SECTION XXXXX
CLOTH DISK FILTER
FIBERGLASS TANK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Furnish all labor, materials, equipment and incidentals required for automatic backwash filter system as shown on the plans and as specified herein, installed, tested and ready for operation.

B. Each Disk Filter shall consist of individual disks of the number required; support columns and frames, a centrally located rotating shaft with vacuum shoe assemblies mounted thereto, 316 stainless steel swivel joints, filtrate pipes, drive mechanism complete with sprockets and non-metallic drive chain, automatic PLC control system with color touch screen .

C. Filter system shall be designed for installation as shown on the contract drawings/plans and installed in the coated steel tank.

1.02 MEASUREMENT AND PAYMENT

A. No separate payment will be made for work required under this section. Contractor will include all costs of the requirements of this section in the appropriate bid item(s) on the bid form.

1.03 QUALITY ASSURANCE

A. Applicable Standards

1. ASTM – American Society for Testing and Materials
2. AISI – American Iron and Steel Institute
3. AGMA – American Gear Manufacturer's Association
4. NEMA – National Electrical Manufacturer's Association
5. NEC – National Electrical Code

B. To assure unity of responsibility, all components of the disk filter system shall be supplied by a single manufacturer.

C. Acceptable Manufacturer:

a. Five Star Filtration, LLC - Five Star Disk Filter
b. Pre-Approved Equal

1.04 SUBMITTALS

A. Submit according to Section 01330 – Submittal Procedures and Section 01340 – Shop Drawings, Product Data, and Samples.

Submit dimensioned, to-scale drawings of equipment showing its proposed installation in this facility. Where piping, structural components, etc. are involved, drawings shall show clearly that the proposed equipment will fit into the plant design without significant modifications and will function as intended in conjunction with other plant items. Modifications to plant structures, piping, electrical, etc. shall be made at the Contractor's expense and only after approval by the Engineer.

B. Information required for approval by the Engineer prior to incorporation into the project shall include the following as a minimum requirement:

1. Certified dimension prints detailing all required anchor bolt locations and conduit stub-outs. Submit dimensioned to-scale drawings showing installation of screening equipment for this specific application.

2. Specifications for all electrical and mechanical components and complete wiring diagrams for all components.

3. Manufacturer's recommended procedures for jobsite storage and handling of equipment.

C. Operation and Maintenance Manuals: Prior to delivery of equipment and updated as required during installation of the equipment, the manufacturer shall furnish complete and detailed installation, operation and maintenance manuals which shall include the following information as a minimum requirement:

1. Assembly, installation and adjustment instructions.

2. Lubrication and maintenance instructions.

3. Complete descriptive literature of all materials and components furnished.

4. Erection drawings with equipment mark numbers.

5. Complete operating instructions for controlling, modifying, and operating the equipment provided for this facility.

1.05 PERFORMANCE REQUIREMENTS

A. The disk filter system shall be capable of meeting the following performance requirements.

PERFORMANCE CRITERIA	**VALUE**
Average Daily Flowrate (MGD (gpm)	0.125 (87)
Peak Daily Flowrate (MGD (gpm)	0.5 (350)
Maximum Influent TSS, mg/L	< 50
Average Influent TSS, mg/L	< 20
Average Effluent Suspended Solids TSS, mg/L	< 5
FILTER DESIGN DATA	
Filter Cloth Material	Polyester, multi-layer
Number of Filter Units	1
Number of Filter disk per unit	3
Filter Disk Diameter, ft.	4
Effective Filter Surface Area per disk, ft^2	25 minimum
Effective Filter Surface Area per unit, ft^2	75 minimum
Backwash Arm Rotational Speed, RPM	1.1
Materials of Construction	304 SS and plastics
FILTER DRIVE UNIT	
Drive Motor (1 per unit)	0.33 HP, 460v, 3 phase
Drive Motor Service Factor	1.3
	Parallel Helical Gear w/ Non-Metallic Chain and Sprocket
BACKWASH CLEANING SYSTEM	
Number of Backwash Vacuum Shoes per Disk	2
Backwash Pumps (2 per unit)	1.5 HP, 460v, 3 phase
Backwash Flowrate, gpm	125
Backwash Flow, % of Influent	< 2

B. The automatic backwash disk filter system shall be suitable for filtering domestic wastewater after conventional treatment. Each filter shall be designed to operate on a continuous basis and shall be designed to operate while receiving varying flow rates.

PART 2 PRODUCTS

2.01 MATERIALS

A. All fabricated material shall be ANSI fiberglass. All welding shall conform to the latest standards of the American Welding Society. Filter cloth shall be multi-layered polyester bags with seal arrangements to allow for easy removal and installation. Filter cloth support grid shall be non-metallic and have a deflection of less than 0.1 inches over the entire 4 foot span of the disk.

