, a relay shall be energized and a "low system air pressure" alarm light shall be activated. The alarm light shall remain latched "on" until the alarm reset push-button is depressed. The low pressure alarm setpoint shall be determined by the FSS.

The "low system air pressure" and "low oil level shutoff" alarm relays shall be provided with spare N.O. dry contacts for connection to the MCP.

6. Appurtenances: As a minimum, the compressed air system shall be provided with the following appurtenances:

a. Air Filter. The filter shall be replaceable element, color change type suitable to remove 99.9 percent of 0.5 micron particles and oil aerosols and shall be sized for compressor rate at 125 psig with a maximum pressure drop of 4 psig over the element life. The filter shall be piped into the system with bypass piping for changing the element without system shutdown.

b. Pressure Regulator. Pressure regulator shall suitable for a maximum inlet pressure of 150 psig and shall be capable of outlet pressure adjustment from 50-125 psig. Pressure regulator shall be constructed with an aluminum or brass body and NPT connections, and shall be provided with an integral pressure gauge. Pressure regulator shall be as manufactured by Norgren, Parker Hannifin, or equal.

2.7.2 Automatic Butterfly Valves

As a minimum, FSS shall provide 12 inch diameter (minimum) automatic butterfly valves at the locations indicated on the Drawings to control the operation of the three (3) filter vessels. Butterfly valves and actuators shall be furnished in accordance with the requirements specified herein.

1. Butterfly Valves: Butterfly valves shall be of the wafer body design for installation between 125 lb. flat face or 150 lb. raised face flanges. The valve shall be non-directional and of the dry stem journal design, providing bubble-tight shut off at 200 psi differential pressure.

Valve bodies shall be stainless steel in accordance with ASTM A 351/A 351M (CF8M). Valve bodies shall be provided with an integrally cast top plate for direct, flush-mounting of actuator, and with valve neck of sufficient length to allow for flange clearance and piping insulation. Valve stems shall be Type 316 stainless steel of the non-wetted two piece design with the lower stem acting as a trunnion for the valve disc and the upper stem being the drive shaft.

The valve disc shall be of a high flow design and constructed of 316 stainless steel in accordance with ASTM A 351/A 351M (CF8M). The valve disc to stem engagement shall have no mechanical fasteners, allowing the valve disc to float to a perfect seal in the valve seat. The valve seat shall have a rigid phenolic backup ring with Buna-N elastomer bonded to it, rendering the valve seat suitable for pressure or vacuum service. The valve seat shall incorporate its own flange seals and they shall mate with full face or raised face flanges. The valve seat shall fully isolate the valve body, stem, and journal areas from the flowing media and shall be field replaceable.

The valve body shall incorporate O-ring secondary seals to maintain lubricant in the stem journals and eliminate exterior moisture from the stem journals.

All wafer butterfly valves shall be the product of a single manufacturer, and shall be Demco Series NE-C, or equal.

2. Valve Actuators: The butterfly valve actuators shall be of double acting pneumatic type as specified herein. The actuator shall be a totally enclosed pneumatic rotary actuator and shall be directly attached to the valve mounting flange or top plate, without the use of special brackets, linkage or couplings. The actuator shall be of the rack and pinion type, providing constant output torque throughout travel. All units shall be factory tested to insure proper operation, and factory lubricated for actuator service life. A smooth, self-draining body shall be provided to resist moisture. The actuator shall have integral porting to eliminate external tubing. Localized mechanical position indication shall be provided and be readable from a distance of 25 feet by use of contrasting colors. The standard operation shall be 0-90 degrees reversible operation for air. Actuator shall be capable of operating in any valve mounting attitude, and capable of being mounted either in line or transverse to the pipeline. Valve manufacturer/supplier shall be responsible to ensure proper selection and operation of valve/operator assembly.

