SECTION 13 1503 – WATER FEATURE FILTERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following:
 - 1. High Rate Sand Filters
 - a. Horizontal Tank Configuration
 - b. Vertical Tank Configuration
 - c. Sand and Activated Filter Media
 - d. Backwash Control Valving
 - 2. Regenerative Media Filters
 - 3. Backwash Holding Tanks and Sumps
- B. Related Sections:
 - 1. SECTION 13 1401 WATER FEATURE PIPE AND FITTINGS
 - 2. SECTION 13 1403 WATER FEATURE PIPE HANGERS, SUPPORTS, AND ANCHORS
 - 3. SECTION 13 1501 WATER FEATURE MECHANICAL IDENTIFICATION
 - 4. SECTION 13 1502 WATER FEATURE PUMPS AND MOTORS
 - 5. SECTION 13 1504 WATER FEATURE CHEMICAL FEED SYSTEMS
 - 6. SECTION 13 1505 WATER FEATURE OZONE GENERATION AND INJECTION
 - 7. SECTION 13 1507 WATER FEATURE HEATERS
 - 8. SECTION 13 1511 WATER FEATURE VALVES, GAUGES, AND METERS
 - 9. SECTION 13 1512 WATER FEATURE COMPRESSED AIR SYSTEMS
 - 10. SECTION 13 1602 WATER FEATURE CONTROLS
- C. References:
 - 1. UNDERWRITERS LABORATORY, INC (UL) STANDARD 508 for Industrial Control Equipment
 - 2. ANSI B16.5 STANDARDS OF PIPES AND FITTINGS
 - 3. ASTM A53 STANDARD SPECIFICATION FOR PIPE, STEEL, BLACK AND HOT-DIPPED, ZINC-COATED, WELDED AND SEAMLESS
 - 4. ASTM A108 STANDARD SPECIFICATION FOR STEEL BAR, CARBON AND ALLOY
 - 5. ASTM A242 STANDARD SPECIFICATION FOR HIGH-STRENGTH LOW ALLOY STRUCTURAL STEEL
 - 6. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) 70 or NATIONAL ELECTRICAL CODE (NEC)
 - 7. NATIONAL SANITATION FOUNDATION (NSF) STANDARD 50
 - 8. Occupational Safety and Health Administration (OSHA) Regulations
- 1.2 SUBMITTALS FOR REVIEW
 - A. SECTION 01 3300 SUBMITTAL PROCEDURES
 - B. Product Data: Submit manufacturer's literature including printed recommendations, dimensions and sizes, installation instructions, specifications, startup procedures and maintenance schedules for the filters, control panels, auto flushing valves and accessories.
 - 1. Indicate on each submittal which materials, models, data, and options are being selected.
 - C. Shop Drawings: Provide certified engineering drawings and calculations to demonstrate structural strength of filter vessels.
 - D. Operation and Maintenance Data: Provide manufacturer's installation instructions, specifications, startup procedures, assembly drawings, troubleshooting checklists, scheduled maintenance recommendations, replacement parts list and repair data.

- E. Manufacturer's Certification: Submit documentation from the manufacturer certifying that Control Console meets UL Standard 508, Industrial Controller.
- F. Manufacturer's Certification: Submit documentation from the manufacturer certifying that the Filter Vessels conform with NSF Standard 50 guidelines.
- G. Warranty: Submit manufacturer's warranty and ensure forms have been completed in the owner's name and registered with the manufacturer.
- H. Filter Manufacturers shall guarantee to repair or replace any filter tank, lateral, diverter, or internal header found defective due to any structural failure caused by delamination, fatigue, rust, scaling, corrosion, and UV rays for a period of five (5) years form date of final payment, except for Pentair Triton filters, which have one (1) year warranty.

