BASIS OF DESIGN - CLOTH MEDIA TERTIARY FILTER SYSTEM - 5 MICRON

GENERAL:

All equipment and components furnished pursuant to HRRSA Request for Proposal 2019-01 "Tertiary Filter Equipment Procurement - Phase II & III" (RFP) will be installed by the Owner and/or an installing GC under the supervision of the Offeror. The scope of supply proposed by the Offeror to meet the requirements of the RFP shall result in a complete and functional system, upon installation, to include at minimum the items contained herein. The Offeror shall clearly and explicitly state ALL items required to achieve a complete and functional system which ARE NOT being furnished by the Offeror pursuant to the RFP and located in the Exceptions statement page of the RFP. C.

The Equipment will be delivered, installed and commissioned in two separate phases, Phase II and Phase III, under the direction of the Offeror's field representative. Phase I equipment was procured and installed under a prior RFP (2018-01). There shall be at minimum three (3) full calendar months between the shipment of Phase II equipment and Phase III equipment to the project site. The RFP and this specification delineates the scope of supply for Phase II and Phase III and requires explicit itemized pricing to be submitted in compliance with the RFP, see "Price Quotation Form" within the RFP.

Mounting Brackets, Hardware and Supports
Drive Assemblies
Center tube Assemblies with 5-Micron Cloth Media Disks
Backwash Systems
Backwash/Waste Pumps, Assemblies and Valves
Pressure Transducer Assemblies
Float Switches
Vacuum Transmitters
Electrical Controls with Internal Components
Control Panels

All motors, pumps, and bearings shall be designed for continuous duty and long operating life in a high humidity atmosphere. All motors and pumps shall be 460 volt, 60 hertz, 3 phase.

The basis of design shall be Model ADFSC-108x24E-PC Aqua MegaDisk filter with PES 14 (5-micron) cloth filter media as manufactured by Aqua-Aerobic Systems, Inc., of Loves Park, Illinois.

The filter media shall have the demonstrated ability to be utilized in a direct filtration application where ferric chloride is dosed directly ahead of the filter to achieve ultra-low phosphorus removal. Owner references shall be provided where full scale and/or pilot testing has been successfully performed with ferric chloride to achieve phosphorus polishing below 0.3 mg/l TP in this manner.

The filter media shall have the demonstrated ability to have a continuous free chlorine residual of 2.0 mg/l in the filter influent flow.

The filter manufacturer shall provide evidence as part responding to the RFP of current manufacturing and completed field testing thereof for an advanced cloth media that has a nominal rating of 2.0 micron or less. This advanced cloth media shall be for ultra-low phosphorus removal by achieving at least 50 percent removal of particles in the 3 micron size range. This advanced cloth media shall be directly installable on the Offeror's proposed cloth media filter system being procured by the referenced RFP in the same manner as regular cloth replacement is performed. The advanced cloth media filter shall result

in a design maximum day flow capacity de-rating no greater than a 1.63 factor. That is to say, a 24 MGD maximum day rating with a 5 micron cloth media when replaced with a 2 micron advanced cloth media shall be NO LESS than 15.0 MGD maximum day rated flow capacity.

Plan and section views of the existing filters are located at the end of this Section. Original design drawings of the existing filters are available on the HRRSA website.

FILTER CLOTH ASSEMBLIES

A single "filter" shall consist of no more than twenty-four (24) cloth disk assemblies. Each filter unit shall have a total of 2,582 square feet of minimum effective submerged filtration area. Only actual filtration media area below the effluent weir elevation will be considered in the filtration area calculation since this is the only area that is submerged and available for filtration 100% of the time.

Cloths shall be of fiber pile construction having a nominal filtration rating of 5 microns. Granular media and screens having structured identical openings shall not be allowed. The pile cloth shall be free chlorine resistant cloth. The pile cloth shall also have a demonstrated ability to be resistance to direct application of ferric chloride.

Pile cloth media with nylon material of construction is not free chlorine resistant and shall not be acceptable. The cloth media shall have an active filter depth of 3 to 5 mm to provide additional collisions between solids particles and the media within the media depth, resulting in capture of solids across a broader particle range. The cloth depth shall also provide storage of captured solids, reducing backwash volumes while maintaining an operational head loss. Woven mesh or micro screen type media with no filtration depth are not acceptable. To avoid excessive media movement, deformation and folding during backwash, the maximum distance between cloth restraints must not exceed 36 inches.

Each cloth disk assembly shall be comprised of eight (8) individual segments, each consisting of a cloth media sock supported by an injection molded polypropylene co-polymer frame with corrosion resistant assembly hardware. Cloth/frame assemblies shall be constructed such that each segment is easily removable from the center tube, without special tools, to allow for removal and replacement of the cloth at the point of installation. Systems requiring special tools and/or the return of media segments to the factory for replacement will not be considered. If the wet weight of the filter disk segment is greater than 50 pounds, a lifting mechanism shall be provided.