Butterfly valve actuators shall "fail-closed" upon loss of power to Filtration System and loss of control by the MCP (MCP loss of power or PLC failure). Solenoid control valves for actuators shall cause the actuators to close the butterfly valves on loss of power.

a. Materials of Construction. The actuator body, end caps and spring cartridge housings shall be made of precision extruded, hard anodized aluminum. The pistons shall be a hard anodized

aluminum alloy. The actuator drive shaft and pinion shall be of hardened and tempered alloy steel. All fasteners shall be electroless nickel-plated. The piston seals and "O" rings shall be made of nitrile rubber. The bushings shall be acetal plastic for maximum efficiency and elimination of galvanic action.

b. Service Requirements. The actuator shall be suitable for operation in temperatures ranging from -13 degrees to 200 degrees F. The actuator shall be designed for pneumatic operation up to a maximum pressure of 125 psi. Filtered air shall not be required for proper operation. The actuator design shall have been tested for a minimum 100,000 cycles under full load with no appreciable wear of parts.

The actuators shall be sized for an 80 psi minimum supply air pressure and shall have an output torque greater than the required operating seating and unseating torque of the butterfly valve. Butterfly valve torque used for sizing purposes shall be the wet torque as published by the butterfly valve manufacturer.

c. Accessories. Speed Controllers: Each actuator shall be equipped with speed controllers. Speed controllers shall allow adjustment of butterfly valve opening and closing speed.

Travel Stops: Travel stops for the actuator shall consist of a mounting plate, with stop cam, fitted between the base of the actuator and the valve mounting flange, and shall be externally adjustable through the full 90 degree of valve travel.

d. Limit Switch. Single-pole, double-throw (SPDT) type, rated 10 amps at 120 volts ac. Housed in NEMA 4X enclosure. Adjustable for OPEN and CLOSED valve positions.

All pneumatic actuators shall be the product of a single manufacturer, and shall be TruTorq, or equal.

2.7.3 Filter Face Piping and Fittings

FSS shall furnish all filter vessel face piping and fittings between the inlet and outlet of each filter vessel. Piping shall be super duplex stainless steel, Schedule 10S in accordance with ASTM A 790, Grade S32750 (Alloy 2507) and Specification Section 40 05 13 PIPELINES, LIQUID PROCESS PIPING with ANSI B16.5, Class 150 flanges (flat faced). Fittings shall be standard weight with ANSI B16.5, Class 150 flanges (flat faced).

Face piping and fittings shall be furnished with all gaskets, nuts, and bolts required for installation by Contractor in accordance with Specification Section 40 05 13 PIPELINES, LIQUID PROCESS PIPING.

2.7.4 Automatic Rate of Flow Control

Automatic rate of flow control valves shall be hydraulically operated, pilot controlled with an electronic control system, diaphragm-actuated and in globe pattern.

1. Control Valves: Valves shall maintain a constant flow rate regardless of fluctuations in system pressure. Main valve body and cover shall be ductile iron ASTM A 536 with Class 150 flanges, fusion bonded epoxy lined (12 mils). Main valve trim, stem and spring shall

be Monel, with external position indicator. Tubing and fittings, Y strainer and isolation valves shall be Type 316 stainless steel. Orifice plates required for flow control shall be sized and furnished by the valve manufacturer. Materials of construction of orifice plates shall be Monel. Valve and pilot system shall be suitable for a working pressure of 150 psi, minimum. Main valve pilot control shall be Type 316 stainless steel with Monel trim.

Where anticavitation trim is required, the valve manufacturer shall fabricate interlocked sleeves containing radial slots that deflect internal flow to impinge upon itself in the center of the flow path. Materials of construction for the sleeves shall be Monel.

The diaphragm may be replaced without removing the valve from the piping. Alignment pins shall be provided to assure proper re-assembly of the cover to the valve body after maintenance or inspection.

Control valves shall be provided with Type 316 stainless steel pilot solenoid valves for operation with the electronic control system and automatic flow adjustment. Hydraulic control lines shall use orifice fittings and speed control valves. Needle valves are not permitted. Maximum pressure loss through the valve shall be 3 psi.

Control valves shall be sized to accurately control rate of flow to filters for filtration, backwash, and rinse, sequences. Valves shall be as manufactured by CLA-VAL Co., or equal.

2. Valve Process Controller: The Valve Process Controller (VPC) (Controller) shall provide the interface between the MCP PLC and the control valve. The associated flow meter signal shall be transmitted to the Controller and received as a 4-20 mA feedback signal. The Controller shall be capable of local manual setpoint control and full manual control of control valve solenoids. Provide analog signal isolators for all 4-20 mA signals.

