SPECIFICATIONS, CALCULATIONS, & SUPPORTING MATERIAL

FOR A GROUND ABSORPTION SEWAGE DISPOSAL SYSTEM

USING SEPTIC TANK, TS-I ADVANCED TREATMENT,

AND SUBSURFACE DRIP DISPOSAL

TO SERVE A NEW COMMERCIAL OFFICE BUILDING

4500 Morris Park Drive

Mint Hill, Mecklenburg County, North Carolina

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SECTION I -GENERAL

Persis-Nova Construction, Inc. is seeking a septic system permit to construct a new commercial office building on a vacant lot located at 4500 Morris Park Drive in Mint Hill, Mecklenburg County, North Carolina. The septic system collection, treatment and disposal system will consist of a baffled septic tank with effluent filter, Orenco AX-20 RT with TS-I advanced treatment technology with incorporated recirculation tank and field dosing tank with pumps and controls. Other components include drip headworks and subsurface disposal. Due to limited available space, soil conditions and limiting topography, a pre-treatment system and subsurface drip effluent disposal system. The design flow has been set at 360 GPD.

Michael Athanas, LSS & Scott Kennedy with MA&A evaluated the area for the proposed disposal and repair area. An application rate of 0.10 G/D/SF has been recommended for the primary and repair. The effluent will be pretreated using a septic tank, Orenco Advantex AX-20 RT Module recirculating textile-media enclosed filter bed and disposed of using subsurface drip irrigation technology.

These specifications and design plans have been prepared for a subsurface effluent drip disposal system using a septic tank, recirculating textile-media filter w/ incorporated recirculation and field dosing tank with a single zone drip disposal system.

The system is designed to accept and treat domestic waste only. No other discharge is allowed, including condensate water from HVAC systems, etc.

The Engineer has designed a textile-media filter and drip irrigation system that dispenses treated effluent through drip irrigation using design criteria intended to comply with NC DEM Administrative Code 15A NCAC 2H.0200 and 15A NCAC 18A .1969, and NC DEH Onsite Section Innovative Wastewater System IWWS – 2000-02R (Geoflow Sub-Surface Drip System) and OSI Advantex Recirculating Textile-Media Filter. (IWWS-2004-03-R4).

Until plan acceptance and construction, the drip field and repair field shall be maintained undisturbed. This shall include placement of signs, ribbons, and barricades to avoid traffic, storage, or parking in the area. Encroachment by any utility or others is not permitted.

The Contractor shall be prohibited from working while the site is wet. The Contractor shall contact the Engineer prior to commencement of work after rainfall. The Contractor shall consult with the Soil Scientist or Design Engineer prior to filling areas shown on plan. This area shall only be filled with a preapproved material.

The Engineer and/or the Soil Scientist have the right to suspend work until soil moisture conditions are favorable to optimal installation.

The installer shall be knowledgeable of the type of system to be installed and shall have prior instruction on the installation of the various components of the system and shall have the prior approval of the component manufacturers, (Orenco) and (Geoflow), and the approval of the Design Engineer.

Geoflow & Orenco Field Representative(s) and designer shall provide written acceptance of the system installation prior to issuance of operation permit.

Scope of the Project: The scope of this project is to construct a system to collect the domestic waste from the proposed commercial office building and convey it via gravity to a properly sized two-compartment septic tank. The outlet at the second compartment of the tank will have a slotted wastewater effluent filter. From the septic tank the effluent flows to a three-compartment module that contains the treatment unit, recirculation chamber, which will dose a textile-media pretreatment filter, which provides an aerobic environment for bacteria. A timer-controlled turbine pump will dose treated effluent to the drip field from the enclosed field dosing chamber within the treatment module.

The drip dosing system will have solenoid valves, spin clean filter, flow meter, air release valves and other apparatus and controls to allow the automatic dosing and maintenance of the system.

The pump controls will have a 24-hour clock, programmable as determined by the operator. Controls shall also have elapsed run time clock and cycle counter for each pump. Unless alternately provided with the advanced Pretreatment System, the drip system control panel shall enable the daily, 7-day and 30-day monitoring requirements of Rule .1970 to be met, such as by data logging the field dosing times or field flow

meter readings. The controls shall also have manual operating capabilities and alarms. The controls are to be located at a readily accessible location at the residence.

DIRECTIONS TO THE PROPERTY:
Take 485 toward Highway 74 (Independence Blvd). Head north on Highway 74 to Matthews-Mint Hill Road. Turn right at end of ramp. Go past Idlewild Road and turn left on Lebanon Road. Take first right on Morris Park Road. Subject property is located at end of road.

SECTION II - REGULATIONS

In addition to compliance with laws, rules and regulations as required under the General Conditions of these Documents, the Contractor shall comply with the following specific regulations as applicable to the nature of work included under this Contract.

Reference Material:

(1) GEOFLOW SUBSURFACE DRIP SYSTEMS. Design and Installation Manual, October 2007, Geoflow, Inc.

(2) LAWS AND RULES FOR GROUND ABSORPTION SEWAGE DISPOSAL SYSTEMS. SECTION .1900 OF THE N.C. Administrative Code: Title 10 Health Services; Environmental Health; Subchapter 10a; Sanitation. Published by N.C. Dept. of Human Resources; Amended effective January 10, 1997.

(3) EPA 625/R-00/008 Design Manual - On-site Wastewater Treatment and Disposal System; February 2002; Chapter 7.

(4) NC DEM Administrative Code : 15A NCAC 2H.0200, 15A NCAC T15A Section .1900

(5) OSI ADVANTEX Treatment System, Manual including performance information, OSI, Inc.

(6) EPA: Technology Assessment of Intermittent Sand Filter, April 1985.

(7) NC DEH-OSWPS – Innovative Approvals for Geoflow, Inc. & Orenco Systems, Inc.

SECTION III - BASIS OF DESIGN

DEVELOPMENT DESCRIPTION

Location	4500 Morris Park Drive Mint Hill, Mecklenburg County, NC
Water Supply	Private Well
Sewage Disposal	On-Site Septic System with One TS-I Recirculating Textile Media Filter, & Subsurface Drip Irrigation
Application Rate	0.10 G/D/Sq. Ft.

PROJECTED WASTEWATER FLOWS

Proposed Use	Commercial Office Building
Base Design Flow	4 Offices with 6 Employees Ea. @ 15 G/D/Employee (Utilizing Low Flow Fixtures) = 360 G/D

DESIGN BASIS - TREATMENT SYSTEM

Septic Tank	1,000-gal pre-cast concrete w/ OSI 4” Biotube Filter at outlet (Top Seam Tank Only)
Effluent Filter	(1) Orenco Model FTPS0436-28-NC
Pretreatment	(1) Orenco Advantex AX20RT Textile packed bed media filter module
Pretreatment Control Panel	VCOM-AX20B1/PTHTUVSA

DESIGN BASIS - DRIP SYSTEM

Design Flow	360 G/D
Application Rate	0.10 G/D/SF
Area	7,200 SF Minimum Required for Primary & Repair
Force Main	(1) +/-525 LF 1.00” Dia. SCH 40 PVC
Scour Return Main	(1) +/-525 LF 1.00” Dia. SCH 40 PVC
Drip Lines	One zone with a minimum total of 1,800 LF Geoflow Wasteflow PC; Drip Line with constant flow rate pressure compensating emitters at 2’ centers; Drip Lines at 2’ centers
Emitters	Zone 1 – 900 emitters @ 0.53 G/H = 7.95 G/M
Operating Pressure Range	10 – 60 PSI
Drip Field Pump	Orenco Systems, Inc. PF Series Pump Model PF2015-12 1.5 HP/230 V/1 Ph (15.9 G/M @ 243.10 Ft TDH)
Drip Field Dosing Pump Controller	VCOM-AX20B1/PTHTUVSA programmable controller •Pump run timer •Pump run contacts •Elapsed pump run clock •Pump cycle counter •Zone valve contacts •Filter flush valve contacts

	•Alarm Features •Float input functions
System Dosing Rate	7.95 G/M
Dosing Time per Day	45.28 Minutes per Day
Pump Run	8 times per day for 5.66 minutes per dose
Flush Time	Every 37th cycle, system to be flushed.
Discharge Volume	8 runs/day x 5.66 min x 7.95 G/M = 360 G/D
Headworks	AQWA Single Zone Assembly
Solenoid Valves	(2) Geoflow Model SVLV-B-100 (1 Supply | 1 Return)
Filter	1.5” Spin Filter Geoflow Model AP4E-1.5F Vortex spin clean filter (w/automatic backwash cycle: 3 minute, 15 seconds)
Flow Meter	3/4” Geoflow Model FM-DDS-075 Flow Meter with Flow Rate/Totalizer
Air Vents	Geoflow Model APVBK-1

SECTION IV - COMPONENTS OF SYSTEM

- Collection system from building
- 1,000-gallon septic tank with slotted filter and access port
- Pretreatment – One OSI Advantex Textile filter containing module with cover with recirculation and discharge chamber
- Single zone offsite subsurface drip system (force mains, pump, pump control with audiovisual alarm, spin clean filter, meter, valves, shelter, drip lines and apparatus.)

A. TREATMENT SYSTEM

1. General Requirements - The Contractor shall furnish, install, test, and place into service and warrant the complete system. The major system components including septic tank, slotted filter, textile filter (pretreatment) module, headworks assembly, drip field and controls. Accessories shall be supplied by a single operating entity and shall be equal to that as specified.
2. Five sets of submittal documents and shop drawings for all mechanical equipment and major materials including piping, tanks, and all other accessories shall be furnished to the Engineer for approval. No equipment shall be installed prior to approval by the Engineer.
3. Precast Structures - General: This section shall apply to the septic tank as shown on the Contract Drawings.
4. Approvals: The tank designs shall have been approved by the Division of Environmental Health of NC DHHS and shall have the approval number imprinted on the delivered tank. The tank shall be State Approved and equal to that manufactured by Shoaf Precast, Inc. Openings or inserts shall be cast in during manufacture. Concrete shall have a minimum compressive strength of 4,000 PSI @ 28 days. Shop drawings shall be submitted to the Engineer for approval. If tanks are to be in traffic area, then tanks shall be constructed to meet H-20 highway loadings. All tanks shall be top seam only.
5. Precast Tank Installation: Installer shall excavate for and install the precast concrete tank as per plans. Installer shall ensure that the tank remains level and true to grade after placement and filling with water. The precast tanks shall be evaluated for water tightness by an approved method such as 24-hour water tightness test with maximum allowable leakage not to exceed a maximum of 1/2-inch rise or fall in 24 hours or vacuum test. Contractor shall use clean, potable water free of any sediment for water testing. Either test method shall be run with risers/and inlet/outlet pipes in place. Testing shall begin after the water level in the tank has stabilized. Each tank shall be installed in the location and to the elevations shown on the plans. A 6" undercut shall be made to allow for washed stone leveling course for the tank to rest on.

   Once testing of the tank has been completed, the tanks shall be backfilled in lifts with well compacted, debris free earth to a level, which directs surface water away from the tanks. Tank access holes in the yard shall be installed and grouted watertight and the earth raked smooth for grassing. All tank lids shall be lockable or constructed to prevent easy removal. Tank access in traffic area shall be 24” cast iron manhole frame and lid. Tanks shall not be pumped during extremely wet conditions.
6. Septic Tank shall consist of a 1,000-gallon capacity, reinforced, precast concrete tank with full baffle and shall have easy access to each chamber from ground level for checking and pumping. The first chamber of the septic tank shall consist of 2/3 to 3/4 of the volume of the total tank and the baffle shall contain a horizontal opening across the tank at about midway its height. The PVC outlet tee shall extend one-fourth depth of liquid level and contain an effluent filter. Locate the septic tank at such height as to provide approximately 15" of cover soil over top of the tank or as necessary to receive gravity flow from the collection system. Provide access at each end of the tank. All metal installed in tank shall be stainless steel.
7. Slotted Effluent Filter: An Orenco 4” Biotube effluent filter shall be installed in the PVC outlet tee of the septic tank. The filter shall be manufactured by Orenco System Incorporated. Filter shall be OSI model FTPS0436-28-NC.
8. Advantex Textile Bio-Filter: One textile-containing packed bed media filter module with cover shall be used, one module for a max. of 4 bedrooms or 480 gallons per module per day. The module shall be as described in manufacturer's literature attached herein.

   The module shall be pressure dosed with effluent filtered from the septic tank. Discharge from the module

shall spill over via gravity to the drip field-dosing chamber of the Orenco AX-20RT Module.

Treatment Performance Standards (TS-I): Tertiary treatment without nitrogen reduction.

The Advantex Textile packed bed media filter module shall be designed installed and operated to meet the following standards:

1. Biochemical Oxygen Demand, 5-day (BOD_5) < 15 mg/l
2. Total Suspended Solids (TSS) < 15 mg/l
3. Ammonium-nitrogen (NH_4-N) <10 (mg/l), or at least 80% removal of NH3 if influent TKN exceeds 50 mg/l
4. Fecal coliform bacteria densities < 10,000 colonies/100 mL

Standards are arithmetic means, except fecal coliforms is a geometric mean.

Advantex Unit and all associated appurtenances are available through AQWA at (888) 552-2792.

9. Control Panel: Control panel for the advanced treatment unit shall be mounted 36" or more above grade and readily accessible. The unit shall be as manufactured by Orenco Systems, Inc. The treatment system control panel shall be designed to control the treatment unit dosing pump. The control panel shall be provided factory pre-wired and evaluated in a NEMA 4X lockable fiberglass enclosure which shall contain the following components. Motor contactors and circuit breakers for use with 230V AC 1 Ph current using a max 1½ HP motor, programmable logic unit shall include time functions, elapsed pump run clock and pump cycle counter, motor function, valve controls and float input function and fused transformer for valves. An audiovisual alarm condition light and siren shall be mounted on the top of the panel and include a separately fused transformer. The unit shall have a hand-off-auto (H-O-A) switch. Product shall be as supplied by AQWA at (888) 552-2792.

   The controller shall be able to perform the following functions: receive input for floats and provide operator set timer-controlled pump operation.

   Floats, pump and control circuits, and the control panel shall meet the requirements of Rule .1952(c). Panel and control equipment shall include lightning protection, be protected from unauthorized access, and always remain accessible to the system operator.

   The activation of any alarm shall result in the activation of a dry and a 120 V powered alarm contacts. These contacts may be used to activate externally mounted alarm devices and telemetry systems. The alarm contacts will automatically reset when the R/O-N Switch for the activated alarm is placed in the reset / off position.

   Panel Operation:
   - High Level Alarm Float: When lifted this float will activate the audible alarm and the illuminated pushbutton.
   - Pump Enable Float: When lifted this float will activate the normal dose function.
   - Redundant Off & Low-Level Alarm Float: When lowered this float will activate the audible alarm and illuminated pushbutton. This float will also deactivate the pump in both auto and manual.
   - Pump Operation: The pump dosing cycles will be controlled by the liquid level in the tank.

   Components Include:
   - Motor contractor & circuit breaker rated for use with 230VAC, 1Ph and 1 Ph max
   - Top mounted audiovisual alarm (360 degree flashing red light and 90dB minimum)

10. Float Switches: Water level float control switches shall be equal to Orenco System, Inc., mercury or mechanically activated switches, with cable of adequate length to terminate in the pump control panel. No splicing of wire allowed between switches and control box. Use mercury switched on control circuits and properly rated mechanical switches on power circuits. Conduit between the pump tank and he control panel shall be sealed to prevent sewer gas from entering the control panel. The dosing tanks shall have 4 float switches, a low-level "pump off" switch, a "pump enabling" float "timer override" and at "high water alarm" float. Floats shall be hung from a stainless-steel float bracket attached to the riser and be within 12 inches of lid of riser. Float bracket shall be attached to riser so that no damage is made to riser and any bolt penetrations into riser shall be sealed watertight with a silicon caulk or manufacturer approved equal. Float clamps or brackets shall be supplied by the manufacturer. The lower-level control or "pump-off" must be positioned above the pump, so that the pump remains submerged at all times.

The upper-level control "pump-enabling" is positioned to pump a specified volume of effluent or assures that a full dose is available for timer-controlled dosing. The “high water alarm” control float is mounted at same level the “timer override” float control. (Note: Care must be taken to ensure that floats do not become fouled by other components in the tank such as the electric power cord or the lifting rope.)

DRIP SYSTEM

1. Piping and Valves: All supply and return manifold piping and fittings shall be Schedule 40 PVC conforming to ASTM D1785 as shown on plans and other pressure sewer pipe shall be Class 200 PVC (ASTM D2241) (SDR 21). All couplings and fittings shall be of polyvinyl chloride compounds (ASTM D1784, Type I, Grade I).

2. Wasteflow PC Dripline: The dripline shall consist of nominal sized 1/2" linear low-density polyethylene tubing, with turbulent flow, drip emitters bonded to the inside wall. The tubing shall have an outside diameter (O.D.) of approximately 0.63 inches. The tubing shall consist of three layers; the inside layer shall be a bactericide protection; the middle layer shall be black, and the outside layer shall be purple striped for ease of identification as effluent water. The dripline shall have emitters spaced at 24" centers along the full length of the tubing. Tubing shall be installed at a minimum of 6 inches below ground surface. The emitters shall be pressure compensating to ensure equal dosing from pressure ranges of 10 to 60 PSI. The emitters shall be molded from virgin polyethylene with silicone rubber diaphragms. The emitter shall have a nominal discharge rate of 0.53 gallons per hour within the system design operating pressure. Each emitter shall be impregnated with Treflan to inhibit root intrusion and shall be guaranteed by the manufacturer to inhibit root intrusion for a period of ten (10) years. Wasteflow PC pressure compensating wasteflow dripline shall be Geoflow Model Number WFPC 16-4-24 as available through AQWA at (888) 552-2792.

3. Ball Valves: All thermoplastic ball valves shall be constructed from PVC Type I Cell Classification 12454 or CPVC Type IV Cell Classification 23447. All o-rings shall be Viton. All valves shall have Safe-T-Shear stem and double stop polypropylene or CPVC handle. All valve union nuts shall have Buttress threads for structural integrity. All seal carriers shall be Safe-T-Blocked. All valve components shall be replaceable for valve serviceability using rebuild kits. All valves shall be warranted against defects in material and workmanship for a period of one year. All valves shall be listed for potable water use by the National Sanitation Foundation (NSF). All 1/2" through 2" valves shall be pressure tested at 235 PSI and all 2-1/2" through 6" valves shall be pressure rated at 150 PSI for water at 73 degrees Fahrenheit, as manufactured by Spears Manufacturing Company or approved equal.

4. Swing Check Valves: Swing check valves shall be flow control PVC swing check valves with rubber flapper and PVC cap as manufactured by Geoflow Model CV-S-10 as supplied by AQWA at (888) 552-2792.

5. Air Vacuum Relief Valve: The air vacuum relief valve provides instant and continuous vacuum relief and non-continuous air relief. Both the body and the removable dirt cover shall be constructed of molded plastic. The body and the dirt cover shall be connected with a 1-inch pipe thread. The ball shall be constructed of a low-density plastic and the internal seal shall be constructed of vinyl. The air vacuum relief valve shall seal at 5 PSI. Inlet size shall be 1-inch male pipe thread. The air vent shall be Geoflow Item Number APVBKV-1 with attached Schrader valve as supplied by AQWA at (888) 552-2792.

6. Drip System Dosing Pump: For the drip field, an Orenco PF Series Model PF2015-12 1.5 HP/230 V/1 Ph, capable of pumping 15.9 GPM @ 243.10’ TDH for the drip irrigation. Details of pump installation are shown on the plan. Product shall be as supplied by AQWA at (888) 552-2792.

7. Drip System Controller shall be mounted 36” or more above grade and readily accessible. The unit shall be as manufactured by Orenco Systems, Inc. The panel model number shall be VCOM AXB2PTROUVSA. The Orenco Treatment System Control Panel is designed to control the irrigation pump, floats, and headworks as well as the dosing of the treatment unit. The control panel shall be provided factory pre-wired and tested in a NEMA 4X lockable fiberglass enclosure which shall contain the following: Components shall include motor contactors and circuit breakers for use with 230V AC 1 Ph current using a max 1½ HP motor. Programmable logic unit shall include time functions, motor function, valve controls and float input function. Unit shall include fused transformer for valves. An audiovisual alarm condition light and siren shall be mounted on the top of the panel and include a separately fused transformer. The unit shall have a hand-off-auto (H-O-A) switch. Product shall be as supplied by AQWA at (888) 552-2792.

   The controller shall be able to perform the following functions: receive input for floats and rain sensors, provide operator set timer-controlled pump operation, timer-controlled contacts for zone valves, scour

valves and flush valves. The controller shall have an event counter, which shall count the number of moisture sensor overrides. The controller shall have an elapsed pump run clock and pump cycle counter.

Unless alternately provided with the Advanced Pretreatment System, the drip system control panel shall enable the daily, 7-day and 30-day monitoring requirements of Rule .1970 to be met, such as by data logging the field dosing times or field flow meter readings.

Floats, pump and control circuits, and the control panel shall meet the requirements of Rule .1952(c). Panel and control equipment shall include lightning protection, be protected from unauthorized access, and always remain accessible to the system operator.

The activation of any alarm shall result in the activation of a dry and a 120 V powered alarm contacts. These contacts may be used to activate externally mounted alarm devices and telemetry systems. The alarm contacts will automatically reset when the R/O-N Switch for the activated alarm is placed in the reset / off position.

Panel Operation:

- High Level Alarm Float: When lifted this float will activate the audible alarm and the illuminated pushbutton. *Note: This function can be combined with the Override Timer On & Off Function*.
- Override Timer & Off Float: When lifted this float will activate the normal timer function. This timer is capable of cycling at a faster rate to accommodate high flow conditions. This float being enabled will force the pump to dose at twice the operating cycle until the effluent is at normal levels in the pump tank again.
- Timer On & Off Float: When lifted this float will activate the normal timer function. This timer will begin with its 'off' cycle.
- Redundant Off & Low-Level Alarm Float: When lowered this float will activate the audible alarm and illuminated pushbutton. This float will also deactivate the pump in both auto and manual.
- Pump & Valve Operation: The pump dosing cycles will be controlled by the timer. During high flow conditions, the pump dosing cycles will be controlled by the override timer. Zone valves (if provided) will open as programmed and the pump comes on. The spin filter valve will open for 1 minute (field adjustable) to allow for drainage of the return line. After an operator defined number of cycles (field adjustable prime numbers), the field flush valve and the zone valve will open for one cycle. At the end of the dose, the field flush valve closes and normal operation resumes. Since the flush cycle is to be set at an odd interval (prime number), the next flush cycle will fall on the opposite zone (if provided).

Components Include:

- Motor contractor & circuit breaker rated for use with 230VAC, 1Ph and 1 Ph max
- Programmable logic unit
- Timer Functions
- Valve control
- Transformer for the valves
- Fuse for the transformer
- Top mounted audiovisual alarm (360 degree flashing red light and 90dB minimum)

8. Headworks: The system headworks shall contain the filter flow meter, the solenoid valves, gauges, fittings, and other apparatus as called for. The headworks shall be located as indicated on the plans. It shall be installed to allow easy access to all components for testing, servicing, or replacement. The unit shall be enclosed in a suitable protective insulated shelter (i.e., large meter box), secured from tampering. All valves located within this box shall be located a minimum of 18" below the box lid. Adequate freeze protection shall be provided. Headworks shall be Geoflow model WHWU-V-1.5F-A-DDS. Product shall be as supplied by AQWA at (888) 552-2792.
9. Electric Solenoid Valve: All solenoid valves shall be Contamination Resistant Remote-Control Valves. All solenoid valves shall be electrically operated and shall be provided with a 24-volt AC solenoid coil. All valves shall be provided with an auxiliary manually operated internal bleed lever and flow control. Valves shall be globe type with 150 PSI pressure rating. Solenoid valves shall be provided with iron pipe sized female pipe thread end connections. All valves shall be treated for sewage effluent. Solenoid valve model shall be SVLV-B as manufactured by Geoflow, Inc. Electrical wiring to solenoid valves shall be type UF wire, UL listed. Product shall be as supplied by AQWA at (888) 552-2792.
10. Spin Clean Filter: The Y filter body shall be molded from glass reinforced black plastic with a 1.5" inch male pipe thread (MPT) inlet and outlet. The two-piece body shall be capable of being serviced by unscrewing and shall include an O-ring seal. An additional 1.5" MPT outlet shall be capable of periodic flushing. The 150-mesh filter screen is all stainless, providing a 28.4 square inch filtration area. The outer support shell shall be woven stainless steel cloth. The inner and outer screens shall be soldered together. The screen collar shall be molded from vinyl. The 1.5-inch filter shall be Geoflow Model Number AP4E-

1.5F. Product shall be as supplied by AQWA at (888) 552-2792.

11. Flow Meter: The Contractor shall install a turbine style ¾" flow meter with rate/totalizer equal to Geoflow series with flow setter mount. Installed in headworks box. The flow meter model FM-DDS-075 is manufactured by Geoflow. Product shall be as supplied by AQWA at (888) 552-2792

SECTION V - SYSTEM INSTALLATION

The field's perimeter shall be flagged by the General Contractor's Surveyor. The areas shall be barricaded to be protected from unauthorized vehicular traffic.

Site shall be mowed prior to installation. No trees are required to be removed. Contractor shall have a 6-inch PVC sleeve installed under the existing drive to sleeve supply and return lines in. Ends of casing pipe shall be sealed water tight. Drip irrigation lines shall be installed on contour. Drip irrigation lines shall be installed in the ground after the ground surface has been scarified and raked smooth as directed herein. The tubing shall be installed at a minimum depth of 6 inches with care to be certain that tubing is not kinked or deformed. After installation, the area shall be raked smooth to drain and to prepare for stabilization. Drip tubing that cannot go through an obstacle such as a root shall be routed around or below the obstacle and not over and exposed on the ground surface. Room has been given around existing root system of trees and all care shall be taken not to cause significant damage to existing trees. Supply and return pipes shall be placed at the back of the existing curb. A 3-foot offset from back of curb to the drip lines has been shown on the plans.

No work shall be performed on the drip field under wet conditions. "If it is too wet to plow," it is too wet to work on drip field. The Contractor shall avoid the smearing of the wetted surface and should this occur, work shall be suspended. After installation of the lines, the ground surface shall be shaped to allow good surface drainage to prevent ponding of surface water. All disturbed areas shall be raked smooth and stabilized according to specifications.

Drip Irrigation Tubing Storage and Handling

The drip irrigation tubing should be kept in the shade due to temperature sensitivity of the tubing and away from exposure to direct sunlight except during the actual installation process.

Construction Sequence

Rule of Thumb: "If soil is too wet to plow," it is too wet to install the system.

1. Lay out drip irrigation field network area with stakes and flagging to ten feet (minimum) beyond the limits of the line. As soon as the absorption area is designated, it should be flagged, roped off and isolated from construction traffic. This barrier should be maintained until the Owner accepts the system. Refer to site plan for the size of absorption area and field locations. Observe all side yard, building, and other setback restrictions.
2. Clear site of all man-made debris, construction materials, etc. Dispose of legally. Cut all trees in the nitrification field flush with the ground. Do not remove any stumps with any earth moving equipment. Stumps shall be ground up with minimal distribution to surrounding soil. Fill areas shown on the plan with an approved soil material approved by the Consulting Soil Scientist and/or the Consulting Engineer.
3. Prior to beginning construction of the system, verify invert elevations of all tanks, carefully locate, lay out and identify disposal site, manifolds and the drip piping network, using a tripod mounted engineer's leveling instrument to accurately establish each lateral along a level contour. (A 2' minimum drip line separation must be maintained centerline to centerline.)
4. Install drip lines, piping, valves, and headworks. Ensure good bedding and cover and uniform slope as specified. All valve boxes shall be flush or slightly above the ground and clear of debris. Install washed stone in bottom to cover exposed soil.
5. Install septic tank and filter module at elevations to allow proper operation. The recirculation and dosing chamber will each contain a pump and a pump enabling float switch, a pump disabling float switch and a high-water alarm float switch. The drip-dosing chamber will be set at elevation to receive gravity from the filter. All components shall be checked, and proper flow verified.
6. Perform leak test on tanks as called for herein. Provide riser access as called for.
7. Carefully backfill tank, module, and trenches to finish grade with clean debris free earth (no stone).
8. Install pumps, filters, fittings, and floats.
9. Install control system and wire per NC Building Code and NEC. Contractor shall verify available electrical power before ordering components. Provide and connect to properly sized and number of breakers in the main panel board.

10. Seed all disturbed areas except for the drip field. Drip field shall be stabilized only until leaf litter covers area. Follow seeding specifications.

Final Landscaping: After the system is installed, the following should be checked to ensure that the system will not be overloaded with excess rainwater and run-off.

(a) The drip field is shared to shed rainwater and is free of low area.

(b) Curtain drains, grassy swales, or ditches for diverting ground and surface water are installed properly.

(c) Gutter and downspout drains are directed away from the system.

Any problems should be corrected before approving the system.

Finally, drip field shall be stabilized, and all other disturbed areas shall be planted with grass according to specifications.

Seeding: After completion of the drip fields, the site shall be stabilized with tall fescue grass. This should be seeded at the rate of 25 lbs. per acre each for a total of 50 lbs. per acre. Before seeding, lime should be added at the rate of 1.5 tons per acre. Fertilizer should be added at the rate of 100 units of Nitrogen, 120 lbs. of P_2O_5 and 120 lbs. of K_2O. Both the lime and fertilizer should be lightly incorporated into the soil before adding seed. After seeding, the area should be mulched until stand is established. Due to the erosion potential of this soil, this is an important part of the system.

SECTION VI - OPERATING CHECKS AND ADJUSTMENTS (START-UP)

The system shall consist of one 1,000-gallon septic tank with slotted filter, Orenco Advantex AX-20RT textile containing module with cover with recirculation pump, dosing chamber, and drip field with pump, headworks, controls, and other apparatus.

All components of the system shall be checked and taken through a complete test cycle in the presence of the Owner's Engineer and to his satisfaction. If the test fails, adjustments shall be made, and the test repeated until the system is determined to operate properly.

Septic Tank: Check water level, inlet pipe, outlet pipe and slotted filter. Verify that the filter can be removed for service and handle is within 12” from top of riser.

Textile Filter: Using manufacturer’s instruction, become familiar with filter components and operation.

Drip System Dosing Tank Pump Chamber - Sequence of Operation: Effluent fills chamber in AX-20RT to level that will activate the "Pump Enabling" float. Pump can now operate. The control panel will be set to allow the prescribed pump cycles per day based on customer setting of the programmable timer. When a pump is called for service, and the level in the dosing tank permits, the zone valve (if provided) and filter flush valve will open. After an adjustable time, the filter flush valve will close, and the system will continue to dose the active drip zone for the operator selectable time. If the timer override float is activated, the pump will be allowed to dose for 5.66 minutes and disable for one hour. Then the pump will activate again until the water level in thank reaches normal again.

Dosing Cycle: If the system is equipped with multiple zones, all zones are dosed individually on an alternating basis so that each field is dosed once every other dosing cycle. The appropriate zone valve opens, the pump doses the field for 5.66 minutes and then the zone valve closes, and the pump stops.

After an operator defined number of cycles (field adjustable prime numbers), the field flush valve and one zone valve will open for one cycle. At the end of the dose, the pump stops and the field flush and zone valves close. Since the flush cycle is to be set at an odd interval (prime number), the next flush cycle will fall on the opposite zone.

The pump shall operate delivering a timer controlled predetermined dose to the designated drip field. The pump shall also shut off when the low water level “pump off” switch is activated.

If the “high water alarm" float switch is activated, the controller shall activate audible and flashing alarm systems. Once energized, the flashing and audible alarm unit must be shut-off manually. After installation, each field shall be independently pressurized, and the function and operating pressure checked to verify compliance with the specifications and required wetted area shown on the Plans. System pressure is to be obtained at the Schrader Valves located at the ends of the manifolds as shown on the plans. **The pressure and flow reading shall be recorded for comparison with future readings. The owner/operator cannot tell if the system is operating properly unless he has this info.**

SEEDING SPECIFICATIONS

SLOPES 3:1 or FLATTER

1. Apply agricultural lime at the rate of 90 LB/1000 SF.
2. Apply 10-10-10 commercial fertilizers at the rate of 20 LB/1000 SF.
3. Seed in accordance with the following schedule and application rate:

DATE	TYPE	PLANTING RATE
Aug 15 - Nov 1	Tall Fescue	200 LB/AC or 7 LB/1000 SF
Nov 1 - Mar 1*	Tall Fescue And	200 LB/AC or 7 LB/1000 SF
	Abruzzi Rye	25 LB/AC or 2 LB/1000 SF
Mar 1 - Apr 15	Tall Fescue	200 LB/AC or 7 LB/1000 SF
Apr 15 - Jul 30	Hulled Common or Bermuda	30 LB/AC or 1 LB/1000 SF
Jul 15 - Aug 15	Tall Fescue And	200 LB/AC or 7 LB/1000 SF
	Brown Millet Or	35 LB/AC or 3 LB/1000 SF
	Sorghum-Sudan Hybrids	30 LB/AC or 3 LB/1000 SF

4. Mulch with straw applied at the rate of 75-100 LB/1000 SF.

* Heavily mulched during January - March period.

SLOPES GREATER THAN 3:1 TO 2:1

1. Apply agricultural lime at the rate of 90 LB/1000 SF.
2. Apply 10-10-10 commercial fertilizers at the rate of 20 LB/1000 SF.
3. Seed in accordance with the following schedule and application rate.

DATE	TYPE	PLANTING RATE
Mar 1 - Jun 1	Sericea Lespediza (scarified) &	50 LB/AC or 11 LB/1000 SF
Mar - Apr	Add Tall Fescue or	150 LB/AC or 32 LB/1000 SF
Mar - Jun	Add Weeping Lovegrass	5 LB/AC or 1 LB/1000 SF
Jun - Sep 1**	Tall Fescue and	60 LB/AC or 12 LB/1000 SF
	Brown Top Millet	35 LB/AC or 3 LB/1000 SF
	Sorghum Sudan Hybrids	30 LB/AC or 1 LB/1000 SF
Sep - Mar 1	Sericea Lespediza (Unhulled-unscarified)	70 LB/AC or 14 LB/1000 SF
	Tall Fescue	150 LB/AC or 32 LB/1000 SF
	Millet or Sudan	20 LB/AC or 1 LB/1000 SF

** Temporary - Reseed September 1 at recommended rates.

4. Mulch with 3" straw applied at the rate of 50-90 LB/1000 SF.

CALCULATIONS

FOR A GROUND ABSORPTION SEWAGE DISPOSAL SYSTEM

USING SEPTIC TANK, TS-I ADVANCED TREATMENT,

AND SUBSURFACE DRIP DISPOSAL

TO SERVE A NEW COMMERCIAL OFFICE BUILDING

4500 Morris Park Drive

Mint Hill, Mecklenburg County, North Carolina

March 23, 2022
Revised May 2, 2022

Prepared for:
Persis-Nova Construction, Inc.
3919 Peasant Plains Road
Stallings, NC 28104
Phone: (704) 684-1205

Prepared by:
PIEDMONT DESIGN ASSOCIATES, P.A.
125 East Plaza Drive, Suite 101
Mooresville, NC 28115
Phone: 704-664-7888
Fax: 704-664-1778
NCBELS No.: C-1007



GEOFLOW
SUBSURFACE DRIP

Updated Mar 2015

FIELD FLOW

Job Description:	*Morris Park Commercial*
Contact:	*Frank Arooji*
Prepared by:	*PDAPA, David DeCaron*
Date:	*2-May-22*

Please fill in the shaded areas and drop down menus:
This spreadsheet is a **guide** for **small** systems with **residential** waste & is not a comp

Worksheet 1- Field Flow

Total field

Total Quantity of effluent to be disposed per day	360	gallons / day
Hydraulic loading rate	0.1	gallons / sq.ft. / da
Minimum Dispersal Field Area	3,600	square ft.
Total Dispersal Field Area	3,600	square ft.

Flow per zone

Number of Zones	**1**	zone(s)
Dispersal area per zone	3,600	square ft.
Choose line spacing between WASTEFLOW lines	2	ft.
Choose emitter spacing between WASTEFLOW emit	2	ft.
Total linear ft.per zone (minimum required)	1,800	ft. per zone
Total number of emitters per zone	900	emitters per zone
Select Wasteflow dripline (16mm)	Wasteflow PC - 1/2gph	dripline
	Wasteflow Classic	
	Wasteflow PC - 1/2gph	
	Wasteflow PC - 1 gph	
Pressure at the beginning of the dripfield	45	psi
Feet of Head at the beginning of the dripfield	103.95	ft.
What is the flow rate per emitter in gph?	0.53	gph
Dose flow per zone	**7.95**	**gpm**

Note: A few States or Counties require additional flow for flushing. Please check your local regul
Flush velocity calculation below is for PC dripline. Classic dripline requires less flow to flush tha
Please refer to Geoflow's spreadsheet "Design Flow and Flush Curves" at www.geoflow.com or ca

If required, choose flush velocity	1.2	ft/sec
How many lines of WASTEFLOW per zone?	9	lines
Fill in the *actual* length of longest dripline lateral	257	ft.
Flush flow required at the end of each dripline	0.89	gpm
Total Flow required to achieve flushing velocity	7.99	gpm
Total Flow per zone- worst case scenario	**15.94**	**gpm**

Select Filters and zone valves

Select Filter Type	Vortex Screen Filter	
Recommended Filter (item no.)	AP4E-1.5F	Screen Filter 0-20
Select Zone Valve Type	Electric Solenoid	-
Recommended Zone Valve (item no.)	0	0

-

Dosing

Number of doses per day / zone:	8	doses
Timer ON. Pump run time per dose/zone:	5.40	mins:secs
Timer OFF. Pump off time between doses	2:54	hrs:mins
Per Zone - Pump run time per day/zone:	0:45	hrs:mins
All Zones - Number of doses per day / all zones	8	doses / day
Allow time for field to pressurize	0:00:30	hrs:mins:secs
Filter flush timer	0:00:20	hrs:mins:secs
Drain timer	0:05:00	hrs:mins:secs
Field flush timer	0:01:00	hrs:mins:secs
Field flush counter	37	cycles
Time required to complete all functions per day	**1:39**	hrs:mins
Dose volume per zone	45	gallons per dose

GEOFLOW
SUBSURFACE DRIP

PUMP SIZING

Job Description:	*Morris Park Commercial*
Contact:	*Frank Arooji*
Prepared by:	*PDAPA, David DeCaron*
Date:	*5/2/2022*

Please fill in the shaded areas and drop down menus:
This spreadsheet is a guide for small systems with residential waste & is not a complete hy
Pressure losses may be grossly overstated, particularly if designing with WASTEFLOW C
The letters on the diagram(right) match the letters in section 2 below.

Worksheet - Pump Sizing

Section 1 - Summary from Worksheet 1

Flow required to dose field	7.95	gpm
Flow required to flush field	7.99	gpm
Flow required to dose & flush field	15.94	gpm
Filter	AP4E-1.5F	
No. of Zones	1	zones
Zone valve	-	
Dripline	Wasteflow PC - 1/2gph	
Dripline longest lateral	257.00	ft.

Section 2	Ft of head	Pressure
A. Flush line - Losses through return line		
Select Pipe from dropdown menu	PVC schedule 40	
Select Flush Line Diameter	1" inch	
Length of return line	525 ft.	
Equivalent length of fittings	105 ft.	
Elevation change. (if downhill enter 0)	**8** ft.	
Pressure loss in 100 ft of pipe	4.16 ft.	1.80 psi
Total pressure loss from end of dripline to return tank	*34.2 ft.*	14.80 psi
B. Dripline - Losses through Wasteflow dripline		
Length of longest dripline lateral	**257** ft.	
Minimum dosing pressure required at end of dripline	34.19 ft.	14.80 psi
Loss through dripline during flushing	8.45 ft.	3.66 psi
Total minimum required dripline pressure	*42.64 ft.*	18.46 *psi*
A+B. Minimum Pressure required at beginning of dripfield		
CALCULATED pressure required at beginning of dripfie	*76.83 ft.*	33.26 *psi*
SPECIFIED pressure at beginning of dripfield (from wor	**104.0 ft.**	45.00 *psi*
Great! SPECIFIED Pressure is greater than CALCULATED Pressure requirement. Go to next step		
C. Drip components - Losses through headworks		
Filter	15.0 ft.	6.50 psi
Zone valve pressure loss (not in diagram)	- ft.	- psi
Flow meter pressure loss (not in diagram)	4.04 ft.	1.75 psi
Other pressure losses	5.00 ft.	2.16 psi
Total loss through drip components	**24.06 ft.**	10.41 psi
D. Supply line - Minimum Pressure head required to get from pump tank to top of dripfield		
Select Pipe from dropdown menu	PVC schedule 40	
Select Supply line diameter	1" inch	
Length of supply line	525 ft.	
Equivalent length of fittings	105 ft.	
Height from pump to tank outlet	6 ft.	
Elevation change. (if downhill enter 0)	15 ft.	
Pressure loss/gain in 100 ft. of pipe	14.93 ft.	6.46 psi
Total gain or loss from pump to field	***115.1 ft.***	49.82 psi
Total dynamic head	**243.1 ft.**	105.23 *psi*
Pump capacity * - Field Flush Flow	**15.9 gpm**	105.23 *psi*
- Field Dose Flow	**8.0 gpm**	
- Filter Flush Flow	**- gpm**	- *psi*
Pump Model Number	**Orenco PF 2015-12**	
Voltz / Hp / phase	**230V - 1.5 HP - 1 Phase**	

MICHAEL ATHANAS & ASSOCIATES
LICENSED SOIL SCIENTIST
556 Walden Trail
Weddington, NC 28173
(704) 576-3887

Reference: Data Sheet for 4500 Morris Park Drive;
PID# 13530104;
Mecklenburg County, NC

Building Footprint: See Site Plan
Building Setback: Unknown
Water Source: Public Well
Proposed Gallon Per Day: 360 GPD
Proposed LTAR: 0.1 gpd/ft2
Suggested Initial System Type: Pretreated Drip
Repair System LTAR: 0.1 gpd/ft2
Repair System Type: Pretreated Drip
Distribution: See Engineer's design
Septic/ Pump tank size: See Engineer's design
Trench Bottom: 14"
Initial System: 3600 ft2 Pretreated Drip **Repair System:** 4010 ft2 Pretreated Drip

Comments: The purpose of the evaluation is to permit this site for office space and warehouses.

- Piedmont Design is handling the system design. See attached site plan.
- See design for low flow water fixtures to be used in building.
- Design is for 24 of employees at 15 gpd.

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
ON-SITE WASTEWATER SECTION

4500 Morris Park Drive; Parcel ID#13530104
COUNTY: Mecklenburg

SOIL/SITE EVALUATION
for ON-SITE WASTEWATER SYSTEM

OWNER: OH Morris Park LLC APPLICATION DATE: _____
ADDRESS: 4500 Morris Park Drive Charlotte, NC 28227 DATE EVALUATED: 3/2022
PROPOSED FACILITY: Commercial Warehouse PROPOSED DESIGN FLOW (.1949): TBD PROPERTY SIZE: 4.01 Acres
LOCATION OF SITE: 4500 Morris Park Drive Charlotte, NC PROPERTY RECORDED: _____
WATER SUPPLY: ☐ Private ☒ Public ☒ Well ☐ Spring ☐ Other _____
EVALUATION METHOD: ☒ Auger Boring ☐ Pit ☐ Cut TYPE OF WASTEWATER: ☒ Sewage ☐ Industrial Process ☐ Mixed

PROFILE #	.1940 LANDSCAPE POSITION/ SLOPE %	HORIZON DEPTH (IN.)	SOIL MORPHOLOGY (.1941)		OTHER PROFILE FACTORS				PROFILE CLASS & LTAR
			.1941 STRUCTURE/ TEXTURE	.1941 CONSISTENCE / MINERALOGY	.1942 SOIL WETNESS/ COLOR	.1943 SOIL DEPTH	.1956 SAPRO CLASS	.1944 RESTR HORIZ	
AB 1	L 4-5%	0"-32"	R C SBK	SS SP FR SEXP		62"	Few to common saprolite inclusions 32"-62"		0.3 0.1+ Drip
		32"-62"	R CL WSBK	SS SP FR SEXP					
AB 2	L 4-5%	0"-40"	R C ABK	SS SP FR SEXP	YBrs 0"-32" No YBrs 32"+	64"	Few to common saprolite inclusions 40"-64"		0.25 0.1+ Drip
		40"-64"	R CL WSBK	SS SP FR SEXP					
AB 3	L 4-5%	0"-5"	Fill	SS SP FR SEXP		52"	Few to common saprolite inclusions 32"-52"		0.3 0.1+ Drip
		5"-32"	R C SBK	SS SP FR SEXP					
		32"-52"	R CL WSBK	SS SP FR SEXP					
AB 4	L 4-5%	0"-12"	R C SBK	SS SP FR SEXP		12"	Few to common saprolite inclusions 12"-39"		0.3 0.1+ Drip
		12"-39"	R CL WSBK	SS SP FR SEXP					
AB 5	L 4-5%	0"-10"	Br CL WSBK	SS SP FR SEXP		40"	Few to common saprolite inclusions 32"-40"		0.3 0.1+ Drip
		10"-32"	R C SBK	SS SP FR SEXP					
		32"-40"	R CL WSBK	SS SP FR SEXP					
AB 6	L 4-5%	0"-10"	Br CL WSBK	SS SP FR SEXP		42"	Few to common saprolite inclusions 29"-42"		0.3 0.1+ Drip
		10"-29"	R C SBK	SS SP FR SEXP					
		29"-42"	R CL WSBK	SS SP FR SEXP					

DESCRIPTION	INITIAL SYSTEM	REPAIR SYSTEM
Available Space (.1945)	TBD	TBD
System Type(s)	Pretreated Drip	Pretreated Drip
Site LTAR	0.1+	0.1+

OTHER FACTORS (.1946): _____
SITE CLASSIFICATION (.1948): _____

EVALUATED BY: Michael Athanas and Associates
OTHER(S) PRESENT: _____

LEGEND

use the following standard abbreviations

LANDSCAPE POSITION	GROUP	SOIL TEXTURE	CONVENTIONAL .1955 LTAR*	LPP .1957 LTAR*	MINERALOGY/ CONSISTENCE	STRUCTURE
CC (Concave Slope)	I	S (Sand)	1.2 - 0.8	0.6 - 0.4	NEXP (Non-expansive)	G (Single Grain)
CV (Convex Slope)		LS (Loamy Sand)			SEXP (Slightly Expansive)	M (Massive)
D (Drainage Way)					EXP (Expansive)	CR (Crumb)
DS (Debris Slump)	II	SL (Sandy Loam)	0.8 - 0.6	0.4 - 0.3		GR (Granular)
FP (Flood Plain)		L (Loam)				SBK (Subangular Blocky)
FS (Foot Slope)						ABK (Angular Blocky)
H (Head Slope)	III	Si (Silt)	0.6 - 0.3	0.3 - 0.15		PL (Platy)
L (Linear Slope)		SiCL (Silty Clay Loam)				PR (Prismatic)
N (Nose Slope)		CL (Clay Loam)				
R (Ridge)		SCL (Sandy Clay Loam)			**MOIST**	**WET**
S (Shoulder Slope)		SiL (Silt Loam)				
T (Terrace)					VFR (Very Friable)	NS (Non-sticky)
	IV	SC (Sandy Clay)	0.4 - 0.1	0.2 - 0.05	FR (Friable)	SS (Slightly Sticky)
		SiC (Silty Clay)			FI (Firm)	S (Sticky)
		C (Clay)			VFI (Very Firm v. Very Sticky)	VS (Very Sticky)
		O (Organic)	None	None	EFI (Extremely Firm)	NP (Non-plastic)
						SP (Slightly Plastic)
						P (Plastic)
						VP (Very Plastic)

*Adjust LTAR due to depth, consistence, structure, soil wetness, landscape, position, wastewater flow and quality.