During filtration, the filter unit shall operate in a static condition with no moving parts. The filter system shall provide for the collection of filtered solids on the outside of the cloth media surface to allow for the direct contact of cleaning systems. Filtered effluent shall be used for backwashing. The filter flow path shall be from the outside of the cloth frame to the inside. Systems with flow paths from the inside to the outside of the cloth frame that collect filtered solids and plastic debris on the interior surfaces of the cloth frame will not be acceptable.

Information submitted pursuant to the RFP shall include calculations that verify the effective filtration surface area. Media surface fused directly to support structure such that water cannot pass through the media shall not be included in these calculations. Because of the frequency of the backwash and misting associated with spray systems, designs that utilize high pressure spray or a moving vacuum head as the sole means of solids removal will not be acceptable.

Number of Filter Units:
Phase II: one (1)
Phase III two (2)

Included information shall include a hydraulic profile through the filter showing the items noted below. Minimum required weir lengths to achieve 24 MGD maximum day flow for Phase II and 48 MGD maximum day flow for Phase III shall be clearly noted and utilized in the development of the information.

- Influent weir length
- Influent weir elevation
- Influent weir nappe at design and peak flow
- Effluent weir length
- Effluent weir elevation
- Effluent weir nappe at design and peak flow

WARRANTY

The Manufacturer shall provide a written warranty against defects in materials and workmanship. Manufacturer shall warrant the goods provided by the Manufacturer to be free from defects in materials and workmanship under normal conditions and use for a period of two (2) years from the date the goods are put into service, or thirty (30) months from shipment of equipment, whichever first shall occur. This warranty shall not apply to any goods or parts which have been altered, applied, operated or installed contrary to the Manufacturer's instructions or subject to misuse, negligence or accident.

MANUFACTURING QUALIFICATIONS

The Offeror shall have experience in the design and manufacture of cloth media filters for a minimum of ten (10) years and shall meet the United States experience requirements set forth in the RFP.

PERFORMANCE AND DESIGN PARAMETERS

The cloth media filter equipment being provided pursuant to this RFP shall be capable of filtering secondary effluent from an enhanced nutrient removal activated sludge system with suspended solids (TSS) concentrations of 20 mg/l at maximum day flow conditions. Filter effluent total suspended solids concentration shall not be greater than 3 mg/l based on a weekly average. Design flow conditions shall be:

Phase II equipment supplied only (one filter unit total, operating)
24 MGD Maximum Daily Flow

Phase III equipment supplied only (two filter units total, operating)
48 MGD Maximum Daily Flow

The filter media shall have the demonstrated ability to be utilized in a direct filtration application where ferric chloride is dosed directly ahead of the filter to achieve ultra-low phosphorus removal. The filter media shall have the demonstrated ability to have a continuous free chlorine residual of 2.0 mg// of the filter influent feed flow.

BASIN MOUNTING BRACKETS, SUPPORTS AND HARDWARE

The filter manufacturer shall furnish 304 stainless steel mounting brackets to accommodate attachment of all filter components to inside of the existing concrete basin as required. All mounting brackets shall be attached to the inside of basin wall with stainless steel anchors and hardware. All necessary mounting brackets, supports and hardware required for a complete and functional filter system **SHALL BE** provided by the filter manufacturer, to include the effluent seal mounting plate for each filter system.

DRIVE ASSEMBLY

Each filter shall include an adjustable drive assembly with a gearbox, cast iron hub with 316 stainless steel sprocket segments, 15-5 PH stainless steel drive chain with 17-4 PH stainless steel link pins, and a 304 stainless steel chain guard. The gearbox shall be parallel in-line helical type, AGMA Class 1 with a 5 HP drive motor rated for 460 volt, 3 phase, 60 Hz. Gear reducer shall be SEW or approved equal. Drive motor shall be SEW, Weg, Baldor, or approved equal.

To reduce energy demand, the drive assembly shall rotate the disks only during backwash. Systems requiring constantly rotating disks during filtration will not be acceptable. Belt drive systems or systems with multiple drive units per filter will not be acceptable.

If motors and gearboxes require routine maintenance and are not accessible from outside the basin side walls, the equipment manufacturer shall provide an internal access platform between the basin side walls and motors and gearboxes.

CENTER TUBE ASSEMBLY & EFFLUENT SEAL MOUNTING PLATE

Each filter shall include a center tube assembly that is a minimum 1/4" thick 304 stainless steel center tube weldment, driven sprocket, wheel assemblies, 304 stainless steel disk segment rods, and frame and cloth assemblies. Each center tube assembly shall also include a Viton v-ring effluent port seal which provides superior chlorine resistance. Materials other than Viton are not acceptable for seal materials. The driven sprocket shall be multi segment made of high grade stainless steel. All fasteners shall be stainless steel.