1.3 REGULATORY REQUIREMENTS

- A. All Work shall conform to applicable state and local codes, specifically, local electrical and health codes as they apply to public water features.
- 1.4 DELIVERY, STORAGE, AND HANDLING
 - A. All components of the filter system shall be supplied in wooden creates to facilitate shipments, handling and/or storage on the job site.
 - B. Coordinate delivery with installation time to assure minimum holding time.
 - C. Accept filters and components on site in factory packing. Immediately upon receipt of shipment, inspect and check for damage.
 - D. Protect filters and components from physical damage including effects of weather, water, and construction debris.
- PART 2 PRODUCTS
- 2.1 HIGH-RATE SAND FILTERS
 - A. Horizontal Tank Configuration
 - 1. Approved Manufacturers
 - a. Neptune-Benson
 - b. Pentair Paragon Aquatics
 - c. Waterco
 - d. Astral Filter
 - 2. Shall be capable of filtering water rates of 15 gpm/sq ft (10 lps/sq m) and backwashing rates from 15 gpm/sq ft (10 lps/sq m) to 20 gpm/sq ft (13.5 lps/sq m) of the filter media area.
 - 3. Backwash Cycle shall be accomplished by reversing the flow through the vessel using filtered water from adjacent vessel(s). Backwash with raw source water is not acceptable.
 - 4. Horizontal Filter Systems include the following components:
 - a. Filter Vessel
 - b. Distribution Piping
 - c. Header Piping
 - d. Fastening Hardware
 - e. Automatic Filter Control Console
 - 5. Filter Vessel:
 - a. Horizontal type pressure vessel for use with a single grade of media.
 - b. Manufactured filament wound fiberglass reinforced with premium isophthalic polyester.

- c. Consisting of an inner corrosion barrier/liner wound with continuous strand fiberglass filaments wrapped in circumferential and longitudinal patterns.
- d. Coated with a minimum 20 mil (0.5mm) premium grade isophthalic gelcoat with UV inhibitor.
- e. Reinforced openings and penetrations with continuous filaments.
- f. Provide a drain in the bottom of the vessel to allow draining of the tank without having to expel the sand media.
- g. Access manhole shall be 12-inches (300mm) by 16-inches (400mm) into the vessel with yoke, cover and gasket fitted on the side to facilitate servicing of the vessel.
- h. Automatic internal and a manual external air relief system in the top of the vessel.
- i. Listed by NSF for a maximum flow rating of 20 gpm/sq ft (13.5 psi).
- j. Rated for a design vacuum of 14.68 psi (101 kPa).
- k. Vessels shall be designed and have provision for stacked installation configuration.
- 6. Distribution Piping:
 - a. Influent and effluent connections shall be sized as shown on the Contract Documents.
 - Influent and effluent pipes shall be fitted with Schedule 80 PVC flanged fittings with a minimum strength requirement of 1,500 lb-ft (207 kg-m) of bending moment and 200 lb-ft (28 kg-m) of torque.
 - c. Internal distribution and collection system constructed of ABS plastic and Schedule 80 PVC pipe, fabricated with flow distributors threaded into Schedule 80 PVC pipe.
 - d. All distributors and laterals shall be threaded and replaceable.
 - e. Internal flow velocities of laterals not to exceed 2-feet (0.6m) per second at the design flow rate.
 - f. All internal components shall be hydraulically balanced to prevent migration of filter media during the filtration cycle.
 - g. Each tank shall uniformly fluidize media in backwash cycle without channeling or breakthrough at any on location.
- 7. Header Piping:
 - a. All header piping and fittings to be constructed of Schedule 80 PVC.
 - b. Piping and fittings to be connected with flanges.
 - c. Flanges to meet ANSI Standard pattern and designed with a minimum strength requirement of 1,500 ft-lb (207 kg-m) of bending moment and 200 lb-ft (28 kg-m) of torque.
 - d. Backwash control valve(s) shall be supplied with each filter.
 - e. Provide a backwash sight glass with each filter system.
 - f. Header piping shall include all piping and fittings which connect two or more filters and valves into a system to provide a single influent, effluent, and backwash connection point.
 - g. Header piping and fittings shall be sized as shown on the Contract Documents.
- 8. Fastening Hardware
 - a. All fastening hardware on flanges, man ways, viewing ports, etc. shall be 316L Stainless Steel.
- 9. Automatic Filter Control System
 - a. Listed by UL as a filter controller under Standard 508, Industrial Controllers.
 - b. Filter Control System shall consist of an automatic controller, with its associated temperature, pressure and flow sensors and backwash control valves.
 - c. Control System shall govern operation of the filter system with logic provided by a programmable microprocessor capable of maintaining program memory without need for power.
 - d. Ability to initiate an emergency telephone call in an alarm condition.