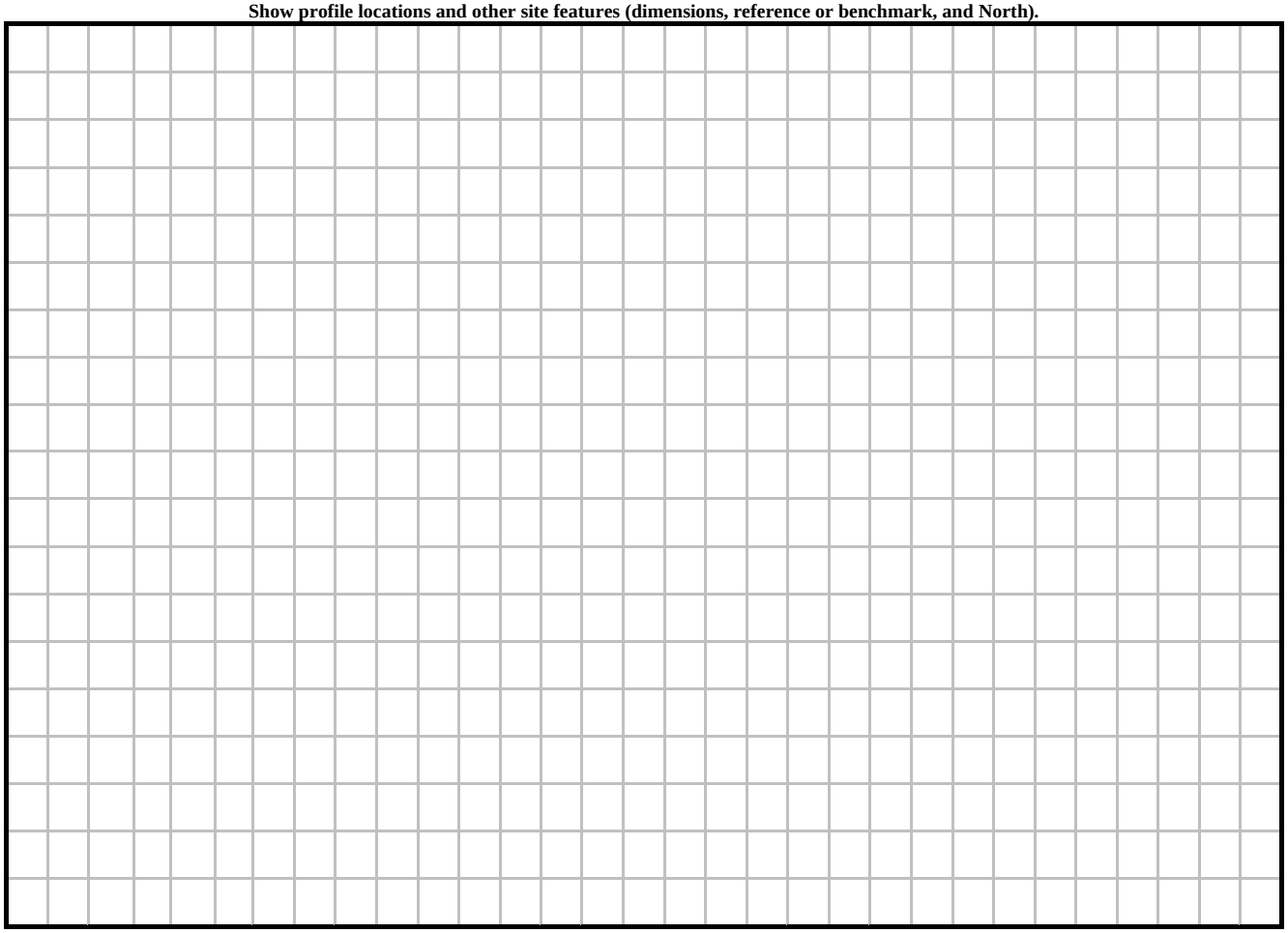
NOTES

HORIZON DEPTH	In inches below natural soil surface
DEPTH OF FILL	In inches from land surface
RESTRICTIVE HORIZON	Thickness and depth from land surface
SAPROLITE	S(suitable) or U(unsuitable)
SOIL WETNESS	Inches from land surface to free water or inches from land surface to soil colors with chroma 2 or less - record Munsell color chip designation
CLASSIFICATION	S (Suitable), PS (Provisionally Suitable), or U (Unsuitable)

Evaluation of saprolite shall be by pits.

Long-term Acceptance Rate (LTAR): gal/day/ft^2

Show profile locations and other site features (dimensions, reference or benchmark, and North).



DENR (######)

Review (#####)

PROPOSED WAREHOUSE

PROPOSED WAREHOUSE

PROPOSED WAREHOUSE

174,471 sq. ft.
4.01 acres

PROPOSED OFFICE

25.00'

105.00'

140.00'

Sidewa

Curb

asphalt

.6" stub

sign

IPF

IPF

IPS

AB#6

AB#3

AB#5

AB#2

AB#4

AB#1

Pit #4

AB#4

6" stub

10' Septic Setback

4,730 SQ FT
REPAIR AREA

10' Septic Setback

62'
55'
47'

60" OAK

65" OAK

65" OAK

26" OAK

25" OAK

28" OAK

N72°42'11"W 309.97'

13530109
N/F ZM PARK, LLC
DB 22173 PG 566

CAST-A-SEAL® 402/402F

CAST-IN BOOT-TYPE CONNECTOR
for 1-1/4" to 6"PVC Pipe

What It Is

CAST-A-SEAL 402/402F is a watertight flexible connector that is cast into the structure when the concrete is poured. The connector is folded into the casting position and placed on the reusable heavy-duty solid plastic mandrel that is installed directly to the form. After the concrete is cured, the form is opened, removing the mandrel from the gasket, but leaving the **CAST-A-SEAL 402/402F** connector embedded in the concrete. The gasket is then simply unfolded at the jobsite and is tightened around the pipe using the supplied stainless steel take-up clamp.



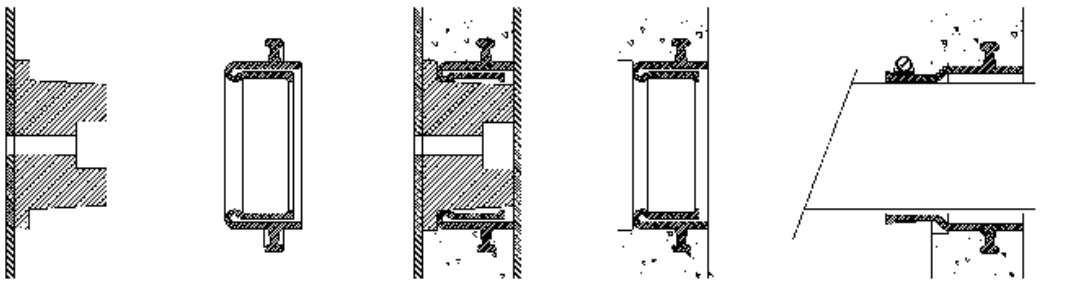
Why It's Better

- Simple cast-in design provides flexible watertight connection
- Eliminates infiltration and exfiltration
- Improves on-site system performance and minimizes maintenance
- Protects groundwater from unintended discharges
- Use in on-site treatment structures, grease interceptors, manholes, wet wells, pump and lift stations, stormwater structures, or any application requiring a flexible watertight connector

How It Performs

CAST-A-SEAL 402/402F *meets or exceeds all requirements of the following Standards, Codes, Specifications and/or Test Methods:*

ASTM C 1227	***IAPMO Z1000***
ASTM C 1644	***IAPMO Z1001***
ASTM C 923	***NPCA Best Practices***
ASTM C 1244	***NOWRA Model Code***
ASTM C 1478	



Attach mandrel to outside form wall.

Invert gasket into casting position.

Place gasket and mandrel in form and pour.

Strip form and mandrel, leaving gasket in place.

Invert gasket to outside of tank, insert pipe and tighten take-up clamp.

Press-Seal believes all information is accurate as of its publication date. Information, specifications, and prices are all subject to change without notice. Press-Seal is not responsible for any inadvertent errors. Copyright 2007

PRESS-SEAL GASKET CORPORATION
Providing Products and Services That Protect Our Planet's Clean Water Supply
800-348-7325 Fax (260) 436-1908
email: sales @press-seal.com
web: www.press-seal.com

Made in USA

CAST-A-SEAL® 402/402F

PRODUCT SPECIFICATION and SELECTION

Submittal Specification

A flexible Pipe-to-Structure connector shall be employed in the connection of the sanitary sewer pipe to precast structures. The connector shall be CAST-A-SEAL® 402/402F as manufactured by Press-Seal Gasket Corporation, Fort Wayne, Indiana, or approved equal. The connector shall be the sole element relied on to assure a flexible, watertight seal of the pipe to the precast structure. The connector shall consist of a rubber gasket and an external take-up clamp.

The rubber gasket element shall be constructed solely of synthetic or natural rubber, and shall meet or exceed the physical property requirements of ASTM C 923.

The external take-up clamp shall be constructed of Series 300 non-magnetic stainless steel and shall utilize no welds in its construction. The clamp shall be installed by torquing the adjusting screw using a torque-setting wrench available from the connector manufacturer.

Selection of the proper size connector for the structure and pipe requirement, and installation thereof, shall be in strict conformance with the recommendations of the connector manufacturer. Any dead end pipe stubs installed in connectors shall be restrained from movement per ASTM C 923.

The finished connection shall provide sealing to 13 psi (minimum) and shall accommodate deflection of the pipe to 7 degrees (minimum) without loss of seal.

Vacuum testing shall be conducted in strict conformance with ASTM C 1244 prior to backfill. Other testing shall be conducted in strict conformance with the requirements of the connector manufacturer.

CAST-A-SEAL 402	PIPE SIZE	PIPE O.D. RANGE	WALL THICKNESS*	APPLICATION
452.0250	1.25" - 2"	1.5" - 2.75"	2.5" - 6"	STANDARD
452.0450	4"	4.2" - 4.7"	2.5" - 6"	STANDARD
452.0402F1	4"	4.2" - 4.7"	2.5" - 6"	Closed Face
452.0650	6"	6.2" - 6.7"	2.5" - 6"	STANDARD
CAS ADAPTER	3"	3.2" - 3.6"	---	Use with 4" CAST-A-SEAL

PRODUCT PERFORMANCE

CAST-A-SEAL402/402F meets and/or exceeds all requirements of ASTM C 923, including physical properties of materials and performance testing, including:

- 13 psi minimum in straight alignment
- 10 psi at minimum 7°angle
- 10 psi minimum under shear load of 150 lbs/in. pipe diameter

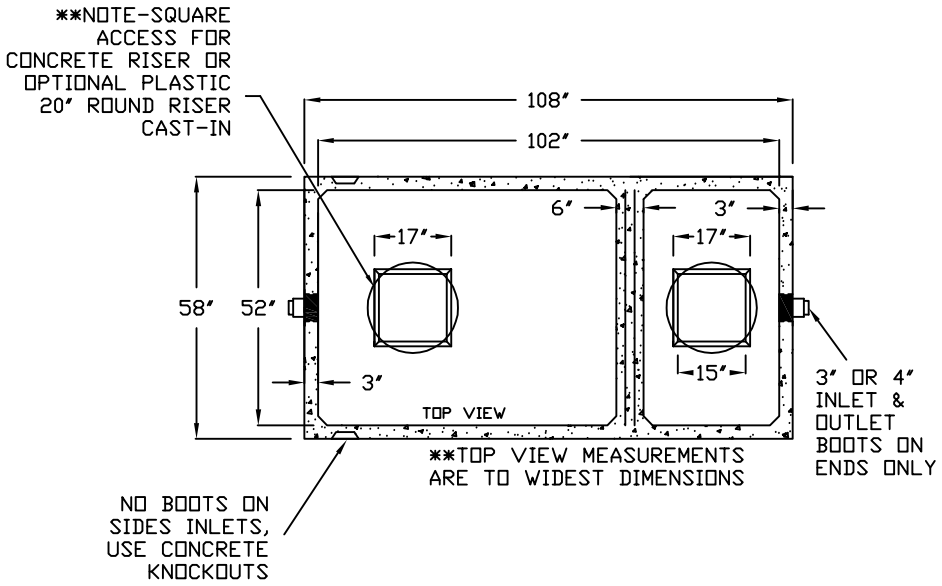
CAST-A-SEAL 402/402F meets and/or exceeds the requirements of the following Standards, Specifications, Codes, and Test Methods:

- ASTM C 923 *Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals*
- ASTM C 1644 *Standard Specification for Resilient Connectors Between Reinforced Concrete On-SIte Wastewater Tanks and Pipes*
- ASTM C 1478 *Standard Specification for Storm Drain Resilient Connectors Between Reinforced Concrete Storm Sewer Structures, Pipes and Laterals*
- ASTM C 1244 *Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test*
- IAPMO/ANSI Z1000 *Standard for Prefabricated Septic Tanks*
- IAPMO/ANSI Z1001 *Standard for Prefabricated Gravity Grease Interceptors*
- *NPCA Best Practices Manual for Precast Concrete On-Site Wastewater Tanks*
- *NOWRA Model Code Framework*

TYPICAL TEST RESULTS for CAST-A-SEAL 402/402F (as in ASTM C 1644, C 923, and C 1478)			
Test	ASTM Test Method	Test Requirements	Typical Result
CHEMICAL RESISTANCE; 1N SULFURIC ACID and 1N HYDROCHLORIC ACID	D 534, AT 22ºC FOR 48 HRS	NO WEIGHT LOSS NO WEIGHT LOSS	NO WEIGHT LOSS NO WEIGHT LOSS
TENSILE STRENGTH	D 412	1200 PSI, MIN.	2100 PSI
ELONGATION AT BREAK	D 412	350%, MIN.	525%
HARDNESS	D 2240 (SHORE A DUROMETER)	±5 FROM THE MANUFACTURER'S SPECIFIED HARDNESS	<2
ACCELERATED OVEN-AGING	D 573, 70± 1ºC FOR 7 DAYS	DECREASE OF 15%, MAX. OF ORIGINAL TENSILE STRENGTH, DECREASE OF 20%, MAX. OF ELONGATION	-13% TENSILE CHANGE, -14% ELONGATION CHANGE
COMPRESSION TEST	D 395, METHOD B, AT 70ºC FOR 22 HRS	DECREASE OF 25%, MAX. OF ORIGINAL DEFLECTION	13%
WATER ABSORPTION	D 471 IMMERSE 0.75 BY 2-IN.SPECIMEN IN DISTILLED WATER AT 70ºC FOR 48 hrs	INCREASE OF 10%, MAX. OR ORIGINAL BY WEIGHT	3.50%
OZONE RESISTANCE	D 1171	RATING 0	PASS
LOW-TEMP, BRITTLE POINT	D 746	NO FRACTURE AT -40ºC	PASS
TEAR RESISTANCE	D 624, METHOD B	200 LBF/IN. (MIN.)	450 LBF/IN.

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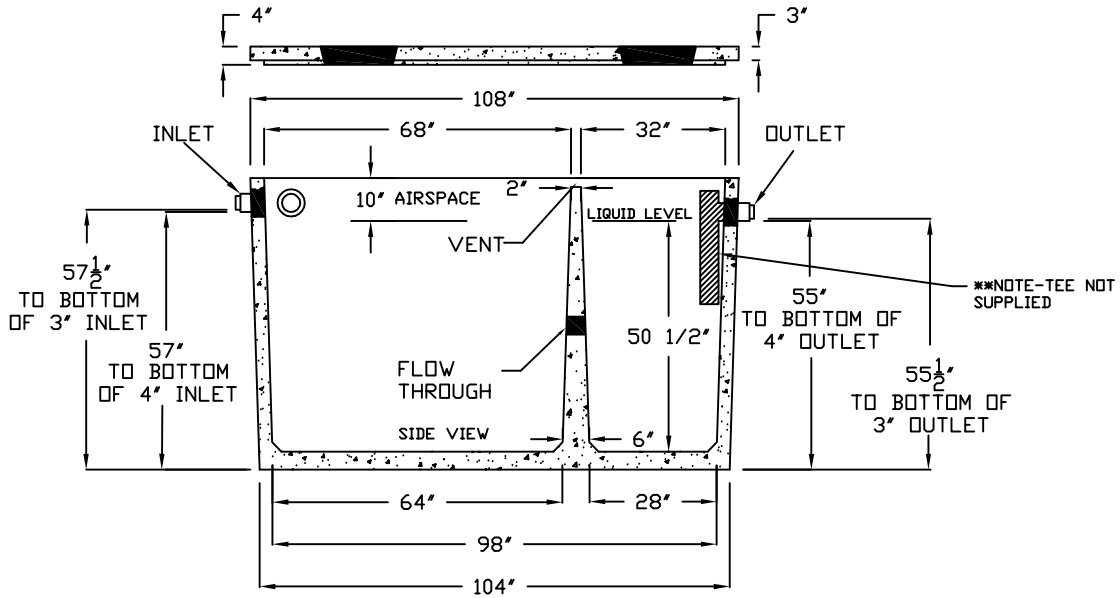


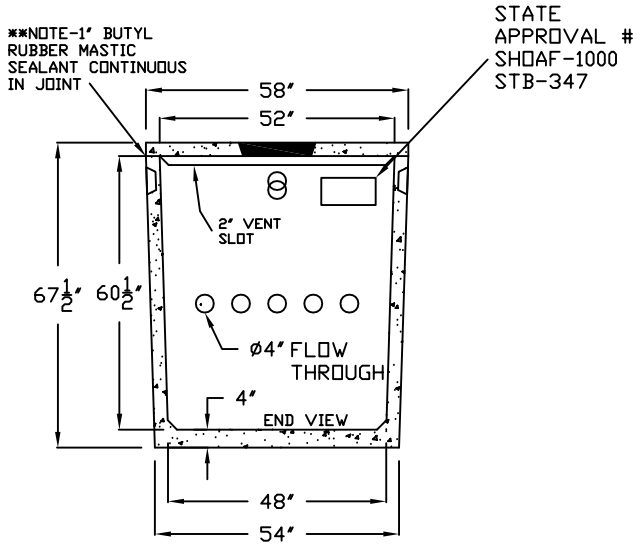
SHOAF PRECAST SEPTIC INC.
4130 WEST US HWY 64
LEXINGTON, NC 27295
PHONE (336) 787-5826
FAX (336) 787-2826
WWW.SHOAFPRECAST.COM

MODEL: TS 1000 STB
NON TRAFFIC
1000 Gallon Septic Tank

SHOAF-1,000 SEPTIC TANK
STB-347 NON TRAFFIC
LIQUID CAPACITY-1,000 GALLONS/AIRSPACE-10"
TANK HEIGHT-67 1/2"
BOTTOM OF TANK TO CENTER OF INLET-59"
BOTTOM OF TANK TO CENTER OF OUTLET-57"
LENGTH TO WIDTH RATIO-2 TO 1
SIZE OF INLET & OUTLET-3" OR 4" PIPE
TYPE OF INLET & OUTLET-POLYLOCK OR EQUAL (MEETS ASTM C-923)
CONCRETE PSI-4000; TANK WEIGHT- 10,500 LBS.
REINFORCEMENT PER STATE CODE

SCALE - N.T.S.





Submittal Data Sheet

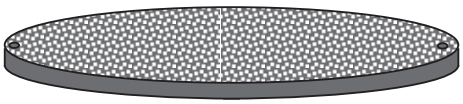
Fiberglass Access Lids

Orenco Systems® Incorporated
1-800-348-9843

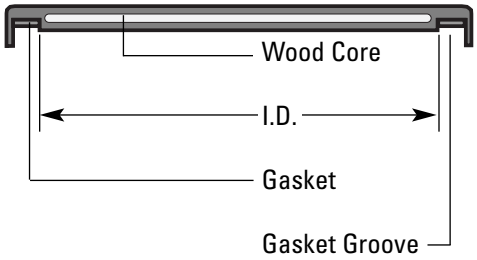
Applications

Orenco Fiberglass Access Lids are used as riser covers, pump basin covers, and access port covers. Lids fit Perma-Loc, Ultra-Rib, KOR FLO, and Ultra-Corr pipe.

Actual View



Cutaway View



General

Orenco Fiberglass Access Lids are molded using fiberglass reinforced polyester resin encapsulating a wood core. The finish is green and the top surface is textured to provide a non-skid surface. (Gasketed lids include a polyurethane or neoprene gasket.) Lid comes with either two or four 1/4" stainless steel flathead socket cap screws and a hex key wrench. Orenco Fiberglass Access Lids are capable of supporting a 2500 lb. wheel load; however, they are not designed or recommended for vehicular traffic.

Standard Models

FL18G-4BU, FL21G, FL24G, FL24-4B, FL24G-4BK, FL30G, FL48G

Nomenclature

FL□□□-□-□-□ **FL24-4B**

- Riser pipe:
  Blank = Ultra-Rib, Perma-Loc
  K = KOR FLO, Ultra-Corr
- Color:
  Blank = green
  B = brown
- Attachment method:
  Blank = 2-bolt-hole lid (30" diameter only)
  4B = 4-bolt-hole lid (24" diameter only)
  4BU = 4-bolt-hole lid Ultra-Rib (18" and 24" diameter only)
- Options:
  G = gasket
  V = vent
  CF = carbon filter
  I2 = 2" insulation
  I4 = 4" insulation
- Lid diameter: 18", 24", 30", 48"
- Fiberglass lid

Specifications

Dimensions	Model FL18	Model FL21	Model FL24	Model FL30	Model FL48
O.D. (in.)	20.25	22.5	26.25	32.0	53.875
Groove I.D. (in.)	17.5	20.25	23.25	29.5	47.5
Avg. Thickness (in.)	0.75	0.75	0.75	1.0	1.5

Options Available

Feature	Model Code Adder	Optional/Standard
Air Vent	V	Optional
Carbon Filter[1]	CF	Optional
Lid Insulation[2]	I2 or I4	Optional

[1] *For more information on this option, refer to the Carbon Filters Submittal Data Sheet, NSU-RLA-CF-1.*

[2] *Blue styrofoam; R-value per 2" increment is 10.*

Materials of Construction

Fiberglass Reinforced Polyester
Wood Core
Neoprene or Polyurethane Gasket

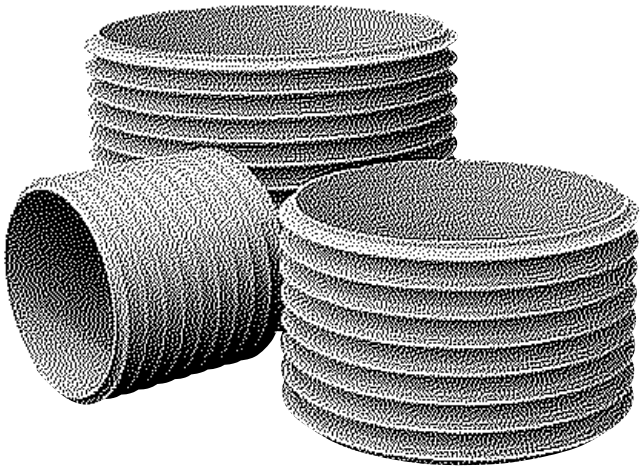
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Access Risers – Ultra-Rib™

Orenco Systems® Incorporated
1-800-348-9843

Applications

Orenco's Access Risers provide access to septic tank openings and can be cast into the tops of concrete tanks, bonded in place, or bolted down using a riser tank adaptor. They can also be used as valve enclosures.



General

Orenco Ultra-Rib™ Access Risers are constructed of ribbed PVC pipe and are available in 12", 18", 21", and 24" diameters. They can be ordered in 3-inch increments in lengths up to 13 ft for 12" and 18" diameter risers, and up to 14 ft for 21" and 24" diameter risers.

Standard Models

RR12XX, RU18XX, RR21XX, RR24XX

Nomenclature

R □ □□ □□ + □ + □ RR24XX

Discharge grommet:
10 = 1"
12 = 1-1/4"
15 = 1-1/2"
20 = 2"

Splice Box:
S = 1" grommet installed (for Orenco SB1 - SB4 splice boxes)
L = 1-1/4" grommet installed (for Orenco SB5, SB6 splice box)
S1 = SB1 attached
S2 = SB2 attached
S3 = SB3 atached
S4 = SB4 attached
L5 = SB5 attached
L6 = SB6 attached
SX = Predrilled hole for external splice box*
XS = Explosion-proof splice box for simplex pumps†
XD = Explosion-proof splice box for duplex pumps†
XT = Explosion-proof splice box for triplex pumps†

Riser height (inches)

Riser diameter: 12"‡, 18"‡, 21", 24"

Routing code:
U = Ultra-Rib™: 18"
R = Ultra-Rib™: 12", 21", 24"

Riser

* Minimum riser height 18"
† Used in Class I Division I environments
‡ Not intended for use over pump vaults

Materials of Construction

Ultra-Rib™ PVC Pipe:	PVC

Specifications

Model	RR12XX	RU18XX	RR21XX	RR24XX
I.D.	11.74 in. (298 mm)	17.65 in. (448 mm)	20.5 in. (521 mm)	23.50 in. (597 mm)
Wall Thickness - excluding ribs	0.10 in. (3 mm)	0.19 in. (5 mm)	0.25 in. (6 mm)	0.20 in. (5 mm)
O.D. - including ribs	14.60 in. (371 mm)	19.44 in. (494 mm)	22.63 in. (575 mm)	28.50 in. (724 mm)
Weight per foot (meter)	5 lb (7.4 kg)	11 lb (16.4 kg)	15 lb (22.3 kg)	19 lb (28.3 kg)

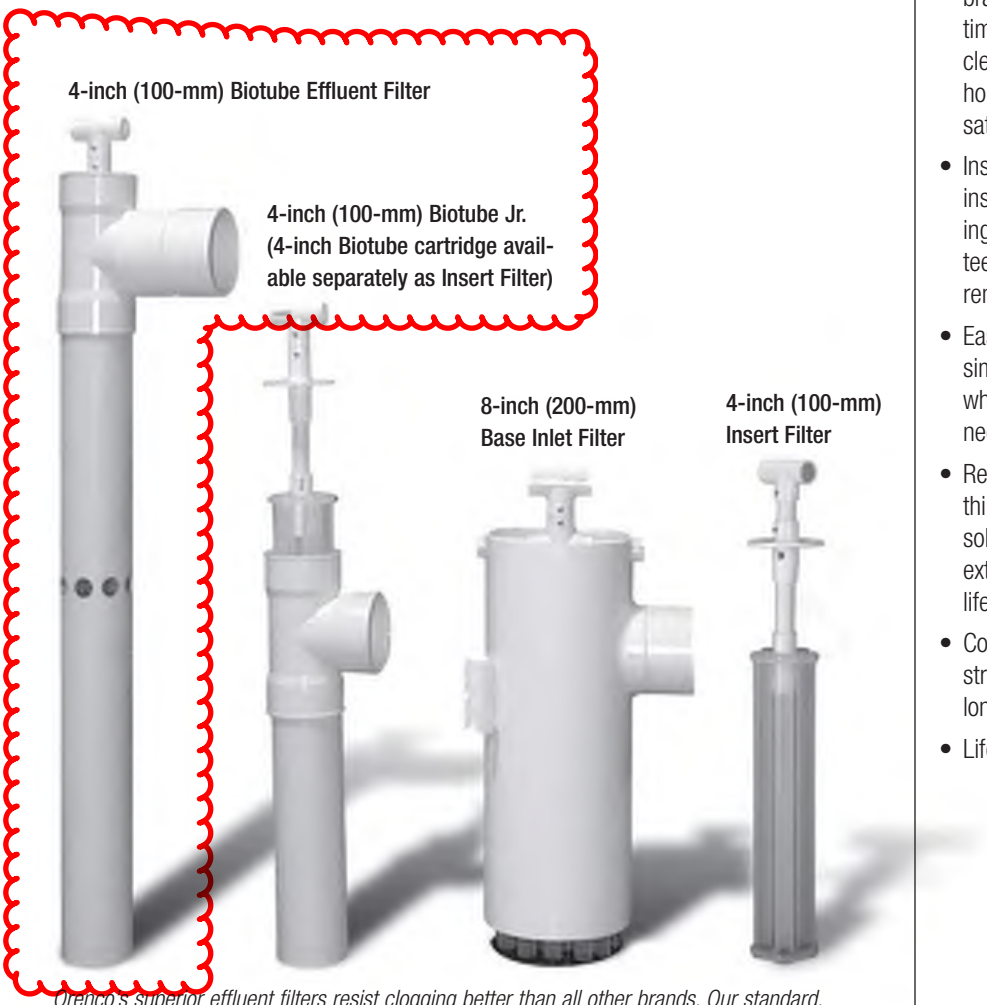
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Orenco® SYSTEMS *Product Sheet*

Residential Biotube® Effluent Filters

Applications

Our patented* 4-inch (100-mm) Biotube Effluent Filters, Biotube Jr., Biotube Base Inlet Filters, and Biotube Insert Filters are ideal for residential septic tanks and have a lifetime warranty. They prevent large solids from leaving the tank, dramatically improving wastewater quality and extending the life of residential drainfields.



Orenco's superior effluent filters resist clogging better than all other brands. Our standard, full-sized 4-inch (100-mm) Biotube Effluent Filter provides maximum long-term protection in a complete package, with housing. Our 4-inch (100-mm) Biotube Jr., at half the size of our standard model, has more filtering capacity than the full-sized filters sold by other manufacturers. For low-profile tanks, there's the Base Inlet Filter. And for tanks with existing outlet tees, the Biotube Insert Filter is ideal.

** Covered by patent numbers 5,492,635 and 4,439,323*

Standard Features & Benefits

- Has 5-10 times more flow area than other brands, so lasts many times longer between cleanings, increasing homeowner satisfaction
- Installs in minutes inside new or existing tanks; extendible tee handle for easy removal
- Easy to clean by simply hosing off whenever the tank needs pumping
- Removes about two-thirds of suspended solids, on average, extending drainfield life
- Corrosion-proof construction, to ensure long life
- Lifetime warranty

Optional Features & Benefits

- Alarm available, to signal the need for cleaning
- Flow modulating discharge orifices available to limit flow rate leaving tank, mitigating surges and increasing retention time
- Custom and commercial sizes available

Biotube Filtering Process

Effluent from the relatively clear zone of the septic tank, between the scum and sludge layers, horizontally enters the Biotube Effluent Filter. Effluent then enters the annular space between the housing and the Biotubes, utilizing the Biotubes' entire surface for filtering. Particles larger than the Biotube's mesh are prevented from leaving the tank.

To Order

Call your nearest Orenco Systems®, Inc. Distributor. For nearest Distributor, call Orenco at 800-348-9843, or visit www.orenco.com and click on "Where to Buy."

Orenco® SYSTEMS

Orenco Systems® Inc. , 814 Airway Ave., Sutherlin, OR 97479 USA
800-348-9843 • 541-459-4449 • www.orenco.com

FT □ □ 04 □□ - □□ M A - □ FTPS0436-28NC

- For customized options (e.g., NC indicates North Carolina regions)
- Indicates float bracket attached
- Indicates flow modulation plate installed
- Cartridge height, 28" and 36" are standard
- Housing height, 36" and 44" are standard
- Indicates filter diameter (inches)
- W = fits 3034 outlet pipe
  S = fits schedule 40 outlet pipe
- P = 1/16" filtration
  Blank = 1/8" filtration
- Biotube effluent filter series

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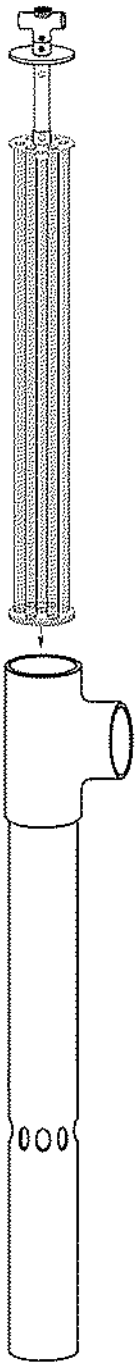
- Add codes for standard options:
  A = float bracket
- Base inlet model
- Cartridge height, 14" standard
- Housing height, 22" standard
- Indicates filter diameter (inches)
  08 = 8"
  12 = 12"
- P = 1/16" filtration
  Blank = 1/8" filtration
- Biotube effluent filter series

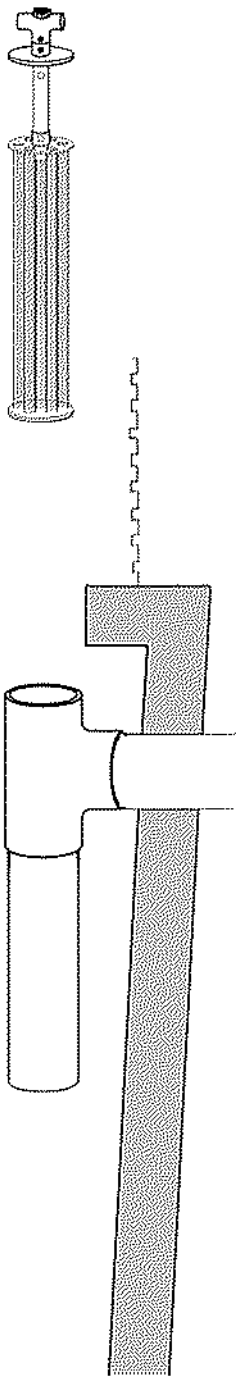
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- For customized options (e.g., NC indicates North Carolina regions)
- Indicates float bracket attached
- Indicates flow modulation plate installed
- Cartridge height (inches)
- Indicates filter diameter (inches)
- W = fits 3034 outlet pipe
  S = fits schedule 40 outlet pipe
- P = 1/16" filtration
  Blank = 1/8" filtration
- Jr. series
- Biotube effluent filter series

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- For customized options (e.g., NC indicates North Carolina regions)
- W = fits 3034 outlet pipe
  S = fits schedule 40 outlet pipe
- Cartridge height (inches)
- Indicates filter diameter (inches)
- P = 1/16" filtration
  Blank = 1/8" filtration
- Insert series
- Biotube effluent filter series





Orenco® SYSTEMS *Instructions*

4-in. Biotube® Effluent Filter

Installation and Maintenance Instructions

Biotube Effluent Filters* extend drainfield life by preventing solids from leaving the septic tank. Our 4-in. (nominal size) filter comes in its own housing, in both 44-in. (1118-mm) and 36-in. (914-mm) lengths. Our Jr. insert filter is 18 in. (457 mm) long, fits in a nominal 4-in. outlet tee, and comes with or without its own housing. Biotube Effluent Filters install in minutes, inside new or existing tanks.

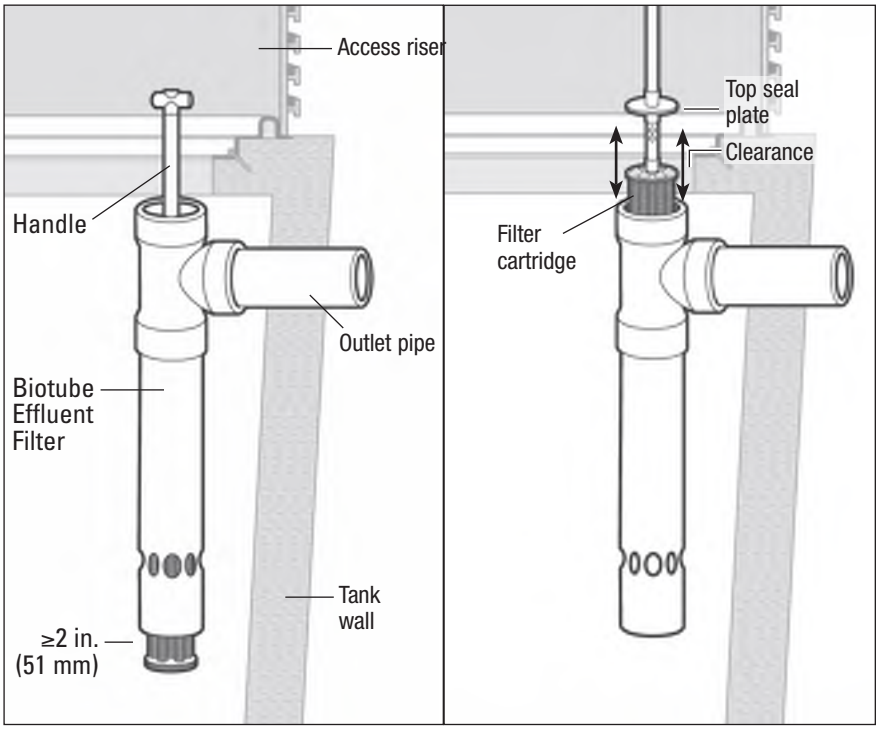


Installation Instructions

Step 1: Test-Fit the Effluent Filter

Test-fit the effluent filter on the septic tank's outlet pipe without gluing. Make sure it fits plumb. Install the assembly as snug as possible to the tank wall, but ensure sufficient clearance for removing the filter cartridge.

If using the 4-in. Biotube Insert Filter, adjust the length of the outlet tee so that the bottom of the Insert Filter extends at least 2 in. (51 mm) below the bottom of the outlet tee.



**Protected by U.S. Patent Numbers 5,492,635 and 4,439,323*

Installation Instructions (continued)

Step 2: Attach Filter to Tank

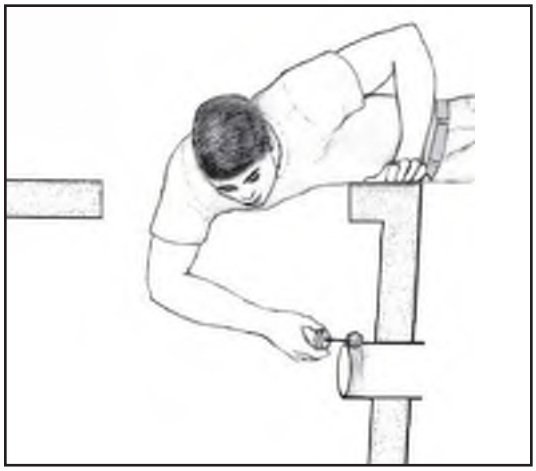
Two attachment methods can be used:

1) Glue the filter onto the tank outlet pipe using appropriate primer and glue.

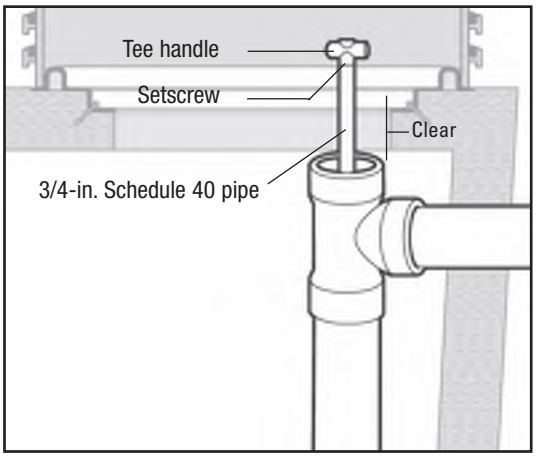
2) A stainless steel setscrew can be used to secure the filter instead of glue.

Step 3: Extend Cartridge Handle

For easier access when servicing, the cartridge handle may be extended using a longer length of 3/4-in. Schedule 40 PVC pipe.



This illustration shows the gluing technique for installing a filter into a new septic tank. Installing a filter into an existing tank is a custom, site-specific job.



Cartridge handles can be extended for easier access.

Maintenance Instructions

To ensure the effluent filter is functioning properly, inspect it every year. Under normal conditions, your effluent filter will function for several years before cleaning is necessary. Clean the filter when it becomes clogged enough to restrict normal flows out of the septic tank. At a minimum, clean the filter whenever the tank is pumped. High-level alarms, which activate when the filter is clogged, are recommended to prevent backups.

Be sure to dress properly when inspecting and cleaning the filter. Wear full-length pants and shirt, shoes, gloves, and goggles or glasses.

Step 1

Remove the access lid to your septic tank by unscrewing the stainless steel lid bolts with the hex head wrench provided. If your lid is above ground, it will be easy to find. If it is buried below ground, find the marker that indicates its location.

Step 2

Remove the filter cartridge by grasping the tee handle and lifting it out of its housing.

Step 3

Spray the cartridge tubes with a hose to remove any material sticking to them. Ensure that the three orifices in the optional flow modulation plate inside the filter are clear of any debris. Make sure the rinse water runs back into the tank, but do not allow solids material to fall into the open filter housing.

Step 4

Firmly place the cartridge back into the housing.

Step 5

Some effluent filters come with an alarm that activates when the filter needs cleaning. If you have an alarm, check to make sure it is working by lifting the float with a stick. An audible horn should sound. The alarm panel is normally mounted on the side of the house or in the garage.

Note: If your effluent filter doesn't have an alarm system and you would like one, call your local septic system installer.

Step 6

Record the date that you inspected and/or cleaned your filter on the form that follows this page. If you checked the alarm or made any other observations about the tank or system, include that information under "Notes."

Step 7

Attach the access lid by placing it on the riser, matching the holes in the lid with the holes in the riser. Insert each lid bolt through the lid and the hole in the riser and tighten with hex head wrench provided. Before leaving, pull up firmly on the lid to make sure it is secure.

Inspection/Maintenance Form

Date Installed: _____ **Model Tank:** _____ **Size:** _____

Model: _____ **Single/Double Compartment:** _____

Date Inspected	Cleaned Yes	Cleaned No	Notes

Important Names and Numbers

System Service Provider: _____ **Phone:** _____

System Installer: _____ **Phone:** _____

Septic Tank Pumper: _____ **Phone:** _____

Electrician: _____ **Phone:** _____

System Designer: _____ **Phone:** _____

Orenco Systems®, Inc., 814 Airway Ave., Sutherlin, OR 97479 USA • 800-348-9843 • 541-459-4449 • www.orenco.com

Installation Manual

AdvanTex®
AX-RT Treatment Systems

Residential Applications



Orenco®
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www.orenco.com

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Septic Tanks Used in AX-RT Treatment Systems . . . . . *Page 3*

Standard Unit Components And Functions . . . . . *Page 4*

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Installation Steps

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How To Use This Manual

This manual contains an Installation Overview and a set of Installation Steps.

- **Installation Overview** — This is a simple overview of the installation steps. Its purpose is to help you quickly see the suggested order of operations for installing an AX-RT unit. It is intended as a summary only — it does not provide complete instructions.
- **Installation Steps** — This provides general instructions for each installation step along with references to detailed installation documents for specific components. Many Orenco products come with installation instructions and all of these instructions are also provided in hard copy form in our Orenco Installer Binder. Contact your Dealer or Orenco for a copy of the binder, or find individual instructions online in the Orenco Document Library at www.orenco.com. There are also steps in this manual covering operations performed before and after the AX-RT unit is installed that are necessary to successfully complete the installation.

You will find *IMPORTANT information, Key Points*, and *Notes* in this manual, marked with easy-to-see visuals:



IMPORTANT — These point out potential hazards to equipment or people during and after the installation.



Key Points — These are critical for a quality installation and must be completed in order for your installation to be successful.



Notes — These cover useful information and tips that can help make your installation simpler or easier. They may also provide information on variations in components or methods.

Before You Begin

At Orenco, we work hard to make your installation as easy and "hassle-free" as possible. This manual provides basic information for installing AdvanTex AX-RT™ treatment units. It is not intended to replace installer training or requirements and instructions detailed in your engineering plans. If you discover any inconsistencies between your engineering plans and the instructions in this manual, contact your engineer or call your AdvanTex Dealer. If you are not an Authorized AdvanTex Installer, contact your local AdvanTex Dealer for training and authorization before installing this system.

The Dealer can provide technical support, training, and replacement components. To find the nearest Dealer, check the Distributor Locator page at www.orenco.com. If there is no Dealer in your area, call Orenco Systems, Inc. at (800) 348-9843 or +1 (541) 459-4449.

Before you begin this installation, read this entire manual and any reference documents you may need to be familiar with to complete the installation. Also, be sure that the instructions for these products are the most current ones available. Please note that ***you must perform the installation according to the current manual or the AdvanTex® Treatment Systems Limited Warranty will be void.*** You can make sure your instructions are current by checking our online Document Library at www.orenco.com. You'll save time and money on installation day, and you'll get fewer call-backs.



Key Point: Inspect your order for completeness and inspect each component for shipping damage. Check to be sure instructions and items supplied comply with your state and local regulations. Carefully read and follow all instructions. Improper installation may void warranties.



IMPORTANT: *The backwash discharge from a salt-type water softener MUST NOT be plumbed into an AX-RT Treatment Unit or the preceding septic tank. Failure to follow this instruction, or any other in this manual, will void the system's warranty. Contact your AdvanTex Dealer if you have any questions about any household plumbing arrangements that may interfere with the functioning of the system.*



Note: *All pipe diameters provided are U.S. nominal PVC pipe sizes. If you are using metric pipe, you may need adapters to connect to the U.S. fittings supplied with AdvanTex Treatment Systems.*

Septic Tanks Used in AX-RT Treatment Systems

Be sure that any septic tank used in an AX-RT Treatment System meets the following conditions:

- The tank must conform to an approved and authorized tank design for AdvanTex Systems, and it must meet all applicable regulatory requirements (no pour-in-place tanks, no homemade tanks, etc.). Call your local Dealer for specifics.
- The tank must be structurally sound.
- The tank must have at least 1000 gal. (3800 L) capacity for an AX20-RT, 1250 gal. (4730 L) for a 5-bedroom AX25-RT, and 1500 gal. (5680 L) for a 6-bedroom AX25-RT at the normal operating level (below the invert of the outlet).
- The tank must have an at-grade access with a watertight, securable and removable lid. If it doesn't, an at-grade access must be installed onto the septic tank and be made watertight.
- The tank must be watertight and free of leaks.
- An Orenco effluent filter (model FTS0444-36V, FTW0444-36V, or FT0822-14B) must be installed in the septic tank.

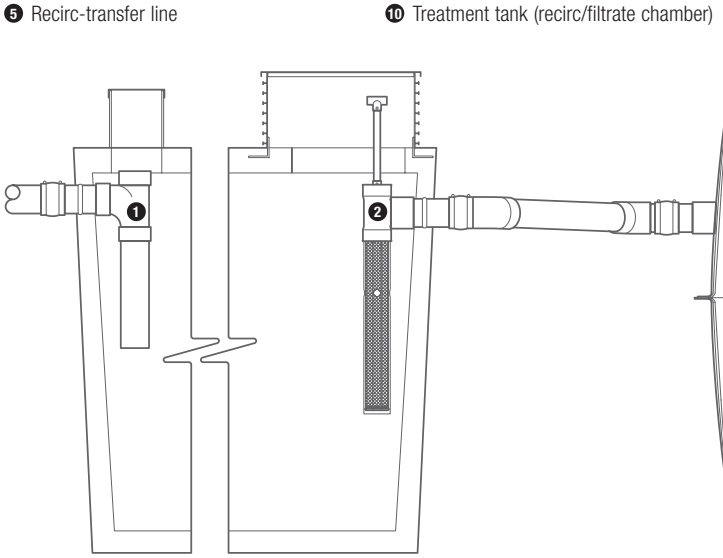


Key Point: For existing septic tanks — the tank's depth of burial must allow for a minimum fall of 1⁄8 inch per foot (10 mm per meter or 1%) from the septic tank's invert of outlet to the AX-RT unit's invert of the inlet. If sufficient fall cannot be met, a grade ring extension must be installed on the AX-RT or a pumping system will need to be installed in the septic tank to move the filtered effluent to the AX-RT unit. (Contact your Dealer for assistance.)