Each filter shall include an effluent seal mounting plate constructed of a minimum 3/8" thick 304 stainless steel.

BACKWASH AND SOLIDS REMOVAL SYSTEM

The backwash function shall incorporate a pump that draws filter effluent through the cloth as the media rotates past the fixed backwash shoe, thereby removing accumulated solids from the cloth surface. Each disk shall be cleaned by a minimum of two backwash shoes, one on each side. The backwash shoes shall remain in a fixed position.

The backwash shoe shall be in direct contact with the cloth to ensure effective media cleaning. Systems utilizing media cleaning mechanisms that do not contact the filter media will not be acceptable. Neither the cloth / support assemblies nor the backwash shoes shall include any gridwork overlays or other interferences that would prevent direct contact of the backwash shoes with the cloth fibers.

The backwash system shall include 304 stainless steel backwash shoe supports with UHMW backwash shoes, reinforced PVC flexible hose with stainless steel hose clamps, 304 stainless steel backwash manifolds, and PVC sludge collection manifold.

BACKWASH/WASTE PUMP ASSEMBLY

The filter backwash assembly for Phase II shall include one (1) backwash/waste pump with associated valves, gauges and one (1) flow meter. The filter backwash assembly for Phase III shall include three (3) backwash/waste pumps with associated valves, gauges and three (3) flow meters. All flow meters shall have 4-20 mA output.

The backwash/waste pumps shall be a Gorman Rupp externally mounted centrifugal suction lift pump. Each pump shall have a synchronous speed of 1200 RPM and shall be rated for 506 gpm at 76 ft TDH. Motors shall be Baldor, Teco, Weg or approved equal. Each pump shall be provided with anchors. Backwashing shall be initiated by basin water level, timer, or manually through the operator interface. Operator shall have the ability to specify backwash time interval elapses through the operator interface.

The backwash water shall be pressurized by the filter's backwash/waste pump for discharging from the filter system. Systems utilizing non-pressurized backwash flow will not be accepted. Programming shall be provided to only allow sequential backwashing of filter units within the same concrete structure.

The vacuum gauge(s) shall have a minimum 2.5" dial with all stainless steel welded construction, 30" Hg to 15 psi compound range, liquid filled, ¼" NPT process connection, 316 stainless steel bourdon tube and tip material, and bronze socket material, Ashcroft or approved equal.

The pressure gauge(s) shall have a 2.5" dial with a black painted steel case, 0-30 psi, heat resistant polycarbonate window, ¼" NPT process connection, "C" shaped bronze bourdon tube, and brass socket material, Ashcroft or approved equal.

Filtering shall not be interrupted during normal backwashing and solids waste discharge.

Number of Backwash Pumps & Flow Meters:
Phase II: one (1) backwash pumps and one (1) flow meter.
Phase III: three (3) backwash pumps and three (3) flows meters.

VALVES

Backwash valve(s) shall be Milliken 601-N0 125# flanged end connection, ASTM A-126 Class B cast iron body with welded in nickel seat, EPDM coated non-lubricated ductile iron plug with 80 % port opening, assembled and tested with an Auma 115 volt, single phase, 60 cycle open/close service electric actuator. Valve actuator shall include a compartment heater, manual override, and limit switch feedback in the open and closed position. Actuator(s) include local controls consisting of pushbutton(s), selector switch(es), and light(s).

Because of fouling that can be caused by stringy material, valves such as butterfly valves or plastic valves shall not be acceptable.

Number of Backwash Valves:
Phase II: three (3)
Phase III: six (6)

Solids wasting valves shall be Milliken 601-N0 125# flanged end connection, ASTM A-126 Class B cast iron body with welded in nickel seat, EPDM coated non-lubricated ductile iron plug with 80 % port opening, assembled and tested with an Auma 115 volt, single phase, 60 cycle open/close service electric actuator. Valve actuator shall include a compartment heater, manual override, and limit switch feedback in the open and closed position. Actuator(s) include local controls consisting of pushbuttons, selector switches, and lights.

Number of Solids Wasting Valves:
Phase II: zero (0)
Phase III: three (3)

The in basin solids waste manifold already exists for Phase II. For Phase III, three (3) independent solids waste manifold systems consisting of perforated schedule 80 PVC pipe shall be provided. Each manifold shall be designed to siphon settled solids for waste discharge through the backwash/waste pump. The operation of the solids waste removal system shall be automatic with user adjustable intervals and duration through the operator interface. Filters that are designed without a solids waste removal system will not be acceptable.