- e. All components housed within a fully gasketed NEMA 4 hinged non-conductive enclosure featuring a security locking device, plus a view window.
- f. Controller shall continuously monitor and be capable of displaying the following:
 - i. Filter Inlet Pressure in psi (kPa)
 - ii. Filter Outlet Pressure in psi (kPa)
 - iii. Differential Pressure in psi (kPa)
 - iv. Current Water Temperature in °F and °C
 - v. System Flow Rate in gpm (lps)
 - vi. Accumulated flow since last backwash cycle in gallons (liters)
 - vii. Elapse time since last backwash cycle
 - viii. Current time of day
 - ix. Current day and date
 - x. Mode of operation
- g. Controller shall provide the following features and functions.
 - i. 7 day/24-hour ON/OFF energy saver timer clock to turn the system ON/OFF on a daily basis.
 - ii. 7 day/24-hour backwash initiation time clock to allow backwash cycle to occur any time during the day on any day of the week.
 - iii. Automatically initiate backwash cycle by user selection and setting of either:
 - 1. Differential Pressure
 - 2. Time
 - 3. Flow Rate
 - 4. Accumulated Flow
 - 5. Or combination of above
- h. Manually initiate a backwash cycle.
- i. Fail-safe monitor and shut down if backwash cycle is interrupted or inhibit signal is received.
- j. Backwash volume counter.
- k. Provide control logic for the following controls allowing the controller to coordinate with accessory equipment.
 - i. Controller only initiates backwash after confirming that there are no other systems already in backwash and that no other inhibit condition exists.
 - ii. A "Fireman's Delay" contact that initiates a constant +24 VAC signal at a user adjustable time prior to the actual backwash cycle, and during the entire backwash cycle, and for a user adjustable time after the backwash cycle. (Used to shut down the ozone generator and heater before backwash cycle and delaying startup after backwash cycle.).
 - iii. A "Pump" contact that initiates a continuous signal during the entire backwash cycle. (Used to turn filter pump(s) off while switching valves if necessary).
 - iv. A "Valve" contact that initiates a continuous signal during the entire backwash cycle. (Used to move backwash control valve into correct position).
 - v. A "Sump" contact that initiates a continuous signal during backwash and for a user adjustable time after the backwash cycle is completed. (Used to start a sump pump as required).
- I. Easily accessible terminal hook-up board and switching to control accessory equipment.
- m. Battery backup to maintain time and date in the event of a power failure.
- 10. Metal fasteners shall be Grade 316L Stainless Steel.
- 11. Provide gauge panel for two (2) oil pressure gauges for influent/effluent read outs.