Standard Unit Components And Functions

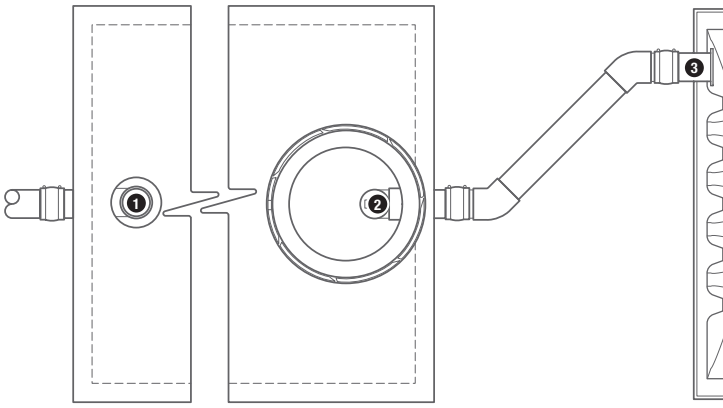
Standard Components (AX20RT-MODE1B shown):

1. Septic tank inlet tee
2. Biotube® effluent filter
3. AX-RT inlet and tee
4. Treatment tank (recirc/blend chamber)
5. Recirc-transfer line
6. Recirc-pump system
7. Manifold and spin nozzles
8. Textile media
9. Tank baffle
10. Treatment tank (recirc/filtrate chamber)
11. Discharge pumping system
12. AX-RT outlet
13. Passive air vent
14. Splice box
15. Control panel, not shown



Side view, septic tank

Side view, AX-RT unit



Top view, septic tank

Top view, AX-RT unit

Raw sewage enters the septic tank through its inlet tee. In the septic tank, the raw sewage separates into a scum layer, a sludge layer, and a clear zone. Effluent from the clear zone passes through a Biotube® Effluent Filter and is discharged to the recirc/blend chamber of the AX-RT unit. The effluent flows through the recirc transfer line to the recirc pumping system, which pumps filtered effluent to the distribution manifold in the top of the unit. Effluent percolates down through the textile media and is divided — by means of a tank baffle — between the recirc/blend chamber and the recirc/filtrate chamber inside of the unit.

The recirc pumping system's operation is controlled by a timer in the control panel. It allows the pump to dose the textile media for short periods (usually 40-60 seconds), typically 72 times a day. These frequent "micro-doses," which optimize the treatment process, occur throughout the day to maintain the proper biological environment.

Installation Overview

Step 1: Review the site plan. If there is no site plan, draw up a plan including locations and distances.

Step 2: Perform the excavations for the AX-RT unit and (if needed) the septic tank.

Step 3: If the septic tank has not been set, set it according to the manufacturer's instructions.

Step 4: Set the AX-RT unit.

Step 5: Install antibuoyancy deadmen on the AX-RT unit (if needed).

Step 6: Partially backfill the AX-RT unit and (if needed) the septic tank.

Step 7: If the tank adapters and risers have not been installed on the septic tank, install them according to the manufacturer's instructions.

Step 8: If no watertightness test has been performed on the tank and the tank-to-riser connections, perform a watertightness test.



Key Point: The tank and tank-to-riser connections must pass this test before the AX-RT is connected to the tank.

Step 9: Perform a watertightness test of the AX-RT unit's midseam.

Step 10: If the effluent filter has not been installed in the septic tank, install it according to the manufacturer's instructions.

Step 11: Connect the transport line from the septic tank outlet to the AX-RT unit.

Step 12: Connect the passive air vent to the AX-RT unit.

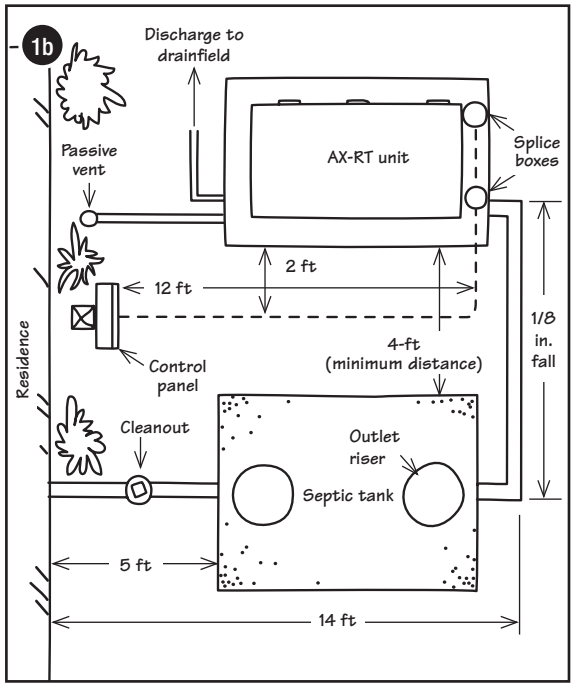
Step 13: Connect the discharge line to the AX-RT outlet.

Step 14: Install and test the control panel and wiring for the AX-RT unit.

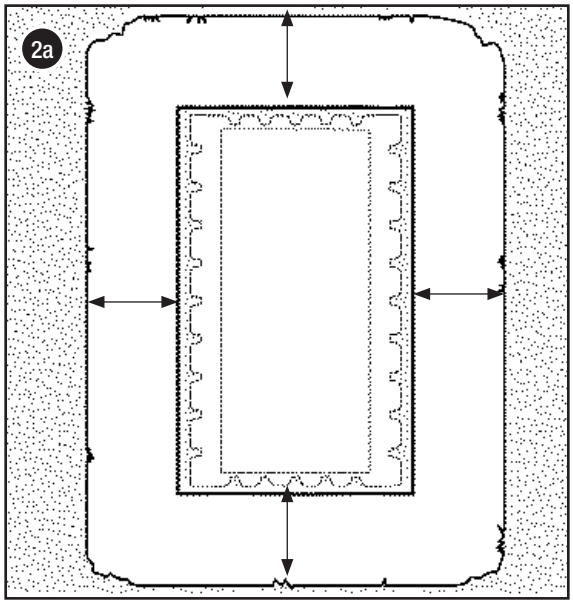
Step 15: Perform an operational test of the AX-RT float switches and pump(s).

Step 16: Complete the backfilling of the AX-RT unit and (if needed) the septic tank.

Installation Steps



This is a sample sketch of an AX-RT unit installed parallel to the septic tank, with no antibuoyancy measures installed. Distances and estimated fall from the septic tank's invert of the outlet to the AX-RT unit's invert of the inlet are included.



AX-RT units require 18-24 inches (457-610 mm) space on all four sides when installed in their own excavation.

Step 1: Review or Sketch Site Plans

Check the site plan for the specifics of your installation.

Key Point: If you're installing the AX-RT unit more than 20 ft (6 m) from the septic tank, contact your Dealer for assistance.

Step 1a: Detailed Site Plan Provided

Make sure that the plan accurately reflects conditions at the site. If it doesn't, contact the Designer before scheduling the installation.

Step 1b: Plan Of Limited Detail Or No Site Plan Provided

If you are installing the AX-RT unit with a plan of limited detail or with no plan, contact your local Dealer for assistance and then sketch a site plan that is consistent with the Designer's specifications:

Key Points:

- Sketch the exact positions of the system components, pipes, electrical conduits, etc. Account for current and likely future landscape features in the sketch. (See *Panel Installation*, EIN-CP-GEN-1, for recommendations for installing control panels.)
- A minimum fall of 1⁄8 inch per foot (10 mm per meter or 1%) is required from the septic tank's invert of outlet to the AX-RT unit's invert of the inlet.
- The invert of the inlet on the AX-RT is 46 in. (1168 mm) up from the base of the unit. The outlet is 24 in. (610 mm) down from the top of the unit for pump dispersal or 41.5 in. (1054 mm) down for gravity dispersal.
- The bottom of the AX-RT lid must sit 2 inches (50 mm) above finished grade when set and level. Standard unit height is 72 inches (1830 mm); grade rings increase height by 6 or 12 inches (152 or 305 mm).
- If the AX-RT unit is installed in its own excavation, the unit requires 18-24 inches (457-610 mm) of space on all four sides.
- If the AX-RT unit is installed in tandem with the septic tank, a minimum of 2 ft (610 mm) separation distance is required between the unit and tank.
- If the AX-RT unit is being installed parallel to the septic tank, offset the unit from the tank by 6 ft (1.8 m) if antibuoyancy measures are necessary or 4 ft (1.2 m) if antibuoyancy measures are not necessary.

Step 2: Perform Excavation(s)

Step 2a: Before excavating, consider the necessary elevations, offsets, and grade requirements for the AX-RT unit and (if needed) the septic tank.

Step 2b: Perform the excavation(s).

Key Points:

- Follow the manufacturer's recommendations for excavating the tank area.
- A minimum fall of 1⁄8 inch per foot (10 mm per meter or 1%) is required from the septic tank's invert of outlet to the AX-RT unit's invert of the inlet.

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Installation Steps

Step 2: Perform Excavation(s), cont.

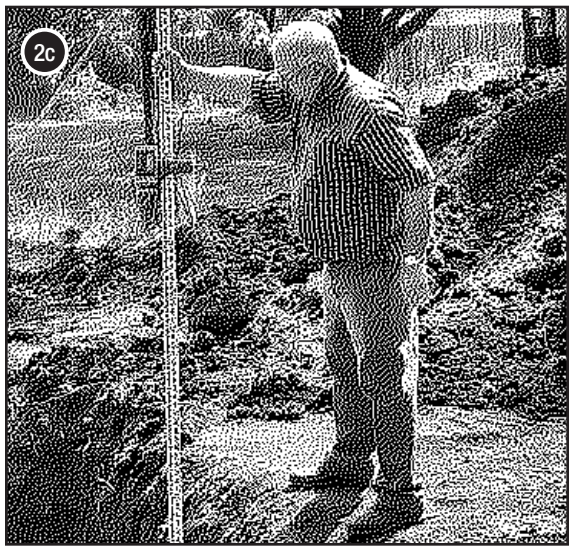
Step 2c: Make sure the bottom of the excavation is suitable for setting the AX-RT unit and (if needed) the tank: stable, smooth, level, and free of debris, rocks, and other sharp objects.

Key Points:

- Follow the manufacturer's instructions for bedding the tank.
- If the bottom of the excavation is uneven or rocky, lay a 4-in. (100-mm) bed of sand or pea gravel and compact the material to create an even, smooth surface.

Step 2d: If the bottom of the excavation is unstable, stabilize the bottom of the excavation before continuing.

- For unstable base soil (peat, quicksand, muck, soft or highly expansive clay, etc.), you may need to over-excavate the site depth and set a firm, 6-in. (152-mm) compacted base of ≤ ½- to ≤ ¾-in. (13- to 19-mm) aggregate or pea gravel.
- For extremely unstable soil, you may need to pour a concrete layer to stabilize the bottom of the excavation.
- If you have doubt about the soil's stability, consult a local civil or structural engineer.



Make sure the excavation is stable, smooth, level, and free from debris, rocks, and sharp objects.

Step 3: Set Septic Tank (If Needed)

Set the septic tank according to the manufacturer's instructions.

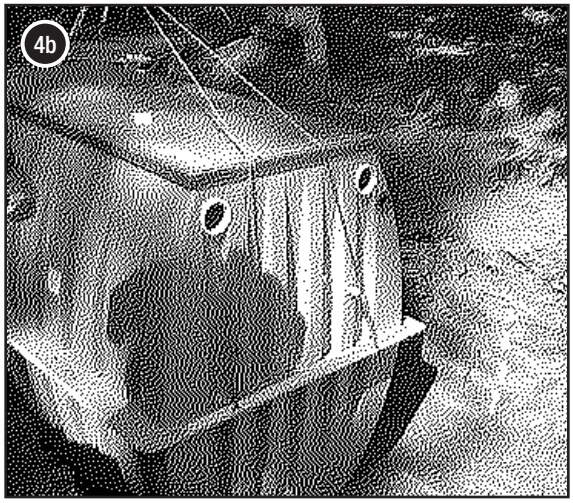
- Use Fiberglass Tank Burial instructions (NIN-TNK-1) to install Orenco's 500-gallon through 2000-gallon (2000-L through 7570-L) Fiberglass Tanks.

IMPORTANT: *Take care to keep everyone clear of the excavation when placing the tank.*

Key Points:

- The tank has to be set at the correct depth to connect to the sewage inlet.
- A minimum fall of 1⁄8 inch per foot (10 mm per meter or 1%) is required from the septic tank's invert of outlet to the AX-RT unit's invert of the inlet.

Installation Steps



Lower the AX-RT unit into position.

Step 4: Set AX-RT Unit

Step 4a: Attach proper lifting equipment to the lifting points on the AX-RT unit.

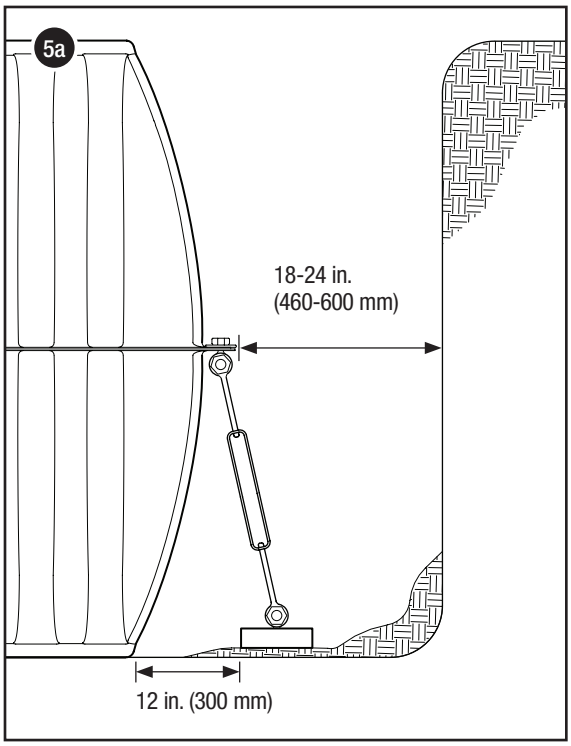
Step 4b: Carefully lift the unit and lower it into the correct position.

Step 4c: Remove the equipment when the unit is set and level in position.

IMPORTANT: *Take care to keep everyone clear of the excavation when placing the unit. Use a lifting device that will not damage the unit or the unit's lid.*

Key Points:

- A minimum fall of 1⁄8 inch per foot (10 mm per meter or 1%) is required from the septic tank's invert of outlet to the AX-RT unit's invert of the inlet.
- The bottom of the AX-RT lid must sit 2 inches (50 mm) above finished grade when set and level.
- If the AX-RT unit is installed in its own excavation, the unit requires 18-24 inches (457-610 mm) of space on all four sides.
- If the AX-RT unit is installed in tandem with the septic tank, a minimum of 2 ft (610 mm) separation distance is required between the unit and tank.
- If the AX-RT unit is being installed parallel to the septic tank, offset the unit from the tank by 6 ft (1.8 m) if antibuoyancy measures are necessary or 4 ft (1.2 m) if antibuoyancy measures are not necessary.



When using Orenco fiberglass deadmen, be sure to place them on a small lift of soil 12 inches (300 mm) from the bottom of the AX-RT.

Step 5: Install Antibuoyancy Deadmen (If Needed)

Determine if antibuoyancy deadmen are necessary for the installation. Orenco offers antibuoyancy hardware kits that can be used with Orenco fiberglass deadmen or concrete deadmen.

- Deadmen are recommended for all installations.
- Deadmen are required if there is a potential for groundwater to be present in the excavation at any time, or if surface runoff can fill the excavation at any time, resulting in a "bathtub" effect.

Note: *This effect occurs in dense soils when water fills an excavation during surface water runoff —usually during a heavy rain event — before the disturbed soil in the excavation has had time to settle.*

- If you are unsure whether to install antibuoyancy deadmen or not, consult the system Designer or an engineer.

Step 5a: Installing Orenco Fiberglass Deadmen

Step 5a (i): Build up a 3- to 4-inch (75- to 100-mm) lift of soil on each side of the unit for the deadmen to rest upon.

Step 5a (ii): Secure the deadmen along the length of the unit, on both sides, with the antibuoyancy kit hardware. Then lower the unit into the hole.

Step 5a (iii): Place the deadmen at least 12 inches (300 mm) from the bottom of the unit, and make sure they are level.

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Installation Steps

Step 5: Install Antibuoyancy Deadmen (If Needed), cont.

Step 5b: Installing Concrete Deadmen

Notes:

- *We recommend preparing concrete deadmen off site before installation.*
- *PVC forms for concrete deadmen can be made from 12-in. dia. × 4-ft long (300-mm × 1200-mm long) PVC half-pipe or chamber material.*
- *Wooden forms for concrete deadmen can be built 12-in. wide × 6 in. tall × 4 ft long (300-mm × 150-mm × 1200-mm).*

Step 5b (i): Fill two forms halfway with concrete.

Step 5b (ii): Place two #4 reinforcing bars in each of the forms.

Step 5b (iii): Finish filling the forms.

Step 5b (iv): Sink eyebolts from the antibuoyancy hardware kit into the concrete for attaching the deadmen later.

Step 5b (v): Let the concrete set completely before moving the deadmen.

Step 5b (vi): Use appropriate lifting gear to set the deadmen in place.

Step 5b (vii): Secure the deadmen along the length of the unit, on both sides, with the antibuoyancy hardware kit and make sure they are level.

Step 6: Partially Backfill Excavation(s)

Partially backfill around the AX-RT unit and (if needed) the tank. Follow the manufacturer's instructions for backfilling around the tank. Follow the steps below to backfill around the AX-RT unit.

IMPORTANT: *Bolt down the AX-RT lid before backfilling! Bolting down the lid increases rigidity and helps prevent deformation.*

Step 6a: Fill the AX-RT with 16 in. (410 mm) of water on both sides of the baffle.

Step 6b: Backfill around the unit with a 16-inch (410-mm) layer of material.

Key Points:

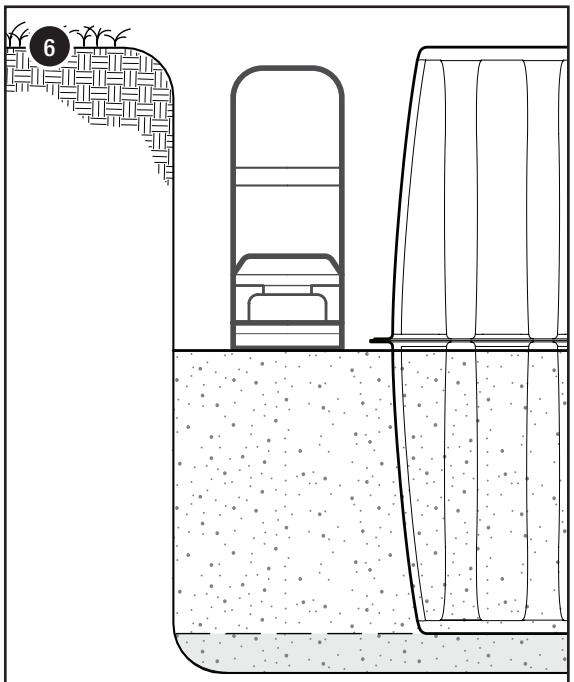
- Do not use native material to backfill if it is primarily sand; very soft or highly expansive clay; or if it contains debris, large (> ¾-in. or 19-mm) rocks, sharp rocks, peat, or muck. In these cases, use ≤ ¾ inch (≤ 19 mm) rounded gravel, crushed stone, or pea gravel as fill material. This material should be washed, free-flowing, and free of debris.
- Do not backfill with sand.

Step 6c: Compact the fill thoroughly with a mechanical compactor.

Step 6d: Fill the AX-RT with water to just above the midseam flange on both sides of the baffle.

Step 6e: Add another 16-inch (410-mm) layer of backfill.

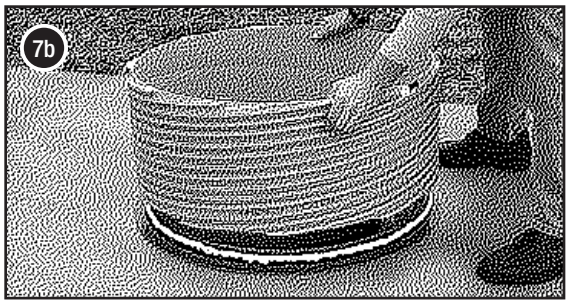
Step 6f: Compact the fill to 2-3 inches (50-75 mm) below the midseam flange.



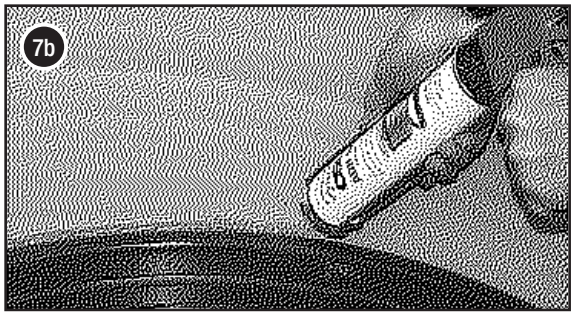
IMPORTANT:

Do not backfill around the unit unless the lid is bolted down!

Installation Steps



See Orenco's *PVC Access Riser Installation* (NIN-RLA-RR-1) instructions for installing access risers on Orenco Tank Adapters.



Watertight seams are critical for proper performance.

Step 7: Install Adapters and Risers (If Needed)

Step 7a: Install tank adapters if needed. Follow the manufacturer's instructions.

- Use PRTA24 and PRTA30 Tank Adapter Installation (NIN-TA-PRTA-2) instructions for installing Orenco PRTA24 or PRTA30 Tank Adapters.
- Use RRFTA and RRFTA30 Tank Adapter Installation (NIN-TA-RRFTA-1) instructions for installing Orenco RRFTA or RRFTA30 Tank Adapters.
- Use FRTA30-FRP Tank Adapter Installation (NIN-TA-FRTA-1) instructions for installing Orenco FRTA30-FRP Tank Adapters.
- Use Tank Adapter Installation for Roth Tanks (NIN-TA-RR-2) instructions for installing Orenco FRTA24-R or Orenco PRTA30 Tank Adapters on Roth Fralo tanks.

Step 7b: Install the access risers and any necessary grommets.

- Use PVC Access Riser Installation (NIN-RLA-RR-1) instructions for installing access risers on Orenco Tank Adapters and grommets in access risers.

Key Points:

- The seam between the tank and the tank adapter has to be watertight.
- Watertight seams and penetrations are critical for proper performance.
- Before installing the riser, make sure the riser is the correct height — the recommended riser height is 2-3 inches (50-75 mm) above final grade.
- Before installing the riser, make sure that the riser penetrations are made at the correct height to make connections.
- Before installing the riser, make sure the penetrations are aligned correctly.
- After installing the riser, make sure all adhesive seams are free of voids, with smooth, continuous fillets.
- After installing the riser, make sure the adhesive is set before continuing.

Step 8: Test Tank and Adapter Seams For Watertightness

Step 8a: Test the tank for watertightness if it has not been tested already.

Note: *Follow the manufacturer's recommendations for watertightness testing. Some manufacturers require the tank be fully backfilled before testing watertightness.*

Step 8b: Test the tank-to-riser adapter seams for watertightness.

- Use PVC Access Riser Installation (NIN-RLA-RR-1) instructions to test the seams between the access riser, tank adapter, and tank for watertightness.

Key Points:

- Watertight seams are critical for proper system performance — the seams between the access riser, tank adapter, and tank must all pass the watertightness test before you continue.
- Follow all applicable regulations and manufacturer's instructions for watertightness testing.

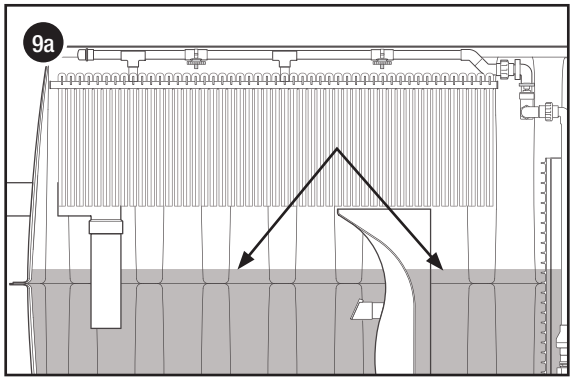
Installation Steps

Step 9: Test AX-RT Midseam for Watertightness

Step 9a: Make sure the AX-RT unit is filled with water to 1-2 inches (25-50 mm) above the midseam flange on both sides of the tank baffle.

Step 9b: Wait 15 minutes and then inspect the midseam flange for leaks. There should be no drop in liquid level and no visible leakage from the seam.

Step 9c: If there is any leakage, contact your Dealer for information on repairing the AX-RT unit.



Fill AX-RT unit with water to 1-2 inches (25-50-mm) above the midseam flange on both sides of the baffle.

Step 10: Install Effluent Filter

Install the effluent filter after the tank has been water tested.

Step 10a: Verify the model of the effluent filter.

- Orenco's FTS0444-36V, FTW0444-36V, and FT0822-14B filters are the only models allowed for use with the AX-RT Treatment Unit.

Step 10b: Dry test-fit the effluent filter on the septic tank's outlet pipe.

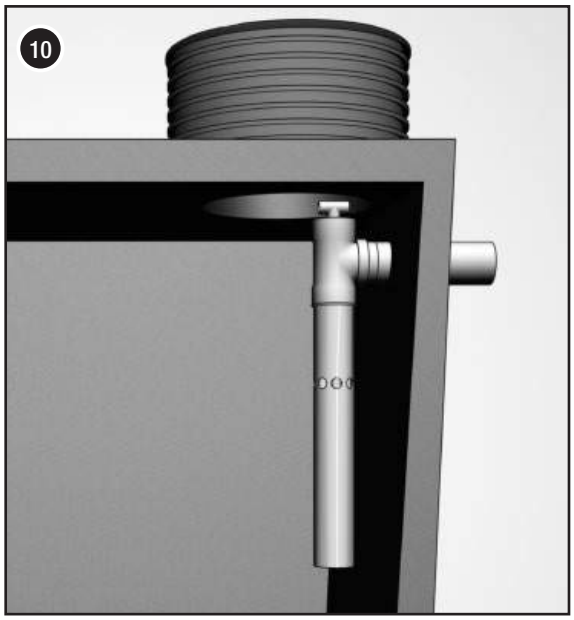
Key Points:

- Make sure the filter is plumb.
- Make sure the filter is snug to the tank wall with enough clearance for easy removal of the filter cartridge.

Step 10c: Secure the filter to the outlet pipe with one of the following methods:

- Glue the filter onto the tank outlet pipe with primer and glue, or
- Secure the filter with a stainless steel set screw.

Step 10d: If necessary for ease of access, extend the cartridge handle with a longer length of ¾-inch nominal (20-mm DN) Schedule 40 PVC pipe.



Effluent filter installed on the septic tank outlet.

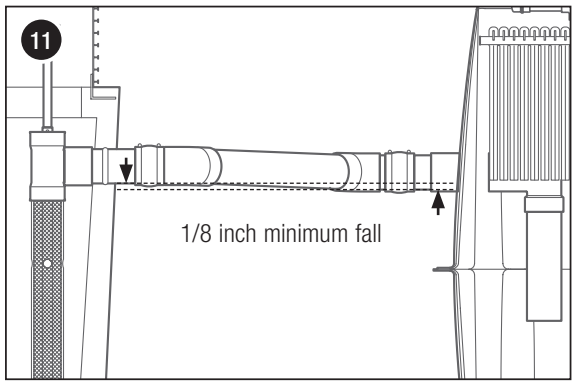
Step 11: Connect Transport Line from Tank to AX-RT

Step 11a: Dry fit the 4-inch (100-mm) transport line and any fittings between the outlet of the septic tank and the inlet of the AX-RT unit.

Key Point: Confirm there is a minimum fall of 1⁄8 inch per ft (10 mm per m or 1%) from the septic tank's invert of outlet to the AX-RT unit's invert of the inlet.

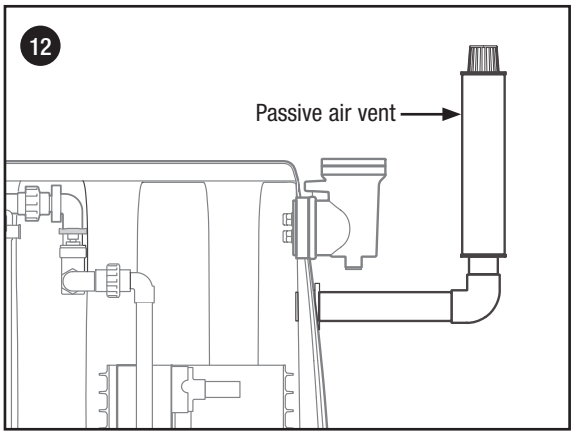
Step 11b: Glue all of the transport line pieces in place.

IMPORTANT: *Do not use primer on ABS parts.*



Confirm a minimum fall of 1⁄8 inch per foot (10 mm per meter or 1%) from the septic tank's invert of outlet to the AX-RT unit's invert of the inlet.

Installation Steps



Install the vent within 20 ft (6 m) of the AX-RT unit.

Step 12: Connect Passive Air Vent

Use 2-inch (50 mm) PVC pipe to plumb the passive air vent to the 2-inch (50 mm) vent fitting that protrudes from the outlet side of the AX-RT unit.

Key Points:

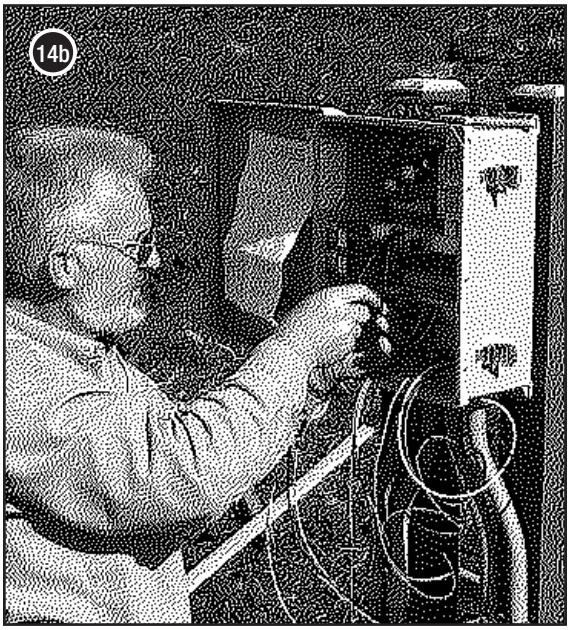
- Install the vent within 20 ft (6 m) of the AX-RT unit, preferably near a wall or other location that will protect it from damage.
- Make sure the vent line is sloped back a minimum of ¼ inch per foot (20 mm per meter) so that it can drain back into the unit.
- Make sure there are no "bellies" in the line that can collect water.
- Make sure the vent's top is a minimum of 3 in. (75 mm) above final grade.

Notes:

- *The air vent can easily be hidden by shrubbery or landscaping.*
- *The air vent can be painted to better blend in with landscaping.*

Step 13: Connect AX-RT Outlet to Transport Line

Glue the AX-RT discharge plumbing line to the transport line for final discharge.



Wire control panel.

Step 14: Mount Control Panel and Perform Wiring

Key Points:

- This step should be performed by a licensed or qualified electrician.
- Installation instructions, schematics, and wiring diagrams specific to the panel and float switch configuration are included with each panel. If any of these is missing, contact your Dealer or Orenco for a replacement.

Step 14a: Install the splice box(es) on the AX-RT using the instructions that came with it.

Step 14b: Mount the panel using the instructions that came with it.

IMPORTANT: *DO NOT mount the control panel on an exterior wall other than a garage or shop wall! The motor contactor makes a sound while engaging and disengaging that can be disruptive to residents.*

Key Points:

- Follow all applicable regulations for placement of the control panel.
- Mount the panel within sight of the tank in a service-friendly location.

Installation Steps

Step 14: Mount Control Panel and Perform Wiring, cont.

Step 14c: Route wires and connect the panel, pump, float switches, and other equipment shown in the instructions and schematics into the control panel.

IMPORTANT: *Follow all applicable regulations and electric codes.*

Key Points:

- Use watertight wire connectors to avoid electrical shorts and other issues.
- Be sure to seal the conduit at the control panel and at the splice box with UL-listed sealing foam, putty, or silicone sealant.

Note: *To help identify wiring runs for individual pumps and float switches, use different-colored wires for each electrical component.*

Step 15: Perform AX-RT Operational Test

IMPORTANT: *Before using a generator to operate a pump, contact your Dealer or Orenco to make sure it can supply sufficient starting amperage to the pump.*

Step 15a: Rotate the manifold so that the spin nozzles face upward.

Step 15b: Remove the cap at the end of the manifold.

Step 15c: Toggle the recirc pump "AUTO/OFF/MAN" switch to "MAN" for 10-20 seconds to flush any debris out of the manifold.

IMPORTANT: *Always make sure there is enough water in the AX-RT's recirc/blend chamber to safely run the pump.*

Step 15d: Rotate the manifold so that the spin nozzle faces down and reinstall the cap on the end of the manifold.

Step 15e: Install the pressure gauge on the manifold.

Step 15f: Toggle the recirc pump "AUTO/OFF/MAN" switch to "MAN" and adjust the gate valve for a pressure gauge reading of 3.0-3.5 psi (20.7-24.1 kPa).

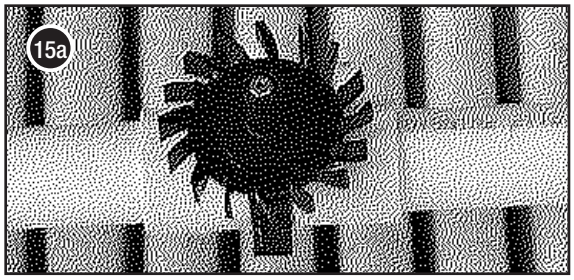
Note: *If the manifold won't pressurize to 3.0-3.5 psi (20.7-24.1 kPa), check for debris, line breaks, or broken valves, and verify that the pump has sufficient power. Contact your Dealer for additional assistance.*

Key Point: Check for complete spray coverage of the textile media and adjust the pressure as needed for complete coverage.

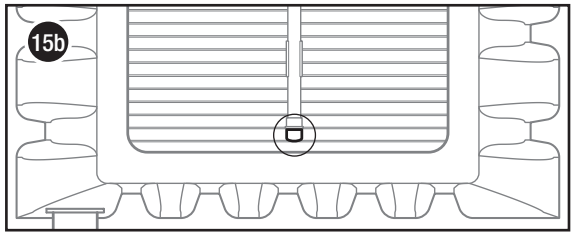
Step 15g: Toggle the recirc pump "AUTO/OFF/MAN" switch to "OFF."

Step 15h: Remove the pressure gauge.

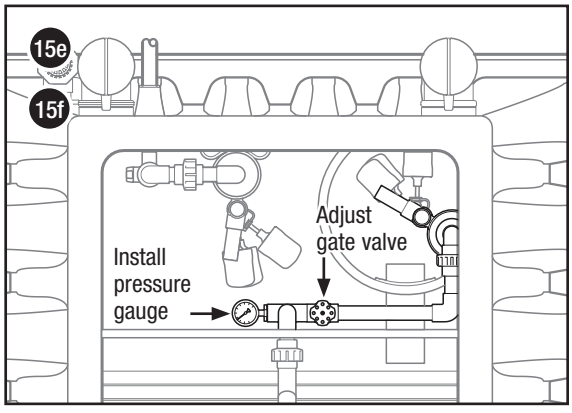
Step 15i: Return the recirc pump "AUTO/OFF/MAN" switch to "AUTO."



Rotate the manifold so spin nozzles face upward.



Remove the cap at the end of the manifold.



Installation Steps

Step 15: Perform AX-RT Operational Test, cont.

Step 15j: If the system uses a VCOM™ control panel, use the instructions that came with it to place the control panel in "Test Mode." If the system uses an MVP control panel, go on to the next step.

Step 15k: Check the operation of the recirc chamber's float switches by raising and lowering the low-level, mid-level, and high-level float in turn and verifying that each performs its intended function.

- If the AX-RT unit has a discharge pump, continue to step **15l**.
- If the AX-RT unit has an MVP panel and gravity discharge, go to step **15o**.
- If the AX-RT has a VCOM panel and gravity discharge, take the panel out of "Test Mode" and go to step **15o**.



IMPORTANT: *Always make sure there is enough water in the AX-RT's discharge chamber to safely run the pump.*

Step 15l: Toggle the discharge pump's "AUTO/OFF/MAN" switch to "MAN" and verify the pump runs.

Step 15m: Toggle the discharge pump's "AUTO/OFF/MAN" switch to "AUTO."

Step 15n: Check the operation of the discharge chamber's float switches by raising and lowering the low-level, mid-level, and high-level float in turn and verifying that each performs its intended function.

- For units with a VCOM control panel, take the control panel out of "Test Mode."

Step 15o: Make sure the recirc pump and (if equipped) discharge pump's "AUTO/OFF/MAN" switches are toggled to "AUTO."

Step 15p: Close and bolt down the lid on the AX-RT unit.

Installation Steps

Step 16: Complete Backfilling

Key Points:

- When backfilling, be careful not to alter the slope of pipes. Brace the pipes or place the pipes on a compacted bed and carefully fill around them.
- Before backfilling, make sure the AX-RT unit's lid and all riser lids are bolted down.

Step 16a: Backfill the septic tank excavation if it has not yet been done. Follow the tank manufacturer's guidelines for backfilling.

Step16b: Backfill and compact around the AX-RT unit in maximum 12-inch (305-mm) lifts.

Key Points:

- Do not use native material to backfill if it is primarily sand; very soft or highly expansive clay; or if it contains debris, large (> ¾-in. or 19-mm) rocks, sharp rocks, peat, or muck. In these cases, use ≤ ¾-in. (≤ 19 mm) rounded gravel, crushed stone, or pea gravel as fill material. This material should be washed, free-flowing, and free of debris.
- For installations in non-cohesive soils* with high seasonal water tables, use ¾-inch crushed rock as the backfill material.
- Do not backfill with sand.

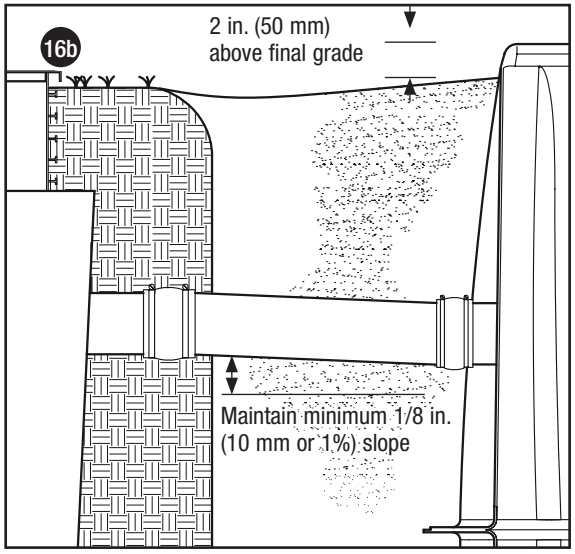
Step 16c: Compact the fill thoroughly with a mechanical compactor.

Key Points:

- The bottom of the AX-RT lid should sit 2 inches (50 mm) above final grade.
- After backfilling, call the system's Service Provider to arrange for the official System Start-up.

Step 16d: Be sure the AX-RT unit's lid is closed and secured.

Step 16e: Be sure the septic tank's access lids are secured.



Backfill the AX-RT in 12-inch (300 mm) lifts.

* As described in OSHA Standards (29 CFR, Part 1926, Subpart P, Appendix A), noncohesive soils or granular soils include gravel, sand, or silt with little or no clay content. Granular soil cannot be molded when moist and crumbles easily when dry. Cohesive soils include clayey silt, sandy clay, silty clay, clay, and organic clay. Cohesive soil does not crumble, can be excavated with vertical sideslopes, is hard to break up when dry, and when moist, can be rolled into threads without crumbling. For example, if at least a 2-inch (51-mm) length of 1/8-inch (3-mm) thread can be held on one end without tearing, the soil is cohesive.

Installation Manual

AdvanTex®
AX-RT Treatment Systems

Residential Applications



AdvanTex Treatment System AX-RTN Models meet the requirements of NSF/ANSI Standard 40 for Class I Systems.

c UL us LISTED

Certified Product Australian Standard

Orenco®
Orenco Systems®, Incorporated

1-800-348-9843
+1-541-459-4449
www.orenco.com

NIM-ATX-AXRT-1
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Orenco Systems®, Inc.



Part 1: Start-Up and Routine Maintenance of AdvanTex® Residential Wastewater Treatment Systems

O&M MANUAL

Orenco Systems®
Incorporated

Changing the Way the World Does Wastewater®

800-348-9843
541-459-4449
www.orenco.com
www.vericomm.net

Introduction

As an authorized AdvanTex Service Provider, you play a crucial role in Orenco's AdvanTex Program.

Orenco has always advocated regular, professional servicing of all onsite systems ... not just during the warranty period but for the life of the system. Regular servicing optimizes the treatment process and protects the property owner's investment. It also ensures that onsite systems protect public health, protect the environment, and are viewed as a reliable, sustainable technology.



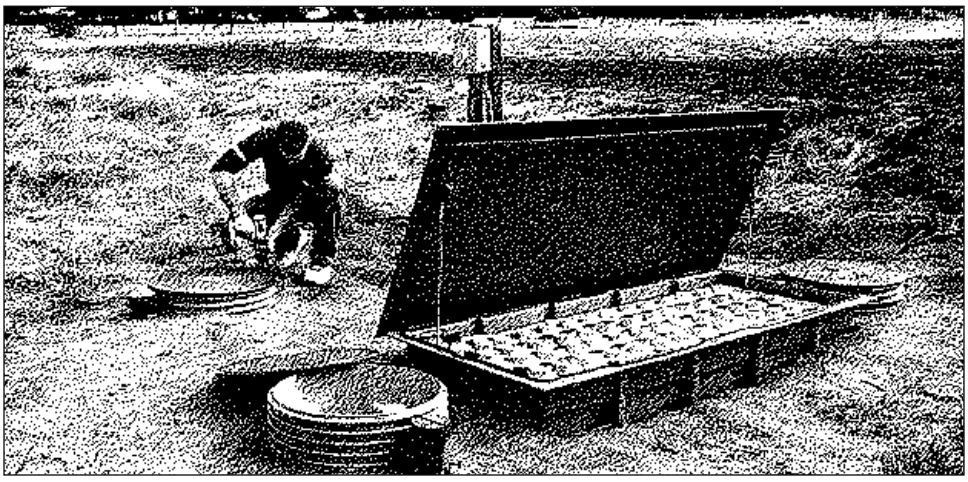
Orenco relies on you to perform the AdvanTex system start-up, do routine (scheduled) maintenance, and respond to calls for unscheduled maintenance (alarm calls). We also rely on you to keep in contact with the homeowners or property owners, review the *Homeowner's Manual* with them, advise them on preventive maintenance, and work to keep the system under a continuous service contract. Equally important, we rely on you to keep good service records on the system, creating a "history" of its performance.

To make your job easier, Orenco has created one of the most service-friendly and trouble-free onsite systems on the market. Then we paired that system with a remote telemetry control panel, to allow you to "view" the system right from your computer. And we've provided a Web-based business tool — advantexservice.com — to help you file and retrieve system data automatically, schedule service events, and manage service technicians.

Finally, we've provided classroom and field training, as well as support materials, like this O&M Manual. Please read this manual thoroughly, for up-to-date information on the best practices for system start-up and routine maintenance. You can find information about troubleshooting in Part 2 of our O&M Manual: *Advanced Service Tips and Troubleshooting Guide*.

We're very proud of our AdvanTex Treatment System. Like all our products, it has gone through extensive research, development, and field-testing. Then each component is built to written specifications and subjected to quality review, before shipping. In addition, our AXN models meet the requirements of NSF-ANSI Standard 40 for Class I Systems. If any component of this system does not meet your expectations, please call your authorized AdvanTex Dealer.

Thank you, in advance, for your knowledge, your conscientiousness, and your good work.



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AdvanTex® O&M MANUAL

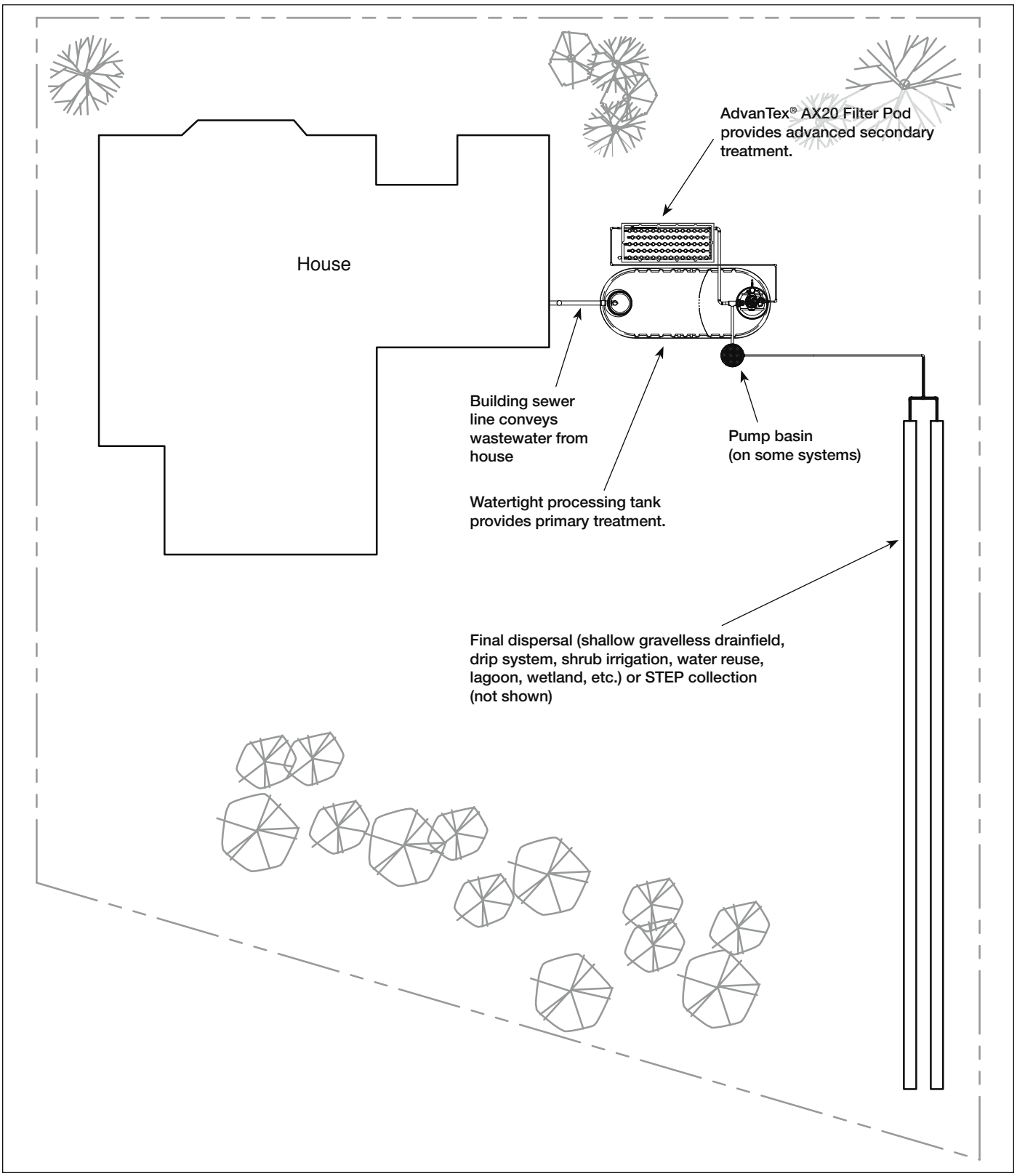
PART 1: START-UP AND ROUTINE MAINTENANCE

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Typical Site Plan for an AdvanTex Treatment System



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How the AdvanTex Treatment System Works

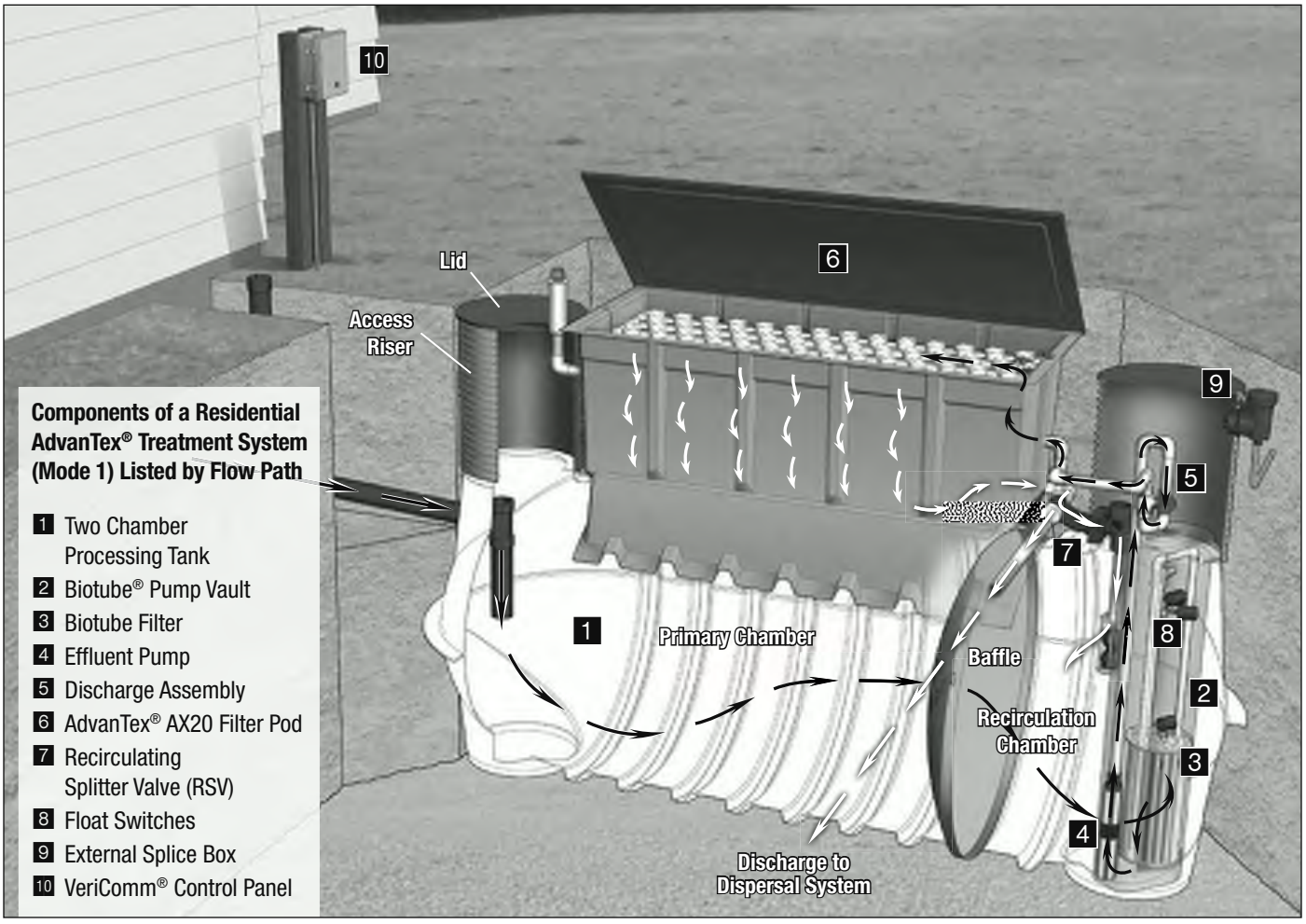
The AdvanTex Treatment System consists of a watertight processing tank and the AX20 textile filter pod. Wastewater from the home flows to the tank, where natural biological and physical processes provide primary treatment. In the primary chamber of the tank, the wastewater separates into three layers: a floating scum layer, a bottom sludge layer, and a relatively clear layer of liquid effluent in the middle.