PRESSURE TRANSDUCER

A submersible pressure transducer shall be supplied for each filter supplied. Each pressure transducer shall have stainless steel wetted parts and provide a 4-20 mA signal over a range of 0 psi to 5 psi. Units shall monitor the water level in each respective concrete filter basin. Pressure transducers shall be provided with a mounting bracket and stainless-steel anchors. Electrical connection shall be 2-wire, loop powered through a shielded integral cable comprised of 22 AWG conductors and separate drain wire. An aneroid bellows providing vented gage atmospheric reference shall be supplied for contractor installation in junction box. The installing contractor shall provide junction box, bellows mounting and interconnecting wiring. Transducers shall be KPSI Model 710 series or approved equal.

Number of Pressure Transducers:
Phase II: one (1)
Phase III: two (2)

FLOAT SWITCH

A float switch shall be furnished to indicate emerging overflow level. The float switch shall be Anchor Scientific Model GSI 40NONC-STO or approved equal. The float shall contain a non-mercury switch, chemical resistant polypropylene casing hermetically sealed and a PVC #18 AWG three conductor cable. Switch rating shall be minimum 4.5 amps non-inductive at 120 VAC.

Number of Float Switches:
Phase II: zero (0)
Phase III: one (1).

VACUUM TRANSMITTER

Each backwash pump supplied shall have a vacuum transmitter. Each vacuum transmitter shall have stainless steel wetted parts and provide a 4-20 mA signal over a compound range of -30 to 0 inHg. Each Transmitter shall be an IFM Effector PA series or approved equal.

Number of Vacuum Transmitters:
Phase II: one (1)
Phase III: three (3).

MISC./SPARE PARTS

Phase II: none.
Phase III:
(6) Frame and cloth assemblies.
(3) Backwash/solids waste valve and actuators.
(3) Viton V-ring effluent port/center tube seals.

CONTROL SYSTEM

The automatic and manual controls for operation of the Filter system shall be furnished fully assembled, wired and pre-programmed in a UL 508A Certified Industrial Control Panel. Controls shall be provided to control or monitor equipment as described in this specification and the RFP. The control system shall include the following control components and practices.

CONTROL PANEL WIRING AND ASSEMBLY

All control enclosures shall be custom assembled and wired in an Underwriters Laboratories (UL) certified cabinet shop using quality 304 Stainless steel materials and labor. Short circuit rating of control enclosure shall be 5 kA RMS symmetrical @ 480VAC maximum.

All control panel single conductor wire shall be 16 AWG multi-strand machine tool wire (MTW) minimum, with PVC insulation.

Wire colors are as follows:

208 VAC or higher	-	Black
120 VAC control power	-	Red
Neutral	-	White
Ground	-	Green
AC Power from remote source	-	Yellow
Neutral from remote source	-	White with Yellow Stripe
24 VDC (+)	-	Blue
24 VDC (-)	-	White with Blue Stripe
VDC (+) from remote source	-	Orange
VDC (-) from remote source	-	White with Orange Stripe
Intrinsically Safe	-	Light Blue

All wires shall be clearly marked with an identification number consistent with the wiring schematic drawing. Wire markers shall be a thermal transfer printable type. The material shall be a self-laminating vinyl. Labels shall be Brady THT-9-427-10 or approved equal.

Wiring inside the control panel shall be run in PVC wiring duct rated for continuous temperatures up to 122° F (50°C). Devices mounted in the enclosure door shall have wires run in spiral wrap to avoid pinch points when opening and closing the door.

Control components mounted internal and external to the enclosure shall be mounted with stainless steel hardware and clearly labeled with a plastic identification nametag. The tag shall be white with black lettering.

CONTROL PANEL QUALITY ASSURANCE

All Control panels shall be UL certified. Testing by manufacturer's electrical engineering prior to releasing for shipment shall be completed. Testing shall consist of the following:

Point to point testing of all wiring prior to application of power
Intended supply voltage shall be applied to the enclosure
All components shall be tested for proper operation and calibration
The PLC and operator interface program shall be loaded and functionally checked
All components shall be checked to confirm proper mounting specifications have been followed
Enclosure shall be inspected for defects and repaired if necessary
All labeling of wires and devices are correct, properly installed and clean

The manufacturer shall finalize the factory checkout by completing a control panel checklist to document all testing completed above.

Upon the successful completion of the control testing of the enclosure assembly, all applicable documentation (i.e. finalized drawing set, signed control checklist cover page, device data sheets, etc.) shall be placed in the drawing pocket of the enclosure.