Upon receiving the setpoint command signal from the MCP PLC, the Controller shall signal the control valve to move and maintain the valve at the desired setpoint. A digital display of current status and setpoint value in scalable engineering units shall be supplied.

The Controller shall compare the flow rate setpoint and feedback values and adjust the valve accordingly to achieve the setpoint. When the feedback signal deviates from the setpoint value, the appropriate opening or closing solenoid on the control valve shall activate. As the feedback signal approaches the setpoint, the solenoid output will pulse on and off to gradually return the measurement to setpoint. One solid state relay shall energize for measurement conditions below the setpoint, while the other shall energize for measurement conditions greater than the setpoint. These outputs shall be wired through intermediate relays to the opening and closing solenoids on the control valve. Solenoid output indicator lights shall illuminate when either the open or closed solenoid is activated.

The total cycle time between each pulse shall be programmable between 1 and 120 seconds. The duration of each pulse shall be directly proportional to the deviation from setpoint outside of an adjustable deadband. The time proportioned outputs shall be independently adjustable for conditions above and below the setpoint to properly tune valve response. The time proportional output band width shall be

independently programmable between 1 and 999 percent of full scale. When the feedback signal returns within the deadband zone, the valve shall maintain position. Provision shall be made to open/close/maintain position in the event of a loss of the feedback signal.

The operator interface shall consist of two rows of alphanumeric characters to display numeric values and units. Color coded alarm, status, and mode indicators shall inform the operator of operating conditions. Security key codes shall protect against undesired changes to the Controller. All programming shall be menu driven.

The Controller shall be flush mounted to the MCP door. The Controller shall be all solid-state construction with the internal chassis capable of being removed for inspection and adjustment. All program memory, including setpoints and tuning parameters, shall be protected by an internal lithium battery rated for 10 year life.

Remote communications shall be accepted through a 4-20 mA DC analog setpoint signal. When remote operation is selected, the Controller shall monitor the remote setpoint signal. When local control is selected, the setpoint shall be changed at the Controller keypad.

Remote digital communications shall be provided. The Controller shall be capable of direct linkage to a computer or other instrumentation which has RS-232 or RS-485 communications. The VCP shall be the Cla-Val Model 131VC-1, as manufactured by Cla-Val, or equal.

3. Filter Effluent Automatic Rate of Flow Control Valves: FSS shall provide three (3) filter effluent automatic rate of flow control valves with 12 inch diameter body and 10 inch internals. The valves shall have a flow capacity equal to the treatment design flow for each filter vessel, with a maximum pressure loss of 3 psi through the globe valve.

The filter effluent rate of flow control valves shall be provided with solenoid valves and an electronic control system for automatic flow adjustment. The flow to the filter vessels shall be evenly distributed through the operating filters according to a total flow setpoint selected by the District Operators via the Plant SCADA and transmitted to the MCP PLC.

4. Filter Backwash Automatic Rate of Flow Control Valve: FSS shall provide one (1) 12 inch filter backwash automatic rate of flow control valve. The valve shall have a flow capacity based on the required backwash flow rate with a maximum pressure loss of 3 psi through the globe valve.

The filter backwash rate of flow control valve shall be provided with solenoid valves and an electronic control system for automatic flow adjustment. The filter backwash rate of flow control valve shall have a mechanical limit stop. The stop shall extend through the cover of the valve and limit the opening distance of the valve, and shall function independently of the electronic control system.

2.7.5 Flow Meters

FSS shall furnish one (1) backwash supply magnetic flow meter and three (3) filter effluent magnetic flow meters in accordance with Specification Section 40 95 00, PROCESS CONTROL.

2.7.6 Design and Construction

The magnetic flow meter shall use characterized electromagnetic induction to produce a voltage linearly proportional to the average flow rate. Each magnetic flow meter shall be microprocessor based, and utilize D.C. bipolar pulsed coil excitation, automatically re-zeroing after every cycle. The sensor shall be a carbon steel flanged tube with PTFE liner and nominal diameter as listed herein.