From the secondary chamber, a pump draws liquid effluent through the Biotube® filter and sends it to the AX20 pod. There, the effluent is sprayed over hanging sheets of porous synthetic textile media. Microorganisms live in this moist, oxygen-rich (aerobic) environment. As effluent trickles over and through the sheets, the microorganisms remove impurities from it.

Effluent recirculates between the tank and the AX20 pod. In Mode 1, the most common configuration, the effluent recirculates to the second compartment of the tank. In Mode 3, effluent recirculates to the first compartment. This mode is used where maximum removal of nitrogen from the effluent is required.

After recirculating several times, the effluent is discharged, either directly from the processing tank or after first being collected in a pump basin. Depending on the design for a particular site, the treated effluent may be discharged to a drainfield, an underground drip irrigation system, a constructed wetland, an effluent sewer (STEP) system, or a reuse system. The system may include equipment for ultraviolet (UV) disinfection before ultimate dispersal of the effluent.

Properly sited, installed, and operated, a Residential AdvanTex Treatment System can treat wastewater to 10 mg/L BOD and 10 mg/L TSS. This level of treatment is better than what municipal wastewater plants provide. The system can also be configured to reduce nitrogen levels as required locally. When effluent treated in this way is dispersed to the soil, natural processes purify it further, and it eventually returns to the underlying water table, where it can be used again.



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Equipment List

Routine maintenance and troubleshooting requires a variety of tools, equipment, and spare parts. We recommend that an Authorized AdvanTex Service Provider have the following items at hand:

For Routine Inspection and Maintenance

- Cordless drill with 3/16-in. Allen wrench for lid bolts on risers and pod
- Extra lid bolts
- Sludge and scum measuring device (e.g., Nasco Sludge Judge® for sludge and Orenco SMUG for scum)
- Hook for raising floats to test them
- Biotube® filter cradle (OM-BIOTUBECRADLE)
- Bronze threaded check valve, for measuring pump flow rate in systems with drainbacks
- Backpack pressure washer
- Trash pump (and generator, if pump is electric) for removing solids from discharge basin
- AX20 manifold brush (AX-LATERALBRUSH)
- AX20 sheet cleaning wand (AX-CLEANINGWAND)
- Handheld computer (PDA) with Bluetooth® Kit or laptop with null modem cable (optional, to turn pump on and off at a distance from the panel)
- Electrical tester (voltage and amperage)
- Phone line tester (available from RadioShack®)
- Dissolved oxygen (DO) meter or colorimetric ampoules
- Sample bottles
- Turbidity meter
- pH meter or pH test strips
- Test strips for nitrate, ammonia, alkalinity
- Tape measure
- Calculator
- A copy of the *AX20 Installation Instructions* (NIM-ATX-AX-1), for reference

For Repairs

- Adhesive (ADH100, SS140, SS115)
- Control panel parts (circuit breakers, motor contactors, relays)
- Effluent pump(s)
- Extension cord
- Flashlight
- Hand tools (pliers, wrenches, screwdrivers, drill bits, hammer, shovel, hand saw, etc.)
- Heat gun or torch for bending conduit
- Inspection mirror (e.g., Prototek “Mirror on a Stick”)
- Plumber’s snake
- PVC cement and primer
- PVC fittings, 3/4 in. to 2 in. (20-50 mm)
- PVC pipe, 3/4 in. to 2 in. (20-50 mm)
- Spare parts for downstream components (e.g. drip headworks, UV)
- Waterproof wire nuts
- Wire stripping/crimping tool
- Float switches

For Troubleshooting

- Digital camera
- Watch or timer
- A copy of Part 2 of the AdvanTex O&M Manual: *Advanced Service Tips and Troubleshooting Guide* (AIM-OM-ATX-2)

For Personal Hygiene and Cleanup

- Bleach/water solution
- Eye protection
- Hand cleanser
- Paper towels
- Protective clothing
- Rags
- Rubber gloves

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Start-Up Checklist

AX20 Start-Up Checklist

Service Provider _____

Technician _____ Start-Up Date _____ Occupancy Date _____

Primary Treatment

Process Tank.

- ☐ Proper inlet tee installed.

Process Tank Pumping Equipment.

- ☐ Discharge plumbing properly installed through watertight grommet. Threaded connections tight, ball valve in open position.
- ☐ Float assembly mounted on Isotube® vault and properly set per AdvanTex Installation Guide. Float cords neatly wrapped around splice box and tied.
- ☐ Floats operate properly.
- ☐ Floats set properly (measuring from outside top of tank).
- ☐ Splice box mounted on access riser. Watertight connectors used.

Process Tank Pumping System.

- ☐ Pump operates in Manual.
- ☐ Pump operates in Automatic.
- ☐ Pump run amps: _____
- ☐ Pump float volts: _____ run volts: _____

Secondary Treatment

Recirculating Splitter Valve Assembly.

- ☐ Verify proper RSV setting (measuring from top of cage to outside top of tank).

AdvanTex System.

- ☐ All posts installed level.
- ☐ All piping properly covered and compacted.

Ventilation System.

- ☐ Ventilation manifold properly located and installed

AdvanTex Filter Operation.

- ☐ Splash height verified

Discharge Pump Basin/Tank.

- ☐ Basin/tank inspected for infiltration.
- ☐ Basin/tank is set level.

Discharge Basin/Tank Pumping Equipment.

- ☐ Pump and discharge plumbing are compatible (e.g. pressure rating).
- ☐ Discharge plumbing properly installed through watertight grommet, and ball valve is in open position.
- ☐ Floats operate properly.
- ☐ Floats set properly (measuring from outside top of tank).
- ☐ Splice box mounted in access riser. Watertight connectors used.

Discharge Basin/Tank Pumping System.

- ☐ Pump operates in Manual.
- ☐ Pump operates in Automatic
- ☐ Pump run amps: _____
- ☐ Pump float volts: _____ run volts _____
- ☐ Dose volume verified.
- ☐ Flow rate verified (draw down test)

Other System Components

- ☐ Disinfection equipment installed properly.
- ☐ Disposal equipment operating properly.

Controls

- ☐ Proper timer settings.
- ☐ Proper wire size used based on information provided by manufacturer.
- ☐ All electrical connections in panel secured.
- ☐ Panel wired per manufacturer's wiring diagram.
- ☐ Service provider name/number written on "For Service Call" label.
- ☐ Control panel functional test, as detailed in the *AdvanTex Installation Instructions*, has been followed.
- ☐ Dial tone verified.
- ☐ Control panel diagrams left in panel for future review.

Final/Safety Inspection

- ☐ All access riser hardware is in place. Lids are secured.
- ☐ All splice box lids are secured.
- ☐ Panel circuit breakers are in the "on" position, panel is set for automatic operation, and panel is latched (or locked if necessary).

Homeowner's Package

- ☐ Homeowner's Package reviewed with homeowner.

Comments

_____

_____

_____

_____

_____

_____

_____

_____

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SCL-ATX-OM-1
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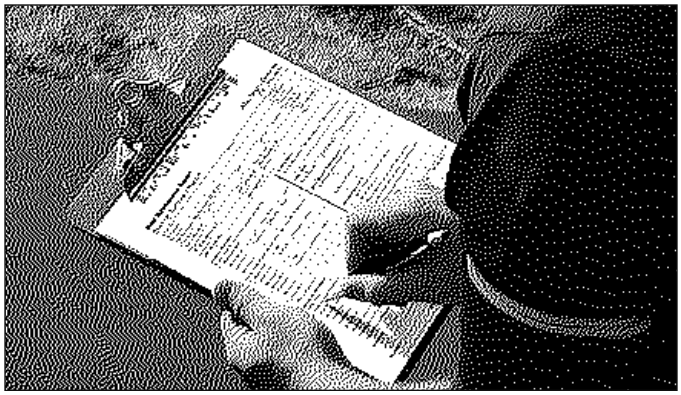
Completing the Start-Up Checklist

System Start-Up Procedure

Your System Start-Up visit provides final confirmation that the system has been correctly installed and is ready to function properly. It also acquaints you, the service provider, with each individual system, so that you are familiar with any special components or requirements.

The *AX20 Start-Up Checklist* (SCL-ATX-OM-1), shown on the preceding page, will help you remember to complete all the steps needed to check the system's functions. While you don't need to return the *Start-Up Checklist* to Orenco, we recommend bringing a copy to the start-up and checking off the steps to make sure that you perform all of them.

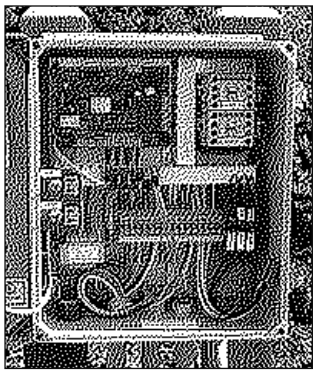
As part of the start-up, you'll also download a computer-generated *Start-Up Summary Report* from advantexservice.com and fax it to the fax number on the bottom of the form. An automated system will add the report to the data file for that system on advantexservice.com. This will confirm that the system is ready for operation, so that Orenco and the AdvanTex Dealer can confidently warranty it and your service contract can begin.



Planning the Start-Up

When the installer calls to tell you that the system is ready for start-up, ask the following questions:

- Did the electrician connect the panel to the home's electrical service and turn the power on?
- Did the installer test the control panel to make sure it was functional?
- Is there phone service, or, at minimum, is the phone line physically connected to the panel?

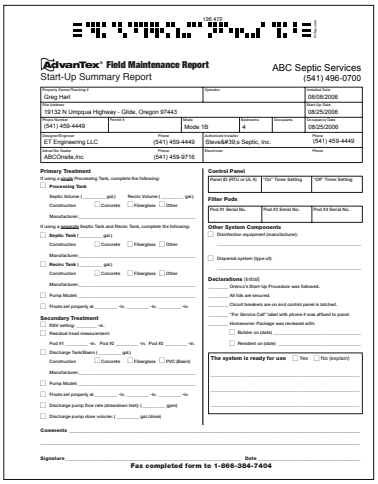


If the installer answers "yes" to these questions, then the system is ready for start-up.

A typical start-up visit takes about an hour. Arrange to meet the system installer at the site so that he or she can answer any questions you may have about the installation. The installer should bring the site plan or as-built. If the system owners can be present too, this is a good opportunity for them to learn how the system functions. As part of the start-up, you will need to review the Homeowner Package with the homeowners or, if the house has not yet been sold, with a representative of the homebuilder. You can do this at the start-up visit, or arrange a meeting prior to the start-up.

Before Leaving the Office

Download the *Start-Up Summary Report* from www.advantexservice.com. The top of the form should be pre-filled with information about the site. If any information is missing, fill in. You will fill out the rest of the form at the site as you go through the start-up procedure.



AdvanTex® Field Maintenance Report
Start-Up Summary Report

ABC Septic Services
(541) 496-0700

Greg Hart — 08/08/2006
19132 N Umpqua Highway - Glide, Oregon 97443 — 08/25/2006
(541) 459-4449 — Model: Mode 1B — 08/25/2006
ET Engineering LLC — (541) 459-4449 — Steve's Septic, Inc. — (541) 459-4449
ABCOnsite,Inc. — (541) 459-9716

Primary Treatment
Processing Tank
Septic Volume (_____ gal.) Recirc Volume (_____ gal.)
Construction ☐ Concrete ☐ Fiberglass ☐ Other
Manufacturer: _____
If using a separate Septic Tank and Recirc Tank, complete the following:
Septic Tank (_____ gal.)
Construction ☐ Concrete ☐ Fiberglass ☐ Other
Manufacturer: _____
Recirc Tank (_____ gal.)
Construction ☐ Concrete ☐ Fiberglass ☐ Other
Manufacturer: _____
Pump Model: _____
Floats set properly at _____ in., _____ in., _____ in.

Secondary Treatment
☐ ABX airbag: _____ in.
☐ Residual head measurement:
Pod #1 _____ in. Pod #2 _____ in. Pod #3 _____ in.
☐ Discharge Tank/Basin (_____ gal.)
Construction ☐ Concrete ☐ Fiberglass ☐ PVC (Basin)
Manufacturer: _____
☐ Pump Model: _____
☐ Floats set properly at _____ in., _____ in., _____ in.
☐ Discharge pump flow rate (drawdown test): (_____ gpm)
☐ Discharge pump dose volume: (_____ gal./dose)

Control Panel
Panel ID (RTU or UL #) | "On" Timer Setting | "Off" Timer Setting

Filter Pods
Pod #1 Serial No. | Pod #2 Serial No. | Pod #3 Serial No.

Other System Components
☐ Disinfection equipment (manufacturer):
☐ Dispersal system (type of):

Declarations (Initial)
_____ Orenco's Start-Up Procedure was followed.
_____ All lids are secured.
_____ Circuit breakers are on and control panel is latched.
_____ "For Service Call" label with phone # was affixed to panel.
_____ Homeowner Package was reviewed with:
☐ Builder on (date) _____
☐ Resident on (date) _____

The system is ready for use ☐ Yes ☐ No (explain)

Comments: _____

Signature _____ Date _____

Fax completed form to 1-866-384-7404

If the system does not have a discharge tank or basin and discharge pump, note that in the *Start-Up Summary Report*.

At the Site

Ask the system installer about the size, material, and manufacturer of each primary tank and discharge tank or basin, and record it on the *Start-Up Summary Report*. Also record the serial number of the AX20 pods.



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Completing the Start-Up Checklist (continued)

Primary Treatment

Open the risers of the tank and of any discharge or recirculation tanks or basins.

WARNING: *Do not enter tank. Entering a tank without proper confined space procedures and equipment can cause serious injury, asphyxiation, or drowning.*

☐ **Proper inlet tee installed.**

In the inlet riser of the primary processing tank, make sure that the inlet tee is present, firmly attached, and plumb.

☐ **Discharge plumbing properly installed.**

In the outlet riser, make sure that the discharge plumbing is properly installed through a watertight grommet. The threaded connections should be hand-tight, and the ball valve should be open. Look at the pump to make sure that it is the model specified on the plans, and record the model on the *Start-Up Summary Report*.



☐ **Float assembly mounted in Biotube® vault.**

☐ **Floats operate properly.**

Before you test the floats, open the control panel and place it in test mode by pressing and holding the red button on the front for 15 seconds. Inside the panel, the correct yellow digital input LED should light up. Release the button when the audible alarm chirps.

If you can't see the inside of the control panel while you raise and lower the float switches, you may need a helper. Pull the float tree out of the water. The floats will go down, the alarm will sound, and all the yellow LEDs should be off.



Raise the bottom float to stop the alarm. A yellow LED should light up.

Next, raise the middle float, if it is present. No alarm should sound, but another yellow LED should light up.

When you raise the top float, the alarm should sound again and the third yellow LED should light up.

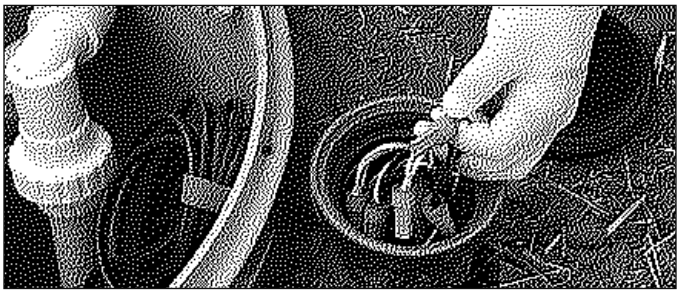
☐ **Floats set properly.**

Replace the float tree in its bracket, making sure it's properly mounted. Neatly coil the float cords, and secure them to the splice box. Measure the float heights from the outside top of the tank and verify that the heights are correct according to the *AX20 Installation Guide*. Record them on the *Start-Up Summary Report*.

NOTE: *Orenco provides float and RSV settings for all tanks approved for use with AdvanTex Treatment Systems in your area. At start-up and during annual maintenance, you need only verify that the actual settings on the equipment match Orenco's recommendations. If you need to adjust the settings to solve a problem, see Appendix 2.*

☐ **Splice box mounted on access riser. Watertight connectors used.**

Inspect the splice box to make sure that it is securely mounted inside or outside the riser; that connections have been made using watertight wire nuts; and that there is no water in the splice box. We also recommend that you seal the conduit using conduit seals or any electrically approved sealant.



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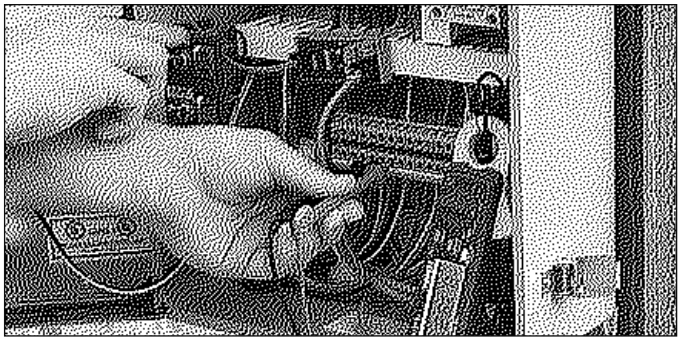
Completing the Start-Up Checklist (continued)

☐ **Pump operates in Manual.**

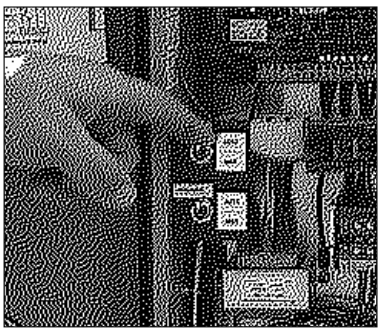
☐ **Pump operates in Automatic.**

☐ **Pump amps and volts checked.**

At the control panel, with the panel still in test mode, check the run amperage of the recirculation pump and discharge pump by placing the clamp of an ammeter around the wire to each pump's circuit breaker and reading the amperage while each pump is running. You can run the pump by holding the toggle switch on MAN. Amperage should be no more than the pump's maximum service factor amperage.



First for the recirculation pump and then for the discharge pump, measure the voltage with the pump off, by putting the probes of a voltmeter on each pump's terminals. Then measure the voltage with the pump running. The difference between running and rest voltage should be no more than 3 percent. That is 3.6 volts for a 120-volt system, or 7.2 volts for a 240-volt system.

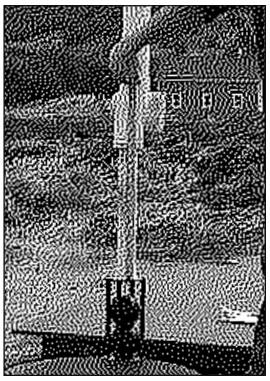


Release the switch back to the AUTO position. Make sure the pump comes on as the timer cycles. Timer cycles are shortened to about 30 seconds in test mode.

Secondary Treatment

☐ **Verify proper RSV setting.**

Measure the distance from the outside top of the tank to the top of the Recirculating Splitter Valve (RSV) ball cage, and record it on the *Start-Up Summary Report*.

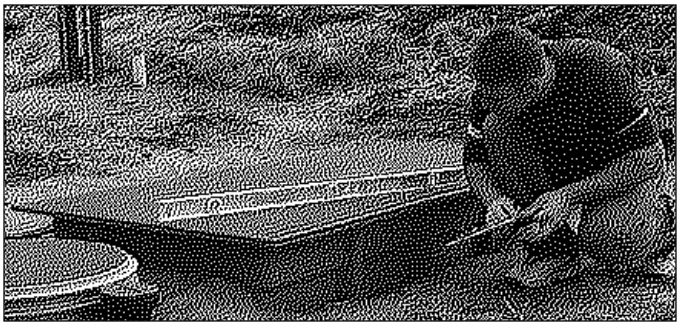


NOTE: *Improper RSV settings are a common installation error, so please check them carefully.*

☐ **All pods installed level.**

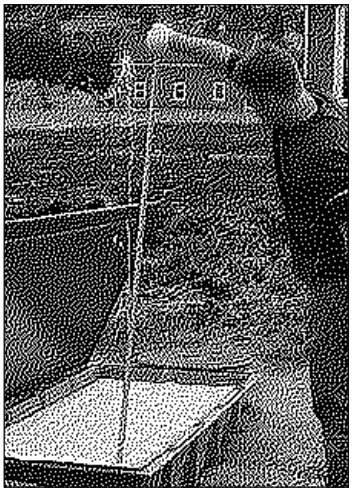
☐ **All piping properly covered and compacted.**

Check that each AX20 pod is installed level and that all piping is covered with compacted fill.



☐ **Ventilation intake(s) properly located and installed.**

☐ **Squirt height verified.**



Open each AX20 pod and make sure that the ball valves at the end of the laterals are closed. Remove an orifice cover and measure the squirt height. Record the squirt height on the *Start-Up Summary Report* as "Residual Head Measurement."

☐ **Discharge basin/tank inspected for infiltration.**

☐ **Discharge basin/tank set level.**

Inspect the discharge pump basin or tank to make sure that it is set level and there is no sign of water infiltration.

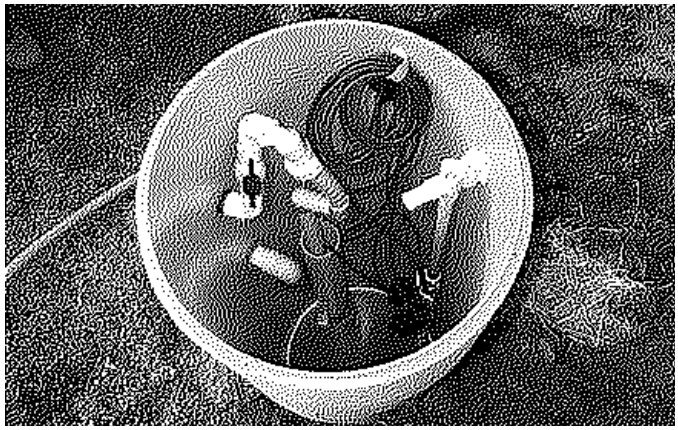
☐ **Pump and discharge plumbing are compatible.**

☐ **Discharge plumbing properly installed.**

Look at the pump to make sure that it is the model specified on the plans, and record the model on the *Start-Up Summary Report*. Verify that the discharge plumbing is installed as specified on the plans; that it is properly installed through a watertight grommet; and that the ball valve is open.

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Completing the Start-Up Checklist (continued)

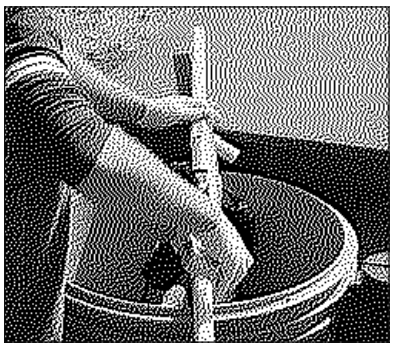


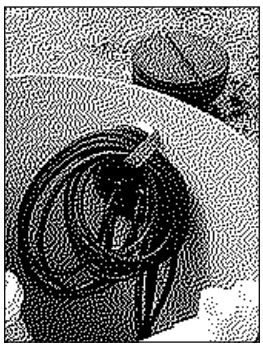
☐ **Discharge floats operate properly.**

☐ **Discharge floats set properly.**

Check the function and settings of the floats in the discharge basin/tank as described under Primary Treatment Components, and record the float heights on the *Start-Up Summary Report*, as before.

NOTE: *To ensure proper system operation, check to make sure that floats are Orenco "A" or "V" floats.*





☐ **Splice box mounted in discharge access riser. Watertight connectors used.**

Inspect the splice box in the discharge basin/tank to make sure that it is securely mounted inside or outside the riser; that connections have been made using watertight wire nuts; and that there is no water in the splice box. Use conduit seals or electrically approved sealant.

☐ **Discharge pump operates in Manual.**

☐ **Discharge pump operates in Automatic.**

☐ **Discharge pump amps and volts checked.**

Test the discharge pump and check running amps, running volts, and resting volts at the same time you check the recirc pump.

☐ **Flow rate verified.**

☐ **Dose volume verified.**

Determining the discharge pump's actual flow rate enables you to determine the dose volume (the volume of wastewater being treated in each dose) and to calculate timer settings.

Knowing the dose volume also enables you to determine the volume of wastewater being treated in a given period. To do this, multiply the dose volume by the number of doses.

To verify the flow rate, follow Steps 1 through 7, then verify the dose volume in Step 8.

Step 1. Determine the gallons per inch (gpi) or liters per centimeter (L/cm) volume of the dosing tank or basin. A 24-in. (600-mm) diameter basin holds 1.88 gpi (2.8 L/cm). A 30-in. (750-mm) diameter basin holds 2.96 gpi (4.4 L/cm). For tanks, consult the manufacturer's volume chart. For Orenco fiberglass tanks, use Fiberglass Tank Volume Charts, NCH-TNK-1.

Step 2. You'll be running the pump for one minute during the flow rate test, so check the liquid level inside the tank/basin to ensure that there's enough water above the pump's minimum liquid level (MLL), or the lowest float (whichever is higher), to complete the test. For example, in one minute, a pump operating at 10 gpm (37.8 L/min) will draw down approximately 5¼ in. (14 cm) of liquid in a 24-in. (600-mm) diameter basin, or

10 gallons ÷ 1.88 gpi = 5¼ in., or
37.8 liters ÷ 2.8 L/cm = 14 cm

So, to perform a flow rate test with the pump and basin in this example, you'd need at least 5¼ in. (14 cm) of water above the MLL or the bottom float (whichever is higher). If there is not enough liquid, add some.

Step 3. If your system isn't configured to drain back to the basin after each dose, skip to step 4. If your system is configured to drain back to the basin, you'll need to account for the drainback volume in your calculations. Or you can stop drainback during the test by temporarily installing a threaded check valve between the pump and the pump discharge assembly. This eliminates the need to measure drainback volume.

Step 4. To measure the flow rate, first measure the distance from the top of the tank or basin to the liquid level. Record this as H_1.

Step 5. Using a stopwatch, hold the discharge pump's toggle switch on MAN for exactly one minute. Then switch off the pump. If the system is configured to drain back into the tank or basin after a dose, wait until drainback is complete.

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Completing the Start-Up Checklist (continued)

Step 6. Measure the new distance from the top of the tank or basin to the liquid level. Record this as H_2.

Step 7. To get the pump's flow rate, find the difference between H_2 and H_1. Multiply this number by the gpi (or L/cm) volume of the tank or basin. Add the drainback volume (DB), if applicable. Then divide by the pump run time in minutes (T). For this test, the pump run time in minutes should equal one minute.

$$\text{Pump flow rate (gpm)} = \frac{[(H2 - H1) \times \text{gpi}] + DB}{T}$$

or

$$\text{Pump flow rate (L/min)} = \frac{[(H2 - H1) \times \text{L/cm}] + DB}{T}$$

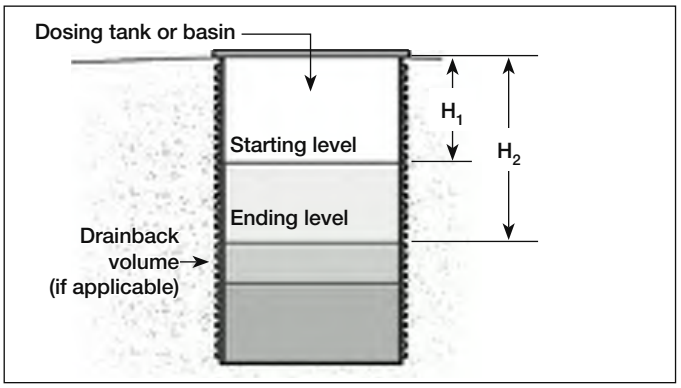
Important: At vericomm.net, enter the gpm value on the "Site Details" page as "Discharge Pump GPM." The VeriComm® panel will use it to automatically calculate and record the system's actual flow rates, which can be used for reports, troubleshooting, and determining timer settings.

Step 8. To verify the pump's dose volume, multiply the pump's flow rate (gpm or L/min) by the pump run time in minutes (T) — as determined by float settings or timer operation, depending on panel model — and subtract the drainback volume, if applicable.

Dose Volume (V) = (gpm × T) - DB,

or

Dose Volume (V) = (L/min × T) - DB

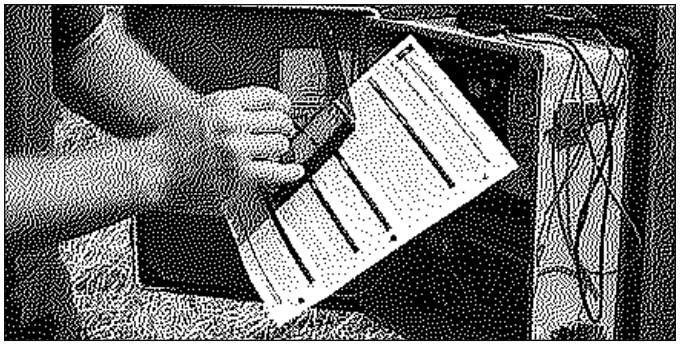


Other System Components

☐ **Disinfection equipment installed properly.**

☐ **Dispersal equipment operating properly.**

Verify that any disinfection and dispersal equipment specified on the plans is present, and follow the manufacturer's instructions to inspect it for proper functioning. Record the disinfection equipment manufacturer and the dispersal system type on the *Start-Up Summary Report*.

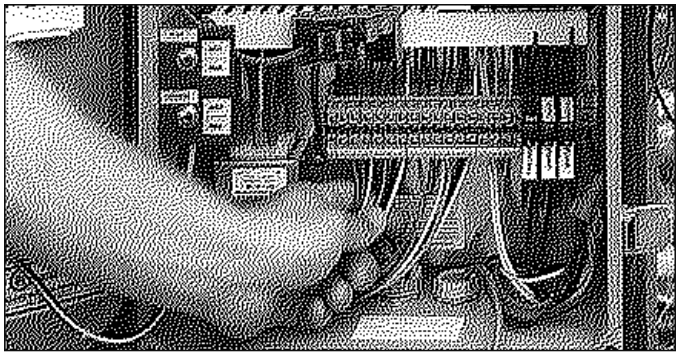


Control Panel

☐ **Proper timer settings.**

Open the control panel and, using a handheld or laptop computer, verify that the timer settings are appropriate for the installation. Record the Panel ID (RTU or UL number) and timer settings on the *Start-Up Summary Report*. Default timer settings are set for an occupancy of 3 people. This may also be adjusted at vericomm.net.

☐ **Proper wire size used based on information provided by manufacturer.**



For Orenco components, the panel installation instructions provide correct wire sizes.

☐ **All electrical connections in panel secured.**

☐ **Panel wired per manufacturer's wiring diagram.**

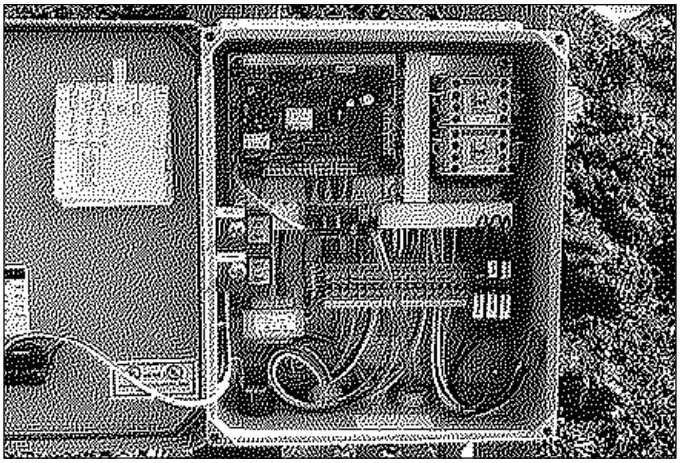
Check the panel to make sure that it is wired according to the diagram clipped inside the panel's door. Gently tug on the wires to make sure they are secured in the terminals.

☐ **Service provider name/number written on "For Service Call" label.**

Write in your company's name and phone number, if it hasn't been done already.

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Completing the Start-Up Checklist (continued)



☐ **Control panel functional test, as detailed in the *Residential AdvanTex Installation Instructions*, has been followed.**

The installer should have performed this test during installation. If not, perform it now.

Before performing the next step, return the panel from test mode to normal mode by holding down the alarm button on the front of the panel until the alarm chirps.

☐ **Dial tone verified.**

If phone service to the panel is not yet connected, you will be notified later when the service is connected and the panel automatically starts calling in.

If phone service *is* available to the panel, quickly press the alarm button on the front of the panel 15 times to force the panel to call in to the VeriComm® Web site. The Modem Activity light on the VCOM board should light up.

If the Modem Activity light does not light up, unplug the phone line from the phone jack on the panel and plug the phone line into a phone line tester, or a phone, to see if there is a dial tone. If there is no dial tone, come back and repeat the forced call-in test when phone service is activated to the panel. If there is a dial tone but the modem will not call in, call your AdvanTex Dealer for troubleshooting assistance.

☐ **Control panel diagrams left in panel for future review.**

Remember to leave the diagrams in the panel.

Final/Safety Inspection

☐ **All access riser hardware is in place. Lids are secured.**

☐ **All splice box lids are secured.**

Close and secure all pod, riser, external splice box, and basin lids.



WARNING: *If lid bolts are missing, replace them with spares. If you have no spare lid bolts, fasten the lid with a self-tapping screw, and immediately call your Dealer for replacement bolts. If the lid is unbolted or if the lid or riser are damaged, be sure to securely block access to the tank opening before leaving the site. Open tanks are hazardous, and children or adults who try to enter them may be seriously injured, asphyxiated or drowned.*

☐ **Panel circuit breakers are in the ON position, panel is set for automatic operation, and panel is latched (or locked if necessary).**

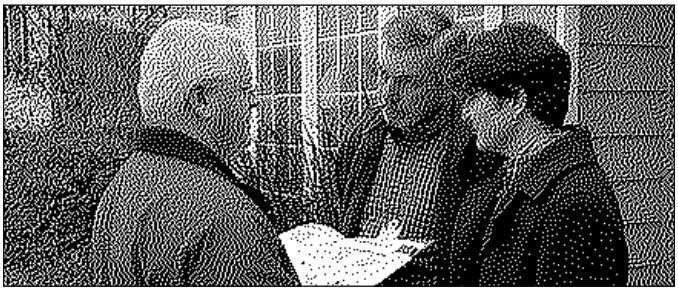
Make sure all circuit breakers are ON. If the panel is in test mode, it will automatically return to normal mode in 30 minutes. To manually return it to normal mode, hold the alarm button on the front of the panel down until the alarm chirps. Close and latch the panel, and lock it if necessary.

Make sure that the *Start-Up Summary Report* is completely filled out.

Homeowner's Package

☐ **Homeowner's Package reviewed with homeowner.**

Go through the *Homeowner's Package* with the homeowner, or with the builder's representative if the home has not yet been sold.



Back at the Office

Fax the completed *Start-Up Summary Report* to the number on the bottom.

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Scheduled Field Maintenance Report

AdvanTex® Field Maintenance Report

Property Owner/Tracking #			Operator	
Site Address				Contact Phone
AX Site ID #	County ID #	Pod #	RTU #/UL #	Date of Last Inspection

Retrieve O&M Info

Daily flow _____

Recirc ratio _____

Timer settings:

Perform Field Sampling/Observations

NTU (15 ± NTUs)	pH (6-9)	DO (2-6)

Odor of Sample

Typical ☐ Musty ☐ Earthy ☐ Moldy

Non-typical ☐ Sulfide ☐ Cabbage ☐ Decay

Oily film in PVU ☐ Yes ☐ No

Foam in tank ☐ Yes ☐ No

Check Control Panel

Recirc Amps	Discharge Amps

Audible and visual alarms ☐ OK

Dial tone (telemetry only) ☐ Yes ☐ No

Inspect/Clean Pump System

	Inspect	Clean
Riser/Lid	☐	
Splice Box	☐	
Float Cords	☐	
Floats	☐	☐
Pump	☐	☐
Biotube® Filter	☐	☐
Biotube Pump Vault	☐	☐
Recirculating Splitter Valve	☐	☐

Measure Sludge/Scum

	Sludge		Scum	
1st Compartment	Current	Previous	Current	Previous
2nd Compartment	Current	Previous	Current	Previous

Inspect/Clean AdvanTex Filter

				Inspect	Clean
Odor:	☐ Normal	☐ Pungent	Laterals/Orifices	☐	☐
Biomat:	☐ Normal	☐ Excessive	Pod Bottom	☐	☐
Bridging/Ponding:	☐ None/Minor	☐ Excessive	Intake Vent	☐	☐

Inspect/Clean Discharge Pump System

	Inspect		Inspect	Clean
Riser/Lid	☐	Floats	☐	☐
Splice Box	☐	Pump	☐	☐
Float cords	☐			

Inspect/Service Other System Components

	Inspect	Clean		Inspect	Clean
Disinfection Equipment	☐	☐	Dispersal Laterals/Orifices	☐	☐

Observations _____

Additional Services Rendered

☐ Cleaned textile sheets? ☐ Replaced UV items?

☐ Replaced/Used other items?

Parts Used: W = Warranty, B = Billable (✓ appropriate selection)

W	B	Item Number	Description

Final/Safety Inspection

☐ RSV reinstalled ☐ Lids bolted on

☐ Manifold reconnected; flush valves closed ☐ Control panel reactivated

Summary/Recommendations

☐ System performing; no further action needed ☐ Tank needs pumping

☐ Call for service ☐ Other? _____

Comments _____

_____

Signature _____ **Date** _____

Fax completed form to 1-866-384-7404

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Performing Scheduled Field Maintenance

Residential AdvanTex Treatment Systems require periodic servicing. AX20 systems need a six-month visit, a one-year visit, and annual visits* thereafter. AX20N systems require four visits during the first two years and annual visits* thereafter. Failure to provide required maintenance will void the AdvanTex Treatment System warranty and may place the system out of compliance with local regulations.

Homeowner Communication

Whenever possible, contact the residents when it's time for a service visit, especially if the residents are new to the home. The service visit is an opportunity to talk with them about proper use of the system, so try to schedule the visit when someone will be there.

Retrieve O&M Info

Download the *Field Maintenance Report* form for your site from www.advantexservice.com. The top of the form should be pre-filled with information about the system.

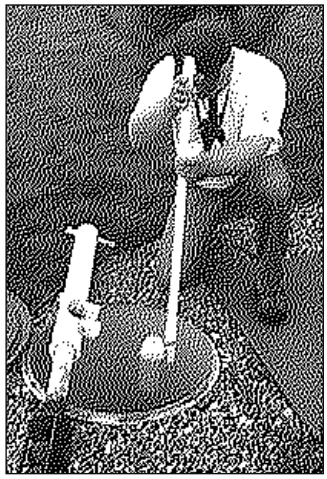
Perform Field Sampling/Observations

When you arrive at the site, remove the lids from the risers and take your sample before doing anything else, so that the sample won't be contaminated by material that you stir up while working. To sample effluent, remove the Recirculating Splitter Valve (RSV) from its quick-release holster and set it aside. There will be enough of a trickle through the RSV plumbing to collect a sample without waiting for the pump to cycle.

IMPORTANT: *To avoid contamination, do not run the pump manually or in test mode to obtain this sample.*

Wash down, brush, or wipe the RSV inlet before taking the sample so there will be no contamination from dislodged solids.

Leave the RSV disconnected for the rest of the service call so that any debris you stir up does not make its way to the drainfield.



☐ **Clarity of sample**

Assess the clarity of the sample by using a portable turbidity meter.

**Servicing intervals may vary according to local regulations.*

WARNING: *Follow the precautions below when performing field maintenance on AdvanTex Systems.*

- *Do not enter the tank. Entering a tank without proper confined space procedures and equipment can cause serious injury or death.*
- *Use proper personal protection equipment, such as rubber gloves and eye protection, as well as protective clothing, to cover parts of the body that will be exposed to wastewater or effluent.*
- *When working on components that contact sewage or effluent, lay them on a plastic sheet or place them in a trash can, not on the lawn. Several tools that reduce the mess of cleaning Biotube® filters and AdvanTex textile sheets are available from Orenco.*
- *Turn off power to electrical components when working in splice boxes or the control panel or when disconnecting pumps.*
- *When finished, use proper personal hygiene.*

☐ **Odor of sample**

Sniff the sample and assess its odor. Record these observations about clarity (NTUs) and odor on the *Field Maintenance Report* form.

☐ **pH of sample**

☐ **Dissolved oxygen of sample**

Using pH test strips or a pH meter, check the pH of the sample and record it on the *Field Maintenance Report* form. Values from 6 to 9 are normal. Also check the sample's dissolved oxygen (DO) using a DO meter (or DO field test ampoules), and record that on the form. Values from 2.5 to 6 mg/L are normal.



☐ **Oily film in PVU**

☐ **Foam in tank**

Check the liquid in the pump vault (PVU) for an oily sheen, and the liquid in the first compartment of the tank for foam or other unusual appearance. Record your observations on the *Field Maintenance Report* form.

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Performing Scheduled Field Maintenance (continued)

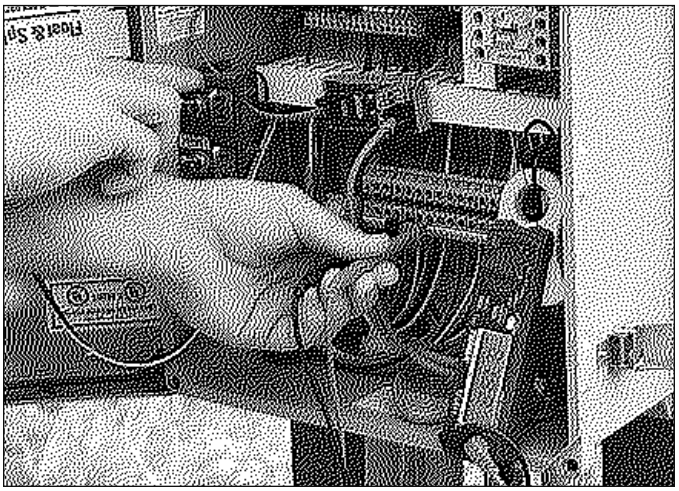
Check Control Panel

Open the control panel and place it in test mode.

☐ **Run amperage**

Check and record the run amperage of the recirculation pump and discharge pump. Place the clamp of an ammeter around the wire to each pump's circuit breaker and read the amperage while each pump is running. You can run the pump by holding the toggle switch on MAN. Amperage should be no more than the pump's maximum service factor amperage.

Release the switch to the AUTO position. Make sure the pump comes on as the timer cycles. Timer cycles are shortened to about 30 seconds in test mode.



☐ **Audible and visual alarms**

Check the operation of the floats and timers by lifting the float trees out of the tank and discharge basin and following the instructions clipped inside the panel door. Make sure that audible and visual alarms are activated when the appropriate float is raised or lowered.

☐ **Dial tone (telemetry only)**

For systems equipped with VeriComm® panels, use a phone line tester or a phone to verify the presence of a dial tone.

Inspect/Clean Recirc Pump System

☐ **Riser/Lid**

Make sure that the lid is intact, and replace it if necessary. Replace any missing lid bolts. Check for marks of liquid infiltration or exfiltration.

☐ **Splice box**

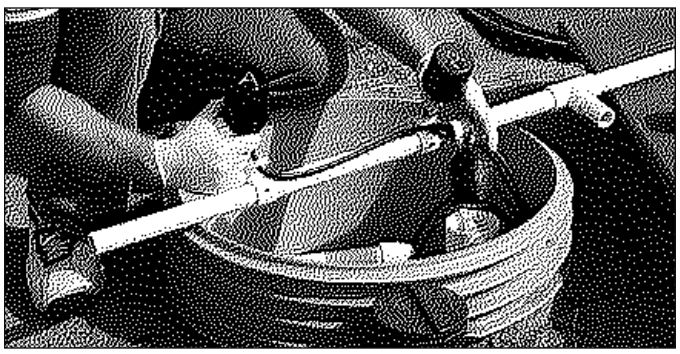
Open the splice box and make sure there is no water in it. If there is, remove the water with a sponge and repair the leak. If you disconnect any connections, do not reuse the wire nuts when you reconnect them — use new ones.



☐ **Float cords**

☐ **Floats**

Verify that the floats are in good condition and properly secured to the float tree. Verify that float cords are neatly wrapped inside the riser so that they cannot interfere with the operation of the floats. Clean floats by hosing or brushing them so that debris falls back into the tank, not into the pump vault.