CONTROL ENCLOSURE

The automatic controls shall be provided in a UL listed, NEMA Type 4X 304 stainless steel (14 gauge) wall mounted enclosure that provides insulation and protection for electrical controls and components from highly corrosive environments indoors and outdoors. Enclosure shall include a seamless foam-in-place gasket to assure watertight and dust-tight seal.

Number of Control Enclosures
Phase II: one (1)
Phase III: one (1)

AIR CONDITIONER

A thermostat-controlled air conditioner shall be supplied for each control panel to protect control components mounted inside the enclosure from high temperatures, humidity and ambient air contaminants. The air conditioner shall be constructed of brushed finish stainless steel 304 material and provide NEMA 4X Type protection from outdoor and hose-down applications. The air conditioner unit shall use CFC-free or environmentally safe refrigerant that is universally accepted.

ELECTRIC HEATER

An electric heater shall be provided for each control panel inside the control enclosure to protect sensitive mechanical and electrical components from the harmful effects of condensation, corrosion and low temperatures. The heater is a thermostatically controlled, fan-driven unit.

MAIN DISCONNECT CIRCUIT BREAKER

A UL listed, automatic molded case 3-pole disconnect breaker shall be provided in each control enclosure. The primary function of the disconnect switch shall be to provide a means to manually open a circuit and automatically open a circuit under overload or short circuit conditions. The disconnect breaker shall have a door mounted operating mechanism with trip indication. Power distribution connectors shall be mounted integrally to the circuit breaker for multiple load connections. Integral connectors shall be provided. The disconnect circuit breaker shall be a Square D.

VARIABLE FREQUENCY DRIVE – DRIVE ASSEMBLY

UL Listed Variable Frequency Drive (VFD) shall be provided to control the drive assembly of the filter. The VFD shall control the drive assembly speed via an analog signal from the PLC. The VFD output frequency shall be programmable. The VFD shall be provided in the control panel.

Number of Dive Assembly VFDs:
Phase II: one (1)
Phase III: two (2)

VARIABLE FREQUENCY DRIVE – BACKWASH PUMPS

UL Listed Variable Frequency Drive (VFD) shall be provided to control each backwash pump. Each VFD shall control pump speed via an analog signal from the PLC based on the feedback of the flow meter. The flow meter shall be supplied by the filter manufacturer and shipped loose with the filter equipment. The VFD output frequency shall be programmable. Each backwash pump VFD shall be mounted in the respective control panel.

Number of Backwash Pump VFDs:
Phase II: one (1)
Phase III: three (3)

TRANSFORMER
A step-down multi-tap transformer shall be supplied when there is a necessity to reduce incoming 3-phase power to 120 VAC single-phase. The transformer power wire connections (incoming and outgoing) shall be protected with a finger-safe cover to protect against accidental contact. Primary and secondary fuse protection shall be provided. Transformer shall be UL listed and of continuous wound construction with vacuum impregnated with non-hygroscopic thermosetting varnish. Transformer shall be Square D.

TRANSFORMER PRIMARY AND SECONDARY FUSE
Properly rated fuses and fuse blocks shall be provided for primary and secondary protection of each transformer. Each fuse shall be equipped with a thermoplastic cover to protect against accidental contact. Clip style fuse block shall be rated up to 600 VAC and 100 amps, dual element, time delay fuses shall be rated up to 600 VAC. Fuse blocks and fuses shall be UL listed.

CIRCUIT BREAKER
All single phase branch or supplementary circuits shall be protected with a single-pole, C-Curve rated circuit breaker. Circuit breakers shall be rated for 240 VAC maximum, 50/60 Hz and UL 489 listed.

FUSE
Properly rated fuses and fuse holders shall be provided for protection of individual control devices (discrete and analog signals) mounted outside of the enclosures. Each fuse shall be housed in a hinged type fuse block to protect against contact with the fuse.

OPERATOR DEVICE
Operator devices (pushbuttons and selector switches) shall be mounted through each respective control enclosure door for manual operation of the filter. Transformer type pilot lights and illuminated pushbuttons shall be provided for indication of an operation status. Lights shall be a 6 VAC incandescent type lamp. Color coding shall be applied as required and is as follows:

Amber – Alarm active, caution; Green – Valve open, motor running; Red – Valve closed; White - Information

All operator devices shall be UL Listed, 30.5mm style, NEMA Type 4X rated, oil and water tight with finger safe guards located on the contact blocks to prevent accidental contact with wire connections. Operator device function shall be identified with an engraved white Gravoply nameplate with black letters.

HIGH FREQUENCY NOISE FILTER
A UL listed active tracking filter shall be provided to protect each PLC and HMI power feeds from high-frequency noise and low-energy transients.