External surfaces shall be factory finished with a high build epoxy paint or better for corrosion prevention. The flow meter electrodes and built in grounding electrodes shall be Type 316 stainless steel. If built in grounding is not provided Type 316 stainless steel grounding rings shall be mounted in each end of the meter.

The preamplifier input impedance shall not be less than 1011 ohms and shall be capable of operating with a power supply of 120 volts ±10%, 60 hz ±5% and power consumption shall not exceed 11 VA. The sensor shall be NEMA 4X, accidental submergence proof (30 ft/48 hours).

Accuracy of the flow meter system shall be ±1% of rate above 1 fps and ±0.1 percent of full scale below 1 fps. Accuracy shall be verified by calibration in a flow laboratory traceable to NIST SP 250. The flow meter system shall be capable of accurately measuring slurries and water with entrained air. The meter shall incorporate an empty pipe detection feature which shall cause the meter to register zero flow when the sensor is not full. Where shown on the Drawings, the meter shall be provided with a positive zero circuit to register zero flow when pumping units are not operating. A closed external dry contact (generated by pump "off" or other similar equipment control signal) input to the flow meter shall drive the meter output to zero.

2.7.7 Schedule of Magnetic Flow

The following magnetic flow meters shall be furnished and delivered by the FSS for installation by Contractor:

Location	Service	Nominal Dia. (inches)	Pressure Rating (psi)	Flow Range (gpm)
Filter Effluent Control:				
Filter No. 1	Water	12	150	0 to 3,000
Filter No. 2	Water	12	150	0 to 3,000
Filter No. 3	Water	12	150	0 to 3,000
Backwash Supply Control Water	Water	14	150	0 to 4,000

2.7.8 Miscellaneous Filter Valves and Appurtenances

1. Filter Vessel Drain Valves: Each filter vessel shall be furnished with one (1) fusion bonded epoxy lined resilient seated gate valve for connection to the filter vessel drain outlet. Resilient seated gate valves shall be flanged, 4 inch diameter, and shall be manufactured in accordance with AWWA C509. Valve shall have a non-rising stainless steel stem, cast iron body and disc in conformance with ASTM A 126, Class B, and flanges in full conformance with ANSI B16.1, Class 125.

Valve disc shall be permanently bonded with resilient material to ensure drip tight shut-off. Valves shall have two stem seal O-rings of Buna N to prevent leakage through the stem. Valves shall be the product of a single manufacturer.

2. Filter Vessel Air-Vacuum Valves: Each filter vessel shall be furnished with two (2) air and vacuum release valves for connection to filter vessel 2 inch diameter top outlets. Air and vacuum release valves shall be 1 inch diameter (minimum) with threaded inlets. Valves shall have ductile iron bodies and covers, stainless steel floats rated 1,000 psi minimum, all stainless steel internal working parts, and EPDM seat material. Seat material shall be selected for a working pressure of 75 psi. Valves shall be suitable for working pressures up to 150 psi. Valve interiors shall be completely fusion bonded epoxy coated (8 to 12 mils) in accordance with AWWA C550 (latest).

Valves shall be as manufactured by APCO, Val-Matic, Crispin, or equal.

Each air and vacuum release valve shall be provided with a stainless steel isolation ball valve, sized to match the inlet of the air valve.

3. Small Isolation Valves and Sample Cocks: Small diameter (2 inch or less) isolation valves for air and vacuum valves, pressure gauges, and switches shall be ball valves with teflon seats, threaded ends, and 316 stainless steel body, ball, stem, and jam nut. Ball valves shall be as manufactured by Stockham, Milwaukee, or equal.

Sample cocks shall be provided at the inlet and outlet of each filter vessel. Sample cocks shall be constructed of 316 stainless steel.

2.7.9 Miscellaneous Filter Instrumentation and Control Devices

1. Differential Pressure Switch: Each filter vessel shall be provided with one (1) snap acting differential pressure switch with a NEMA 4X enclosure to detect the differential pressure across the filter inlet and outlet. Switch shall have SPDT contacts rated 10A at 120 Vac.

2. Pressure Gauges: Each filter vessel shall be provided with two (2) liquid filled pressure gauges with minimum 4 inch diameter dials and stainless steel bourdon tubes for connection to filter inlet and outlet.