2.02 EQUIPMENT

A. Filter Tank

1. The filter tank shall be constructed of a minimum 1/4" thick fiberglass with gel coating designed for the service intended.

2. All structural shapes shall be designed for the intended use and of adequate strengths to withstand all loads during fabrication, shipping and operations.

3. The filter tank shall incorporate a 4" inlet nozzle with a influent trough designed to evenly distribute the flow across the width or length of the filter tank.

4. The filter tank shall incorporate one (1) 8" effluent nozzles connected to a filtrate trough designed to remove the entire flow of the filter tank.

5. The filter tank shall incorporate one 4" backwash nozzles connected to a center rotating backwash manifold within the tank. The backwash manifold shall be constructed of 304 stainless steel. Each end of the center rotating backwash manifold shall be connected to a 316 stainless steel swivel joint design for submerged service.

6. The filter tank shall incorporate a drain/sludge removal port with a minimum 2" nozzle. Inside the tank located within the sloped wall hopper shall be a perforated drain pipe sized adequately and designed to evenly remove settled sludge from the filter tank.

B. Filter Disk

1. The filter disk frame shall be constructed from Type 304 stainless steel as a integral unit completely welded and supported for all operating and installation loads.

2. Each disk shall have grid support structure incorporated and it shall be designed to secure the grid in place and minimize wear to the filter cloth bags.

3. Each disk shall have a single top mounted effluent pipe adequately sized for the application and shall include a lifting eye for easy removal and placement of the one piece disk assembly.

4. Each disk shall be attached to the effluent trough independently to allow disk isolation. Only one wall connection point per disk shall be allowed. The disk filter design shall insure the ability to sample filtrate from each disk independently.

C. Support Frame

1. Each disk shall be secured in place in the filter tank by a support column. The support column shall be designed to withstand all loads of the disk and the rotating shaft assembly.

2. The disk is also supported by a vertical frame designed to maintain the disk location on the center of the support column.

3. Each vertical frame member shall have a UHMW wear strip securely fastened to the stainless steel guide frame angle to minimize damage to the filter disk and cloth as it is being installed and removed from the frame.

D. Rotating Backwash Assembly

1. Each filter unit shall incorporate a centrally located rotating backwash manifold that will operate as the rotating mechanism for the vacuum shoe assembly and also act as the transmission pipe for the backwash water being drawn by the backwash pumps located externally to the filter tank.

2. The center shaft/backwash manifold shall be constructed from 304 stainless steel pipe.

3. The center shaft shall be supported and secured at each end to a 316 stainless steel swivel joint designed for submersible service. This allows for a non-rotating connection at each end while the shaft is driven by a drive mechanism located above the top of the tank.

4. The backwash manifold / rotating shaft is welded to a sprocket hub constructed of 304 stainless steel with a UHMW split-ring sprocket designed for the rotational speed requirements of the application.

5. Each vacuum shoe (two for each filter disk) shall be adjustable to insure that the shoe is parallel to the disk face. The system shall incorporate a torsion spring/pivoting mechanism designed to maintain the proper tolerance of the vacuum shoe disk interface.

6. Each vacuum shoe assembly shall be located 180 degrees from the shoe on the opposite side of the disk.

E. Swivel Joints

1. The swivel joints shall be designed to allow rotation of the backwash assembly and center shaft during the backwash cycle.

2. Construction of the swivel joint shall be 316 stainless steel with a double row true ball bearing race alignment and o-rings designed to keep contaminants out while keeping in the lubricant. Stainless steel ball bearings are precision ground with raceways machined to precise tolerances.

3. Swivel joints shall be designed for submerged service.

F. Drive Mechanism

4. The drive assembly shall be designed to rotate the backwash assembly and center shaft during the backwash cycle.

5. The drive assembly shall consist of a parallel helical gear drive unit coupled to the shaft with a sprocket and chain assembly.

6. The gear motor shall be a SEW Eurodrive gearbox directly coupled to e TEFC induction motor, SEW Model K57R37DT71C4-KS. Gear ratio to be 689.0. The motor shall be rated for 0.33 HP, 460v, 3-phase, 60Hz. operation.

7. Reducer design end rating shall be equal or exceed AGMA requirements. Speed reducer shall be selected for not more than AGMA class I service.

8. Drive chain shall be NH78 non-metallic with stainless steel pins

9. Drive sprocket shall be a NH78, 11 tooth shear pin sprocket assembly, 9.26 inch P.D., nylon body with UHMW segmental rim, 304 stainless steel hardware and 6061 aluminum shear pins.

10. Reduction sprocket shall be a NH78, 30 tooth segmental sprocket rim, split UHMW.

11. The drive motor assembly shall be mounted on a 304 stainless steel motor bracket that incorporates adjustable placement capabilities and a removable chain guard.