GROUND FAULT DUPLEX RECEPTACLE
A UL listed ground fault circuit interrupter (GFCI) duplex receptacle shall be provided within each control panel supplied for instrument (e.g. programming terminal, modem, etc.) use only. The receptacles shall be protected with a 5 Amp circuit breaker. The receptacle shall carry a 20A / 120VAC rating. The electro-mechanical circuit interrupter shall be double-pole and trip free (GFCI protection and shall not be overridden by holding reset button). Built-in transient suppression shall protect GFCI's internal circuitry from voltage transients.

24 VOLT DC POWER SUPPLY
A UL listed, industrial grade, compact power supply shall be supplied for each control panel to provide 24 VDC power to such rated components. The power supply shall be DIN rail mounted and functional with

input voltage of 100 to 240 VAC (single-phase) incoming control power. The power supply shall have a green LED which shall be illuminated when output voltage is “OK”.

CONTROL RELAY

UL listed control relays for general control purposes shall be supplied with a pilot light to indicate when the coil is in an energized state. The relay socket shall be panel or DIN rail mounted inside the enclosure. The relays shall provide the following ratings: 120VAC coil, 10A contact rating (thermal), 250 VAC insulation rating and 5 million mechanical life cycles. Relays shall be Square D.

TERMINAL BLOCK

Standard feed-through screw terminal blocks, DIN rail mounted, shall be supplied for all point to point wiring connections. All terminals shall be numbered per the wiring schematic with printed markers. Terminals shall carry a 600V AC/DC voltage rating.

PROGRAMMABLE LOGIC CONTROLLER

The existing Modicon 350 PLC shall be utilized and programed to operate and control all aspects of the Phase II filter system. The existing Modicon 350 PLC shall operate the existing filter system as well as the Phase II filter system in an efficient tandem fashion.

The Phase III filter system shall be automatically controlled through a Modicon 350 programmable logic controller (PLC) mounted inside the main control panel. The PLC components shall consist of a base unit, expansion I/O modules, and memory module. All input and output points supplied (including unused) shall be wired to terminal blocks. The PLC user memory shall consist of a minimum of 20K words of program and data. All PLC hardware shall be UL listed and operate at an ambient temperature of -4° to 140° F (-20° to 60° C).

Number of PLCs:
Phase II: zero (0)
Phase III: one (1)

MEMORY MODULE

Each controller shall be shipped with a memory module for user program and data backup

HUMAN MACHINE INTERFACE OVERVIEW

The existing human machine interface shall be utilized to operate all aspects of the Phase II filter system. The existing human machine interface will operate the existing filter system as well as the Phase II filter system in an efficient tandem fashion.

The Phase III control system shall be equipped with a UL listed operator interface that provides control display screens. These screens shall be used by the operator to monitor and control filter status, setpoint and alarm information. The Interface shall allow the Operator access to adjust the following operating parameters:

- Backwash interval, Backwash duration, Solids Waste interval, Solids Waste duration, Number of Backwashes between Solids Waste interval.

The operator interface shall provide information to assist the Operator in assessing the status of the filter system. The interface screen shall display, at minimum, the following parameters:

- Water level in the filter, Time since last Backwash, Time since last Solids Waste withdrawal, Elapsed time on the Drive Motor, Elapsed time on the Backwash/Waste Pump(s), Total Backwash time and cycles, Total Solids Waste withdrawal time and cycles.

The operator interface shall allow the Operator to:

- Initiate Backwash
- Control all electric actuated valves

The interface shall display the alarm history. The alarm history shall include the time and date of the most recent 25 alarms along with the description of the alarm.
The interface shall also display current alarms, including the date, time and a description of the alarm.
As a diagnostic aid to the Operator, the interface shall display the time between Backwashes for the most recent 40 Backwashes.