☐ **Pump**

Turn circuit breaker off at service panel. Switch MOA and circuit breakers in control panel to "Off." Pull the pump and place it on a cleanable surface, like the riser lid, or in a plastic trash can. Check the intake screen; wash off particles as necessary. Record the kinds of particles in the Comments section of the *Field Maintenance Report* form and report findings to user (for preventive maintenance). Reinstall the pump, checking to make sure the discharge valve is open.

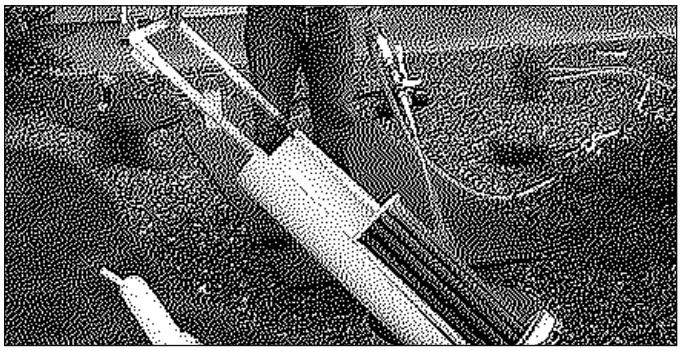
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Performing Scheduled Field Maintenance (continued)

☐ **Biotube® Filter**

☐ **Biotube Pump Vault**

Clean the Biotube Filter at every visit. Make sure that the RSV is out. Slide Biotube cartridge out of vault. Hold Biotube cartridge over open inlet of tank or primary compartment. Carefully spray build-up into tank. (The Biotube Cradle, available from Orenco, holds the Biotube Filter on the lip of the riser and directs debris into the tank away from the pump vault.) Flush vault bottom.

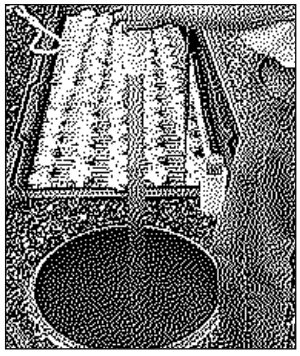


☐ **Recirculating Splitter Valve**

Move the RSV from side to side to check that the balls move freely. Then verify that the liquid level in the tank is within the normal range. If it is low, the ball mechanism could be jammed in the seated position. If it is high, the RSV may not be making a tight seal when the balls are seated. Clean the balls and replace the balls or the cage if necessary. Don't replace the RSV in the tank until you're ready to leave the site.

Measure Sludge/Scum

Measure sludge and scum in both compartments of the tank, and record the measurements on the *Field Maintenance Report* form. Schedule pumping of the tank when the bottom of the scum layer is within 3 in. (75 mm) of the flow-through port of the tank baffle or when the sludge accumulates to within 6 in. (150 mm) of the flow-through port.



Note any unusual appearance or smell of the tank's contents, and consult the *Advanced Service Tips and Troubleshooting Guide*, available from your AdvanTex Dealer, if necessary. If you find kitty litter, sanitary products, excessive grease, or other material that shouldn't be in the tank, talk to the residents of the home and remind them not to flush those things.

Inspect/Clean AdvanTex Filter

Open the AdvanTex Filter pod.

☐ **Odor**

☐ **Biomat**

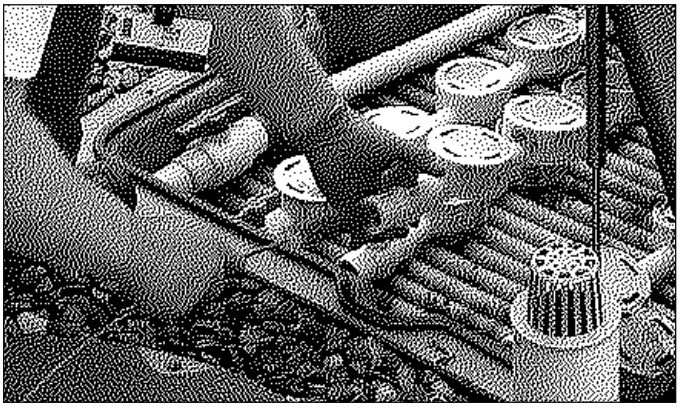
☐ **Bridging/Ponding**

Check that the odor and appearance of the biomat are normal. Pungent or unusual odor, ponding (excessive liquid), and bridging (excessive solids) are problems that need immediate attention. The *Advanced Service Tips and Troubleshooting Guide* can help you ascertain the cause. You may need to change the timer settings or discuss household habits with the system users.

☐ **Laterals/Orifices**

Inspect the orifice shields. A clean area around an orifice cover is a sign of a plugged orifice; clean these orifices out before cleaning the laterals.

To clean and flush the manifold, open the flush valves at the ends of the laterals and brush or jet the laterals.



☐ **Pod bottom**

Pull out a few sheets, inspect the pod bottom, and note any excessive buildup of debris. When you're done cleaning the manifold, remove the RSV from the tank, and run the pump for two or three minutes with the flush valves open and the RSV removed to flush debris from the pod's underdrain back into the tank. You can do this while you are performing other tasks. After flushing, close the flush valves and make sure the orifice covers are on more or less straight. Replace the RSV in the tank.

☐ **Intake vent**

Make sure that the ventilation intake is not damaged or blocked, and clean or replace it if necessary.

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Performing Scheduled Field Maintenance (continued)

Inspect/Clean Discharge Pump System

- ☐ Riser/Lid
- ☐ Splice box
- ☐ Float cords
- ☐ Floats
- ☐ Pump

If there is a discharge pump basin, inspect it and its components. Clean floats and pump by hosing them. If you pull the pump, check to make sure the discharge valve is open after reinstalling.

Over time, solids may accumulate in the discharge basin. Use a trash pump to pump these solids into the inlet end of the processing tank.

Inspect/Service Other System Components

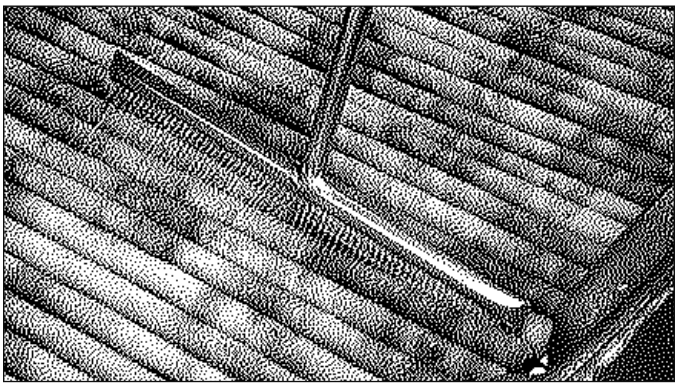
- ☐ Disinfection equipment
- ☐ Dispersal laterals/orifices

Follow the manufacturer's instructions to inspect and service other components of the system.

Additional Services Rendered

- ☐ Cleaned textile sheets?

You should not need to clean the textile sheets every year, but it may be necessary now and then. Don't clean them unless the buildup of biomat is bridging across the sheets, because removing too much of the biomat inhibits the system's treatment performance.



If you need to clean the sheets, remove the RSV so that solids can freely drain back to the tank. Then clean the sheets one by one with the AdvanTex Cleaning Wand, a hose, or a backpack pressure washer (at low pressure). Wash debris down into the pod, where it will drain back into the processing tank.

- ☐ Replaced UV items?
- ☐ Replaced/used other items?

Document any equipment replaced and any additional observations.

Final/Safety Inspection

Review the Field Maintenance Report form to ensure all activities have been performed.

- ☐ RSV reinstalled

If you haven't done so already, replace the RSV.

- ☐ Manifold reconnected and valves closed

Make sure that the flush valves at the ends of the AX20 laterals are closed.

- ☐ Lids bolted on

Replace all lids and tighten all lid bolts.



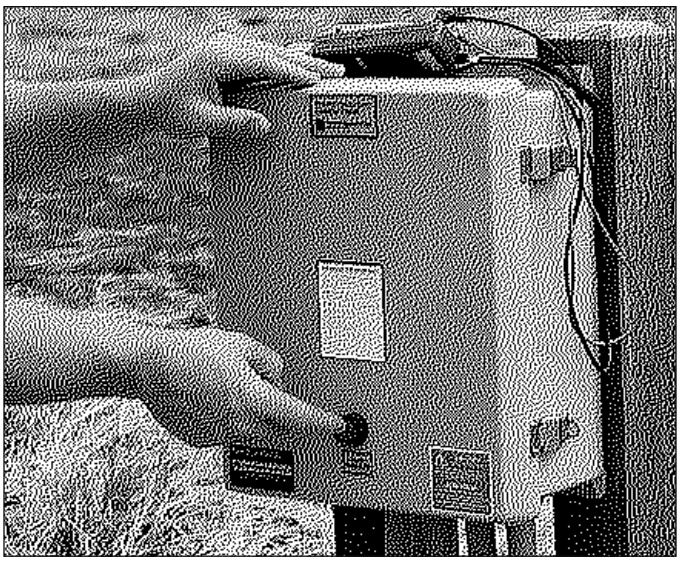
WARNING: *If lid bolts are missing, replace them with spares. If you have no spare lid bolts, fasten the lid with a self-tapping screw, and immediately call your Dealer for replacement bolts. If the lid is unbolted or if the lid or riser are damaged, be sure to securely block access to the tank opening before leaving the site. Open tanks are hazardous, and children or adults who try to enter them may be seriously injured, asphyxiated, or drowned.*

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Performing Scheduled Field Maintenance (continued)

☐ **Control panel reactivated**

Make sure that all circuit breakers have been switched back on. The panel will automatically return from test mode to normal mode in 30 minutes. To manually return it to normal mode, hold down the alarm button on the front of the panel until the alarm chirps. Close and latch the panel, and lock it if necessary.



Summary/Recommendations

☐ **Treatment system is performing; no further action necessary.**

☐ **Call for service**

☐ **Tank needs pumping**

☐ **Other?**

Check-off or document final recommendation(s). Back at the office, schedule any necessary follow-up.

Comments

Record any additional observations from your visit on the *Field Maintenance Report* form, along with information about equipment repaired or replaced.

Fax the completed form to the number on the bottom. The automated system will record the completion of the site's visit and archive an image of the form on advantexservice.com for future reference.

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Unscheduled Field Maintenance Report

AdvanTex® Field Maintenance Report
Unscheduled

Property Owner/Tracking #				Operator
Site Address				Contact Phone
AX Site ID #	County ID #	Pod #	RTU #/UL #	Date of Last Inspection

Dispatcher Comments

Date:_____ Time: _____

Notification of site condition

☐ Made by VeriComm® Monitoring System
☐ Made by Homeowner
☐ Other _____

Site condition at time of call

☐ Alarm ☐ Tank Overflow
☐ Odor ☐ Sewage Backup
☐ Other _____

Field Sampling/Observations

☐ Necessary ☐ Not necessary

NTU (15 ± NTUs)	pH (6-9)	DO (2-6)

Odor of Sample.

Typical ☐ Musty ☐ Earthy ☐ Moldy
Non-typical ☐ Sulfide ☐ Cabbage ☐ Decay

Conditions at site

Alarm On ☐ Yes ☐ No
(If yes, alarm type_____)
Tank Liquid Level ☐ Normal ☐ High ☐ Low
Pump Operational? ☐ Yes ☐ No
Circuit Breakers
Recirc. . . . . ☐ Tripped ☐ On ☐ Off
Discharge. . . . . ☐ Tripped ☐ On ☐ Off
Controls . . . . . ☐ Tripped ☐ On ☐ Off

VCOM® ATRTU Board: (if applicable)

Document the panel status by shading the appropriate inputs and outputs as indicated by the yellow and red LEDs.

Inputs	① ② ③ ④ ⑤ ⑥ ⑦ ⑧
Outputs	① ② ③ ④
Power (Green LED)	☐ On ☐ Off ☐ Flashing

Cause of Malfunction: ☐ Mechanical ☐ Process-Related

_____
_____
_____
_____

Services Rendered:

_____
_____
_____
_____

Parts Used: W = Warranty, B = Billable (✓ appropriate selection)

W	B	Item Number	Description

Notes/Final Recommendations:

☐ System performing; no further action needed ☐ Additional service needed

_____
_____

Final/Safety Inspection:

Lids bolted on? ☐ Yes ☐ No
(If damaged, comment _____)
Control Panel reactivated? ☐ Yes ☐ No
Circuit Breakers:
Recirc: ☐ On ☐ Off Discharge: ☐ On ☐ Off Controls: ☐ On ☐ Off

Time at Site	Travel Time	Total Time

Signature _____

Date _____ **Time** _____

Fax completed form to 1-866-384-7404

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Performing Unscheduled Field Maintenance

Unscheduled Maintenance Procedures

If you receive an alarm call or phone call that requires a visit to an AdvanTex site, download the *Field Maintenance Report: Unscheduled* from www.advantexservice.com. The top of the form should be pre-filled with information about the site. If any information is missing, fill it in.

Depending on the type of problem that caused the alarm, you may not need to check all the boxes — they're just there to reduce the amount of writing you have to do. But do use the notes areas to record any repairs or adjustments you make, and to document anything unusual. These notes may help you on future service calls, and they help Orenco and your Dealer identify patterns of problems.

We recommend that you send a copy of this form to the homeowners after your visit. This reinforces any advice you may give them about proper use of their system. It also reassures them that the VeriComm® monitoring system is working and that you are diligently maintaining their system.

Notification of Site Condition

- ☐ **Made by VeriComm Monitoring System**
- ☐ **Made by Homeowner**
- ☐ **Other** _____

Indicate whether you learned about the problem from the VeriComm system, from the homeowner, or some other way — perhaps from a neighbor.

Site Condition at Time of Call

- ☐ **Alarm**
- ☐ **Tank Overflow**
- ☐ **Odor**
- ☐ **Sewage Backup**
- ☐ **Other** _____

Describe the condition that prompted the alarm.

WARNING: *Do not enter tank. Entering a tank without proper confined space procedures and equipment can cause serious injury, asphyxiation, or drowning.*

Field Sampling/Observations

- ☐ **Necessary**
- ☐ **Not necessary**

If the cause of the problem is not immediately apparent, use proper techniques (described in the "Performing Scheduled Field Maintenance" section) to sample effluent from the RSV. Do this first so that subsequent activity will not contaminate the sample. Test the sample's clarity, pH, and dissolved oxygen, and record the results on the form. Also check the box that describes the odor of the sample.

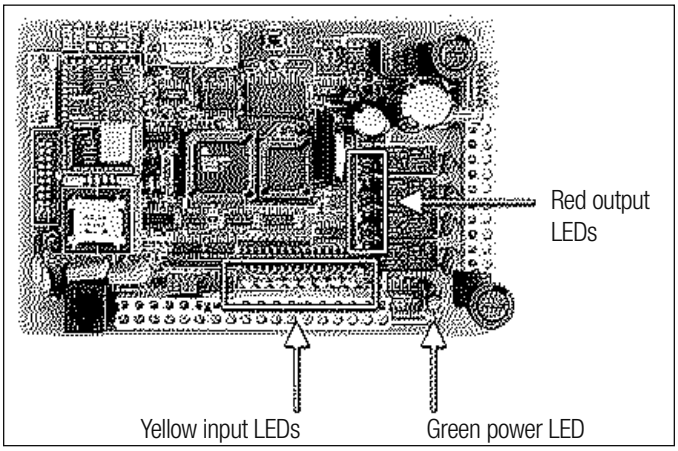
Conditions at Site

Alarm On	☐ **Yes**	☐ **No**	
(If yes, alarm type _____)			
Tank Liquid Level	☐ **Normal**	☐ **High**	☐ **Low**
Pump Operational?	☐ **Yes**	☐ **No**	
Circuit Breakers			
Recirc	☐ **Tripped**	☐ **On**	☐ **Off**
Discharge	☐ **Tripped**	☐ **On**	☐ **Off**
Controls	☐ **Tripped**	☐ **On**	☐ **Off**

Record the status of each part of the system on the form. Use the "Notes" field to describe problems in more detail.

VCOM ATRTU Board (if applicable)

Shade the appropriate circles to indicate which inputs (yellow) and outputs (red) are active on the ATRTU board inside the panel, and record the status of the green power light.



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Performing Unscheduled Field Maintenance (continued)

Cause of Malfunction

☐ Mechanical

☐ Process-Related

When you have found the cause of the malfunction, record whether it is a mechanical problem (such as failure of a float or loosening of a connection) or a problem with the biological processes in the system (such as recirculation ratio, system abuse, or insufficient ventilation). Describe the problem in as much detail as possible in the space provided.

Services Rendered

Describe what you did to correct the problem.

Parts Used

Record any new parts you installed. Check the appropriate box to show whether they are covered under warranty or billable to the customer.

Notes/Final Recommendations

Write down any observations about this incident that will be useful to you, the homeowner, your AdvanTex Dealer, or Orenco.

Final/Safety Inspection

WARNING: *If lid bolts are missing, replace them with spares. If you have no spare lid bolts, fasten the lid with a self-tapping screw, and immediately call your Dealer for replacement bolts. If the lid is unbolted or if the lid or riser are damaged, be sure to securely block access to the tank opening before leaving the site. Open tanks are hazardous, and children or adults who try to enter them may be seriously injured, asphyxiated, or drowned.*

Lids bolted on? ☐ **Yes** ☐ **No**

(If damaged, comment _____)

Control panel reactivated? ☐ **Yes** ☐ **No**

Circuit Breakers:

Recirc: ☐ **On** ☐ **Off**

Discharge: ☐ **On** ☐ **Off**

Controls: ☐ **On** ☐ **Off**

Verify the condition of system components upon leaving the site.

Time/Date/Signature

Record time at site and travel time.

Sign and date the form. Then fax it to the number at the bottom. The bar code at the top will ensure that a PDF of the form will go into the Service Provider's inbox on advantexservice.com, for assignment to the appropriate site.

Make a copy of the form and send it to the homeowner, along with the invoice.

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Change of Service Provider Authorization

AdvanTexService.com

Change of Service Provider
Authorization Form

Property Owner		
Site Address		
Contact Phone	Pod #	RTU #/UL #

Fill this form out completely, have it signed by the Homeowner, and fax to 1-541-459-2884

Previous Service Provider: _____

New Contract Start Date: [ ]

Additional Comments: _____

_____

_____

_____

_____

_____

_____

_____
New Service Provider Company

_____
New Service Provider Signature Date

As the homeowner, you acknowledge that you are not under contract with any other Authorized Service Provider as of the "New Contract Start Date," noted above.

_____
Homeowner Signature Date

Fax completed form to 1-541-459-2884

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Changing Service Providers

Consistent maintenance is important to ensuring the excellent performance of AdvanTex Treatment Systems. So, when a service contract expires, it must be renewed, either with the existing service provider or with another Orenco-authorized service provider. Our Web site, advantexservice.com, provides tools to help with this effort.

When a service contract expires, contact the homeowners and offer a renewal. If the homeowners renew the contract, update the information in advantexservice.com.

If the homeowners do not renew the contract within 60 days, notify the Dealer (if the system is still under warranty) and make a note in advantexservice.com. If a service contract is required by law, notify the county or other regulatory jurisdiction as well.

When homeowners do not renew their service contract with their current service provider and select you to be their new service provider, you will need to have access to the site information for that system. Before meeting with the homeowners, you should log onto advantexservice.com and do the following:

- Print the *Change of Service Provider Authorization Form*.
- Fill out the form, including the site information, previous service provider's name, start date of the new contract, and any explanatory comments.
- Have the homeowners sign the form.
- Add your name, company name, and signature and fax the form to Orenco at the number on the bottom.

Once the form is received, you will have access to the site inform -ation for that system, so you can schedule the next service call. In addition, the automated system will archive an image of the form on advantexservice.com for future reference.

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Appendix 1: AX20 Timer Settings Worksheet

The following chart shows recommended timer settings for a new system.

RESIDENTS	TIME ON (SEC)	TIME OFF (MIN)	NOTES
2	10 sec (0.17 min)	20.00	• Assumes water usage of 50 gal. (190 L) per person per day and a return recirculation ratio of 3 : 1 (Filter recirculation ratio of 4 : 1). • Override OFF cycle time is set at one-half of the OFF cycle time. Override ON cycle time is set the same as the ON cycle time.
3	15 sec (0.25 min)	19.75	
4	20 sec (0.33 min)	19.45	
5	25 sec (0.42 min)	19.70	
6	30 sec (0.50 min)	19.50	

As you gain experience with a system, you may conclude that you need to make adjustments, sometimes significant ones. This worksheet is intended to help you determine appropriate start-up timer settings (Pump ON, Pump OFF) for a single-pod AX20 system. Typical values and ranges are provided for each parameter. If you have any questions or if your values fall outside the desired ranges on this worksheet, contact your Dealer.

PARAMETER		TYPICAL VALUES	NOTES
	Number of people	3	Range of 2 to 8 people.
	Water usage per person	50 gpd (190 L/d)	Typical daily average is 50 gal. (190 L) per person.
Q_i	Actual daily flow (total)	150 gpd (570 L/d)	(Number of people) × (water usage per person).
R_b	Return recirculation ratio	3 : 1	You can adjust this ratio (return flow to forward flow) up or down depending on system performance. (Range of 2 to 6.)
R_f	Filter recirculation ratio	4 : 1	
	Total daily flow to AX20	600 gpd (2280 L/d)	(Actual daily flow) × (return recirculation ratio + 1). Must be ≤ 3000 gpd (11,370 L/d). Actual flow should not exceed 500 gpd (1895 L/d). (500 gpd × 6:1 R_b = 3000 gpd)
Q_d	Actual pump dose rate	33.3 gpm (126 L/min)	Determine this value by field-testing or by using Orenco's PumpSelect™. Start at the low end.
T_d	Pump ON cycle time (dose)	0.25 min	Select a value between 0.17 minutes (10 seconds) and 0.75 minutes (45 seconds).
T_r	Pump OFF cycle time (rest)	19.75 min	See Pump OFF equation below.

PUMP OFF EQUATION **EXAMPLE**

Plugging in the above values and rounding results in the following:

$$T_r = \left[\frac{1440 \cdot T_d \cdot Q_d}{(R_b + 1) \cdot Q_i}\right] - T_d$$

$$T_r = \left[\frac{1440 \cdot 0.25 \cdot 33.3}{(3 + 1) \cdot 150}\right] - 0.25 = 19.74 \approx 19.75$$

After you determine your Pump ON and Pump OFF times, double check to make sure your start-up settings fall within the cycle time (CT) range, below. If they don't, make adjustments per the "Note."

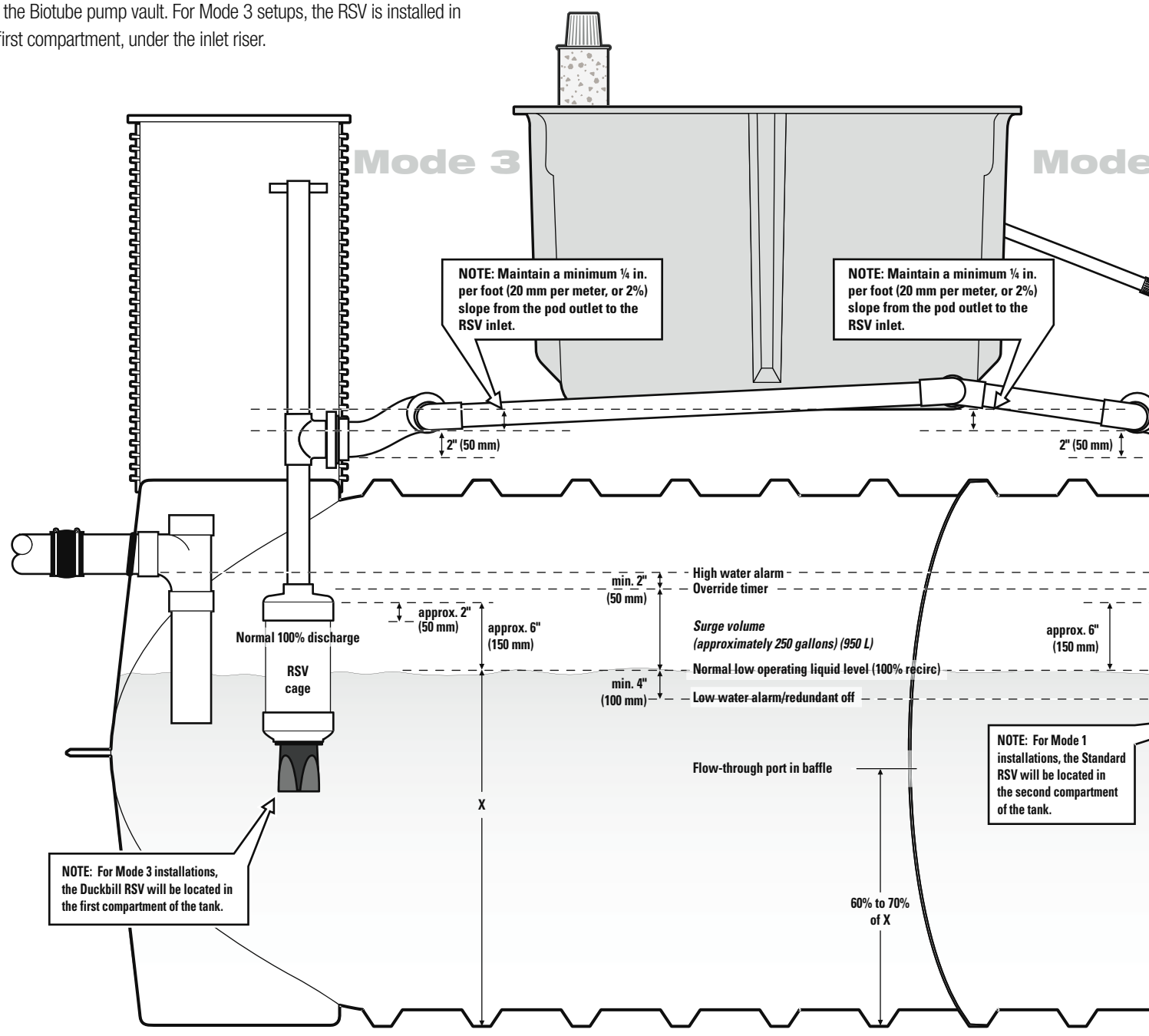
ADDITIONAL PARAMETERS		TYPICAL VALUES	NOTES
CT	Cycle time	20 min	Low flow applications may result in cycle times of an hour or more, which can cause the media to dry out or odors to develop in the recirc tank. If CT is much more than 30 minutes, consult your Dealer or Orenco for suggested adjustments.
	Pump cycles per day	72 cycles	1440 min/day ÷ (OFF cycle time + ON cycle time). Must not exceed the pump's maximum rated cycles of 300 cycles per day.
	Gallons per cycle	8.3 gal. (31 L)	With 68 orifices and using the T_d range recommended above, you will maintain the recommended 0.08 to 0.25 gal. (0.45 to 0.95 L) per orifice per dose.

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Appendix 2: Float and RSV Settings

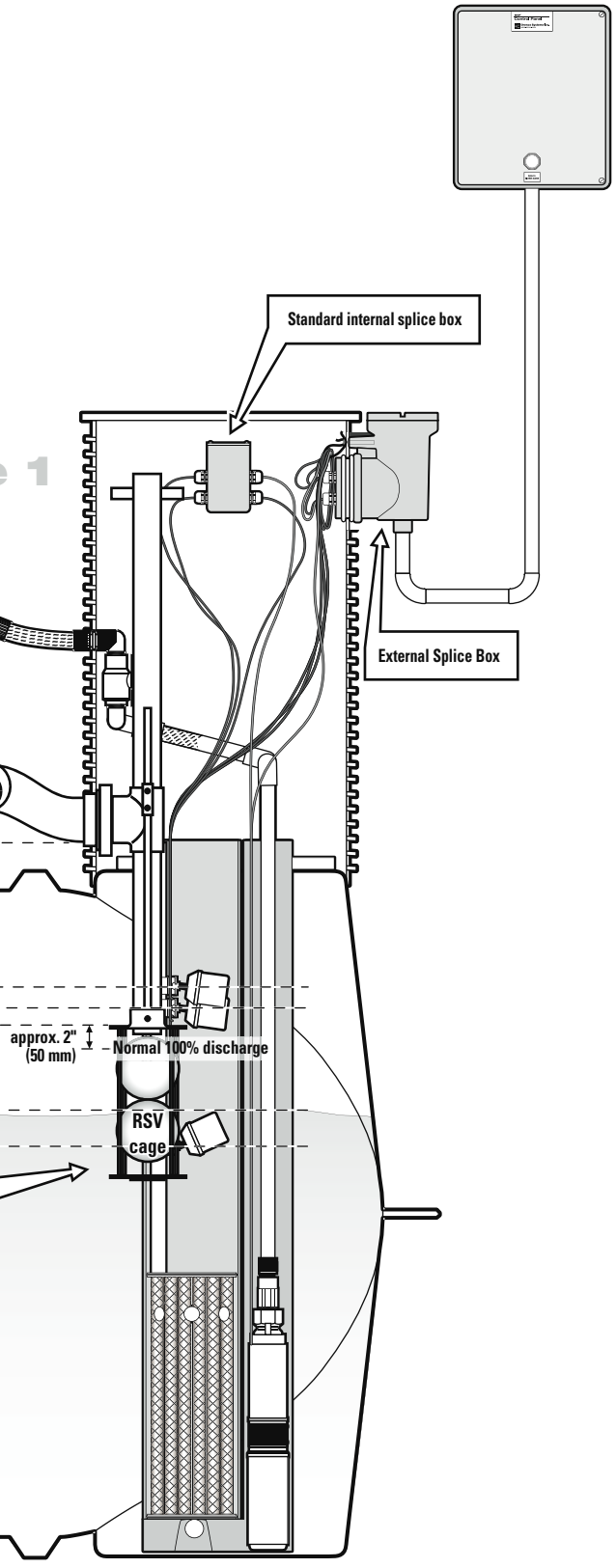
Orenco will provide the float and RSV settings for tanks that are approved for use with AdvanTex Treatment Systems in your area. Service Providers are simply required to verify that the float and RSV settings are correct.

This diagram shows how these settings are established for AdvanTex Treatment Systems that use a VeriComm® Control Panel. The diagram shows both a Mode 1 and a Mode 3 setup. For Mode 1 setups, the recirculating splitter valve (RSV) is installed in the second compartment, with the Biotube pump vault. For Mode 3 setups, the RSV is installed in the first compartment, under the inlet riser.



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Appendix 2: Float and RSV Settings (continued)



Typical RSV Levels

For stinger pipe lengths up to 24 in. (600 mm) long, the "normal low operating liquid level" will be approximately 5-6 in. (125-150 mm) below the top of the RSV cage. (The normal low operating liquid level is the level at which 100% of the filtrate returns to the tank.) For most residential applications, the recommended surge volume — the volume between the low liquid level and the high water alarm float — is approximately 250 gallons (950 L). For Mode 3 installations, the duckbill model RSV, which has a flexible PVC tube that vents the RSV cage to atmosphere, is required.

Typical Float Levels

Be sure to check the plans for any site-specific or tank-specific float settings. The top float is normally set equal with the tank's invert of inlet. The bottom float should be approximately 4 in. (100 mm) below the normal low operating level.

NOTE: *Before leaving the site, verify that the "low water alarm/redundant off" float is positioned at least 10 in. (250 mm) below the top of the RSV cage.*

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Notes

O&M MANUAL

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www.vericomm.net

AdvanTex Treatment System AXN Models meet the requirements of ANSI-NSF Standard 40 for Class I Systems.

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Part 2:
Advanced Service Tips and Troubleshooting Guide

O&M MANUAL

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www.orenco.com
www.vericomm.net

Introduction

As an authorized AdvanTex® Service Provider, you play a crucial role in Orenco's AdvanTex Program.

Orenco has always advocated regular, professional servicing of all onsite systems ... not just during the warranty period but for the life of the system. Regular servicing optimizes the treatment process and protects the property owner's investment. It also ensures that onsite systems protect public health, protect the environment, and are viewed as a reliable, sustainable technology.



Orenco relies on you to perform the AdvanTex system start-up, do routine (scheduled) maintenance, and respond to calls for unscheduled maintenance (alarm calls). We also rely on you to keep in contact with the homeowners or property owners, review the *Homeowner's Manual* with them, advise them on preventive maintenance, and work to keep the system under a continuous service contract. Equally important, we rely on you to keep good service records on the system, creating a "history" of its performance.

To make your job easier, Orenco has created one of the most service-friendly and trouble-free onsite systems on the market. AdvanTex is a packed bed (media) filter. And media filters are the most suitable technology for onsite wastewater treatment because they are reliable and provide consistent, high-quality effluent. We then paired our media filter with a remote telemetry control panel, to allow you to "view" the system right from your computer. And we've provided a Web-based business tool — advantexservice.com — to help you file and retrieve system data automatically, schedule service events, and manage service technicians.

Finally, we've provided classroom and field training, as well as support materials, like this O&M Manual. Please read it thoroughly, and refer to it often.

We're very proud of our AdvanTex Treatment System. Like all our products, it has gone through extensive research, development, and field-testing. Then each component is built to written specifications and subjected to quality review, before shipping. In addition, our AXN models meet the requirements of NSF-ANSI Standard 40 for Class I Systems.

Thank you, in advance, for your knowledge, your conscientiousness, and your good work.



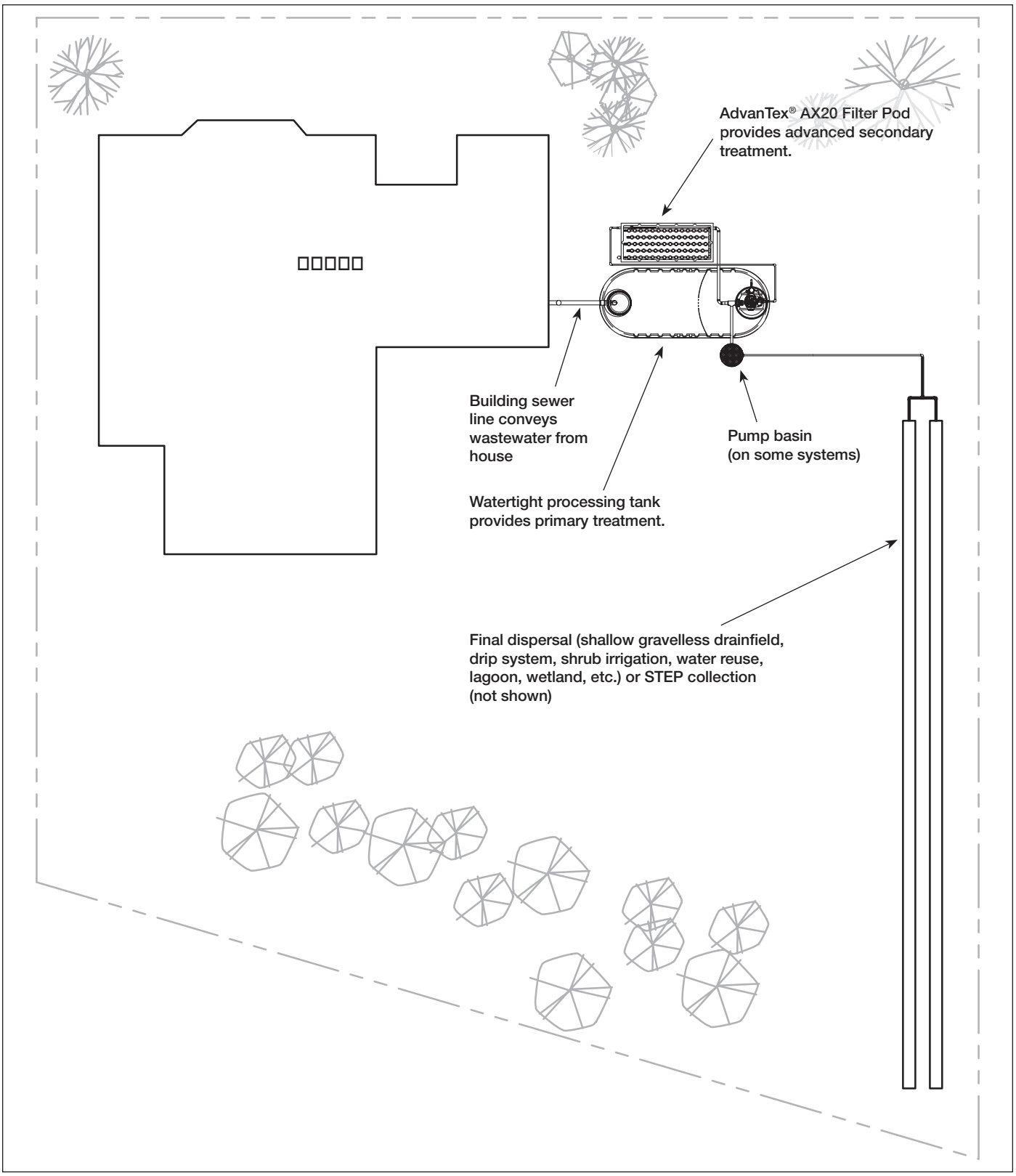
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Typical Site Plan for an AdvanTex® Treatment System



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Equipment List

Routine maintenance and troubleshooting require a variety of tools, equipment, and spare parts. We recommend that an Authorized AdvanTex Service Provider have the following items at hand:

For Routine Inspection and Maintenance

- Cordless drill with 3/16-in. Allen wrench for lid bolts on risers and pod
- Extra lid bolts
- Sludge and scum measuring device (e.g., Nasco Sludge Judge® for sludge and Orenco SMUG for scum)
- Hook for raising floats to test them
- Biotube® filter cradle (OM-BIOTUBECRADLE)
- Backpack pressure washer
- Trash pump (and generator, if pump is electric) for removing solids from discharge basin
- AX20 manifold brush (AX-LATERALBRUSH)
- AX20 sheet cleaning wand (AX-CLEANINGWAND)
- Handheld computer (PDA) with Bluetooth® Kit or laptop with null modem cable (optional, to turn pump on and off at a distance from the panel)
- Electrical tester (voltage and amperage)
- Phone line tester (available from RadioShack®)
- Dissolved oxygen (DO) meter or colorimetric ampoules
- Sample bottles with grab sample device
- Turbidity meter
- pH meter or pH test strips
- Test strips for nitrate, ammonia, alkalinity
- Tape measure
- Calculator
- A copy of the *AX20 Installation Instructions* (NIM-ATX-AX-1) and *AdvanTex O&M Manual Part:1 Start-Up and Routine Maintenance* (AIM-OM-ATX-1), for reference

For Repairs

- Adhesive (ADH100, SS140, SS115, SS845)
- Control panel parts (circuit breakers, motor contractors, relays)
- Effluent pumps
- Extension cord
- Flashlight
- Hand tools (pliers, wrenches, screwdrivers, drill bits, hammer, shovel, hand saw, etc.)
- Inspection mirror (e.g., Prototek "Mirror on a Stick")
- Plumber's snake
- PVC cement and primer
- PVC fittings (3/4 in. to 2 in.)
- PVC pipe (3/4 in. to 2 in.)
- Spare parts for downstream components (e.g. drip headworks, UV disinfection unit)
- Waterproof wire nuts
- Wire stripping/crimping tool
- Float switches

For Troubleshooting

- Digital camera
- Watch or timer
- A copy of Part 2 of the AdvanTex O&M Manual: *Advanced Service Tips and Troubleshooting Guide* (AIM-OM-ATX-2)

For Personal Hygiene and Cleanup

- Bleach/water solution
- Eye protection
- Hand cleanser
- Paper towels
- Protective clothing
- Rags
- Rubber gloves



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Factors Affecting the AdvanTex Treatment Process

Properly designed, installed, and operated, a Residential AdvanTex Treatment System can treat wastewater to 5 mg/L BOD_5 and 5 mg/L TSS. If treatment performance fails to meet that standard, the cause may be the design, installation, settings, or use of the system — or more likely, a combination of those factors. Here's what happens in each part of the system, and how each of these factors can keep the system from performing as well as it should.

Processing Tank

Primary treatment happens in the tank, and several conditions inside the tank affect the ultimate effluent quality. The first is the **incoming wastewater**: its strength (concentration), mass loading (amount of each wastewater component), hydraulic loading (volume), and chemical characteristics. Residential wastewater (raw influent) typically has BOD_5 of 450 mg/L, TSS of 500 mg/L, and total Kjeldahl nitrogen (TKN) of 70 mg/L. Practices in the home may raise the levels of these components and may also introduce harmful chemicals and indigestible solids into the system. Although the AdvanTex system is robust enough to accommodate a houseful of weekend guests or a couple of days of canning, residents must be aware that in the long run, certain habits can harm their septic system or increase the need for system servicing and/or pumping. The Troubleshooting section of this manual lists some household practices to inquire about when a system has problems.

In addition to the composition of a home's effluent, the **size of the tank** and the **volume of the effluent** also affect performance. Residential systems are sized and designed to accommodate the North American average of 50-60 gallons per person per day and are sized for a certain number of residents. A change in the number of residents, or a sudden increase in their water use per capita, can push wastewater through the tank without allowing the minimum 24 hours of retention time required for thorough separation and digestion of wastes.

Finally, the tank and all pipe joints must be **watertight** to prevent both infiltration and exfiltration of liquid. Infiltration of rainwater or groundwater will overload the system, preventing proper stratification in the processing tank and overloading the AdvanTex textile filter. Exfiltration of liquid effluent from the tank can make liquid levels too low for stratification, leading to clogging of the Biotube® effluent filter. Of course, exfiltration also pollutes the soil, and potentially the groundwater.

AdvanTex Textile Filter

The AdvanTex textile filter provides secondary wastewater treatment. The filter is a sturdy, watertight fiberglass basin filled with a nonwoven textile material. This lightweight, highly absorbent media treats a large amount of wastewater in a small space because it has a very large surface area — about five times greater than that of an equivalent volume of sand, for example. Textile also has a greater void volume (for free flow of oxygen) and greater water-holding capacity.



These properties make it an excellent environment for aerobic micro-organisms to live and digest the nutrients in effluent. As effluent from the processing tank percolates through and between the sheets of textile, the microorganisms remove what they need from it, reducing BOD_5 and TSS. Also, the aerobic conditions within the AdvanTex filter are ideal for microbes that convert ammonia to nitrates (nitrification). For sites where maximum denitrification is necessary, AdvanTex filters can be configured in Mode 3, so that the filtrate recirculates back to the high-carbon, low-oxygen environment at the inlet end of the processing tank, which is ideal for microbes that reduce nitrates to nitrogen gas (denitrification). Harmless nitrogen gas is then released back into the atmosphere.

In addition to being affected by **oxygen**, the AdvanTex filter's performance is affected by **mass loading, hydraulic loading, strength,** and **chemical characteristics** of the influent. If the effluent coming from the processing tank is contaminated with harsh chemicals or excessive grease, the biomat of microorganisms will suffer. The graphs on the next page show that low-to-moderate loading rates produce BOD_5 and TSS of <5 mg/L, and higher loading rates produce BOD_5 and TSS in the range of 15-25 mg/L.

About Recirculation Ratio

Maintaining an **appropriate recirculation ratio** is important for proper functioning of the system. Adjusting the frequency and length of the doses of effluent delivered from the tank to the AdvanTex filter optimizes the conditions for the microorganisms.

A recirc ratio that's too high can generate a highly aerobic biomat growth on the pump filter. It also increases alkalinity consumption and dissolved oxygen concentration in the processing tank, which can inhibit denitrification. Conversely, a recirc ratio that's too low can tend to liberate periodic odors during dosing events. The optimum ratio is typically between 2:1 and 6:1.

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Normal Performance of the AdvanTex System

The table below summarizes the typical levels of BOD_5, TSS, and TKN in each part of the AdvanTex system, if proper conditions (described in the preceding section) are met:

Typical Values in the AdvanTex Treatment System

	BOD_5 (mg/L)	TSS (mg/L)	TKN (mg/L)
Raw Influent[1]	450	500	70
Primary Chamber Effluent	150	40	70
Secondary Chamber Effluent[2]	15-40	10-20	[4]
AXN Filtrate[3]	5	5	[4]

[1] Source: Crites and Tchobanoglous. *Small and Decentralized Wastewater Management Systems*, p. 180, 183, 1998. McGraw-Hill. Based on 50 gpcd.

[2] Will vary with recirc ratios and mode configuration. The numbers here represent a recirc ratio between 2:1 and 6:1 and are derived from Orenco and third-party testing in Mode 1.

[3] Actual performance results, based on a six-month accumulative average from NSF (National Sanitation Foundation) testing on the AX20N at 500 gpd, using composite sampling. Performance and servicing frequencies will vary relative to the mass load being treated. Procedures for treating excessively high loads will require engineering review. For more information, please review AdvanTex Design Criteria.

[4] Dependent on treatment system configuration and recirc ratios.

When all parts of the AdvanTex system are operating correctly and the component values in each part are within the limits above, the typical values or properties from field tests of AdvanTex effluent (filtrate) are summarized in the table below.

Typical Values for AdvanTex Effluent (Filtrate)

Parameter	Sampling Method	Typical Values or Properties
Clarity	Visual[1]	Clear (≤15 NTUs)
Odor	Sniff[2]	Non-offensive (musty is OK; rotten egg or cabbage is not OK)
Biotube® filter	Visual	No liquid level differential inside/outside vault, one-year cleaning interval
Oily film	Visual; inside the pump vault	None; no red, blue, green, or orange sheen
Foam	Visual; inside tank	None
pH	Field[3]	6-9
DO	Field[3]	≈2.5-6

If effluent is cloudy or smells pungent or if the biomat on the textile filter appears greasy, waxy, or oily, laboratory tests of the filtrate will aid troubleshooting. Following are the typical values for various lab tests of AdvanTex filtrate.

[1] To check for clarity, service providers can carry a portable turbidity meter or calibrated turbidity standards.

[2] To check for odor, service providers can simply sniff the effluent sample or can use a sulfide measuring packet or an olfactory snifter device.

[3] To check for pH, service providers can use litmus paper, a pocket pH meter, or a benchtop pH meter.

Typical Values for Supplemental Lab Tests

Sampling Parameter	Sampling Method	Typical values[1] (mg/L)	
		Mode 1	Mode 3
BOD_5	Grab	≈10	≈10
TSS	Grab	≈10	≈10
TN	Grab	≈25	≈10-20[2]
G&O	Grab	<1	<1

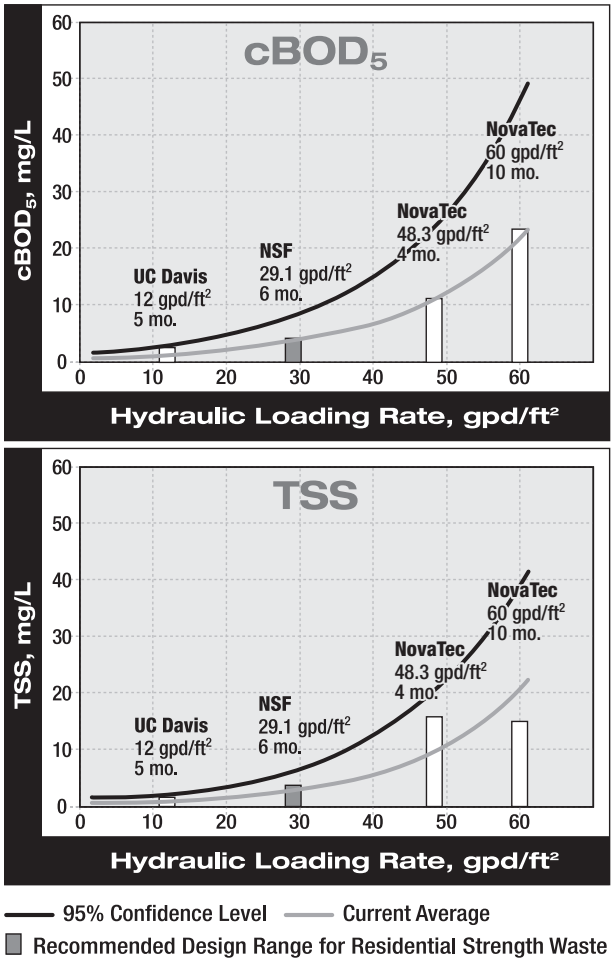
[1] Values are based on testing by Orenco and third parties.