- B. Vertical Filter Configuration
 - 1. Approved Manufacturers
 - a. Pentair Triton Commercial
 - b. Neptune-Benson
 - c. Hayward Industrial Products
 - 2. Shall be capable of filtering water rates of 15 gpm/sq ft (10 lps/sq m) and backwashing rates from 15 gpm/sq ft (10 lps/sq m) to 20 gpm/sq ft (13.5 lps/sq m) of the filter media area.
 - 3. Backwash Cycle shall be accomplished by reversing the flow through the vessel using filtered water from adjacent vessel(s). Backwash with raw source water is not acceptable.
 - 4. Vertical Filter System shall include the following:
 - a. Filter Vessel
 - b. Distribution Piping
 - c. Header Piping
 - 5. Vessel:
 - a. Constructed of molded colorfast polymeric material or seamless filament wound fiberglass reinforced plastic.
 - b. Automatic air-relief valve.
 - c. Drain port location in the bottom of the vessel.
 - d. Inspection cover in the top of the vessel.
 - e. Internal distribution piping to direct water evenly across the entire sand surface.
 - 6. Distribution Piping:
 - a. Influent and effluent connections shall be sized as shown on the Contract Documents.
 - b. Influent and effluent pipes shall be fitted with Schedule 80 PVC flanged fittings with a minimum strength requirement of 1,500 lb-ft (207 kg-m) of bending moment and 200 lb-ft (28 kg-m) of torque.
 - c. Internal distribution and collection system constructed of ABS plastic and Schedule 80 PVC pipe, fabricated with flow distributors threaded into Schedule 80 PVC pipe
 - d. All distributors and laterals shall be threaded and replaceable.
 - e. All internal components shall be hydraulically balanced to prevent migration of filter media during the filtration cycle.
 - f. Each tank shall uniformly fluidize media in backwash cycle without channeling or breakthrough at any on location.
 - 7. Header Piping:
 - a. All header piping and fittings to be constructed of Schedule 80 PVC.
 - b. Piping and fittings to be connected with flanges.
 - c. Flanges to meet ANSI Standard pattern and designed with a minimum strength requirement of 1,500 ft-lb (207 kg-m) of bending moment and 200 lb-ft (28 kg-m) of torque.
 - d. Backwash control valve(s) shall be supplied with each filter.
 - e. Provide a backwash sight glass with each filter system.
 - f. Header piping shall include all piping and fittings which connect two or more filters and valves into a system to provide a single influent, effluent, and backwash connection point.
 - g. Header piping and fittings shall be sized as shown on the Contract Documents.

2.2 SAND AND ACTIVATED FILTER MEDIA

A. Grade #20 Silica Sand conforming to the following shall be used for both horizontal and vertical sand filters:

- 1. Effective size: 0.018-inch (0.45mm)
- 2. Uniformity Coefficient: 1.5
- 3. Mean Diameter: 0.0243-inch (0.61mm)
- 4. Standard Deviation: 0.00432-inch (0.11mm)
- 5. Conforming to the following gradation:

Sieve No.	Opening Size	Percent Retained on Sieve
(U.S. Series)	Inches (mm)	(% by weight)
20	0.033 (0.838)	2
30	0.023 (0.584)	58
40	0.016 (0.406)	36
50	0.012 (0.305)	4

- B. Activated Filter Media (AFM)
 - 1. Filter media for both horizontal and vertical sand filters shall be AFM engineered & activated glass media produced by Dryden Aqua.
 - 2. Supply and install Grade 1, Grade 2 and Grade 3 AFM in quantities appropriate for the specific filter according to filter manufacturer specified media levels.
 - a. Grade 3 media (2.0-4.0mm) shall be used as underlayment support below filter laterals. Fill to mid-point of top of lateral assembly as recommended by filter manufacturer.
 - b. Grade 2 media (1.0-2.0 mm) shall be used as a base layer above laterals approximately 20-30-percent of total filter bed depth (above laterals).
 - c. Grade 1 media (0.4-1.0 mm) shall be used as the top layer filling to manufacturer specified bed depth, 70-80-percent of total bed depth (above laterals) leaving required freeboard above media bed.

2.3 BACKWASH CONTROL VALVING

- B. Acceptable Manufacturers
 - 1. ASAHI AMERICA
 - 2. Approved Filter Manufacturer
 - 3. Approved Equal
- C. Horizontal Sand Filter System
 - 1. Motorized Butterfly Valve
 - a. Electric actuator with reversing type motor and manual override.
 - b. Integral thermal overload protection with auto-reset.
 - c. Permanently lubrication gear train.
 - d. Adjustable travel-stop limit switches.
 - e. Capable of being operated by a low voltage signal from filter control center and separate Hand-Off-Auto (HOA) switch.
 - f. Fully field adjustable closure stops to limit the percent of valve closure to assure proper system flow rate.
 - 2. Pneumatically Actuated Butterfly Valve and Pneumatic Actuator with manual override
 - a. Double Piston, Rack and Pinion Design Double Acting Air-to-Air Operation.
 - b. ISO mounting pattern for valve with NAMUR mounting pattern for solenoids and accessories.
 - c. Valves 4-inches (100mm) and smaller to include flats on actuator shaft for manual override. Valves larger than 4-inches (100mm) to include de-clutchable gear operated manual override.
 - d. Actuator bodies to be of highly corrosion resistant glass filled polyamide or aluminum with Rilsan coating.