HUMAN MACHINE INTERFACE

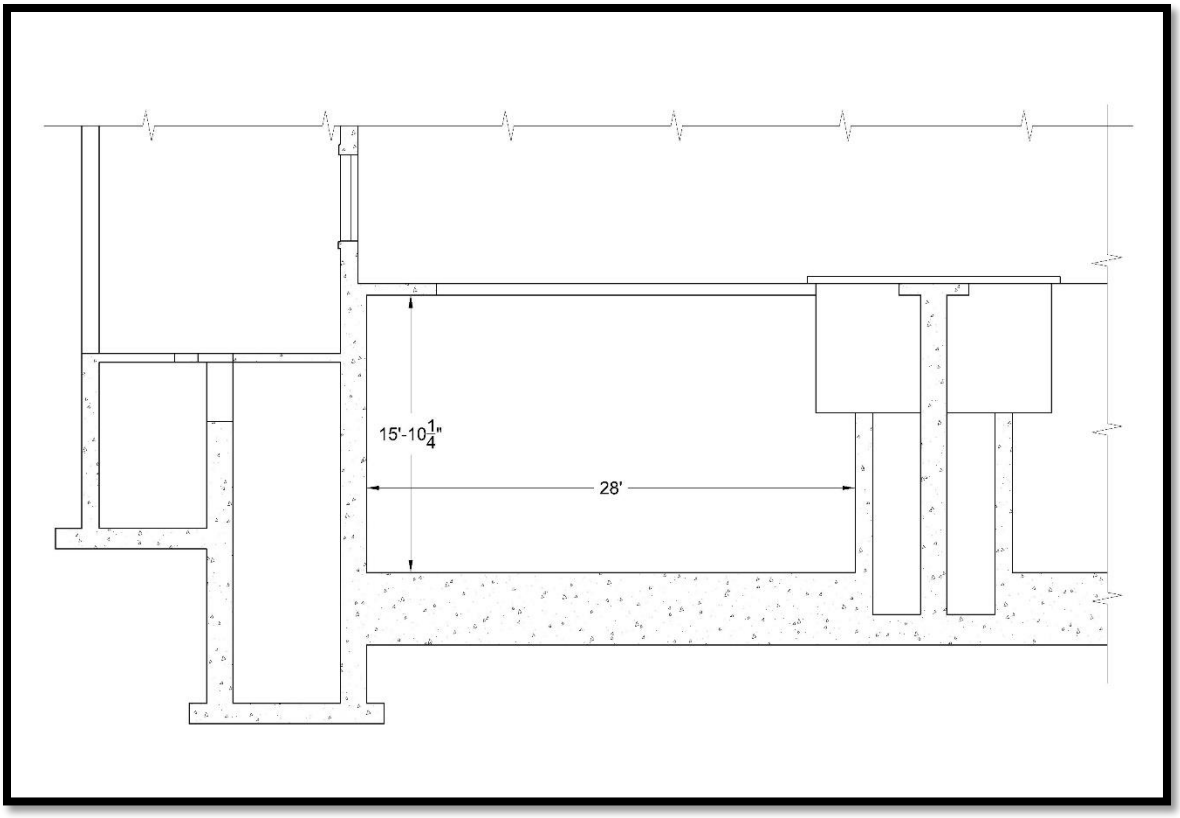
The operator interface shall be a NEMA Type 4X rated, 12" diagonal, color touchscreen display with Ethernet and serial communications. The interface shall be a liquid crystal display (LCD). The display type shall be color active matrix thin-film transistor (TFT) with 640 x 480 pixel resolution. The rated operating temperature shall be 32° to 131° F (0° to 55° C).

Number of HMIs:
Phase II: zero (0)
Phase III: one (1)