G. Control Panel and Operation

1. The disk filter control system shall be supplied by the disk filter manufacturer and shall included but not be limited to the following components:

   a. 36” x 24” x 8” NEMA 4X Fiberglass wall mounted enclosure with 3-point latching.
   b. NEMA motor starter with over-current protective devices and overloads
   c. Selector switches and pilot lights
   d. Door mounted circuit breaker
   e. Magnetic circuit breakers
   f. Power transformer
   g. Stirring fan
   h. 20 amp quad receptacle
   i. PLC hardware
   j. 12 inch OIT color touch screen, panel mounted PC
   k. Relays
   l. Wireless communication system for data lagging and remote control
   m. Ultra-sonic water level sensing system

2. The automatic controls for the disk filter operation shall be furnished as an integral part and shall be provided in a NEMA 4X fiberglass enclosure with 3-point latching. The control panel shall be 460v, 3-phase, 60 Hz. with 120v, 1 phase, 60 Hz. control voltage.

3. The main disconnect shall be enclosed in the control panel, with a handle mechanism extending through the door.

4. The backwash cycle is initiated by the ultrasonic level sensor located in the filter tank. The filter drive unit and the backwash pumps are activated, and an electric actuated valve opens to begin backwashing one side of the filter. After a pre-set time has elapsed, valve 1 closes and valve 2 opens to begin backwashing the other side of the filter; the system again reaches a pre-set time and the PLC then checks to insure the water level (headloss) has receded; if the water level (headloss) has indeed been reduced; then the system shuts down the backwash system; if not then the system will repeat the sequence until the water level (headloss) is reduced to an acceptable level.

5. The panel operational sequence shall include a sludge draw-off adjustable timer. This timer shall be pre-set and field adjustable from the touch screen panel.

6. All pre-set timers shall be adjustable from the touch screen without having to enter the control panel.

7. The control panel shall incorporate a wireless communication system capable of transmitting data collected from flow meters, turbidity meters, and TSS monitors. The control system PLC will store the data within the disk filter control panel for access from remote locations.

8. The control panel shall incorporate a complete manual override system and all switches, lights and necessary components shall be furnished.

9. The contractor is responsible for all field wiring and interconnecting conduit between the supplied control panel and the disk filter equipment. The filter supplier shall provide all necessary diagrams and schematics for a complete system.

H. Backwash Pumps

1. The two backwash pumps shall be Gorman-Rupp Model 12B-B-2 1"10 Series" Self-priming Centrifugal Pumps with suction and discharge spool flanges mounted on a fabricated galvanized steel vertical v-belt base with belts, sheaves, belt guards and aligned to a 1.5 HP, 1800 RPM, 460/3/60, TEFC Electric Motor.

2. Design duty condition: 125 GPM @ 25 TDH

3. Pump shall handle 2” solids.

4. Pumps shall have 2” suction and 2” discharge flanges.

I. Automatic Backwash Control Valves

1. The backwash valves shall be Bray Series 30 Electric Actuated Butterfly Valve.

2. Valves shall be 115 VAC operated and controlled by the PLC.

3. Valves shall have manual override and position indicator.

4. Valves shall be UL Listed and housed in a NEMA 4/4X enclosure and be permanently lubricated with a mechanical brake.

5. Valves shall move from fully closed to fully open in 15 seconds and have a stall torque of 300 in-lb. with a 25% duty cycle. Thermal overloads shall be included.

J. Manual Isolation Valves (Backwash Pumps)

1. The manual backwash valves shall be Bray Series 30 Butterfly Valves.

2. Valves shall be rated for 150 psi.

3. Valves shall have stainless steel shaft and shall be blow-out proof.

4. Valves shall be a wafer body design, fully supported flange bolt holes, be full bodied with v-notch EPDM liner.

K. Spare Parts

1. One (1) filter cloth

2. Two (2) complete repair kits for swivel joints

3. Twelve (12) shear pins for drive sprocket assembly

PART 3 EXECUTION

3.01 INSTALLATION

A. General

1. Install the disk filter system per the manufacturer's directions and the drawings. Provide all supports and anchoring device required to install the disk filter unit. The Equipment Manufacturer will provide adequate crating and protection of the disk filter equipment for shipment to the project site.

2. Installation Instructions will be provided that specifically outline installation of the equipment.

3. Lifting instructions will be provided to assist the installing contractor.

B. Field Services: The equipment manufacturer shall furnish the service of a factory-trained representative for two (2) working days and two (2) separate trips. These two trips shall consist of one (1) trip to monitor the installation and one (1) trip for startup and instruction of the plant operating personnel.

C. Warranty: The equipment shall materially conform to the description in this Specification and the Contract Documentation and shall be free from defects in material and workmanship. Warranty periods are 12 months from final acceptance

END OF SECTION