- e. Solenoid valve to be NEMA IV, with manual override and speed controls.
- f. Actuators shall be incorporated valve position limit switches coupled to the valve shaft and indicating to the PLC the fully OPEN or CLOSED position of the valve.
- g. Fully field adjustable closure stops to limit the percent of valve closure to assure proper system flow rate.
- h. Supply air pressure regulator to be provided, properly rated for working range of actuator
- i. Supply air working range 80-120 psi (550-830 kPa).
- j. Each actuator air line to be supplied with a ball valve for isolation.
- k. Actuator Seals shall be BUNA N.
- I. Integral thermal overload protection with auto-reset.
- m. Permanently lubricated gear train.
- n. Capable of being operated by a low voltage signal from filter control center and separate HOA switch.
- 3. Tandem Butterfly Valves (up to 14-inches (350mm) diameter)
 - a. Body construction shall be one piece thermoplastic PVC conforming to Cell Classification 12454. Body shall be wafer type conforming to ANSI B 16.5 bolt circle.
 - b. Disc shall be PVC or Polypropylene.
 - c. Stem shall be 316L Stainless Steel non-wetted type.
 - d. External metallic trim shall be 300 Series Stainless Steel, epoxy or powder coated.
 - e. Seals: Full Seat design, Isolating stem from median and functioning as a gasket for mating flanges. Material shall be EPDM.
 - f. Valves shall have bubble tight shut-off with the following pressure ratings:
 - i. Sizes up to 10-inches (250mm) 150 psi (1.0 MPa).
 - ii. Size 12-inches (300mm) and larger 100 psi (690 kPa) based on ambient Temperature.
 - g. Tandem Butterfly arrangement shall consist of two (2) butterfly valves mounted to a flanged T-style fitting.
 - h. Tandem mounting kit and hardware shall be manufactured stainless-steel and allow independent adjustment of opening and closing of valves.
 - i. Tandem mounting kit shall be of a design that fully supports valves and actuator.
 - j. Valves shall operate in opposite directions (i.e., one valve is opening as the other valve is closing).
 - k. All valves shall be tested by the manufacturer prior to shipment. Test documents shall be available upon request.
- D. Vertical Sand Filter System
 - 1. Multiport Type Control Valve
 - a. Include the following settings:
 - i. Filter: Normal operation
 - ii. Backwash: For cleaning filter sand bed
 - iii. Rinse: For rinsing after backwash
 - iv. Waste: Bypassing filter for draining or lowering pool water
 - v. Recirculate: Water bypasses filter
 - vi. Closed: Shuts off flow from the pump to the filter
 - b. All construction materials shall be either PVC, CPVC, ABS, or similar thermoplastic material.
 - c. Control Valves shall be sized to meet the flow requirements of the filter system with minimal pressure loss of less than 10 psi (69 kPa).