Each pressure gauge and sample cock assembly shall be furnished with manual isolating valves and threaded 316 stainless steel Schedule 40 pipe and fittings.

3. Solenoid Valves: Electro-pneumatic solenoid valves shall be provided for automatic butterfly valve operation. Solenoid valves shall be rated for a minimum of 150 psi air working pressure and shall be provided with NEMA 4X enclosures. Solenoid valve coils shall be rated for continuous duty. Solenoid valves shall be provided with a manual override.

Solenoid valves and differential pressure switch for each filter vessel shall be mounted in a separate stainless steel NEMA 4X enclosure equipped with a terminal block. Enclosure shall be furnished with back panel for mounting solenoid valves and differential pressure switch, solid hinged door, and padlockable door hasp. Enclosure shall be suitable for mounting on each filter vessel.

2.7.10 Anchorage

All equipment to be furnished under these Specifications shall be furnished with all necessary anchor bolts, nuts, washers, sole plates, structural steel supports, anchor tie rods, turnbuckles, jacking pads, leveling jacks, and other material necessary for anchoring the equipment to the foundations. Unless specified otherwise, all anchor bolts, nuts, and washers shall be Type 316 stainless steel. Anchor bolts for filter vessels shall be provided with leveling nuts.

2.7.11 Protective Coatings

1. Filter Face Piping and Fittings: Interior: All interior surfaces shall be sandblasted in conformance with SSPC-SP10 (near white blast cleaning) to achieve a 1.5 mil to 2.5 mil (40-60 micron) blast profile. All interior surfaces shall be fusion bonded epoxy lined (12 mil thickness). Interior coating system shall be certified by the National Sanitation Foundation to be in accordance with ANSI/NSF Standard 61 for potable water.

Exterior: All exterior surfaces shall be sandblasted in conformance with SSPC-6 (commercial blast cleaning). The coating system shall consist of one prime coat of a two component zinc-rich primer, Tnemec 90-97, or equal. The prime coat shall have a MDFT of 2.5 mils.

2. Auxiliary Equipment and Components: Unless specified otherwise, auxiliary equipment and components specified herein shall be provided with factory finish coatings. Colors available shall be submitted to the District for selection.

3. Butterfly Valves, Rate of Flow Control Valves, and Flow Meters: Exterior of butterfly valves, rate of flow control valves, and flow meters shall be compatible with field finish coating system. Field finish coating system shall consist of one (1) to two (2) coats of high solids epoxy followed by one (1) coat of polyurethane.

2.7.12 Spare Parts

The following spare parts shall be provided for equipment specified herein:

1. One (1) complete set of manhole gaskets for each filter vessel (three (3) per filter vessel).

2. One (1) complete set of flange gaskets for face piping and fittings on one (1) filter vessel.

2.7.13 Inspection

District reserves the right to inspect the Filtration System during any stage of construction at the FSS's plant. The FSS shall provide the District with construction schedule monthly. FSS shall provide minimum ten (10) days notice to District prior to testing, sandblasting, and coating.

PART 3 EXECUTION

3.1 GENERAL

The Filtration System shall be fabricated, furnished, and delivered to project site by the FSS where it will be unloaded, stored, assembled,

erected, and placed into operation by the Contractor. FSS shall provide printed erection instructions and recommendations as specified herein. In addition, FSS shall furnish a service engineer to provide technical direction to the Contractor during installation, testing, and startup.

3.2 ENGINEERING SERVICES FURNISHED BY FSS

The filter supplier shall provide service personnel to be at the Project site the number of man-days listed herein. Costs are to include travel and subsistence. The work required shall include, but not be limited to, the following:

a. Filtration System unloading and storage coordination, inventory upon delivery of all equipment and material, and initial installation instructions to Contractor - 2 trips and 16 hours onsite (2 working days).

b. During media installation - 1 trip and 40 hours onsite (5 working days).

c. When installation is 95% complete - 1 trip and 8 hours onsite (1 working day).

d. Pre-startup and coordination with District's SCADA Subcontractor - 1 trip and 8 hours onsite (1 working day).

e. Filtration System startup, testing and initial operation - 2 trips and 64 hours onsite (8 working days, 1 day for startup and testing, and 7 days for initial operation)

f. Operator training - 1 trip and 16 hours onsite (2 working days) including 8 hours of classroom instruction.

g. Additional time and trip to perform final programming and modifications necessary for proper operation of the Filtration System and its integration with Plant SCADA and Well and Chemical Systems operation. These services are anticipated to be required after initial operation. FSS shall include the cost of one trip for 6 hours.