[2] Typical nitrogen reduction ranges from ≈60-70%, with sufficient carbon source and alkalinity.

[3] To check for dissolved oxygen, use a DO meter or DO test kit.

Effluent Quality vs. Hydraulic Loading Rates

ANSI/NSF Standard 40 and Other Third Party Testing Results



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Troubleshooting Effluent Quality



Once you know the typical values for wastewater treatment system performance, you can be proactive and troubleshoot nontypical process indicators, before system performance is affected.

Low Effluent Quality

If your effluent samples are cloudy and color/turbidity is significantly higher than expected (greater than 15 NTU), do the following:

- Check the Biotube® filter for clogging.
- Check to see if the textile filter smells of chemicals (medication, chlorine, etc.) or has a granular or crusty appearance. (For example, a white crystalline crust could signal that water softener discharge or industrial strength detergents have been flushed into the system.)
- Check to see if the recirc ratio is too high or the pump dose time is too long. If the effluent $cBOD_5$ is high and TSS is low, a large amount of soluble $cBOD_5$ has not yet been consumed. That would likely be because the recirc ratio is too low for the influent strength or insufficient start-up time has elapsed. Typical organic reduction within the first 24 hours in residential systems is about 75% or greater. As the biomat begins to develop, greater reductions in the soluble $cBOD_5$ will occur (typically within the first 7-10 days). With a higher influent strength, the soluble $cBOD_5$ would not be readily removed until the biomat on the media is established.
- Check that ventilation is occurring, at the pod and from the house to the tank.
- Interview the users about system abuse, especially in the area of harmful chemicals, solvents, strong cleaning agents, or water softener backwash.

Special Note about Water Softeners: *Water softener backwash is extremely high in salts, which can disrupt system performance, especially nitrogen reduction processes. Talk with residents to make sure that no water softener backwash is discharging into the processing tank. Plumbing water softener backwash into the processing tank voids the warranty.*

If none of these troubleshooting steps makes a difference, lab tests may be necessary to determine the cause of the problem. Call Orenco for recommended lab tests or design remedies.



Odor

If the tank or textile filter smells like rotten eggs or cabbage:

- Check dissolved oxygen levels using a DO meter or DO wet test kit.
- Note filtrate DO levels that are <2.5 (less than 2.5) or >6 (greater than 6) mg/L.

Filtrate DO that's <2.5 mg/L indicates insufficient oxygen. If the filtrate DO is <2.5 mg/L:

- Check filter surface for evidence of clogging.
- Check that the pump is working.
- Check that ventilation is occurring, at the pod and from the house to the tank.
- Check that the recirc ratio isn't too low; increase if too low.
- Check that influent strength isn't too high (see AdvanTex Design Criteria).
- Check to ensure hydraulic retention time isn't too high.

Filtrate DO that's >6 mg/L indicates excessive aeration. If the filtrate DO is >6 mg/L:

- Check to ensure recirc ratio isn't too high.
- Check to see if influent flows are below normal.
- If influent flows are below normal or recirc ratio is too high, reduce recirc ratio.

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Troubleshooting Other Symptoms

Biotube® Filter Clogging

If a visual inspection of the Biotube® filter for biomass build-up shows the need for cleaning more often than once a year (annual cleaning is typical for recirculating systems), try the following:

- Verify the pump isn't running too long (typically 3 cycles/hour).
- Ensure the recirc ratio isn't too high.
- Verify normal DO levels; if high, reduce recirc ratio.
- Check for below normal influent flows.
- Check influent Grease & Oil and TSS; if excessive, a review of component sizes may be required.





Oily Film

All signs of oil or grease anywhere in the system (in the tank, in the vault, on the effluent filter or textile filter) must be investigated. Ask the system user to identify the probable source:

- Recent change of car oil?
- Canning meat or poultry?
- Excessive use of garbage disposal?
- Excessive use of bath or mineral oils? (Jacuzzi® tub?)
- Excessive use of detergents?

If the system user can't identify the probable source, try the following:

- Sample and test at all process steps, including influent (if possible).
- Label, date, and photograph all samples.
  - When photographing, use standard glass beakers and set samples in front of a common, uniform background
- Check biomat accumulation at AdvanTex Filter.
- Note if biomat is yellowish and wax-like or lard-like. If so, scrape biomat sample for analysis:
  - Photograph/document biomat sample.
  - Send to lab with effluent samples.

Excessive grease and oil (>25 mg/L) is typically a design and management concern with commercial applications.

Foam

Foam rarely occurs in packed bed filters. If you see foam in the textile filter, call Orenco.

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Troubleshooting Nitrogen Reduction

AdvanTex Treatment Systems do an excellent job of reducing nitrogen, especially in the Mode 3 configuration, where total nitrogen (TN)* is typically reduced to 10-15 mg/L, from typical influent total Kjeldahl nitrogen (TKN)** of 70 mg/L. Because many people purchase AdvanTex for its nitrogen-reducing capabilities, and because nitrogen reduction is a complex, many-staged process, it's important to understand the process, its related factors, the signs of effective nitrogen reduction, and how to keep the process optimized.

It's also important to know the TN limits required by the system user's permit. Some regulatory agencies have no requirement; some require a specific percentage reduction of a certain kind of nitrogen (90-95% nitrification of ammonia nitrogen, for example); and some require that TN be reduced to levels at or near drinking water quality at the point of final dispersal. A level of 20 mg/L TN is becoming increasingly accepted by regulators because it's typically achievable without relying on supplemental carbon and alkalinity feeds.

Finally, because influent characteristics greatly affect the amount of nitrogen reduction possible from any given system, it's vital to know the alkalinity of your waste source and the local or regional norms for organic and ammonia nitrogen.



The Process

Appendix 1 describes the nitrification/denitrification cycle in more detail, but a brief description should help you with most troubleshooting. In nitrogen reduction, ammonia is converted to nitrate in an aerobic environment, and then reduced through bacterial action in an anaerobic environment to nitrogen gas, which is released harmlessly to the atmosphere. Optimum nitrogen reduction typically requires the following:

- Adequate alkalinity of approximately 250 mg/L or higher (a lab test shows levels).
- pH of 6-9. Fixed-film microbial processes generally thrive between pH 6 and 9. Treatment problems typically result from rapid changes in pH rather than extreme long-term mean values, although long-term levels can result in less efficient process activity.
- Filtrate DO level of 2.5-6 mg/L, process tank DO level of <1 mg/L.
- Adequate time for the nitrifying bacteria to develop (one to three months).
- Adequate temperature (below 40° F retards the process).
- Good organic removal.

For a thorough description of the nitrogen reduction process, see Appendix 1. In residential wastewater, the ammonia level is typically about 60 mg/L and the TN is typically ≈70 mg/L.

Signs of Effective Nitrogen Reduction

Service providers frequently ask us, "How do I know if my wastewater treatment system is reducing nitrogen?" A thorough description of key indicators is included in Appendix 1. Following is a brief summary:

- Clear, odorless filtrate effluent (a "see and sniff" test is generally considered sufficient).
- Normal-looking biomat on the textile filter (light-brown to dark-brown and gelatinous in texture).

Additional filtrate tests will show ...

- Typically, low BOD_5, low turbidity and high clarity.
- DO of ≈ 2.5-6 mg/L.
- Low ammonia levels (≈<1-3) and relatively high nitrate levels, since nitrification converts ammonia to nitrate.

* Total Nitrogen (TN) is the sum of organic nitrogen (ON), ammonia nitrogen (NH_3-N), nitrate nitrogen (NO_3-N), and nitrite nitrogen (NO_2-N).

** Total Kjeldahl Nitrogen (TKN) is the sum of organic nitrogen (ON) and ammonia nitrogen (NH_3-N).

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Troubleshooting Nitrogen Reduction (continued)

Troubleshooting Nitrogen Reduction

If you suspect that the system is not meeting expectations for nitrogen reduction, troubleshoot each of the critical factors that contribute to optimum nitrogen reduction, to determine a cause.



Filtrate Alkalinity Too Low — Sufficient alkalinity is required to achieve the desired degree of nitrification for any wastewater treatment system, because it takes 7.14 parts alkalinity to nitrify 1 part ammonia.

If filtrate alkalinity is too low:

- Check the recirc ratio; a high recirc ratio increases alkalinity consumption.
- Check influent TKN or ammonia levels and source alkalinity.

If a large quantity of nitrification is required, it may be necessary to add alkalinity-raising chemicals to the system.

Filtrate pH Too Low — Nitrification is particularly sensitive to pH but tends to thrive at levels between pH 7 and 8. The nitrification process releases hydrogen that consumes alkalinity and causes pH levels to drop. A pH level of <6 retards microbial activity of all kinds, including denitrification, and with a pH level <5.5, nitrification may show signs of degradation. Maintaining an alkalinity of 50 to 80 mg/L in the effluent is typically sufficient to maintain pH levels above 5.5. If the filtrate pH level is too low:

- Check influent alkalinity level (pH drops when too much available alkalinity is consumed).
- Check recirc ratios; reduce if too high.
- Ask system user about chemical discharges into the system, including carpet cleaners, chlorine, and photo developing agents.

Filtrate DO Levels Outside Range of 2.5-6 mg/L — If filtrate DO is too low (indicating insufficient oxygen), the system may release sulfide odors during dosing events, or there may be a more lasting smell within the filter pod. Try the following:

- Check for surface clogging/ponding and clean as necessary.
- Check air flow through the vent assembly.
- Check the recirc ratio; if it's too low (<2:1), increase as necessary.

If your filtrate DO is too high (indicating excessive aeration), it's likely that excessive recirculation or insufficient hydraulic retention time are factors. Try decreasing the recirc ratio.



High Filtrate Ammonia Levels — Because ammonia is biochemically oxidized to nitrate during nitrification, high ammonia levels are a sign that something is amiss. Try the following:

- Check for surface clogging/ponding and clean as necessary.
- Check for sufficient aeration (measure DO).
- Ensure no blockage of air flow into textile filter (indicated by thick biomat development or a build-up of grease and oils).
- Ensure no blockage in the manifold, causing ...
  - — Localized hydraulic overloading, saturation
  - — Short circuiting
- Check for sufficient alkalinity; if insufficient, consider supplemental buffering using equipment that automatically adds an alkaline compound to the system. Call Orenco Engineering for assistance, if necessary.

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Troubleshooting Nitrogen Reduction (continued)

Low Filtrate Nitrate Levels — Residential packed bed filters normally yield more than 98% nitrification (conversion of ammonia to nitrate). Therefore, the ammonia levels in the filtrate should be low and the nitrate levels higher. Some denitrification occurs in the packed bed filter, so the normal nitrate level may vary. Be sure you are familiar with the mode of operation, as some AdvanTex modes are configured to produce lower nitrate levels. If it appears that nitrification is dropping off:

- Check the recirc ratio; adjust as necessary (high recirc ratios may drive pH too low for effective nitrification/denitrification, and low recirc ratios may not provide sufficient aeration).
- Verify incoming ammonia levels.
- Check recirc/blend for excessive organic food source (high BOD_5 may cause greater oxygen demand through the filter, reducing nitrification).

Adequate Time and Temperature — Nitrifying bacteria require one to two months to develop, and extremely cold temperatures (below 40° F) retard that process. If the AdvanTex Treatment System has been installed in a very cold climate, nitrification may not "kick in" for several months until warmer temperatures are reached. Typically, a June-September installation provides the necessary temperatures for a 30-60 day nitrification start-up time. Once nitrifiers colonize, they typically continue to nitrify through normal winter conditions. Only in severely cold regions should additional insulation be necessary.

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Appendix 1: More Information about Nitrogen Reduction

Nitrogen removal (or "nitrification/denitrification") is a biochemical process. In nitrification, ammonia is oxidized to nitrate ($2NH_3$ converts to $2NO_3$ + $3H_2O$). This nitrate is then reduced through bacterial action (denitrification) to nitrogen gas, which is released harmlessly to the atmosphere.

During the nitrification process, about 9 parts oxygen are consumed in converting 2 parts ammonia to nitrate. Therefore, depending on the concentration of ammonia, a considerable amount of air may be needed. Other processes, like BOD_5 reduction, may occur simultaneously and further elevate the demand for aeration, especially if the organic level is high. In an abundance of air, all the aerobic or facultative microbes compete for their share of oxygen.

When the organic concentration is high, the microbes that oxidize organic matter, primarily the heterotrophic bacteria, are aggressive and tend to outcompete other microbes for the available free oxygen in solution. Ammonia is oxidized by autotrophic bacteria, which do not have as aggressive a growth rate, so if oxygen is not abundant, nitrification suffers. Consequently, the nitrification process usually lags until the organic concentration is depleted or until sufficient oxygen is present. At a 2.5:1 BOD_5/TKN ratio, the nitrifiers may only make up about 10 percent of the microbial population. At 0.5:1 BOD_5/TKN, the nitrifiers make up about 35 percent of the population.

In a filtering process, the filter column must be deep enough, or the filter media must be efficient enough at filtering organic particles, to deplete organic concentrations to a level in which a sufficient population of nitrifiers will be sustained. The physical (dimensional) features of the filter will vary depending on the media's characteristics — void ratio, moisture holding capacity, and effective surface area per unit volume ratio. Tankage, surge capacity, application rates, and loading characteristics are other design considerations that play a role in the sizing of the filter unit.



Performance Indicators

To judge the nitrogen-reducing performance (or potential) of any wastewater treatment system, be sure to check the following performance indicators:

Clear, Odorless Effluent — Simple, "see and sniff" tests can be performed easily in the field. Effluent from packed bed filters (recirculating textile filters, recirculating sand filters, intermittent sand filters) that are performing well should be clear (with turbidity <20 NTUs) and odorless.



Tests for Ammonia and Nitrate Nitrogen — If the system is oxidizing ammonia to nitrate (nitrifying), lab tests should measure relatively low ammonia levels and relatively high nitrate levels in the filtrate. Because nitrification responds to many and varying conditions within the aerobic treatment processes, *ammonia and nitrate nitrogen levels in the filtrate are the most ideal constituents to watch for any changes in performance.* Start-up times can be plotted, optimum recirc ratios can be gauged, cleaning frequencies can be predicted, and nonvisible clogging or saturation can be detected by watching either of these constituents.

Typical nitrification in single-family residential systems is expected to be in the 98-99% range. Investigate if the process appears to degrade by 5 percentage points or more.

BOD_5 — The nitrification process requires oxygen, which is why nitrification is enhanced when BOD_5 is extremely low. Measures of filtrate BOD_5 should be <15 mg/L, although higher BOD_5 may not necessarily correlate with low levels of nitrification.

Typical influent characteristics are shown on page 8. When BOD_5 is high, there is a greater organic demand for oxygen, which may hamper the nitrogenous demand for oxygen. Increasing the recirc ratio should help establish oxygen balance.

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Appendix 1: More Information about Nitrogen Reduction (continued)



Biological Growth on Filter — With "fixed film" treatment systems, biological growth on the filter media is natural. The biomat should appear light-brown to dark-brown in color and gelatinous in texture.

Dissolved Oxygen — Dissolved oxygen also provides critical information with which to diagnose how well a system is performing. Measures of DO should be in the range of 2.5 to 6 mg/L. If the DO level drops, the degree of nitrification will normally drop as well, which could be a sign of blinding or saturated flow conditions — anything that might inhibit free air from flowing into the system. (Nevertheless, it's quite possible to have low filtrate DOs and still have high effluent quality, as measured by BOD_5 and TSS levels.)



pH — For normal residential nitrogen loads, pH is typically maintained between 6 and 8.

Influent Characteristics — Influent characteristics (see page 9) will greatly affect the amount of nitrogen reduction that is possible from any wastewater treatment system. High solids and/or fats and cooking oils increase the oxygen demand and accumulation of material on and within the media, affecting the available oxygen for nitrification.

Alkalinity — The nitrification process releases hydrogen ions into solution, which tends to lower the pH level. Alkalinity is essential for nitrification. For each part ammonia that is nitrified, 7.14 parts alkalinity are consumed (buffering the acidity caused by the release of hydrogen ions). Consequently, if the degree of nitrification is less than expected, it could simply be a lack of sufficient alkalinity to support more. Typical residential nitrification requires alkalinity above about 250 mg/L for recirculating processes and double that for single-pass processes.

Many wastewater streams do not have sufficient alkalinity to support complete nitrification. In this case, nitrification may deplete the alkalinity, and pH may drop to a level that retards the microbial activity (<6). Recirculating the effluent helps, since half the alkalinity can be restored in the recirc or process tank, wherever denitrification occurs (and adjusting the recirc ratios may also bring the pH back to preferred operating levels). But wastewater streams that are alkalinity-starved can't provide for 100% nitrification.

The use of low flush fixtures can reduce nitrification performance. Low flush fixtures tend to reduce hydraulic loads, which causes elevation of wastewater constituents (i.e., higher concentrations of BOD_5, TSS, TKN, etc.). In this case, the available alkalinity in the water supply may not be adequate to accomplish the full level of nitrification desired.

These constraints exist for all wastewater treatment operations, regardless of whether the operation involves a suspended growth contact stabilization process or an attached growth packed bed filter. Packed bed systems will perform better, especially if they have a large attached growth surface area per unit volume ratio, because the micro-sites near the attached side of the biomat, where denitrification typically occurs, return some of the alkalinity. Textile packed bed filters, because of their large surface area per unit volume ratio, tend to perform even better.

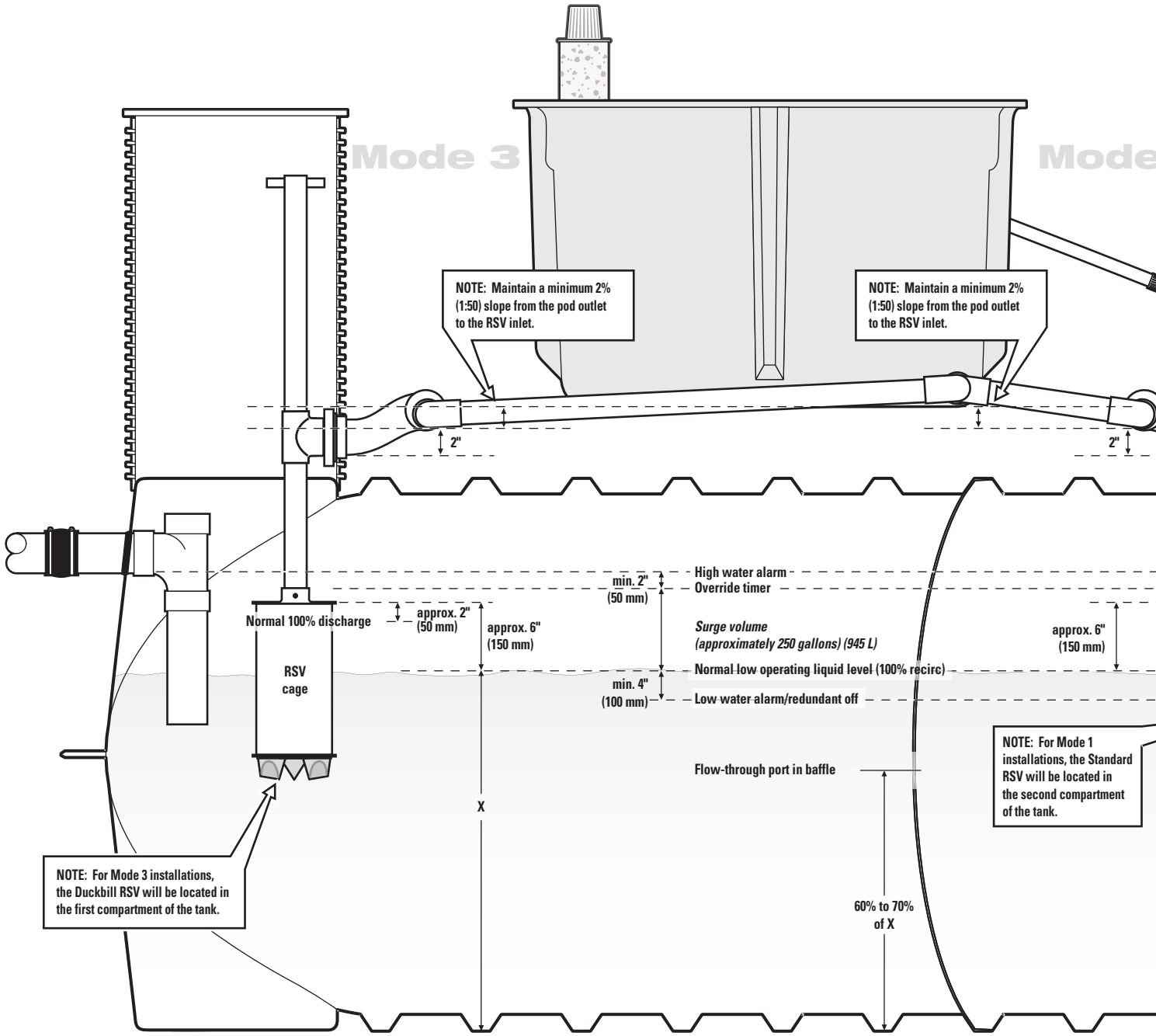
Nevertheless, additional buffering may be necessary to accomplish the level of nitrification desired. In low alkalinity conditions, pH adjustment can be made with the addition of quicklime or hydrated lime, soda ash, or caustic. If the alkali is to be introduced at a process point preceding sedimentation zones, such as in the tank, lime would be preferred. Soda ash and caustic both contain sodium, which is a dispersant and will impede settling of solids in the tank.

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Appendix 2: Float and RSV Settings

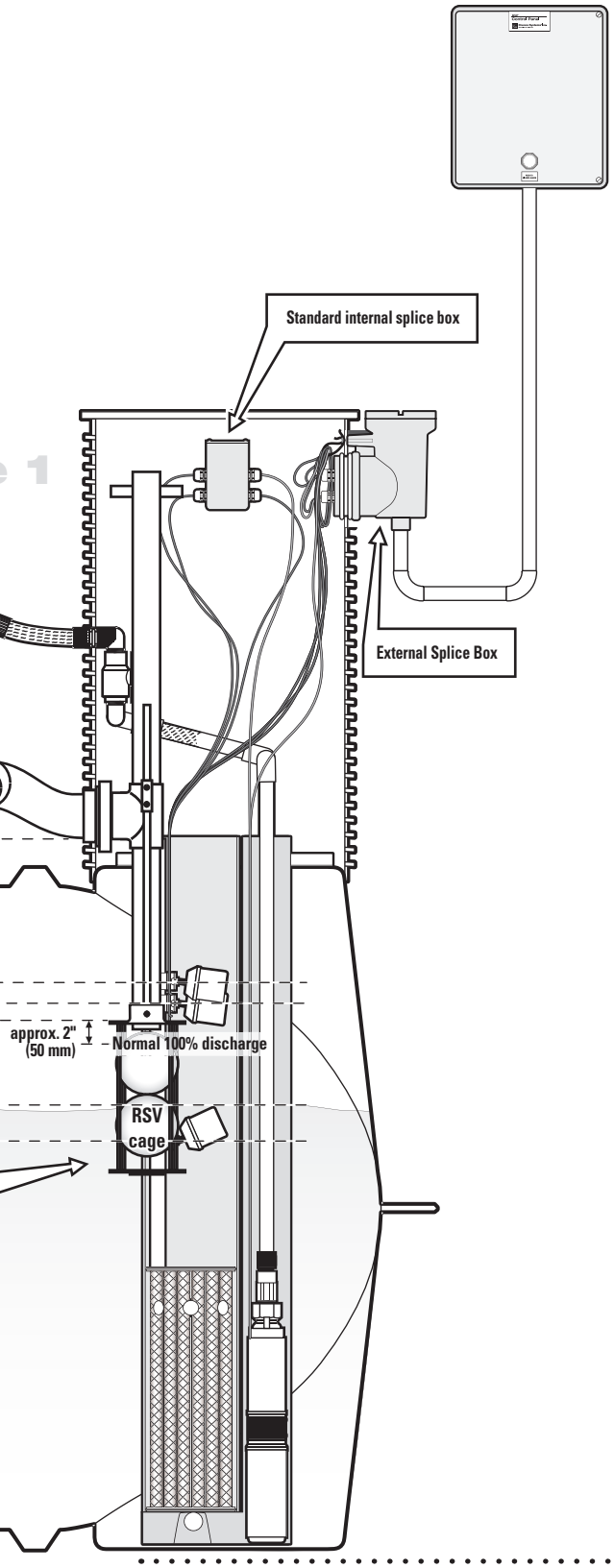
Orenco will provide the float and RSV settings for tanks that are approved for use with AdvanTex Treatment Systems in your area. Service Providers are simply required to verify that the float and RSV settings are correct.

This diagram shows how these settings are established for AdvanTex Treatment Systems that use a VeriComm® Control Panel. The diagram shows both a Mode 1 and a Mode 3 setup. For Mode 1 setups, the recirculating splitter valve (RSV) is installed in the second compartment, with the Biotube pump vault. For Mode 3 setups, the RSV is installed in the first compartment, under the inlet riser.



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Appendix 2: Float and RSV Settings (continued)



Typical RSV Levels

For stinger pipe lengths up to 24 in. (610 mm) long, the "normal low operating liquid level" will be approximately 5-6 in. (127-152 mm) below the top of the RSV cage. (The normal low operating liquid level is the level at which 100% of the filtrate returns to the tank.) For most residential applications, the recommended surge volume — the volume between the low liquid level and the high water alarm float — is approximately 250 gallons (948 L). For Mode 3 installations, the duckbill model RSV, which has a flexible PVC tube that vents the RSV cage to atmosphere, is required.

Typical Float Levels

Be sure to check the plans for any site-specific or tank-specific float settings. The top float is normally set equal with the tank's invert of inlet. The bottom float should be approximately 4 in. below the normal low operating level.

NOTE: *Before leaving the site, verify that the "low water alarm/redundant off" float is positioned at least 10 in. (254 mm) below the top of the RSV cage.*

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Appendix 3: Timer Settings

The following chart shows recommended timer settings for a new system.

RESIDENTS	TIME ON (SEC)	TIME OFF (MIN)	NOTES
2	10 sec (0.17 min)	20.00	• Assumes water usage of 50 gal. (190 L) per person per day and a return recirculation ratio of 3 : 1 (Filter recirculation ratio of 4 : 1). • Override OFF cycle time is set at one-half of the OFF cycle time. Override ON cycle time is set the same as the ON cycle time.
3	15 sec (0.25 min)	19.75	
4	20 sec (0.33 min)	19.45	
5	25 sec (0.42 min)	19.70	
6	30 sec (0.50 min)	19.50	

As you gain experience with a system, you may conclude that you need to make adjustments, sometimes significant ones. This worksheet is intended to help you determine appropriate start-up timer settings (Pump ON, Pump OFF) for a single-pod AX20 system. Typical values and ranges are provided for each parameter. If you have any questions or if your values fall outside the desired ranges on this worksheet, contact your Dealer.

PARAMETER		TYPICAL VALUES	NOTES
	Number of people	3	Range of 2 to 8 people.
	Water usage per person	50 gpd (190 L/d)	Typical daily average is 50 gal. (190 L) per person.
Q_i	Actual daily flow (total)	150 gpd (570 L/d)	(Number of people) x (water usage per person).
R_b	Return recirculation ratio	3 : 1	You can adjust this ratio (return flow to forward flow) up or down depending on system performance. (Range of 2 to 6.)
R_f	Filter recirculation ratio	4 : 1	
	Total daily flow to AX20	600 gpd (2280 L/d)	(Actual daily flow) x (return recirculation ratio + 1). Must be ≤ 3000 gpd (11,370 L/d). Actual flow should not exceed 500 gpd (1895 L/d). (500 gpd x 6:1 R_b = 3000 gpd)
Q_d	Actual pump dose rate	33.3 gpm (126 L/min)	Determine this value by field-testing or by using Orenco's PumpSelect™. Start at the low end.
T_d	Pump ON cycle time (dose)	0.25 min	Select a value between 0.17 minutes (10 seconds) and 0.75 minutes (45 seconds).
T_r	Pump OFF cycle time (rest)	19.75 min	See Pump OFF equation below.

PUMP OFF EQUATION **EXAMPLE**

Plugging in the above values and rounding results in the following:

$$T_r = \left[\frac{1440 \cdot T_d \cdot Q_d}{(R_b + 1) \cdot Q_i}\right] - T_d$$

$$T_r = \left[\frac{1440 \cdot 0.25 \cdot 33.3}{(3 + 1) \cdot 150}\right] - 0.25 = 19.74 \approx 19.75$$

After you determine your Pump ON and Pump OFF times, double check to make sure your start-up settings fall within the cycle time (CT) range, below. If they don't, make adjustments per the "Note."

ADDITIONAL PARAMETERS		TYPICAL VALUES	NOTES
CT	Cycle time	20 min	Low flow applications may result in cycle times of an hour or more, which can cause the media to dry out or odors to develop in the recirc tank. If CT is much more than 30 minutes, consult your Dealer or Orenco for suggested adjustments.
	Pump cycles per day	72 cycles	1440 min/day ÷ (OFF cycle time + ON cycle time). Must not exceed the pump's maximum rated cycles of 300 cycles per day.
	Gallons per cycle	8.3 gal. (31 L)	With 68 orifices and using the T_d range recommended above, you will maintain the recommended 0.08 to 0.25 gal. (0.45 to 0.95 L) per orifice per dose.

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Appendix 4: Glossary

Alkalinity: The amount of ions available in the filtrate to react with hydrogen ions. Although pH paper or a pH meter provides a quick field measure of the overall balance of acidity vs. alkalinity in the system and is useful for detecting changes that may cause problems, quantitative determination of alkalinity (measured in mg/L) is done in a lab.

BOD: Biological Oxygen Demand, a measure of the amount of organic material in wastewater. cBOD means carbonaceous BOD; the terms are often casually used interchangeably. $cBOD_5$ means "five-day cBOD" and is a lab test in which the sample is incubated for five days.

DO: Dissolved oxygen, in mg/L. It can be measured in the field using a DO meter or colorimetric kit, or in a lab.

G&O: Grease and oil, in mg/L, measured in a lab.

NTU: Clarity and color of wastewater can be measured in nephelometric units (NTU). Clarity of a sample in a glass container can be compared by eye against a prepared sample. To obtain a quantitative measure of turbidity, a turbidity meter can be used in the field or in a lab.

pH: A measure of the acidity or alkalinity of wastewater on a scale from 0 (acid) to 14 (alkaline), with 7 being neutral. pH can be measured in the field using pH test strips or a pH meter.

TN, TKN: Total Nitrogen (TN) is the sum of organic nitrogen (ON), ammonia nitrogen (NH_3-N), nitrate nitrogen (NO_3-N), and nitrite nitrogen (NO_2-N). Total Kjeldahl Nitrogen (TKN) is the sum of organic nitrogen (ON) and ammonia nitrogen (NH_3-N).

TSS: Total suspended solids, in mg/L, measured in a lab.

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Notes

O&M MANUAL

NSF/ANSI STANDARD 40

AdvanTex Treatment System AXN Models meet the requirements of ANSI-NSF Standard 40 for Class I Systems.

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AdvanTex® O&M MANUAL

SUPPLEMENTAL INFORMATION, AX-RT

Introduction: AdvanTex® AX-RT Treatment Unit Operation

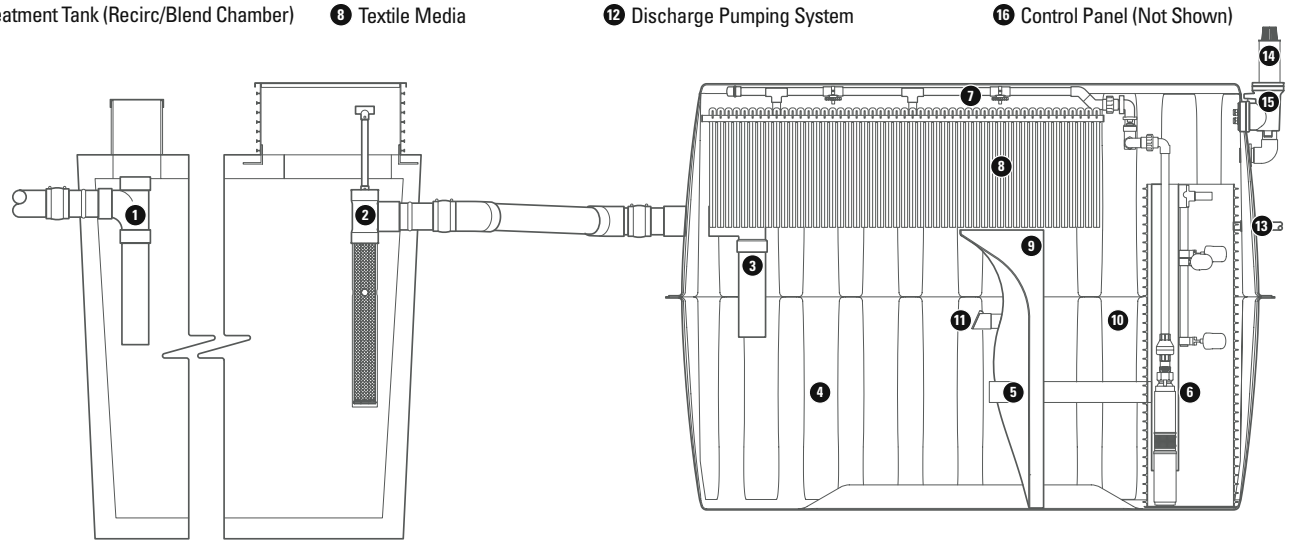
This supplement contains information to help you successfully operate and maintain an AdvanTex® AX-RT Treatment System. The AX-RT operates similarly to the AdvanTex AX20 Treatment System, but there are some differences to be aware of when performing O&M activities. A big difference is that the AX-RT consists of a single, self-contained module for recirculation, treatment, and dosing, instead of separate units.

Another difference is that the AX-RT has no Recirculating Splitter Valve (RSV). Effluent percolates down through the textile media and is split — by means of a tank baffle — between the recirc/blend chamber and the recirc/filtrate chambers of the AX-RT recirculating treatment tank.

Raw sewage enters the septic tank through its inlet tee. In the septic tank, the raw sewage separates into three distinct zones — a scum layer, a sludge layer, and a clear zone. Effluent from the clear layer passes through a Biotube® effluent filter and is discharged by gravity to the recirc/blend chamber of the AX-RT unit. The effluent then flows through the recirc transfer line to the recirc pumping system. The recirc pumping system pumps effluent from the recirc/blend chamber through the manifold to the spray nozzles in the top of the unit. Effluent percolates down through the textile media and is divided — by means of a tank baffle — between the recirc/blend chamber and the recirc/filtrate chamber inside of the unit.

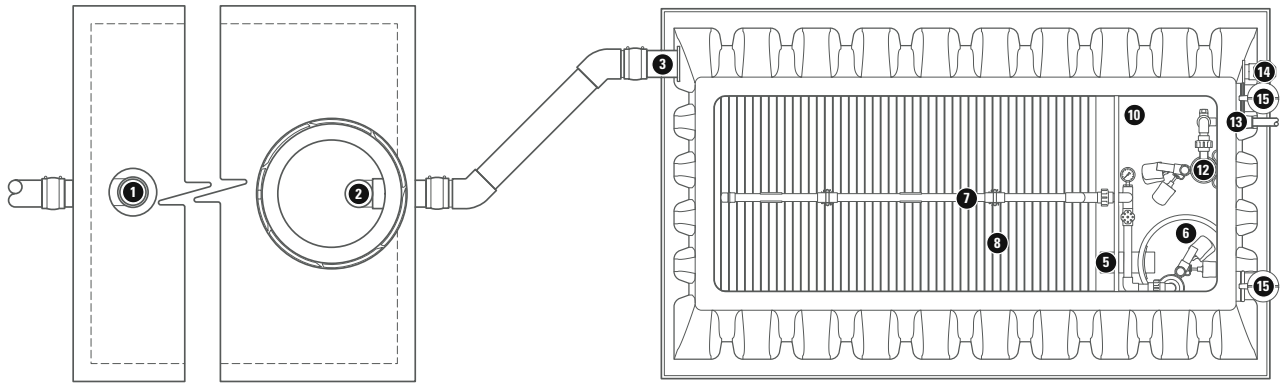
Figure 1. AdvanTex® AX-RT Functional Areas and Components (AX20-RT Shown):

1. Septic Tank Inlet Tee
2. Biotube® Effluent Filter
3. AX-RT Inlet and Tee
4. Treatment Tank (Recirc/Blend Chamber)
5. Recirc Transfer Line
6. Recirc Pumping System
7. Manifold and Spin Nozzles
8. Textile Media
9. Tank Baffle
10. Treatment Tank (Recirc/Filtrate Chamber)
11. Recirc-Return Valve
12. Discharge Pumping System
13. AX-RT Outlet
14. Passive Air Vent
15. External Splice Box
16. Control Panel (Not Shown)



Side view, septic tank

Side view (AX20-RT pump discharge model)



Top view, septic tank

Top view (AX20-RT pump discharge model)

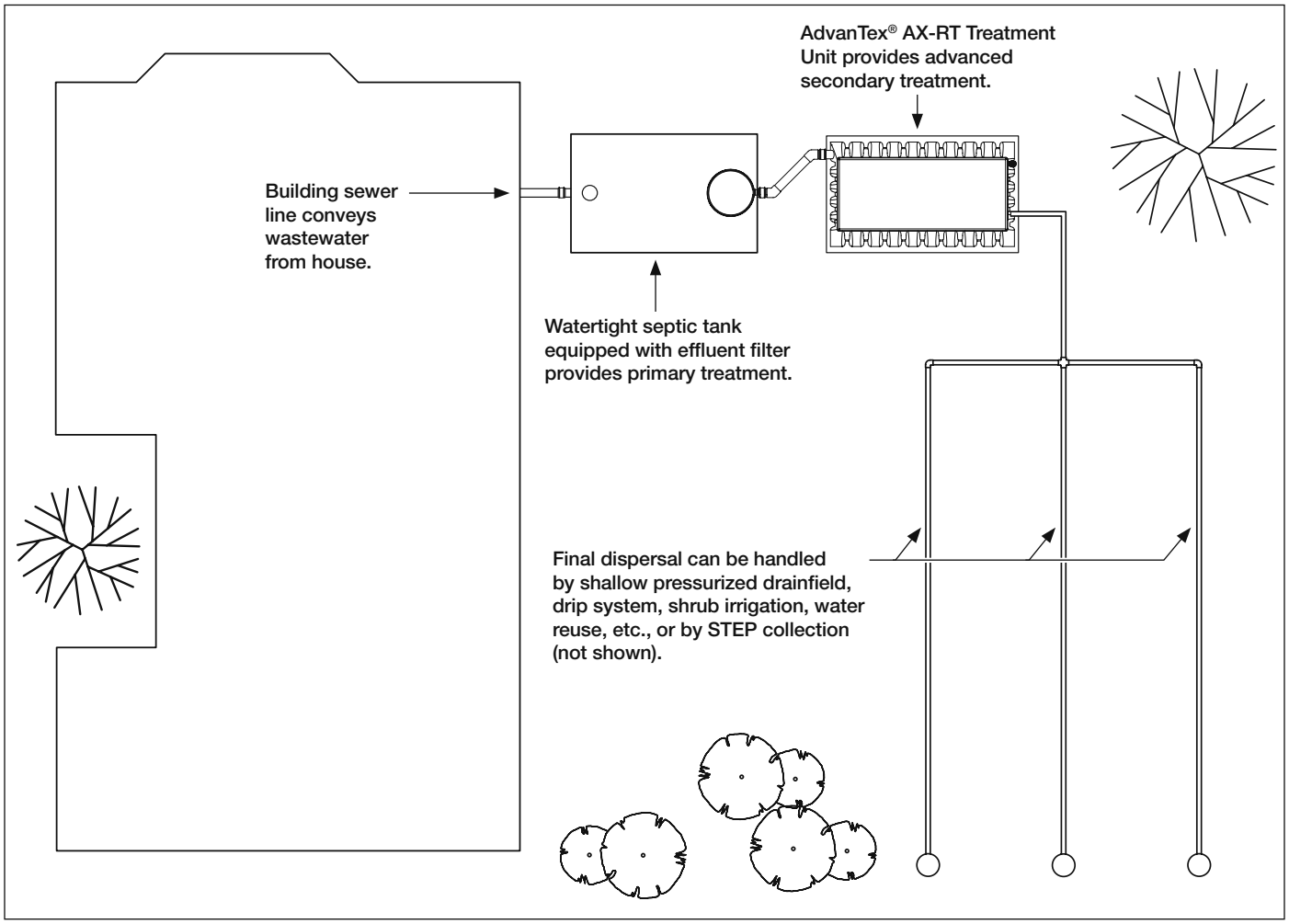
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Introduction to AdvanTex AX-RT, continued

The recirc pump's operation is controlled by a timer in the control panel. It allows the pump to dose the textile media for short periods (usually a 1-1.5 minutes), typically 72 times a day. These frequent "micro-doses," which optimize the treatment process, occur 24 hours a day, to maintain the proper biological environment.

Treated effluent can be discharged to the drainfield by means of a discharge pump system or by gravity discharge. The "High Level Alarm" and "ON" floats for the discharge pump are set at the factory and are non-adjustable. Dose volume for the discharge pump system is determined by adjustments to the "OFF" float. AX-RT units with gravity discharge simply discharge when the level of treated effluent in the recirc/filtrate chamber is at the level of the discharge outlet. For units equipped with UV disinfection, the effluent passes through the UV treatment unit before being pumped or flowing by gravity to final dispersal.

Typical Site Plan for an AdvanTex AX-RT Treatment Unit



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AdvanTex O&M Manual: Changes Specific to the AX-RT

The following shows AX-RT-specific information not found in Parts 1 and 2 of the *AdvanTex® O&M Manual* that are relevant to operating and maintaining the AdvanTex AX-RT Treatment Unit. Use the general information found in the *O&M Manual* along with this information to start up and properly service AX-RT systems.

Start-Up Checklist Changes

Primary Treatment

Note: *All pumping equipment is contained in the AX-RT unit. Substitute the checklist item below for the checklist items in the "Process Tank Pumping Equipment" and "Process Tank Pumping System" sections.*

Septic Tank

☐ Biotube® filter installed correctly on the septic tank outlet.

Note: *There is no recirculating splitter valve (RSV) or separate discharge basin in an AX-RT system. Floats in the recirculation pump system are set at the factory for correct performance. Do not adjust the floats in the recirculation pump system. Substitute the checklist items below for the checklist items in the "Secondary Treatment" section.*

Secondary Treatment

AX-RT Unit

☐ AX-RT unit installed level.

☐ All piping properly covered and compacted.

Ventilation System

☐ Passive air vent on AX-RT unit properly installed.

Recirculation Pump System

☐ Floats operate properly.

☐ Pump plumbing connected correctly to manifold.

Recirculation Pump System Operation

☐ Pump operates in "Manual."

☐ Pump operates in "Automatic."

☐ Pump run amps:_____

☐ Pump rest volts:_____ run volts:_____

AX-RT Filter Operation

☐ Complete, square spray square pattern with full coverage of sheets

☐ Manifold pressure:_____
(Typically 3.0-3.5 psi or 20.7-24.1 kPa.)

AX-RT Discharge Unit (pump discharge only)

☐ Floats operate properly.

☐ Pump discharge plumbing connected correctly.

☐ "Off" float adjusted for correct discharge dose to dispersal.

Setting Timers for New Systems

Initial timer settings for an AX-RT should be established based upon expected average daily flows and a recirculation ratio of 4:1 (filter recirculation ratio). Table 1 provides recommended timer settings. If flows vary significantly from expected flows, timer settings should be adjusted accordingly. Contact Orenco for more information.

Table 1. Recommended Timer Settings for New Systems

Models AX20-RT, AX20-RTUV	Number of Residents	Time On Setting Min (Sec)	Avg Daily Flow, gpd (L/day)	Time Off Setting Min
	2	0.8 (45)	100 (379)	30
	3	0.8 (45)	150 (568)	20
	4	0.8 (45)	200 (757)	15
	5	0.8 (45)	250 (946)	15
	6	0.8 (45)	300 (1136)	10
	7	0.8 (45)	350 (1325)	10
	8	0.8 (45)	400 (1514)	8
Model AX25-RT	**Number of Residents**	**Time On Setting Min (Sec)**	**Avg Daily Flow, gpd (L/day)**	**Time Off Setting Min**
	2	1.0 (60)	100 (379)	40
	3	1.0 (60)	150 (568)	30
	4	1.0 (60)	200 (757)	20
	5	1.0 (60)	250 (946)	15
	6	1.0 (60)	300 (1136)	15
	7	1.0 (60)	350 (1325)	10
	8	1.0 (60)	400 (1514)	10
	9	1.0 (60)	450 (1703)	8
	10	1.0 (60)	500 (1893)	8
	11	1.0 (60)	550 (2082)	7
	12	1.0 (60)	600 (2271)	7

- *Assumes water usage of 50 gal. (190 L) per person per day and a return recirculation ratio of 3:1. (Filter recirculation ratio of 4:1.)*
- *Override OFF cycle time is set at one-half of the OFF cycle time. Override ON cycle time is set the same as the ON cycle time.*

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Setting Discharge Dose Volume

The AX-RT is pre-set at the factory for a discharge dose volume of 43 gal/dose (162 L/dose). If necessary, use the discharge pump "Off" float to make adjustments to the discharge dose volume. Each 1-in. (12.7 mm) increase or decrease in "Off" float height is equal to approximately 8.7 gal. (33 L) change in dose volume.

Do not adjust the settings of the "High-Level Alarm" and "On" floats.

Table 2. Dose Volume Information

Pump gal./min (L/sec)	10 (0.6)	20 (1.3)	30 (1.9)	50 (3.2)
Factory float setting*, in. (mm)	30 (762)	30 (762)	30 (762)	30 (762)
Lowest "Off" setting, in. (mm)	16 (406)	18 (457)	20 (508)	24 (610)
Max dose volume, gal. (L)	156 (591)	139 (526)	123 (466)	90 (341)

**Settings are measured from the bottom of the discharge side of the AX-RT unit.*

Perform Field Sampling

When you arrive at the site, remove the lid from the AX-RT and take your sample from the recirc/filtrate side of the AX-RT unit before doing anything else, so that the sample won't be contaminated by material that you stir up while working.

When you collect effluent samples, be careful not to touch the textile sheets, unit walls, or other components. Disturbing the sheets, walls, or other components could contaminate the samples. Also, be sure to thoroughly clean and dry your sampling device between uses to avoid cross-contamination.

Measure Sludge and Scum

Measure sludge and scum in the septic tank AND on the recirc/blend side of the AX-RT unit. Follow the instructions for pumpouts found in the *AdvanTex O&M Manual* for the process tank.

NOTE: *A light buildup of solids is expected to form in the AX-RT unit over time. After the second year that the system is in use, we recommend measuring solids accumulation in the AX-RT whenever you perform regularly scheduled maintenance.*

If more than trace amounts of scum or solids are found in the recirc/blend side of the AX-RT unit, check the recirc/filtrate side of the unit for solids and scum, schedule a pumpout, and begin troubleshooting the system. The Advanced Service Tips and Troubleshooting Guide can help you determine the cause. You may need to change timer settings or discuss household habits with the system users.

Notes

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HOMEOWNER'S MANUAL

Onsite Wastewater Collection & Treatment Systems

How to Take Care of Your Wastewater System



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How to Take Care of Your Wastewater System

Congratulations!

Your home includes reliable, carefully engineered equipment — manufactured by Orenco Systems®, Inc. — for the collection and/or treatment of household wastewater.



And your service provider should have a copy of this manual. It's available on our Document Library, at www.orenco.com. Or call 800-348-9843 (541-459-4449) and we'll send you another.