- d. Control Valves shall include a integral sight glass sufficient in size to enable operator visual inspection of the backwash water.
- e. Selection of the Control Valve setting shall be operated with a level action handle for ease of function selection.
- f. Selection of the Control Valves shall be provided with a liquid filled pressure gauge.
- g. Backwash Control Valves shall be proven to operate properly with filter system selected and approved for use by the filter manufacturer.
- 2. Tandem Butterfly Valves (up to 8-inches (200mm) diameter)
 - a. Body construction shall be one piece thermoplastic PVC conforming to Cell Classification 12454. Body shall be wafer type conforming to ANSI B 16.5 bolt circle.
 - b. Disc shall be PVC or Polypropylene.
 - c. Stem shall be 316L Stainless Steel non-wetted type.
 - d. External metallic trim shall be 300 Series Stainless Steel, epoxy or powder coated.
 - e. Seals: Full Seat design, Isolating stem from median and functioning as a gasket for mating flanges. Material shall be EPDM.
 - f. Tandem Butterfly arrangement shall consist of two (2) butterfly valves mounted to a flanged T-style fitting.
 - g. Tandem mounting kit and hardware shall be manufactured stainless-steel and allow independent adjustment of opening and closing of valves.
 - h. Tandem mounting kit shall be of a design that fully supports valves and actuator.
 - i. Valves shall operate in opposite directions (i.e., one valve is opening as the other valve is closing).
 - j. All valves shall be tested by the manufacturer prior to shipment. Test documents shall be available upon request.
- 1.2 REGENERATIVE MEDIA FILTER SYSTEMS
 - A. Approved Manufacturers
 - 1. Neptune-Benson
 - 2. Aquify
 - B. Filters shall be sized to meet the filtering flow rates shown on the Contract Documents and fit spatially in the footprint provided in the Contract Document.
 - C. All controls and valving must be accessible for correct operation and regular maintenance as outlined in the manufacturer's Operation and Maintenance Manual.
 - D. Components:
 - 1. Filter Vessel
 - 2. Flexible Tube Filter Elements
 - 3. Internal Components
 - 4. Bump Mechanism
 - 5. Vacuum Transfer System
 - 6. Sight Glass
 - 7. Pressure Gauge Panel
 - 8. Inspection (Viewing) Window
 - 9. Valves and Automatic Regeneration Controller
 - 10. Filter/Regulator
 - 11. Air Compressor
 - 12. Automating Pneumatic Valves
 - E. Filter Vessel

- 1. Vessel shall be suitable for 50 psi (345 kPa) working pressure and hydrostatically tested to a minimum of 75 psi (517 kPa).
- 2. Vessel material can be:
 - a. Type A-26 Carbon Steel with an elastomeric polyurethane lining
 - b. 316L Stainless Steel.
 - c. Fiber wound composite structure (provide specification of process and materials for review by the Design Engineer).
- 3. Welds performed by qualified operators and result in fully penetrated welding free of ripples, grooves, overlaps, abrupt ridges, or valleys, and be chipped and brushed clean leaving a smooth surface.
- 4. Support Legs shall be removable for shipping and access into the mechanical room.
- 5. Gasket materials shall have a sealing capacity of a minimum 1.5 times the design pressure.
- 6. Equipped with a UL listed grounding lug.
- 7. Provide bracket for mounting of automatic controller, lifting davit for head assembly, gauge panel, filter regulator, vacuum transfer blower, and vacuum hose rack.
- 8. Filter tank and associated liner shall carry a 15-year warranty.
- 9. Coat exterior of tank with high solids enamel with a total film thickness of 4-6 mils (0.010-0.015mm).
- 10. Provide a minimum 16 oz. (0.47 liter) of enamel touch up paint with each filter tank supplied.
- F. Internal Components
 - 1. All metal directly exposed to the pool water shall be 316L Stainless Steel.
 - 2. Filter elements shall be fabricated of multi-filament high strength polyester braid.
 - 3. The filter influent connection shall be fitted with a stainless-steel flow diversion assembly to eliminate disturbance to the filter element during operation.
- G. Bump Mechanism
 - 1. Pneumatically operated.
 - 2. Externally mounted on the top of the filter vessel.
 - 3. Provides means of dislodging the media and accumulated solids which then recoats the filter element.
- H. Vacuum Transfer System
 - 1. Provide a vacuum transfer system to allow automatic recharging of media in the filter from either a bag or bulk media storage container.
 - 2. Vacuum Blower components
 - a. TEFC 0.5 hp (0.37 kW), 115/203V, single phase motor, 50/60 Hz.
 - b. In-line filter to prevent dust and media form being drawn into the blower.
 - 3. Provide three (3) 1.5-inch (32mm) Schedule 80 PVC ball valves for assembly of transfer system.
 - 4. Provide assembly instructions of vacuum system.
 - 5. Provide 10-feet (3m) of 1-1/2-inch (32mm) vacuum hose with fittings.
- I. Sight Glass
 - 1. Provide one (1) standard backwash sight glass and install in recirculation lines based on the manufacturer's recommendations.
- J. Automatic Controller
 - 1. The automatic controller shall provide total control of the system's filtration and regeneration cycles and provide all necessary equipment interlocks and timing mechanisms to execute the filter program.