During startup, the service engineer shall work with Contractor and provide detailed instructions to District's personnel for operation of the Filtration System. These training services shall include both classroom and onsite instruction.

The service engineer shall be able to speak, write, and understand the English language and shall be completely familiar with the foot-pound-second system of measurement. FSS shall provide a certification of installation.

3.3 INSTALLATION, TESTING, AND STARTUP

All equipment provided by the FSS shall be factory tested to the fullest extent possible prior to shipment.

All equipment shall be furnished complete by the FSS and shall be assembled, erected, and installed by the Contractor in accordance with the FSS's shop drawings, erection instructions, and technical assistance by periodic visits by FSS's service engineer.

Filtration System installation shall be checked and approved by Manufacturers' and System Supplier's Representatives before commencing startup and testing. All equipment provided by the FSS shall be field tested after erection in the presence of the FSS's service engineer to confirm and verify the structural, mechanical, and electrical compliance to the Specifications.

FSS's service engineer shall provide a written report describing the engineer's observations, including notation of any deficiencies with the equipment or its installation. All equipment deficiencies shall be corrected by FSS at no cost to the District. All installation deficiencies will be corrected by the Contractor.

3.4 INSTALLATION OF CONTROL VALVES

Installation of automatic control valves and components shall be in accordance with manufacturer's written instructions. Manufacturers shall guarantee equipment against defects in material and workmanship for a period of two years from date of project acceptance.

Contractor shall coordinate with the valve manufacturer to ensure that all electrical connections necessary for proper valve operation and monitoring are installed prior to startup and testing.

Manufacturer's representative shall visit project site for startup, setting valves, and classroom instruction. Manufacturer shall visit the site after initial operation to reset and adjust valves.

3.5 INSTALLATION CERTIFICATION

Prior to start up, the FSS shall certify in writing to the District that the Filtration System and its components have been installed in accordance with the FSS's recommendations and inspected by FSS's authorized representative, and serviced with the proper lubricants, that applicable safety equipment has been properly installed, that the proper electrical and mechanical connections have been made, and that the Filtration System is ready for startup and initial operation.

3.6 OPERATOR TRAINING

FSS shall provide on the job training for District personnel. Training shall be conducted by qualified, experienced factory representatives of the various equipment manufacturers. Training shall include, both instruction of the contents of the operation and maintenance manuals and operation and maintenance of the Filtration System, including all equipment and components.

Training for the Filtration System shall include review of the operation and maintenance manual for the facility, review and demonstration of the operation of the plant and each component, review of safety procedures, review of preventive maintenance (daily, weekly, monthly, and annually), review of component repairs, and review of stocking and obtaining spare parts.

Subsequent to startup and during initial operation, the FSS's representative(s) shall provide instructions to the District's personnel on operation and maintenance of the Treatment Facility. Said instruction shall include classroom instruction as well as hands-on field instruction.

The FSS's Menifee/Perris I Desalters Iron and Manganese Removal Facility, Operation and Maintenance Manual shall be used as the outline for the operator training.

Instruction time shall include, as a minimum, the following:

Component	Minimum Instruction Time
Operation, Sampling, & Chemical Adjustment	4 hours
Valves and Operators	1 Hour
Filter Vessels	2 Hours
Flow Meters	1 Hour
Miscellaneous Facilities	2 Hours
Instrumentation and Controls, including System Interactions and Alarms	4 Hours

Total 14 Hours (minimum)

3.7 WARRANTY

In addition, Contractor's standard warranty for all Filtration System equipment shall carry the FCC's standard warranty for workmanship and materials for minimum of two (2) years from final payment per Contract Completion Schedule, except for the more stringent warranty periods specified herein. All warranties shall be turned in to the District prior to project completion.

-- End of Section --