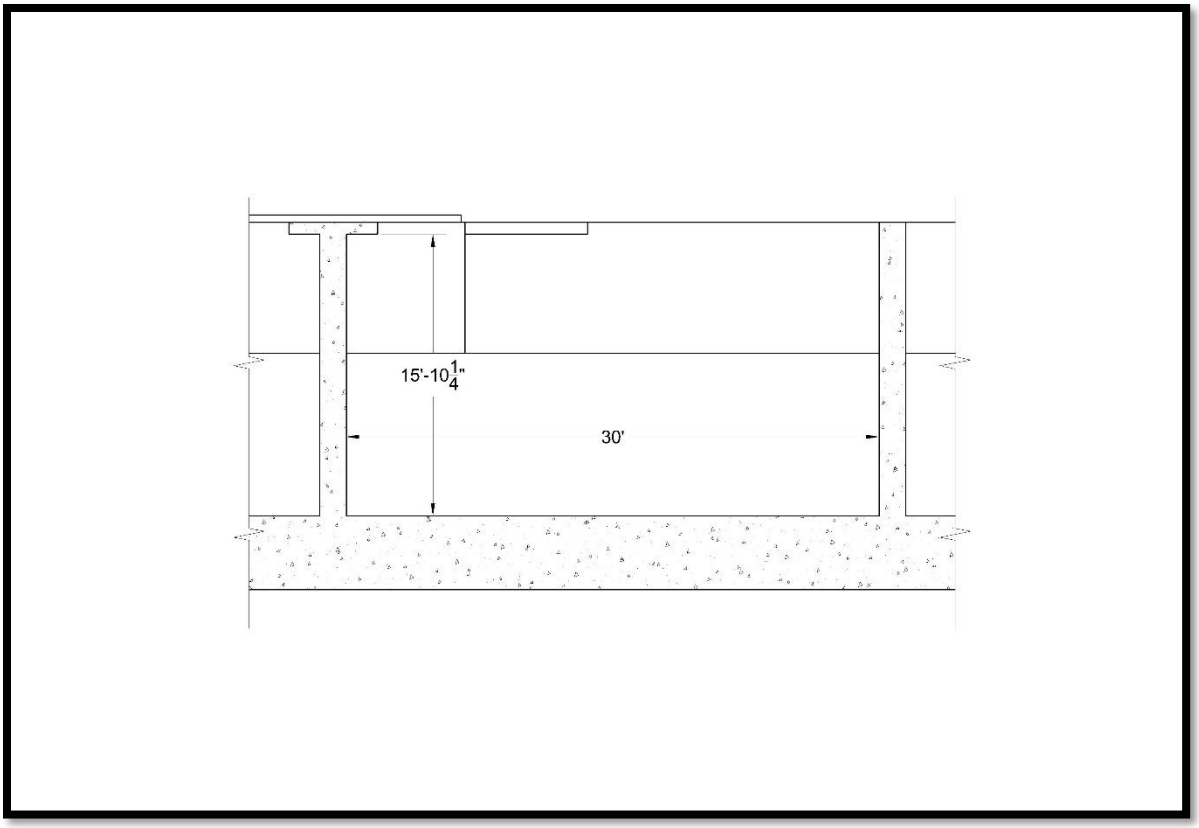
HUMAN MACHINE INTERFACE SUN SHIELD

A sun shield constructed of 304 stainless steel shall be mounted over the operator interface to provide protection and visibility of operator screens in outdoor applications.

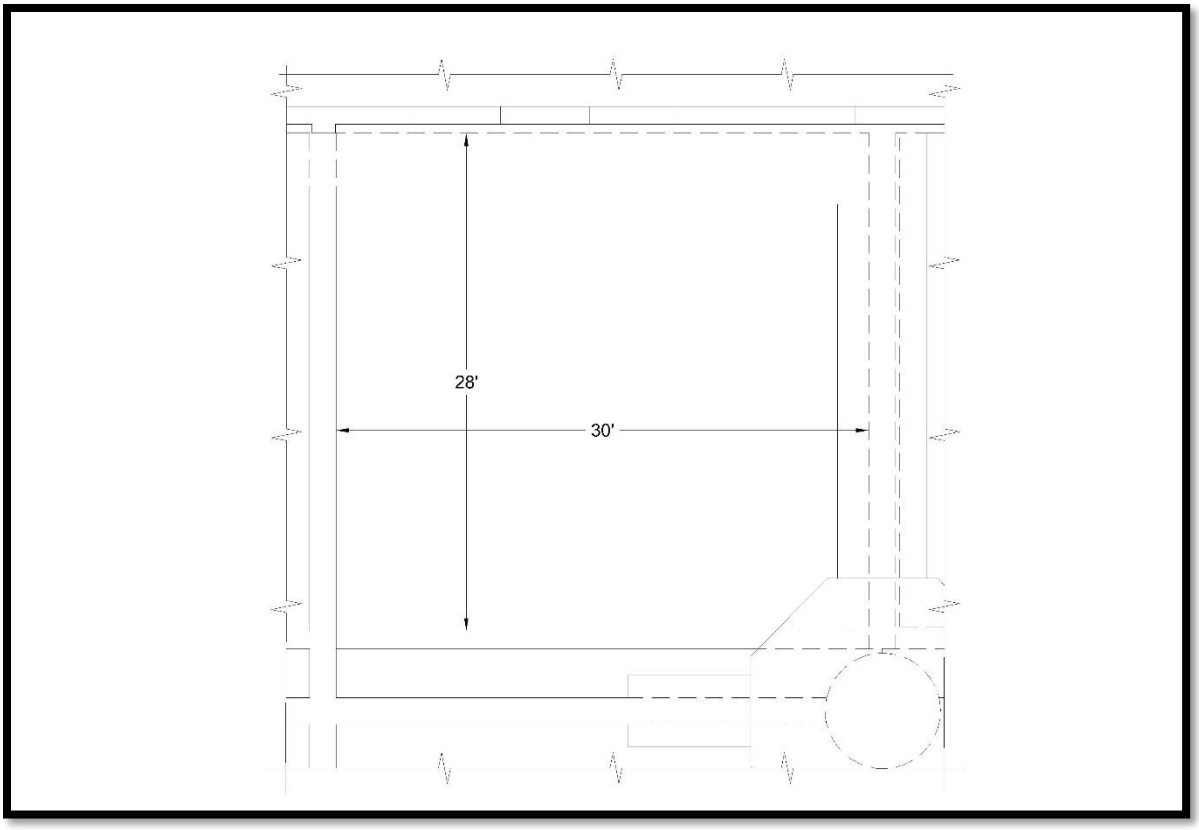
Number of HMI Sun shields:
Phase II: zero (0)
Phase III: one (1)



Section View - Existing Filters



Section View - Existing Filters



Plan View - Existing Filter Cell

END OF SECTION