- 2. The controller shall contain a microprocessor that will activate the following functions of the system:
 - a. Bump Cycle / Manual or Automatic.
 - b. Precoating of the filter elements.
 - c. Stopping and starting of the main recirculation pump.
 - d. Opening and closing of pneumatically operated valving.
 - e. Vacuum Transfer System.
 - f. Heater Cool Down Delay.
 - g. Auxiliary contacts to interlock chemical control or other equipment.
 - h. Keyed switch to activate continuous, intermittent bump cycle for element cleaning.
- 3. The controller panel shall display the following functions:
 - a. Filter status
 - b. Precoat status
 - c. Recirculation Pump status
 - d. Vacuum Transfer Pump status
 - e. System Power
- 4. The controller enclosure shall be NEMA Type 12 industrial enclosure.
- K. Filter/Regulator
 - 1. Each filter shall include a combination filter/regulator. The regulator shall be adjustable from 0-120 psi (0-827 kPa) 1/2-inch (15mm) F.P.T. connections shall be provided for field installation of air lines.
- L. Air Compressor
 - 1. Provide an air compressor for each solitary filter in the mechanical room.
 - 2. Provide two (2) air compressor in each room where multiple filter tanks are installed in the same mechanical room.
 - 3. The system will require one (1) air compressor that shall include:
 - a. 6-gallon (22.7 liter) tank.
 - b. 2 hp (1.5kW), electric motor, 120V, single phase.
 - c. 2.7 CFM (76.4 lpm) at 90 psi (620 kPa).
 - d. Oil free pump.
 - e. One (1) water separator with automatic drain shall be included for each air compressor supplied. 1/2-inch (15mm) F.P.T. connections shall be provided for field installation of air lines.
 - f. Enough pneumatic hose to activate each filter and valve in the mechanical room where the filter is installed.
- M. Automating Pneumatic Valves
 - 1. All valves 3-inches (80mm) to 12-inches (300mm):
 - a. Constructed with cast aluminum ASTM S12A housing and fully coated with Rilsan on all interior and exterior surfaces.
 - b. Internal components include EPDM resilient lining, Rilsan coated ductile iron disc and T304 stainless steel shaft.
 - 2. Valves 14-inches (350mm) and larger shall be constructed with cast iron housing and epoxy coated ductile iron disc.
 - 3. Valves shall be Dominion Butterfly Valves and shall be provided for the influent, effluent, and precoat lines.
 - 4. Pneumatic Actuators.

- a. Each filter shall include pneumatic actuators for one (1) influent valve, one (1) effluent valve, and one (1) precoat valve.
- b. Double acting with valve mounted drilling to ISO 5211.
- c. Include two (2) 1/4-inch (6mm) FPT ports for open / close connections. Flow control valves with quick connect fittings shall be provided at each port to allow speed control adjustment for the open / close function of the actuators.
- d. Materials of Construction
 - i. Body: Aluminum alloy, extruded according to ASTM 6063, anodized according to UNI 4522
 - ii. Ends: Die-cast in aluminum alloy according to ASTM B179, epoxy-polyester coated
 - iii. Pistons: Die-cast in aluminum alloy according to ASTM B179
 - iv. Pinion: Nickel-plated steel
 - v. Slideways: Acetal resin (LAT LUB 731320T)
 - vi. Fasteners: 304 Stainless Steel
 - vii. Springs: Epoxy Coated Steel, pre-compressed
 - viii. Seals: NBR Nitrile rubber
 - ix. Lubricant: MoS2
- e. The actuators shall be factory lubricated to allow for 1,000,000 maneuvers.
- f. The actuators shall have adjustable travel stops for both directions.
- g. Working temperature limits: 4 °F (-15 °C) to 186 °F (85 °C).
- N. Regenerative Filter Media
 - 1. Media shall be expanded perlite with a median particle size of 37 microns. Percentage retained on a +150 Tyler Mesh shall not be less than 8-percent or more than 25-percent. Darcy permeability shall be between 1.2 and 1.85.
 - 2. The media shall contain no more than 1/10-percent (0.001%) of crystalline silicate.
 - 3. The media shall be certified by the Manufacturer for use in the filter. The media shall be NSF Standard 50 listed.
 - 4. The media shall be CelaPerl 1000 as supplied by EP Minerals.
 - 5. Each filter shall be furnished with six (6) charges of filter media.
- O. Warranty:
 - 1. Filter tanks shall carry a ten (10) year fully rated warranty as regularly offered by the tank manufacturer.
 - 2. Bump tire and internal tube elements shall carry a fully rated ten (10) year warranty
 - 3. Valve bodies shall carry a five (5) year fully rated warranty.
 - 4. Valve operators and system accessories including the RMF controller, quick exhaust valve, and solenoid valve shall carry one (1) year warranties as provided by the manufacturer.