When properly designed and installed, onsite wastewater treatment does a terrific job of decomposing household waste and recycling precious water resources. Our systems use little energy and frequently outperform municipal sewage treatment plants. The treated effluent is often returned harmlessly to the soil, where it receives final polishing and filtration for groundwater recharge. There's no degrading of our nation's rivers and oceans . . . which is so often the case with municipal sewage.

As with any engineered system, such as your car or your heat pump, your onsite wastewater system will work better and last longer if it is regularly maintained by a qualified service provider. Your service provider should be present during installation, so he or she is familiar with your system, especially those service lines, conduits, and connections that get buried.

Your system will also work better and last longer if you learn what can go into it — and what can not. Little effort is required. Just read and practice the "do's and don'ts" that follow. Every member of your household should be familiar with these. And if you have guests who want to "help out in the kitchen," be sure to tell them, too. With this preventive maintenance, along with periodic inspections, your onsite wastewater system should function for decades. And you'll save water, energy and pumpout costs, too!

There's a place on the back of this Homeowner's Manual to record "Important System Facts." If those have not been filled in for you, please record those now, before you file or shelve this manual. And give a copy of these facts to your service provider, especially if your service provider changes. You'll be glad you did.

Do's and Don'ts for INSIDE the House

There are a number of do's and don'ts that will help ensure a long life and minimal maintenance for your system. As a general rule, nothing should be disposed into any wastewater system that hasn't first been ingested, other than toilet tissue, mild detergents, and wash water. Here are some additional guidelines.



Don't flush dangerous and damaging substances into your wastewater treatment system. (Please refer to the "Substitutes for Household Hazardous Waste," on the next panel.) Specifically, do not flush . . .

- Pharmaceuticals
- Excessive amounts of bath or body oils
- Water softener backwash
- Flammable or toxic products
- Household cleaners, especially floor wax and rug cleaners
- Chlorine bleach, chlorides, and pool or spa products
- Pesticides, herbicides, agricultural chemicals, or fertilizers



Don't use special additives that are touted to enhance the performance of your tank or system. Additives can cause major damage to other areas in the collection system. The natural microorganisms that grow in your system generate their own enzymes that are sufficient for breaking down and digesting nutrients in the wastewater.



Do collect grease in a container and dispose with your trash. And avoid using garbage disposals excessively. Compost scraps or dispose with your trash, also. Food by-products accelerate the need for septage pumping and increase maintenance.



Do keep lint out of your wastewater treatment system by cleaning the lint filters on your washing machine and dryer before every load. Installing a supplemental lint filter on your washing machine would be a good precautionary measure. (This normally takes just a few minutes. Lint and other such materials can make a big difference in the frequency and cost of pumping out your primary treatment tank.)



Do use your trash can to dispose of substances that cause maintenance problems and/or increase the need for septage pumping.

Don't ever flush the following down the drain:

- Egg shells, cantaloupe seeds, gum, coffee grounds
- Tea bags, chewing tobacco, cigarette butts
- Condoms, dental floss, sanitary napkins, diapers
- Paper towels, newspapers, candy wrappers
- Rags, large amounts of hair
- "Flushable" wipes, baby wipes, medicated wipes, cleaning wipes



Don't plumb water softener discharge brine into your wastewater system. (The softened WATER is OK, just not the BRINE that's produced during the regeneration cycle.)

Do route the brine around your wastewater system so it discharges directly into the soil. This is a cost-effective solution that ensures the long-term performance of your system and the biological processes that occur inside it.

Water softener brine interferes with nitrogen removal. And it degrades treatment by interfering with the settling process inside the tank. Without proper settling, solids, grease, and oils are carried through your system, clogging components. This increases your costs by...

- requiring the tank to be pumped more often (at hundreds of dollars per pumpout)
- requiring filters to be cleaned more often
- fouling drainfields and other downstream equipment

Do's and Don'ts for INSIDE the House



Don't ignore leaky plumbing fixtures; repair them. A leaky toilet can waste up to 2,000 gallons (7500 liters) of water in a single day. That's 10-20 times more water than a household's typical daily usage. Leaky plumbing fixtures increase your water bill, waste natural resources, and overload your system.



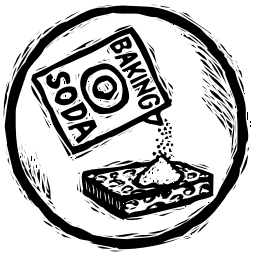
Don't use excessive amounts of water. Using 50 gallons (200 liters) per person per day is typical. If your household does not practice any of the "water conserving tips" below, you may be using too much water.

Do conserve water:

- Take shorter showers or take baths with a partially filled tub. Be cautious about excessive use of large soaking tubs.
- Don't let water run unnecessarily while brushing teeth or washing hands, food, dishes, etc.
- Wash dishes and clothes when you have a full load.
- When possible, avoid doing several loads in one day.
- Use water-saving devices on faucets and showerheads.
- When replacing old toilets, buy low-flush models.



Don't leave interior faucets on to protect water lines during cold spells. A running faucet can easily increase your wastewater flow by 1,000 to 3,000 gallons (4,000 to 12,000 liters) per day and hydraulically overload your system. Instead, properly insulate or heat your faucets and plumbing.



Do use substitutes for household hazardous waste. Replace the following hazardous products with products that are less environmentally harmful. The hazardous cleaners are listed below, followed by the suggested substitute.

Ammonia-based cleaners:

- For surfaces, sprinkle baking soda on a damp sponge.
- Or for windows, use a solution of 2 tbs (30 mL) white vinegar to 1 qt (1 L) water. Pour the mixture into a spray bottle.

Disinfectants:

Use borax: 1/2 cup (100 g) in a gallon (4 L) of water; deodorizes also.

Drain decloggers:

Use a plunger or metal snake, or remove and clean trap.

Scouring cleaners & powders:

Sprinkle baking soda on a damp sponge or add 4 tbs (50 g) baking soda to 1 qt (1 L) warm water. Or use Bon Ami® cleanser; it's cheaper and won't scratch.

Carpet/upholstery cleaners:

Sprinkle dry cornstarch or baking soda on, then vacuum. For tougher stains, blot with white vinegar in soapy water.

Toilet cleaners:

Sprinkle on baking soda or Bon Ami; then scrub with a toilet brush.

Furniture/floor polishes:

To clean, use oil soap and warm water. Dry with soft cloth. Polish with 1 part lemon juice and 2 parts oil (any kind), or use natural products with lemon oil or beeswax in mineral oil.

Metal cleaners:

- Brass and copper: scrub with a used half of lemon dipped in salt.
- Stainless steel: use scouring pad and soapy water.
- Silver: rub gently with toothpaste and soft wet cloth.

Oven cleaners:

Quickly sprinkle salt on drips; then scrub. Use baking soda and scouring pads on older spills.



Laundry detergents:

Choose a liquid detergent (not a powder) that doesn't have chlorine or phosphates.

Do's and Don'ts for OUTSIDE the House



Don't enter your tank, ever! Gases that can be generated in the tank and/or oxygen depletion can be fatal.

Do keep the tank access lid secure to the riser at all times with stainless steel lid bolts. If bolts are lost or damaged, call your service provider immediately for bolts. Or call Orenco at (800) 348-9843 or +1 (541) 459-4449. If the tank lid becomes detached from the riser or if the lid or riser becomes damaged, BLOCK ACCESS TO THE TANK OPENING IMMEDIATELY AND KEEP CHILDREN AWAY until all repairs are made.



Don't drive over your tank or any buried components in your system, unless they've been equipped with a special traffic lid. If the system is subject to possible traffic, put up a barricade or a row of shrubs.

Don't dig without knowing the location of your wastewater system. As much as possible, plan landscaping and permanent outdoor structures before installation. But easily removable items, such as bird baths and picnic tables, are OK to place on top of your system.

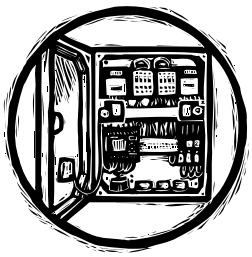


Don't dump RV waste into your wastewater system. It will increase the frequency of required septage pumping. When dumped directly into the pumping vault, RV waste clogs or fouls equipment, causing undue maintenance and repair costs. (Also, some RV waste may contain chemicals that are toxic or that may retard the biological digestion occurring within the tank.)



Don't ever connect rain gutters or storm drains to the sewer or allow surface water to drain into it. And don't discharge hot-tub water into your system. The additional water will increase costs and reduce the capacity of the collection and treatment systems. It can also wash excess solids through the tank, and, for properties with drainfields, additional water can flood the drainfield.

At the Control Panel



Do locate your electrical control panel where it will be protected from potential vandalism and have unobstructed access.

Do familiarize yourself with the location of your wastewater system and electrical control panel. Refer to the panel's model number when reporting a malfunction in the system.

Do make arrangements with a reliable service person to provide regular monitoring and maintenance, and place the service person's phone number on or in your control panel!

Do remember that the audible alarm can be silenced by pushing the lighted button located directly above the "Push to Silence" label on the front of the electrical control panel. Hold the button until the alarm goes off. With normal use, the tank has a reserve storage capacity good for about 24 hours.

Don't turn off the main circuit breaker to the wastewater pumps when going on vacation. If there is any infiltration or inflow into the system, the pumps will need to handle it.

IMPORTANT! CAUTION!

Only a qualified electrician or authorized installer/operator should work on your control panel. Before anyone does any work on either the wiring to the level control floats and pumps in the vault or on the control panel itself, it is imperative to first switch the isolation fuse/breaker and the circuit breakers in the panel to the "Off" positions, then switch "Off" the power to the system at the main breaker!

HOMEOWNER'S MANUAL

Onsite Wastewater Collection & Treatment Systems



Do keep an "as built" system diagram in a safe place for reference. And keep accurate records of maintenance and service calls. Make sure whoever services your tank keeps a complete record, and ask for a copy for your records.

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IMPORTANT SYSTEM FACTS

Distributor or Dealer:

Please fill out the following important information before giving out this Homeowner's Manual:

Distributor/Dealer Name

Distributor/Dealer Address

Distributor/Dealer Phone Number(s)

Authorized Service Provider Name

Authorized Service Provider Phone Number(s)

Authorized Installer Name

Authorized Installer Phone Number(s)

Engineer Name (if applicable)

Engineer Phone Number(s)

Regulatory Agency

Regulatory Contact Name

Regulatory Contact Phone Number(s)

Permit # (if applicable)

Property Address

Property Owner Name(s)

Start-Up Date

Control Panel Model # and UL #

AdvanTex® Model # (if applicable)

AdvanTex® Serial # (if applicable)

NSF/ANSI STANDARD 40

AdvanTex® Treatment System AXN Models meet the requirements of NSF-ANSI Standard 40 for Class I Systems.

ABR-OM-1
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Orenco Systems®, Inc.

Technical Data Sheet

External Splice Box

Orenco Systems® Incorporated
800-348-9843

Applications

The Orenco® External Splice Box attaches outside the access riser of an underground tank. It is engineered specifically for water and wastewater treatment systems and is especially suited for use in locations prone to high groundwater and other wet conditions. Its separate conduit hubs, large volume, and optional dividers make it useful for maintaining isolation of high and low voltage wires where needed. It has four cord grips which accommodate power cords for floats and pumps of 0.170 - 0.470 inches (4.3 - 11.9 mm) in diameter. Unused cord grips can be plugged watertight with the supplied cord grip plugs. Each External Splice Box is provided with a hole-cutting template to simplify installation on the riser and a 4-inch (100-mm) diameter grommet for the riser penetration.

General

To specify the Orenco External Splice Box for your installation, require the following:

- Watertight for prolonged submergence per UL listing (Type 6P)
- Attachment external to access riser to allow inspection with no need to open the riser lid
- Volume of 100 $in.^3$ (1639 cm^3) for easy wiring access and to accommodate multiple wiring configurations
- Bottom entry, so conduit or direct-bury cable always remains below minimum burial depth
- Molded of UL (f1) rated plastic, resistant to cold and UV exposure, suitable for external applications
- Optional divider plates available for isolating high and low voltage wires from separate conduits or direct-bury cable

Standard Models

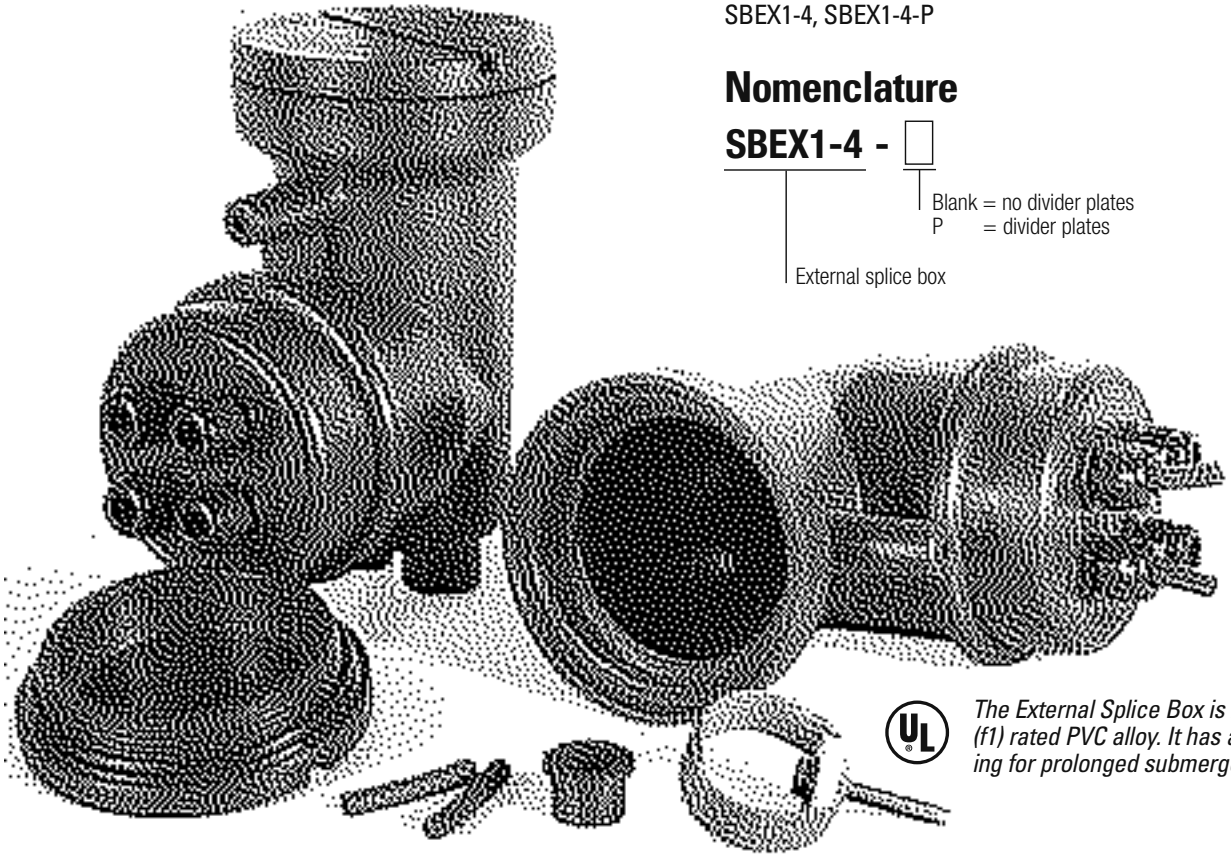
SBEX1-4, SBEX1-4-P

Nomenclature

SBEX1-4 - ☐

Blank = no divider plates
P = divider plates

External splice box



The External Splice Box is molded of a UL (f1) rated PVC alloy. It has a UL Type 6P listing for prolonged submergence.

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1 REQUIRED

External Splice Box (continued)

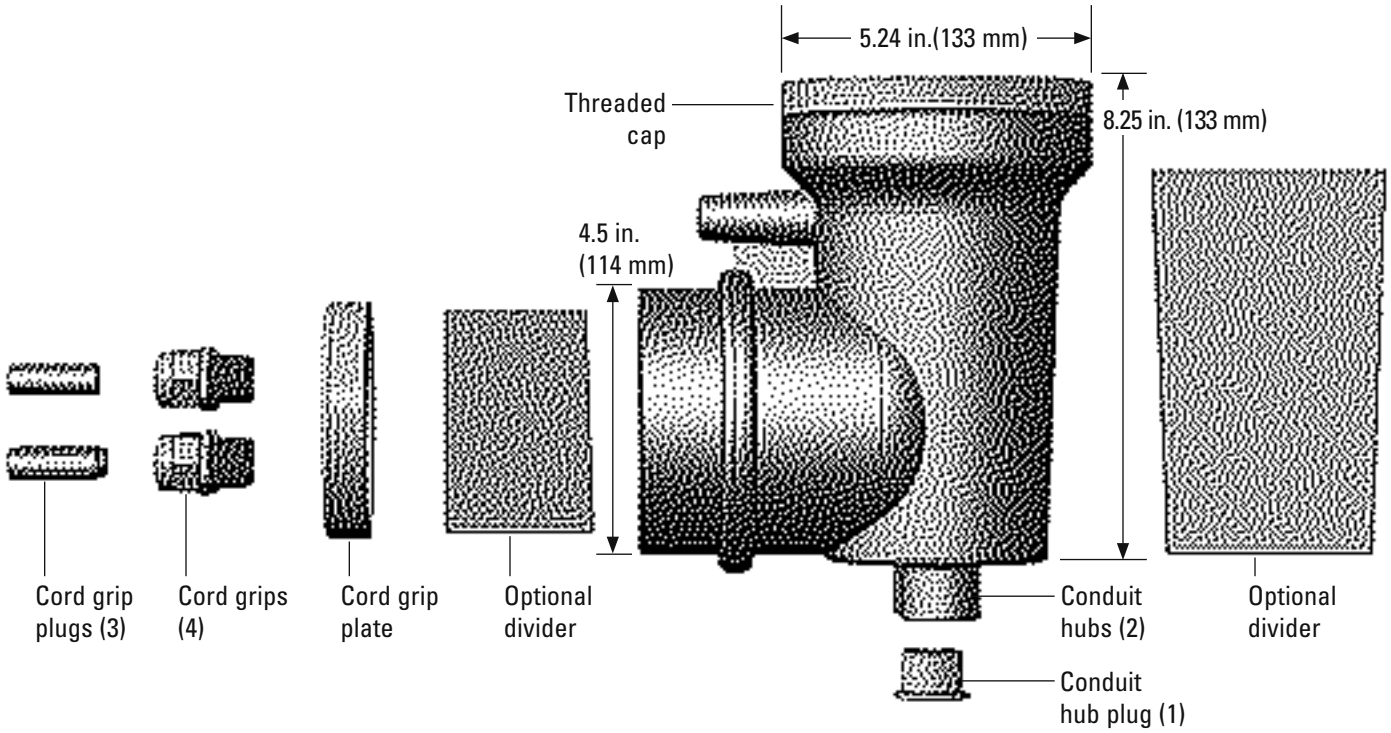
Physical Specifications

Volume	100 in.^{3} (1639 cm^3)
Cord grips	4 per SBEX
Cord grip plugs	3 per SBEX
Cord diameters accommodated	0.170- 0.470 in. (4.3 - 11.9 mm)
Conduit hubs	2
Conduit hub plug	1
Conduit sizes accommodated	¾ in. 1 in. (with coupling) ½ in. (with fitting or bell end)
Diameter of hole into riser	5 in. (127 mm) (hole-cutting template included)

Materials of Construction

Splice box	PVC alloy
Cord grips	Nylon
Cord grip plugs	EPDM rubber
O-rings	Buna rubber
Conduit hub plug	PVC per ASTM D-1784
4-in. (100-mm) grommet*	EPDM rubber

** Grommet not shown in illustration below*



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Installation Manual

VeriComm Control Panel
VCOM-AX20B1 /PT UV Drip
Manual# EIN-CP-AX-125

Orenco Systems®
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97479-9012

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FACSIMILE:
(541) 459-2884

This Manual Contains:

Description	Document Number
1. VCOM Panel Installation Instructions	EIN-CP-GEN-4
2. Panel Wiring Diagram	EDW-WD-AX-89
3. Recirc. Float Arrangement & Splice Box Wiring Diagram	EDW-FS-AX-2
4. Discharge Float Arrangement & Splice Box Wiring Diagram	EDW-FS-AX-4
5. VCOM-AXB/PT UV Drip Operation	EIN-CP-OP-1226

EIN-CP-AX-125
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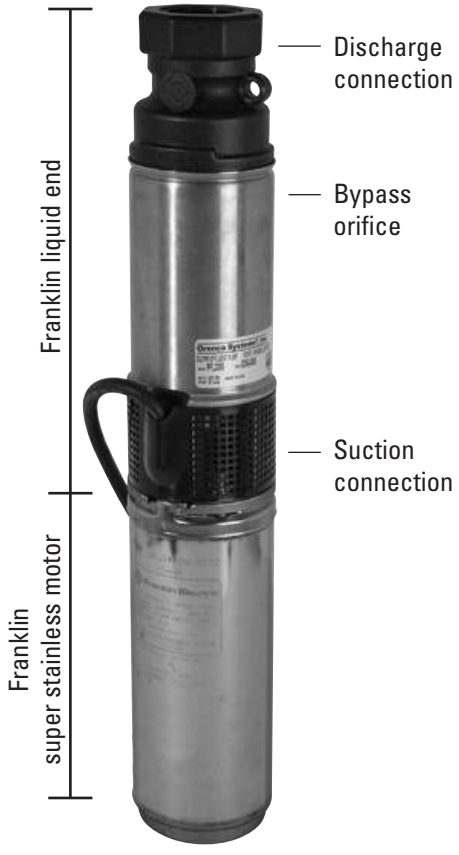
PF Series High-Head Effluent Pumps

Technical Data Sheet

Applications

Our submersible High-Head Effluent Pumps are designed to transport screened effluent (with low TSS counts) from septic tanks or separate dosing tanks. All our pumps are constructed of lightweight, corrosion-resistant stainless steel and engineered plastics; all are field-serviceable and repairable with common tools; and all standard 60-Hz PF Series models are CSA certified to the U.S. and Canadian safety standards for effluent pumps, meeting UL requirements.

Orenco's High-Head Effluent Pumps are used in a variety of applications, including pressurized drainfields, packed bed filters, mounds, aerobic units, effluent irrigation, effluent sewers, wetlands, lagoons, and more. These pumps are designed to be used with a Biotube® pump vault.



Features/Specifications

To specify this pump for your installation, require the following:

- Minimum 24-hour run-dry capability with no deterioration in pump life or performance*
- 1/8-inch (3-mm) bypass orifice (patent pending) to ensure flow recirculation for motor cooling and to prevent air bind
- Liquid end repair kits available for better long-term cost of ownership
- TRI-SEAL™ floating impeller design on 10-, 20-, and 30-gpm models; floating stack design on 50-gpm models
- Super stainless Franklin Electric motor, rated for continuous use and frequent cycling
- Type SOOW motor cable (suitable for Class I, Division 1 and Division 2 applications)
- Five-year warranty from date of manufacture against defects in materials or workmanship

* Not applicable to 5-hp models

Standard Models

See specifications chart, pages 2-3, for a complete list.

Nomenclature

PF □□ □□ □ □-□□ PF2010-12

Cord length:
Blank = 10'
20 = 20'
30 = 30'
50 = 50'

Note: Three-phase cords available only in 10-foot or 30-foot lengths.

Voltage (nameplate):
1 = 115 (1/2 hp only)
200 = 200
2 = 230 (220 if 50 Hz)
4 = 460

Frequency:
1 = single-phase 60 Hz
3 = three-phase 60 Hz
5 = single-phase 50 Hz

Horsepower:
05 = 1/2 hp
07 = 3/4 hp
10 = 1 hp
15 = 1-1/2 hp
20 = 2 hp
30 = 3 hp
50 = 5 hp

Nominal flow (gpm):
10
20
30
50

Pump (PF Series)

C US LR80980

Orenco Systems®
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Changing the Way the World Does Wastewater®

800-348-9843
www.orenco.com

NTD-PU-PF-1
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PF Series High-Head Effluent Pumps (continued)

Specifications

60 Hz

Model	Design gpm (L/sec)	Horsepower (kW)	Phase	Nameplate voltage	Actual voltage	Design flow amps	Max amps	Impellers	Discharge size and material[1]	Length, in. (mm)	Min. liquid level,[2] in. (mm)	Weight,[3] lb (kg)	Rated cycles/day
PF100511	10 (0.6)	0.5 (0.37)	1	115	120	12.7	12.7	6	1 1/4 in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100512	10 (0.6)	0.5 (0.37)	1	230	240	6.3	6.3	6	1 1/4 in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF10053200	10 (0.6)	0.5 (0.37)	3	200	208	3.8	3.8	6	1 1/4 in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100712[4, 5]	10 (0.6)	0.75 (0.56)	1	230	240	8.3	8.3	8	1 1/4 in. GFP	25.9 (658)	17 (432)	30 (14)	300
PF10073200[4, 5]	10 (0.6)	0.75 (0.56)	3	200	208	5.1	5.2	8	1 1/4 in. GFP	25.4 (645)	17 (432)	31 (14)	300
PF101012[4, 5]	10 (0.6)	1 (0.75)	1	230	240	9.6	9.6	9	1 1/4 in. GFP	27.9 (709)	18 (457)	33 (15)	100
PF10103200[4, 5]	10 (0.6)	1 (0.75)	3	200	208	5.5	5.5	9	1 1/4 in. GFP	27.3 (693)	18 (457)	37 (17)	300
PF102012[6, 7, 8]	10 (0.6)	2 (1.49)	1	230	240	12.1	12.1	18	1 1/4 in. SS	39.5 (1003)	22 (559)	48 (22)	100
PF10203200[6, 8]	10 (0.6)	2 (1.49)	3	200	208	8.7	8.7	18	1 1/4 in. SS	37.9 (963)	20 (508)	44 (20)	300
PF200511	20 (1.5)	0.5 (0.37)	1	115	120	12.3	12.5	4	1 1/4 in. GFP	22.3 (566)	18 (457)	25 (11)	300
PF200512	20 (1.5)	0.5 (0.37)	1	230	240	6.4	6.5	4	1 1/4 in. GFP	22.5 (572)	18 (457)	26 (12)	300
PF20053200	20 (1.5)	0.5 (0.37)	3	200	208	3.7	3.8	4	1 1/4 in. GFP	22.3 (566)	18 (457)	26 (12)	300
PF201012[4, 5]	20 (1.5)	1 (0.75)	1	230	240	10.5	10.5	7	1 1/4 in. GFP	28.4 (721)	20 (508)	33 (15)	100
PF20103200[4, 5]	20 (1.5)	1 (0.75)	3	200	208	5.8	5.9	7	1 1/4 in. GFP	27.8 (706)	20 (508)	33 (15)	300
PF201512[4, 5]	20 (1.5)	1.5 (1.11)	1	230	240	12.4	12.6	9	1 1/4 in. GFP	34.0 (864)	24 (610)	41 (19)	100
PF20153200[4, 5]	20 (1.5)	1.5 (1.11)	3	200	208	7.1	7.2	9	1 1/4 in. GFP	30.7 (780)	20 (508)	35 (16)	300
PF300511	30 (1.9)	0.5 (0.37)	1	115	120	11.8	11.8	3	1 1/4 in. GFP	21.3 (541)	20 (508)	28 (13)	300
PF300512	30 (1.9)	0.5 (0.37)	1	230	240	6.2	6.2	3	1 1/4 in. GFP	21.3 (541)	20 (508)	25 (11)	300
PF30053200	30 (1.9)	0.5 (0.37)	3	200	208	3.6	3.6	3	1 1/4 in. GFP	21.3 (541)	20 (508)	25 (11)	300
PF300712	30 (1.9)	0.75 (0.56)	1	230	240	8.5	8.5	5	1 1/4 in. GFP	24.8 (630)	21 (533)	29 (13)	300
PF30073200	30 (1.9)	0.75 (0.56)	3	200	208	4.9	4.9	5	1 1/4 in. GFP	24.6 (625)	21 (533)	30 (14)	300
PF301012[4]	30 (1.9)	1 (0.75)	1	230	240	10.4	10.4	6	1 1/4 in. GFP	27.0 (686)	22 (559)	32 (15)	100
PF30103200[4]	30 (1.9)	1 (0.75)	3	200	208	5.8	5.8	6	1 1/4 in. GFP	26.4 (671)	22 (559)	33 (15)	300
PF301512[4, 5]	30 (1.9)	1.5 (1.11)	1	230	240	12.6	12.6	8	1 1/4 in. GFP	32.8 (833)	24 (610)	40 (18)	100
PF30153200[4, 5]	30 (1.9)	1.5 (1.11)	3	200	208	6.9	6.9	8	1 1/4 in. GFP	29.8 (757)	22 (559)	34 (15)	300
PF302012[4, 5, 7]	30 (1.9)	2 (1.49)	1	230	240	11	11	10	1 1/4 in. SS	35.5 (902)	26 (660)	44 (20)	100
PF30203200[4, 5]	30 (1.9)	2 (1.49)	3	200	208	9.3	9.3	10	1 1/4 in. SS	34.0 (864)	24 (610)	41 (19)	300
PF303012[6, 7, 8]	30 (1.9)	3 (2.23)	1	230	240	16.8	16.8	14	1 1/4 in. SS	44.5 (1130)	33 (838)	54 (24)	100
PF303032[6, 8]	30 (1.9)	3 (2.23)	3	230	240	10	10.1	14	1 1/4 in. SS	44.3 (1125)	27 (686)	52 (24)	300
PF305012[6, 7, 8]	30 (1.9)	5 (3.73)	1	230	240	25.6	25.8	23	1 1/4 in. SS	66.5 (1689)	53 (1346)	82 (37)	100
PF305032[6, 8]	30 (1.9)	5 (3.73)	3	230	240	16.6	16.6	23	1 1/4 in. SS	60.8 (1544)	48 (1219)	66 (30)	300
PF500511	50 (3.2)	0.5 (0.37)	1	115	120	12.1	12.1	2	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500512	50 (3.2)	0.5 (0.37)	1	230	240	6.2	6.2	2	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF50053200	50 (3.2)	0.5 (0.37)	3	200	208	3.7	3.7	2	2 in. SS	20.3 (516)	24 (610)	28 (13)	300
PF500712	50 (3.2)	0.75 (0.56)	1	230	240	8.5	8.5	3	2 in. SS	23.7 (602)	25 (635)	31 (14)	300
PF50073200	50 (3.2)	0.75 (0.56)	3	200	208	4.9	4.9	3	2 in. SS	23.1 (587)	26 (660)	32 (15)	300
PF500734	50 (3.2)	0.75 (0.56)	3	460	480	1.8	1.8	3	2 in. SS	34.8 (884)	25 (635)	31 (14)	300
PF501012	50 (3.2)	1 (0.75)	1	230	240	10.1	10.1	4	2 in. SS	27.0 (686)	26 (660)	35 (16)	100
PF50103200	50 (3.2)	1 (0.75)	3	200	208	5.7	5.7	4	2 in. SS	26.4 (671)	26 (660)	39 (18)	300
PF501512[4]	50 (3.2)	1.5 (1.11)	1	230	240	12.5	12.6	5	2 in. SS	32.5 (826)	30 (762)	41 (19)	100
PF50153200[4]	50 (3.2)	1.5 (1.11)	3	200	208	7	7	5	2 in. SS	29.3 (744)	26 (660)	35 (16)	300
PF503012[4, 5, 7, 8]	50 (3.2)	3 (2.23)	1	230	240	17.7	17.7	8	2 in. SS	43 (1092)	37 (940)	55 (25)	100
PF503032[4, 5, 8]	50 (3.2)	3 (2.23)	3	230	240	10.4	10.4	8	2 In SS	40 (1016)	30 (762)	46 (21)	300
PF50303200[4, 5, 8]	50 (3.2)	3 (2.23)	3	200	208	13.1	13.1	8	2 in. SS	43.4 (1102)	30 (762)	55 (25)	300
PF505032[6, 8]	50 (3.2)	5 (3.73)	3	230	240	16.5	16.5	13	2 in. SS	59.3 (1506)	49 (1245)	64 (29)	300
PF751512	75 (4.7)	1.5 (1.11)	1	230	240	12.1	12.3	4	2 in. SS	33.4 (848)	30 (762)	44 (20)	100

See notes on following page.

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PF Series High-Head Effluent Pumps (continued)

50 Hz Model	Design gpm (L/sec)	Horsepower (kW)	Phase	Nameplate voltage	Actual voltage	Design flow amps	Max amps	Impellers	Discharge size and material[1]	Length, in. (mm)	Min. liquid level,[2] in. (mm)	Weight,[3] lb (kg)	Rated cycles/day
PF100552	10 (0.6)	0.5 (0.37)	1	220	230	3.9	4.1	6	1 1/4 in. GFP	23 (584)	17 (432)	26 (12)	300
PF100752	10 (0.6)	0.75 (0.56)	1	220	230	6.2	6.2	9	1 1/4 in. GFP	26.8 (658)	17 (432)	30 (14)	300
PF300552	30 (1.9)	0.5 (0.37)	1	220	230	4.1	4.1	4	1 1/4 in. GFP	22.5 (572)	19 (483)	26 (12)	300
PF300752	30 (1.9)	0.75 (0.56)	1	220	230	6.1	6.1	5	1 1/4 in. GFP	24.8 (630)	19 (483)	29 (13)	300
PF301052	30 (1.9)	1 (0.75)	1	220	230	7.4	7.4	7	1 1/4 in. GFP	28.4 (721)	20 (508)	32 (15)	100
PF301552[4, 5]	30 (1.9)	1.5 (1.11)	1	220	230	9.3	9.3	8	1 1/4 in. GFP	35.4 (899)	24 (610)	40 (18)	100
PF500552	50 (3.2)	0.5 (0.37)	1	220	230	4	4	2	2 in. SS	20.3 (516)	25 (635)	29 (13)	300
PF500752	50 (3.2)	0.75 (0.56)	1	220	230	6.3	6.4	3	2 in. SS	23.7 (602)	25 (635)	31 (14)	300
PF501052	50 (3.2)	1 (0.75)	1	220	230	7.3	7.4	4	2 in. SS	27 (686)	26 (660)	35 (16)	100
PF501552	50 (3.2)	1.5 (1.11)	1	220	230	9.1	9.1	5	2 in. SS	32.5 (826)	30 (762)	42 (19)	100

[1] GFP = glass-filled polypropylene; SS = stainless steel. The 1 1/4-in. NPT GFP discharge is 2 7/8 in. octagonal across flats; the 1 1/4-in. NPT SS discharge is 2 1/8 in. octagonal across flats; and the 2-in. NPT SS discharge is 2 7/8 in. hexagonal across flats. Discharge is female NPT threaded, U.S. nominal size, to accommodate Orenco discharge hose and valve assemblies. Consult your Orenco Distributor about fittings to connect hose and valve assemblies to metric-sized piping.

[2] Minimum liquid level is for single pumps when installed in an Orenco Biotube Pump Vault or Universal Flow Inducer. In other applications, minimum liquid level should be top of pump. Consult Orenco for more information.

[3] Weight includes carton and 10-ft cord.

[4] High-pressure discharge assembly required.

[5] Do not use cam-lock option (Q) on discharge assembly.

[6] Custom discharge assembly required for these pumps. Contact Orenco.

[7] Capacitor pack included with pump. Custom control panel required.

[8] Torque locks are available for all pumps, and are supplied with 3-hp and 5-hp pumps.

Materials of Construction

Discharge:	Glass-filled polypropylene or stainless steel
Discharge bearing:	Engineered thermoplastic (PEEK)
Diffusers:	Glass-filled PPO (Noryl GFN3)
Impellers:	Celcon® acetal copolymer on 10-, 20, and 30-gpm models; 50-gpm impellers are Noryl GFN3
Intake screen:	Polypropylene
Suction connection:	Stainless steel
Drive shaft:	7/16 inch hexagonal stainless steel, 300 series
Coupling:	Sintered stainless steel, 300 series
Shell:	Stainless steel, 300 series
Motor:	Franklin motor exterior constructed of stainless steel. Motor filled with deionized water and propylene glycol for constant lubrication. Hermetically sealed motor housing assures moisture-free windings. All thrust absorbed by Kingsbury-type thrust bearing. Rated for continuous duty. Protected against thermal overload and equipped with surge arrestors for added security.

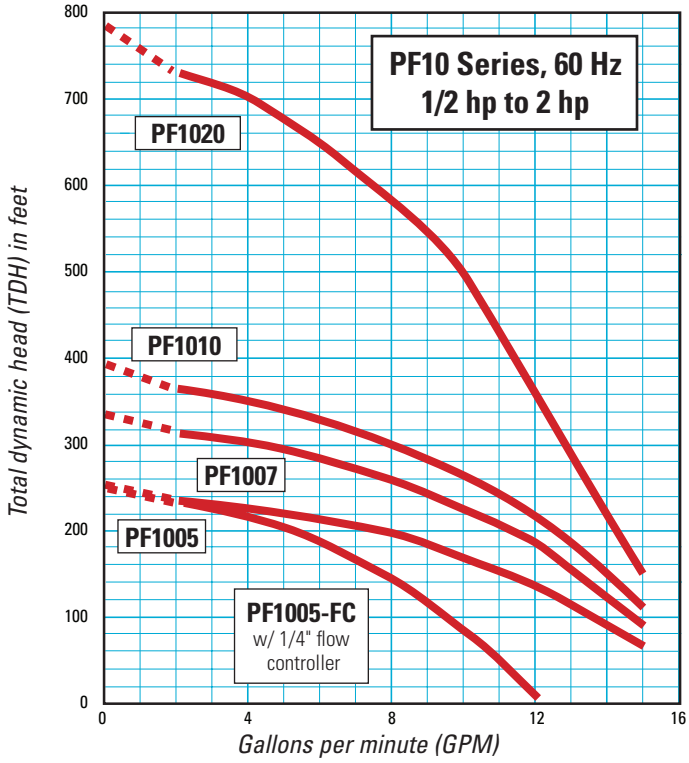
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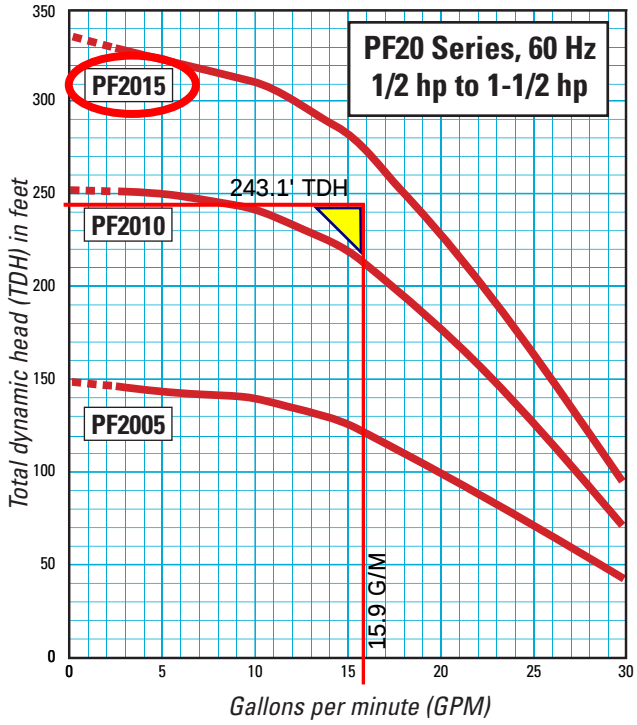
PF Series High-Head Effluent Pumps (continued)

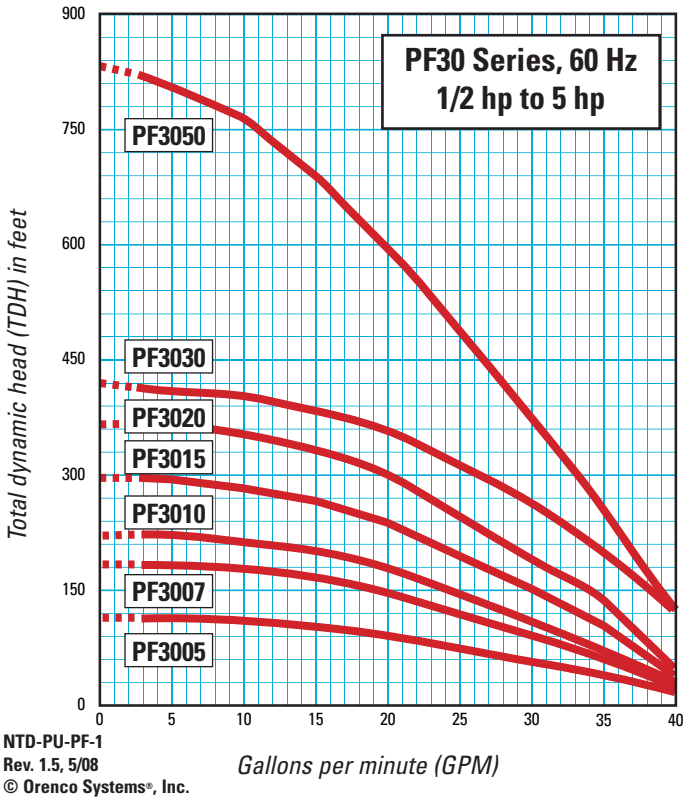
Using a Pump Curve

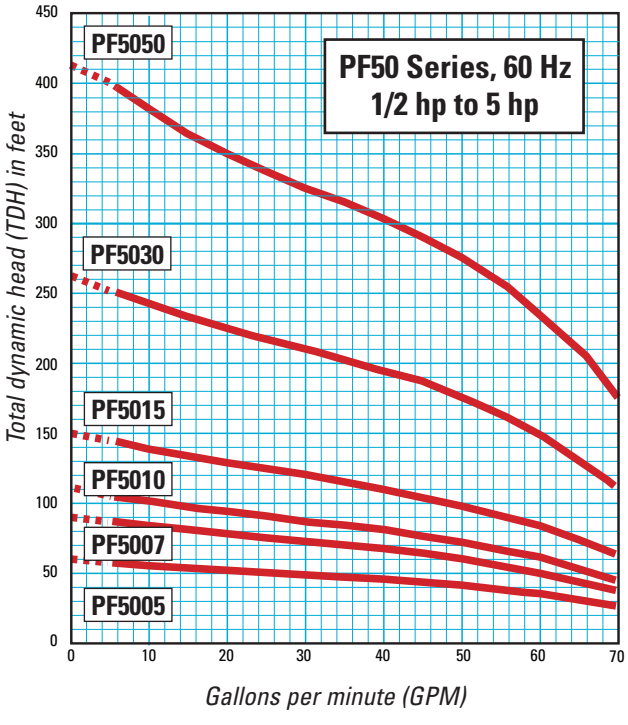
A *pump curve* helps you determine the best pump for your system. Pump curves show the relationship between flow (gpm or L/sec) and pressure (total dynamic head, or TDH), providing a graphical representation of a pump's optimal performance range. Pumps perform best at their *nominal flow rate*—the value, measured in gpm (or L/sec), expressed by the first two numerals in an Orenco pump nomenclature. At low flow rates, TDH varies from pump to pump, so it is represented as a dashed line in the pump curves. For most accurate pump specification, use Orenco's PumpSelect™ software.