1.3 BACKWASH HOLDING TANKS AND SUMPS

- A. Backwash Holding Tanks
 - 1. Tanks shall be constructed of cast-in-place concrete per location and dimensions as indicated on the Contract Documents.
 - 2. Tank walls and floor shall be watertight.
 - 3. Tank floor shall slope to the drain.
 - 4. Tank shall have an open top.
 - 5. Provide a means of access into the tank by means of a fiberglass ladder inside the tank. For above grade tanks, provide a fiberglass ladder on the outside of the tank.
- B. Backwash Sumps
 - 1. Acceptable Manufacturers

- a. ASA Manufacturing Incorporated
- b. Approved Equal
- 2. Sumps shall be constructed of premium fiberglass and resin with a durable smooth gelcoat interior.
- 3. Include a heavy-duty grate cover.
- 4. Drainpipe shall discharge from the bottom of the box. Side discharges may only be used as approved by the Engineer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces, substrates, and conditions for compliance with requirements of other sections in which related Work is specified, and determine if surfaces, substrates, and conditions affecting performance of the Work of this section are satisfactory. Do not proceed with the Work of this section until unsatisfactory conditions have been corrected in a manner acceptable to the Installer. Starting installation constitutes acceptance of surfaces, substrates, and conditions.

3.2 INSTALLATION

- A. Install filters in strict compliance with the Manufacturer's recommendations to ensure the Manufacturer's warranty conditions can be met.
- B. Locate filters in locations indicated on the Contract Documents, on smooth and level concrete housekeeping pads.
- C. Inspect filters removing any dirt or foreign material from the Filter vessel and influent, effluent, and distribution piping.
- D. Verify access to filter man ways, control panel, drains, and valves in accordance with the Manufacturer's recommendations.
- E. Install appropriate amount of filter media in each Filter vessel in accordance with manufacturer's recommendations.
- F. Assemble header piping and valves on site as indicated on the Contract Documents. Pipes may need to be trimmed in the field. Header piping shall be installed without springing or forcing, true to line and grade, and square with the filter system.
- G. Mount filter control console in the location indicated on the Contract Documents.
- H. Run drain lines from filter drain locations with Schedule 40 pipe to floor drain and anchor drain pipe to unistrut supports and concrete floor as required.
- I. Install backwash site glass in accordance with the Manufacturer's recommendation. Sight glass shall be installed in line so backwash flow from each vessel shall flow directly through the site glass.
- J. Pipe backwash effluent line to backwash holding tank or sump or to the sanitary sewer line connection.
- 3.3 Backwash Holding Tank or Sump
 - A. Provide a backwash holding tank or sump as indicated on the Contract Documents.
 - B. Tank or sump shall be sized to accommodate one (1) filter at a backwash rate of 25 gpm (95 lpm) per square foot (929 sq cm) of filter area for a minimum duration of five (5) minutes.
 - C. Backwash effluent lines from the filters shall discharge a minimum of 1.5 times the effluent lines size or 6-inches (150mm), depending upon requirements of the local jurisdiction, above the top of the tank or sump and be in a manner to prevent backwash water from splashing out.
 - D. Backwash tank or sump shall have a drain in the bottom connected to the sanitary sewer line. The line shall be sized to meet the flow requirements provided by the Civil Engineer.

END OF SECTION