60 Hz Models





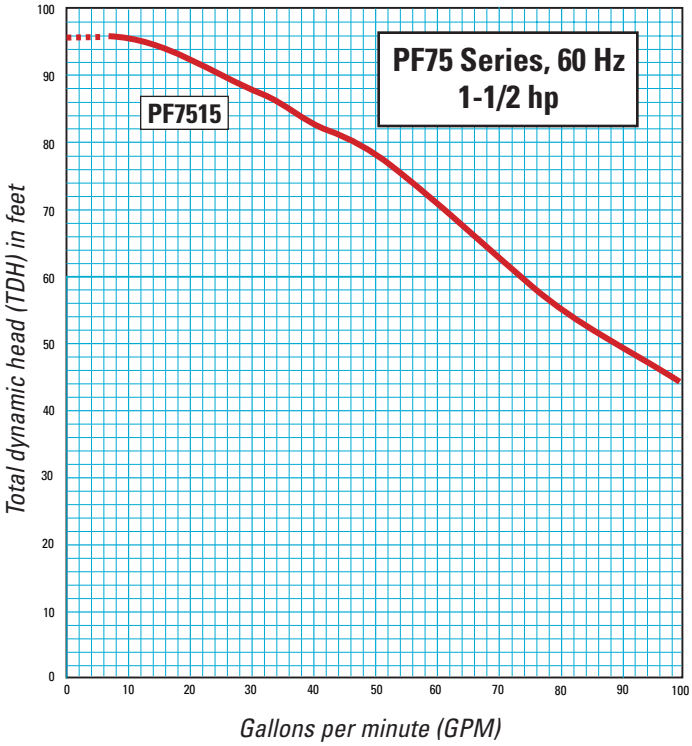




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PF Series High-Head Effluent Pumps (continued)

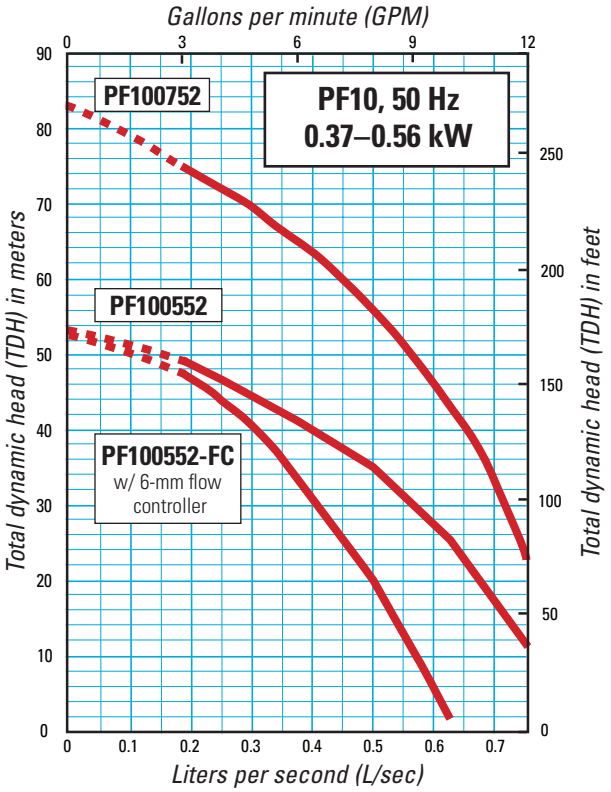
60 Hz Models (continued)

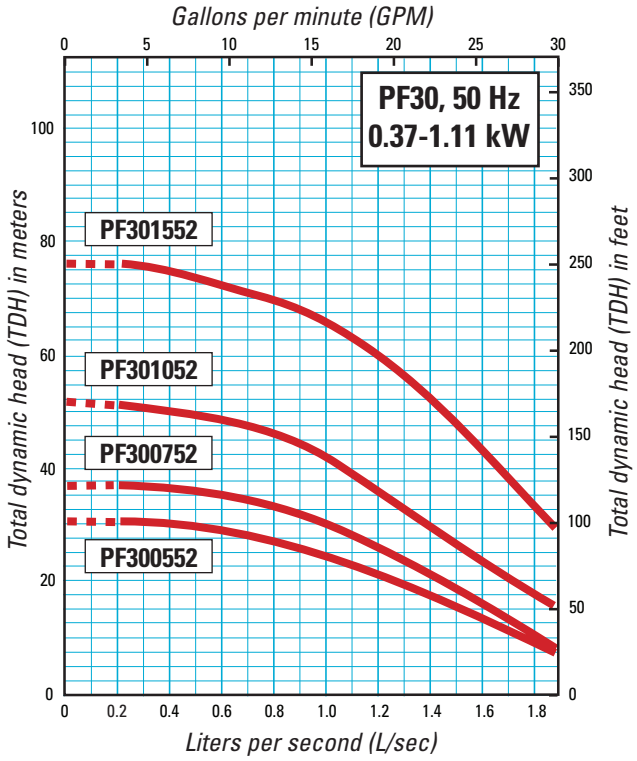


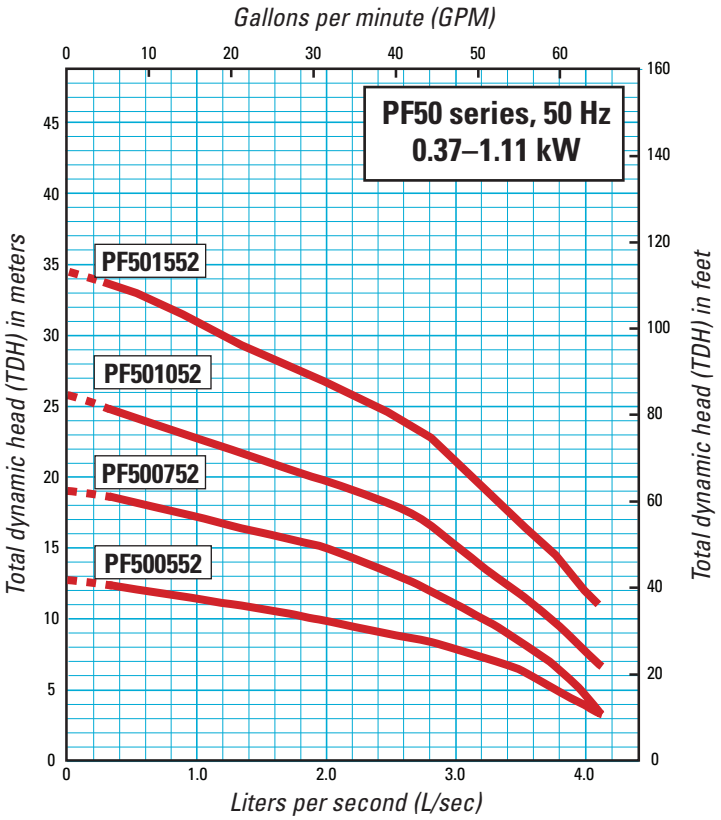
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PF Series High-Head Effluent Pumps (continued)

50 Hz Models

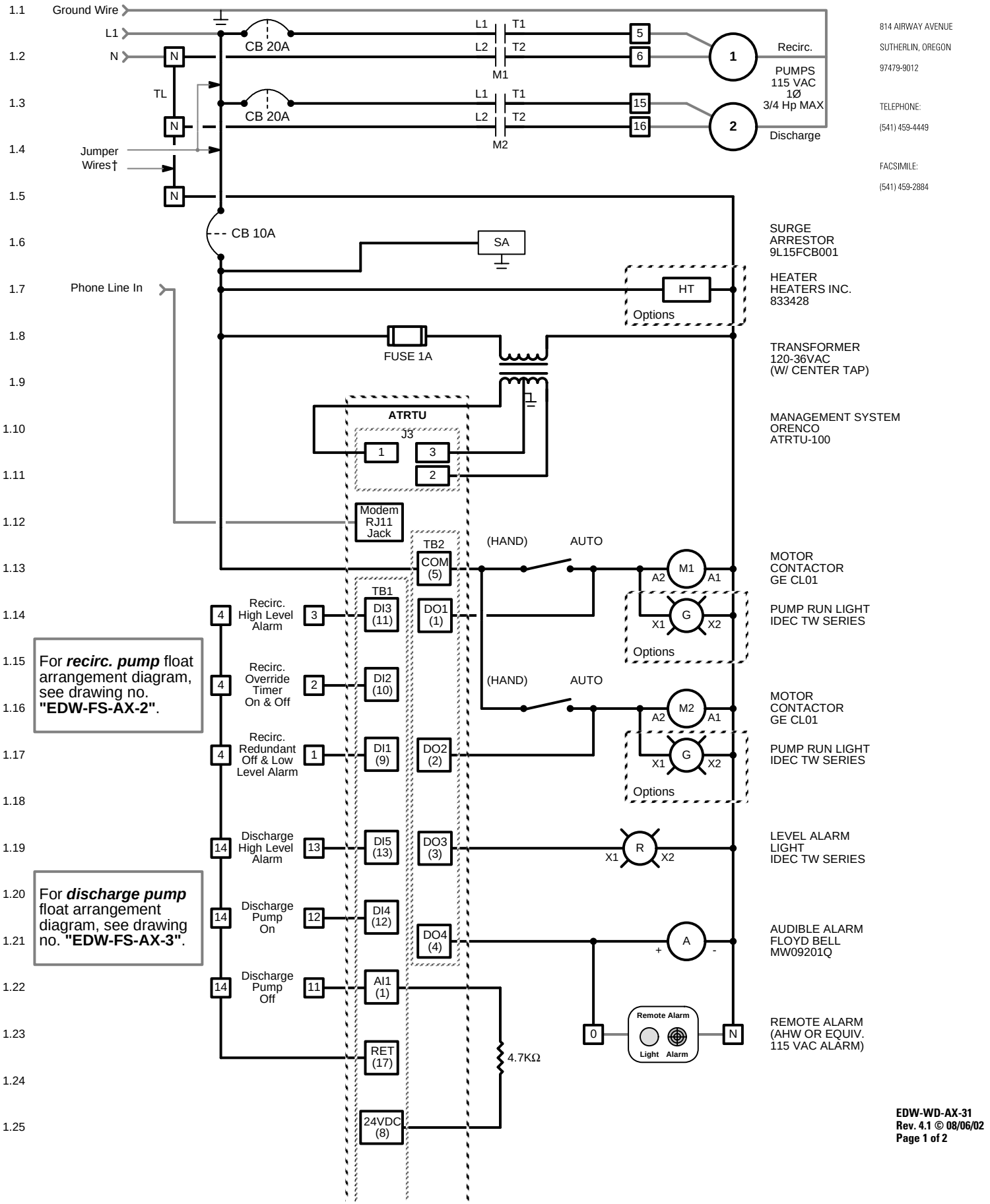






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Control Panel Wiring Diagram
AdvanTex™ Treatment Systems
Model VCOM-AXB1 SA, VCOM-AX20B1 SA

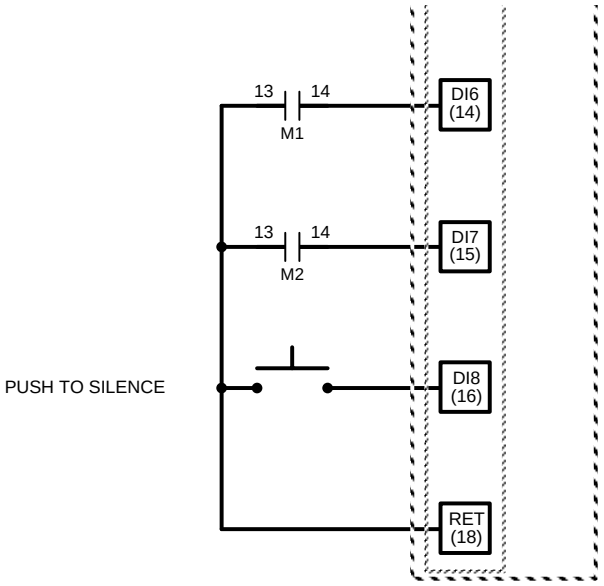


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97479-9012

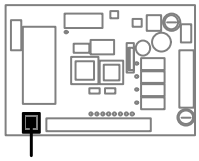
TELEPHONE:
(541) 459-4449

FACSIMILE:
(541) 459-2884



For VCOM-AXB operation description, see drawing no. **"EIN-CP-OP-611"**.

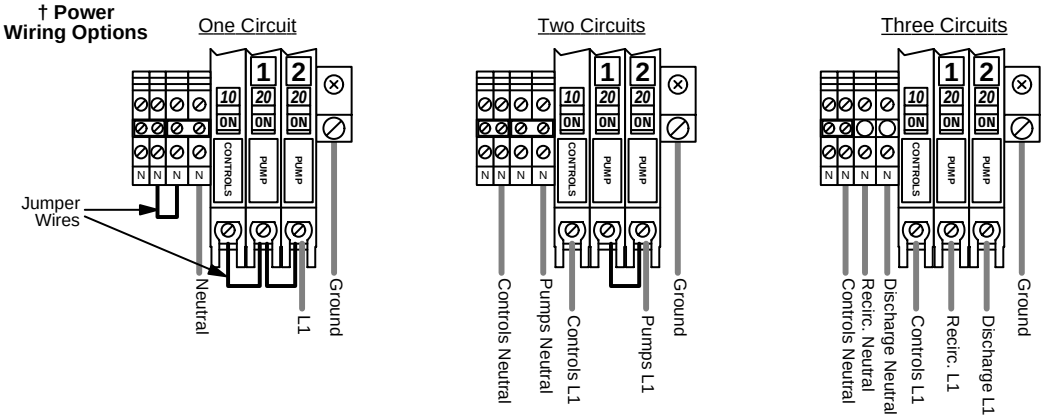
Telephone Line Connection



Orenco Model ATRTU-100

Connect phone line directly to RJ-11 jack on PC board.

† Power Wiring Options



Instructions:

Factory default. Wire as shown.

Remove the jumper wire between the pump 1 and controls circuit breakers and the jumper wire between the neutral blocks.

Remove all jumper wires. Remove the terminal link from the pump neutral blocks.

VCOM Panel Installation

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1-800-348-9843

This document contains general installation instructions for VeriComm® control panels. Consult all supplemental documents (Control Panel Wiring Diagram, Float Arrangement Diagram, etc.) before installation. Follow the outlined sequence below.

1 Getting Started

Read all instructions before proceeding with the installation. Improper installation may void warranties.

1. Inspect your order for completeness and inspect each component for shipment damages. If something is missing or damaged, contact your supplier to obtain replacement parts.

2. Check to ensure the instructions and items supplied conform to state and local regulations.

3. A qualified electrician must be employed to install and service the panel and ancillary wiring. The equipment must be installed in compliance with the National Electric Code, as well as state and local codes.



The VCOM panels are part of the VeriComm product line, and work in conjunction with the VeriComm® Monitoring System.

2 Control Panel Placement

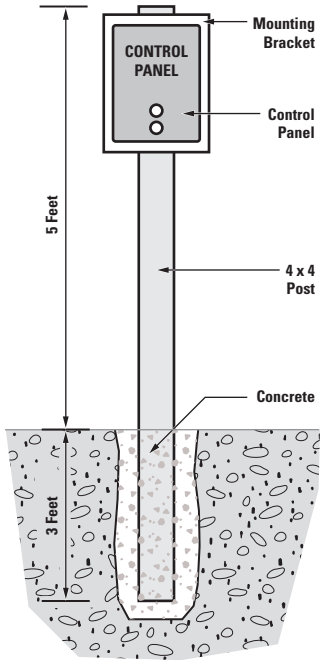
1. Physical installation of the control panel should be within view of the septic tank and located at a convenient height (about five feet above grade).

2. The panel should be securely fastened to a 4 x 4 post that has been concreted into the ground. Alternatively, the panel can be fastened to an exterior wall, subject to the restrictions below:

    - If the panel contains motor contactors, a thumping sound can be heard each time the pump is started or stopped. Therefore, *these panels should not be mounted on an exterior wall* unless it is in a location away from living areas, such as on a garage wall.

3. If possible, position the panel in the shade to protect it from weather. Extreme temperatures can cause inconsistent performance of the electrical components.

4. Check state and local electrical codes for proper placement of panels. Ensure that access to the panel is not obstructed.



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3 Float and Pump Installation

1. Install the electrical splice boxes for the floats and pumps before installing the actual floats and pumping equipment. The splice boxes are installed near the top of the riser, using the grommets provided.

2. Install the floats. Thread the float and pump cords through the cord grips into the PVC splice box, leaving adequate length of electrical cord coiled inside the riser to allow easy removal of the pump and float assembly.

3. Tighten the cord grips, using hand pressure or a wrench if necessary, until the cord will no longer move in the cord grip. If the cord grips are not tight enough, the seal will not be watertight, but over-tightening may damage the cord or the cord grip, so use only as much force as necessary.

4. Run the wires from the control panel to the splice box. The wires can be brought through a conduit, or can be buried using suitable direct-burial wire. Conduit that enters the splice box must be sealed, even if the wires are direct-buried, to prevent the infiltration of water into the splice box. Use an electrically approved sealant to plug the wires coming in through the conduit hub. The number of wires required depends on the control panel and the number of floats and pump(s) used.

   Consult the appropriate float arrangement diagram for the control panel and float arrangement being used.

   Wire should be sized at 14 AWG for the floats. Refer to the figure below to determine the proper size for the pump wires. When calculating wire size, the length and size of your branch circuit wires from the service entrance panel to the pump control panel must also be taken into account.

Recommended Breaker & Wire Size

Pump Motor Size	Breaker Size	Wire Size	Max Distance*
120 VAC 1/2 hp	20 amp	10 AWG	105 ft
240 VAC 1/2 hp	15 amp	14 AWG	161 ft
3/4 hp	20 amp	14 AWG	130 ft
1 hp	20 amp	12 AWG	172 ft
1-1/2 hp	20 amp	12 AWG	126 ft

* *This is the maximum distance from this sub-panel to the pump motor for the recommended wire size. Distance is based on 3% maximum voltage drop from sub-panel to load at maximum recognized pump motor amps at 75° C.*

5. All splices made in the splice box should use waterproof wire nuts or butt connectors and heat shrink tubing. Refer to Drawing EIN-SB-SB-1 for instructions on making waterproof splices. Refer to the appropriate float arrangement diagram for instructions on how to connect the floats together.

Note

- Do not remove the colored markers or the paper tags from the float cords. These should be left on the float cord, outside the splice box.
- Do not thread the markers and tags through the cord grips.
- Adequate length of cord should be left within the splice box to allow for easy removal for future disconnecting and re-splicing.
- A cord is secure and the connection watertight when the cord grip is tight enough to prevent slippage.
- Wire that is improperly sized (too small) can cause excessive voltage drop and poor pump performance.
- Splices that are not waterproof may cause a malfunction of the pump controls if water should leak into the splice box.

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4 Control Panel Connections

1. Connect the wires coming from the floats to the terminals in the control panel. Refer to the appropriate float arrangement diagram for the correct terminal connections for your system.

2. Connect the wires coming from the pumps to the pump terminals. Refer to the panel wiring diagram for the correct terminal connections for your system.

3. Connect the incoming power to the panel. Power to the panel must be appropriate to the control panel and pump motor (120 VAC, single-phase for a 120 VAC motor, 240 VAC single-phase for a 240 VAC motor, etc.).

4. Ensure that the panel is properly grounded and that the fuse or breaker and wire size, from the main power panel and to the pump, are correctly sized. A separate circuit for the pump controls and each of the pump motors is recommended.

   NOTE: *Voltage for the controls in the panel is always 120 VAC, although the pump voltage may be 120 VAC or 240 VAC.*

5. Use 60° minimum CU conductors only. Torque the terminal blocks to 15 LB-IN and the ground lugs to 45 LB-IN. Torque the circuit breakers to 20 LB-IN for 14-10 AWG wire, 25 LB-IN for 8 AWG wire, and 27 LB-IN for 6-4 AWG wire.

WARNING ▲

Do not service the pump or any electrical wiring in the pump vault without disconnecting the power at the circuit breaker and/or fuse.

Serious injury and/or damage to the system could result if the panel is not properly grounded. Ensure that the fuse, breaker, and wire size—from the main power panel and to the pump—are sized correctly.

The pump vault is a hazardous area and may contain explosive gases. Take appropriate precautions according to local, state, and federal regulations before commencing work in the pump vault.

It is the responsibility of the installer to comply with all local, state, and federal regulations that may govern the installation of systems of this nature. Failure to comply with such regulations may void the manufacturer's warranty and could possibly cause bodily injury.

5 Telephone Line Installation

The VeriComm control panels utilize a common phone line with the homeowner. These panels do not require a dedicated phone line.

1. Install a standard analog line from the homeowner's phone splice box to the VeriComm control panel.
   Recommended Part:
   Outdoor 4-conductor phone cable
   Radio Shack Cat. #: 278-386

2. If an RJ-11 crimping tool is available, crimp an RJ-11 plug directly to the phone wire and move to step 3. Otherwise, terminate the installed phone cable into a modular quick jack inside the panel.
   Recommended Parts:
   Modular quick jack
   Radio Shack Cat. #: 279-355
   2-ft. UL-listed line cord
   Radio Shack Cat. #: 279-334



3. Connect the phone line to the modular jack on the surge arrestor/DSL filter in the panel.

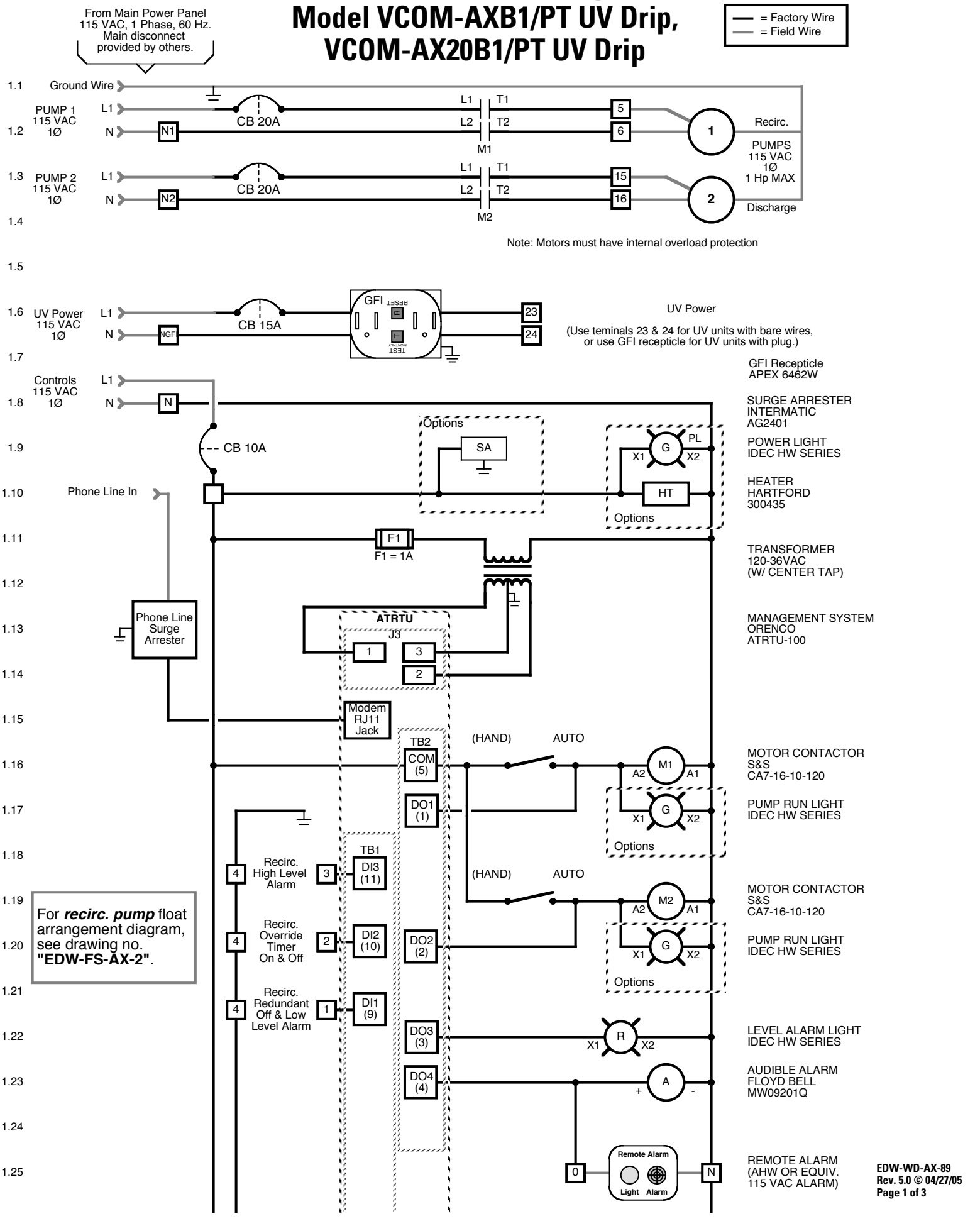
Note ◆

- Phone wires should not be run in the same conduit as power wires.

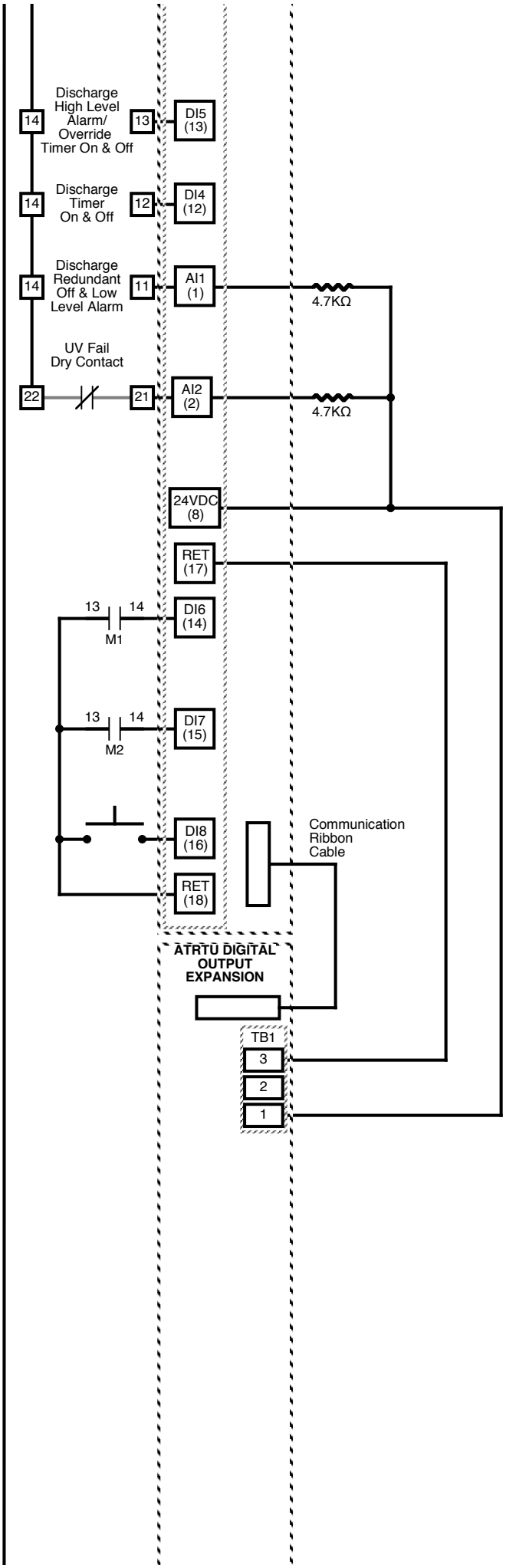
- The phone line surge arrester / DSL filter requires a good connection to ground to be effective. Ensure that this sub-panel is effectively grounded to the service panel.

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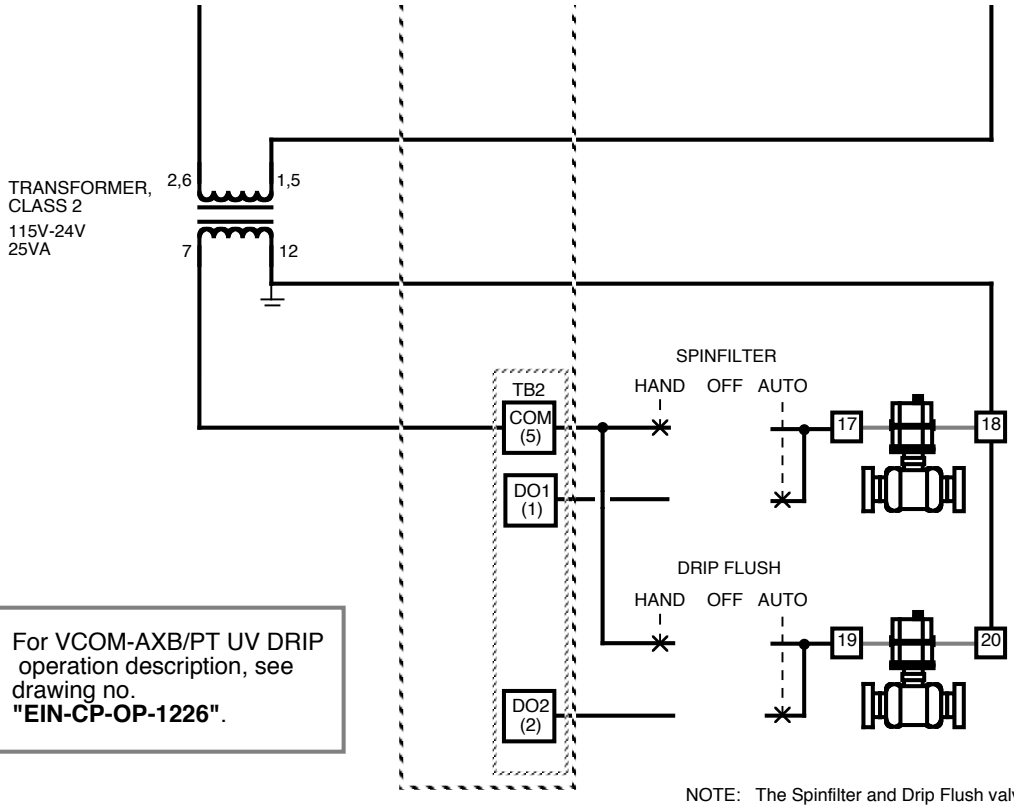
Control Panel Wiring Diagram
AdvanTex® Treatment Systems
Model VCOM-AXB1/PT UV Drip, VCOM-AX20B1/PT UV Drip



For ***discharge pump*** float arrangement diagram, see drawing no. **"EDW-FS-AX-4"**.



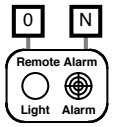
MANAGEMENT SYSTEM
ORENCO
ATRTU-4DO
Rev. A



For VCOM-AXB/PT UV DRIP operation description, see drawing no. **"EIN-CP-OP-1226"**.

NOTE: The Spinfilter and Drip Flush valves must be NORMALLY CLOSED.

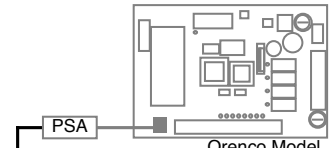
Remote Alarm Connections



Orenco Model AHW or equiv.

Note: 115VAC signal is present during alarm conditions.

Telephone Line Connection

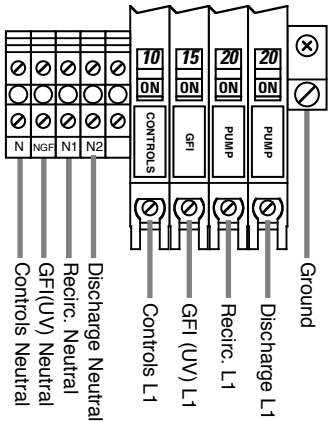


Orenco Model ATRTU-100

Connect phone line to RJ-11 jack on phone line surge arrestor/DSL filter.

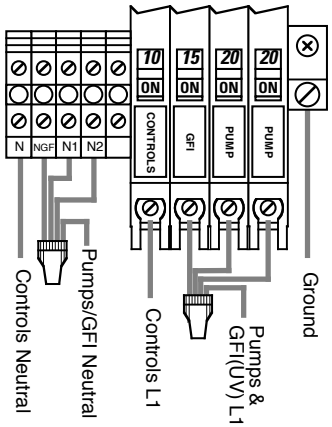
Power Wiring Options

Four Circuits



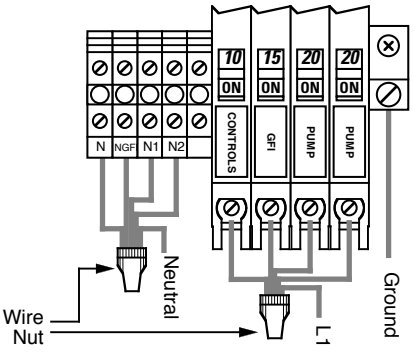
Factory default. Wire as shown.

Two Circuits



Use one wire nut to connect the pole of each pump circuit breaker and GFI breaker together with the incoming L1 power line. Use another wire nut to connect the neutral block of each pump and GFI with the incoming neutral line.

One Circuit



Use one wire nut to connect the pole of each pump circuit breaker together with the controls and GFI breakers and with the incoming L1 power line. Use another wire nut to connect the neutral block of each pump with the controls and GFI neutral blocks and with the incoming neutral line.

Float & Splice Box Wiring Diagram

For use in two pump systems, recirc. side.

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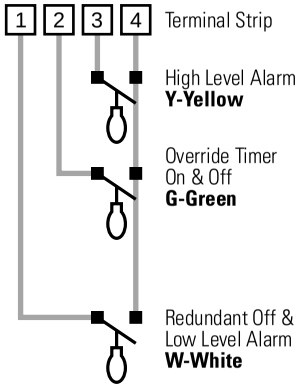
TELEPHONE:

(541) 459-4449

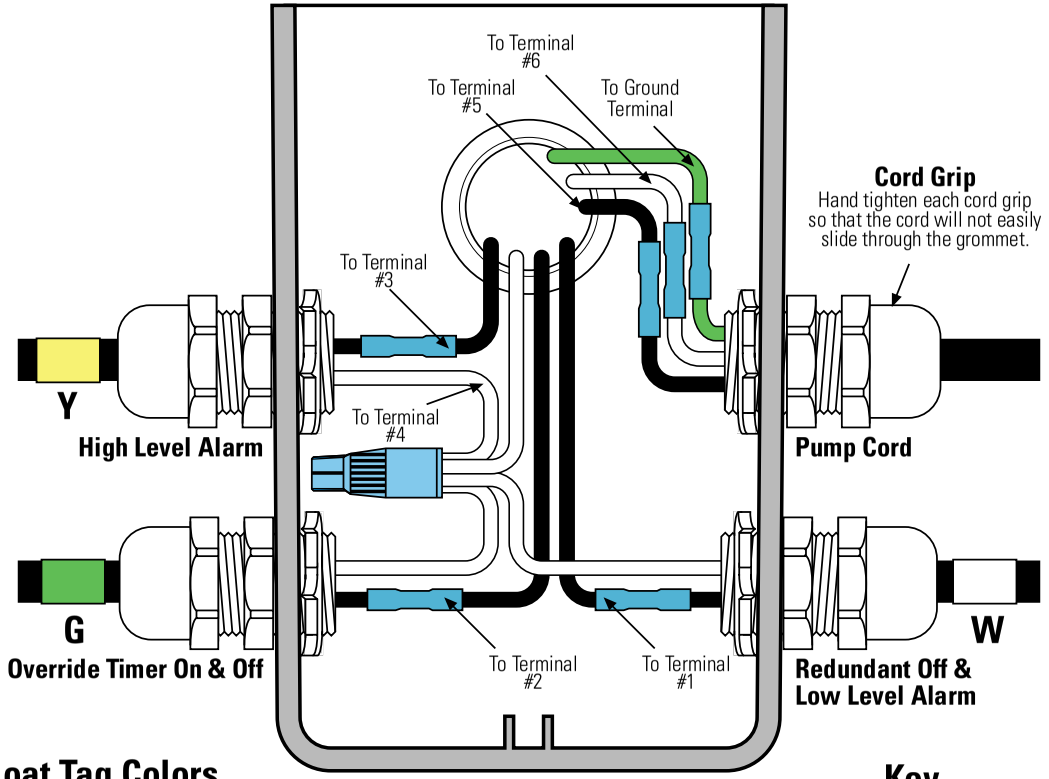
FACSIMILE:

(541) 459-2884

Float Arrangement



Splice Box Wiring



Float Types



Typical Orenco float model: A

Specs: contact - normally open
differential - no minimum
power rating - signal

Float Tag Colors

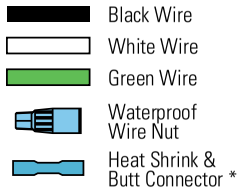
Y	Yellow	**R**	Red
P	Purple	**O**	Orange
B	Blue	**E**	Grey
G	Green	**W**	White

Note: Multi-function floats will have more than one marker

Attention: Failure to follow splicing instructions will void warranty

* Refer to drawing EIN-SB-SB-1 for splicing instructions.

Key



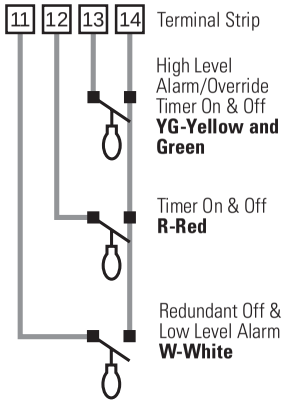
Control Panel Series	Float Function Color Code	Splice Box Model	Drawing No.
VCOM-AXB	**YGW/**	**SB4**	**EDW-FS-AX-2**

EDW-FS-AX-2
Rev 1.0 ©08/10/01

Float & Splice Box Wiring Diagram

For use in two pump systems, discharge side.

Float Arrangement

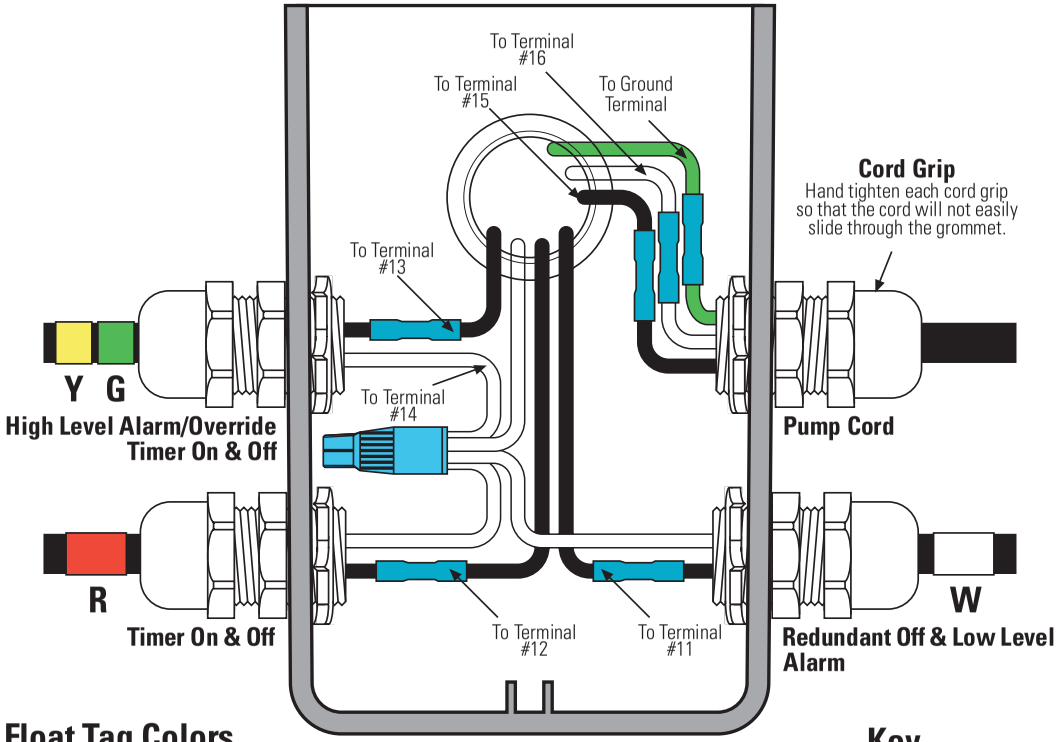


Float Types



Typical Orenco float model: A
Specs: contact - normally open differential - no minimum power rating - signal

Splice Box Wiring



Float Tag Colors

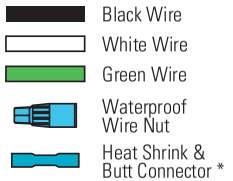
Y	Yellow	**R**	Red
P	Purple	**O**	Orange
B	Blue	**E**	Grey
G	Green	**W**	White

Note: Multi-function floats will have more than one marker

Attention: Failure to follow splicing instructions will void warranty

* Refer to drawing EIN-SB-SB-1 for splicing instructions.

Key



Control Panel Series	Float Function Color Code	Splice Box Model	Drawing No.
VCOM-AXB/PT	**/(YG)RW**	**SB4**	**EDW-FS-AX-4**

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EDW-FS-AX-4
Rev 1.1 © 03/15/04

VCOM-AXB /PT UV DRIP Panel Operation

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1-800-348-9843

Overview

The VCOM-AXB /PT UV DRIP telemetry-enabled panel is used for remote monitoring and control of the dual pumping operations of time-dosed Recirculating and Discharge pumps with a drip system.

Basic control logic manages the day-to-day functionality of the control panel. The VCOM-AXB /PT UV DRIP system recirculates the blend four to five times; until the recirculating splitter valve (RSV) seats, then small amounts of treated wastewater are pumped into the discharge tank. As the discharge tank fills, effluent is removed through a timed dosing drip system. During peak flow conditions, each tank has more aggressive timer settings to manage the increased demand. The drip system is periodically flushed to prevent clogging.

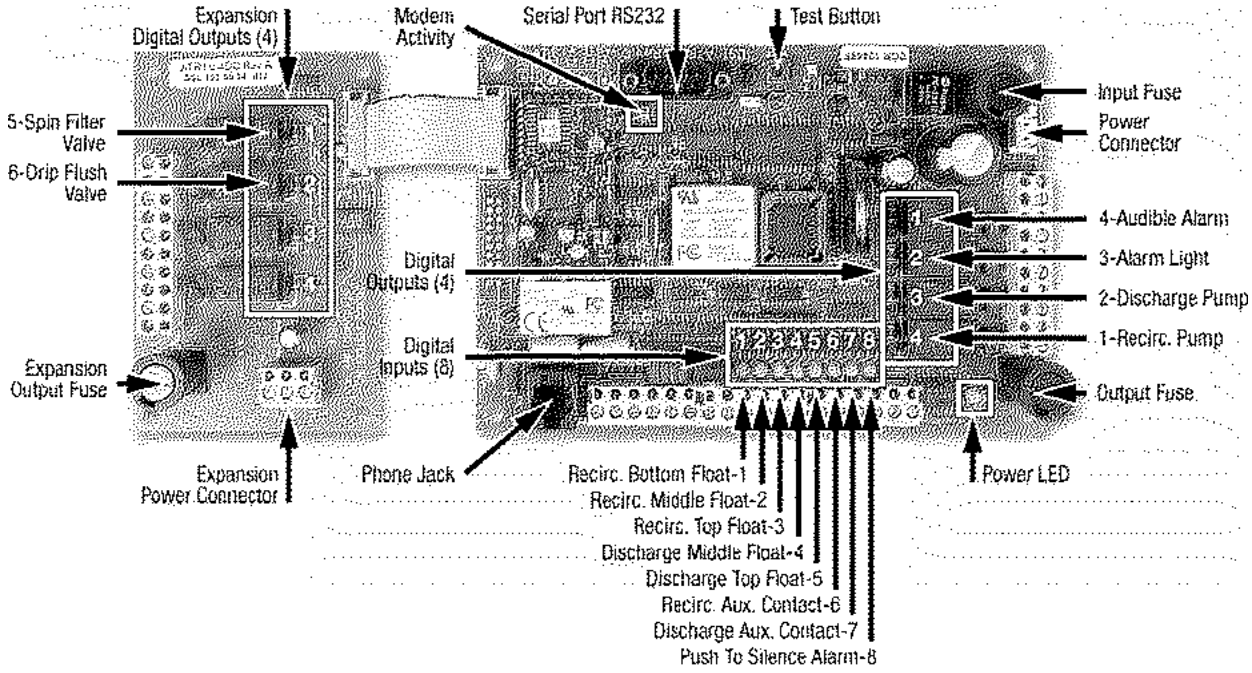
Fault conditions are automatically reported to the VeriComm Monitoring System and not locally at the panel, making the system virtually invisible to the homeowner. However, if fault conditions are not responded to, or the system cannot communicate with the VeriComm Monitoring System, then local alarms may be activated.

To silence local alarms, press the "Hold-To-Silence" button until the audible alarm stops.

The procedures outlined in the remainder of this document are to verify proper installation; they should be conducted in the sequence outlined while in "Test Mode".

Inputs & Output Definitions

The following inputs and outputs are used with your control panel:



Note:

1. Digital inputs are the yellow LEDs horizontally aligned along the bottom of the controller,
2. Digital outputs are the red LEDs vertically aligned on the right side of the controller, and
3. Inputs and outputs are activated by various events (e.g., Floats are activated when the float is in the up position; "Hold-To-Silence" is activated when the push button, located on the front of the panel is pressed).

Analog Inputs (NO LED indications on analog inputs):

1. Analog Input #1 – Discharge Bottom Float.
2. Analog Input #2 – UV Sensor.

Verify System Status

- ❑ Ensure that the panel installation instructions have been completed.

- ❑ Verify that the circuit breakers are in the on position.

- ❑ Verify controller status. The "Power LED" located on the controller (see Fig. 1, pg. 1) will either be:
  - Blinking – indicates that the controller is operating normally, or
  - Solid Off (when power is applied) – indicates that there is a possible problem with:
    1. The input fuse (F1) on the PC board,
    2. The main fuse located inside the panel,
    3. The controls circuit breaker located inside the panel, or
    4. The incoming line voltage.

Enable Test Mode

While in test mode, the alarm light will be flashing if there is NOT an alarm condition present. During an alarm condition the alarm light will be steady.

- ❑ Hold the "Hold-To-Silence" button on the front of the panel until the audible alarm sounds (approximately 15 seconds) to enable test mode.
  - Digital input #8 should be illuminated when the button is held in.
  - When the audible alarm sounds to indicate that the panel is in test mode, release the button.

- ❑ While in test mode, the panel will operate in the following manner.
  - The Call Home function is disabled,
  - Local audible and visual alarms are activated as alarm conditions occur,
  - System Data Logs are suspended, and
  - Timer off cycles are shortened.



1. Control Panel 2. Recirculating Splitter Valve 3. AdvanTex™ Filter
4. Processing Tank 5. Splice Box 6. BioTube® Pump Vault
(Float Assembly, Filter, Pump) 7. Pump Basin (Float Assembly, Pump)

Manual Pump Test

- ❑ Verify that the Recirc pump is submerged in water before continuing. If the RO (bottom) float drops, the alarm will sound.

- ❑ Press down the spring-loaded "MAN/AUTO" switch for the Recirc pump located inside the panel. The Recirc pump should immediately activate. For verification:
  - Digital input #6 should illuminate (see Fig. 1, pg. 1), indicating that the Recirc auxiliary contact is on.

- ❑ Verify that the Discharge pump is submerged in water before continuing. If the RO (bottom) float drops, the alarm will sound.

- ❑ Press down the spring-loaded "MAN/AUTO" switch for the Discharge pump located inside the panel. The Discharge pump should immediately activate. For verification:
  - Digital input #7 should illuminate (see Fig. 1, pg. 1), indicating that the Discharge auxiliary contact is on.

Combined Pump Test

- ❑ Verify that the Recirc and Discharge pumps are submerged in water before continuing.

- ❑ Press down the spring-loaded "MAN/AUTO" switch for both pumps. Digital inputs #6 & #7 should illuminate (see Fig. 1, pg. 1), indicating that the auxiliary contacts are on for both pumps.

- ❑ Measure the voltage and amperage of the pump.
  - Measure the voltage at each of the pump terminals in the panel while both pumps are running. A low voltage condition could indicate that the site wiring is improperly sized.
  - Using a loop ammeter, place the ammeter clamp around the loop of wire located above the pump circuit breaker. (This should be done for each pump.) The amperage should be within the specifications of the pump.

UV Light Status

- ❑ Because UV models vary, some adjustments may need to be made. The alarm light and audible should activate when the UV fails.

- ❑ Ensure that the UV light has been installed correctly and that it has power.

- ❑ Verify that all the float alarms are cleared.
  - The Recirc. RO float is up (digital input #1 should be illuminated).
  - The Recirc. high level alarm float is down (digital input #3 should NOT be illuminated).
  - The Discharge high level alarm float is down (digital input #5 should NOT be illuminated).
  - The Discharge low level alarm float is up (check the float visually).

- ❑ Force the UV light to fail. This must be done without disconnecting power or switching the circuit breaker to OFF.

- ❑ The alarm light, on the front of the panel should change state, e.g. if the alarm light was ON it will turn OFF, vise versa.
  - If the alarm did not change state there is a possible problem with:
    1. The UV light,
    2. The UV sensor contact,
    3. The GFI circuit breaker located inside the panel, or
    4. The GFI outlet located inside the panel.

- ❑ If the alarm light and audible are deactivating when the UV fails:
  - The VCOM board will need to be connected to directly or through the web, and
  - Point #58 will need to be changed from **Y** to **N**.

- ❑ If connection and changes can not be made immediately, then an insulated jumper wire will need to be installed between terminals #15 and #16 before continuing.

Recirc Float Test

While in test mode, the Recirc floats will function as described:

High Level Alarm (top float): This float activates the alarm light (steady) and audible alarm when lifted. Pressing and holding the illuminated "Hold-To- Silence" button on the front of the control panel will silence the audible alarm. The alarm light will remain steady until the float is lowered.

Override On/Off (middle float): This float activates the override timer when lifted. The override timer controls the pump during high flow conditions. The override timer function will remain active until the set minimum number of override cycles has been completed and the float has lowered.

Redundant Off & Low Level Alarm (bottom float):
This float enables the timer function when lifted. The timer function controls the pump during normal flow conditions. Note: The timer will start with its off cycle. This float also disables the pump and activates the alarm light (steady) and the audible alarm when lowered. The audible alarm may be silenced by pressing the illuminated "Hold-To-Silence" button on the front of the control panel. The alarm light will remain steady until the float is lowered.

To perform the following test, sufficient effluent is required. If there is not enough effluent in the Recirc Tank, turn the Recirc pump circuit breaker off.

To test the functionality of the Recirc floats and ensure that the panel is installed correctly, follow the steps below:

1. RO/Low Level Alarm Float Test

- ❑ Pull the Recirc float assembly out of the pump vault and position it so that all the floats are in the down position.

- ❑ If the Discharge high level (top) float is lifted (digital input #5 is illuminated), then pull the Discharge float assembly out of the pump vault and position it so the bottom float is up and the other floats are down.
  - Digital inputs #1, #2, #3, and #5 should NOT be illuminated.
  - The alarm light (steady) and audible alarm should activate.

- ❑ Lift and secure the bottom float in the up position.
  - Digital input #1 should be illuminated.
  - Within a few seconds, the audible alarm should shut off and the alarm light should be flashing.
  - The Recirc pump will start to cycle in approximately 36 second intervals, starting with the off cycle.
  - Digital output #1 and digital input #6 should be illuminated during the on cycle.

2. Override Timer Float Test

- ❑ Lift and secure the middle float in the up position.
  - Digital inputs #1 and #2 should be illuminated.
  - The Recirc pump cycle will shorten to 24 second intervals.
  - Digital output #1 and digital input #6 should illuminate when the Recirc pump is on.

3. High Level Alarm Float Test

- ❑ Lift and secure the top float in the up position.
  - Digital inputs #1, #2, and #3 should be illuminated.
  - The audible alarm and alarm light (steady) should activate. Digital outputs #3, and #4 should illuminate.

- ❑ Drop the top float and ensure that it is in the down position.
  - Within a few seconds, the audible alarm should shut off and the alarm light should be flashing.
  - Digital output #4 should NOT be illuminated.
  - The Recirc pump should continue cycling as indicated by digital output #1, and input #6 being illuminated.

4. Returning To Normal Cycle Time

- ❑ Drop the middle float and ensure that it is now in the down position.
  - The Recirc pump should complete the minimum override cycles (default is three) and then return to its normal cycle time.

- The Recirc pump should continue cycling as indicated by digital output #1, and input #6 being illuminated.
- Digital input #1 should remain illuminated, indicating that the bottom float is in the up position.

❑ Reinstall the Recirc float assembly into the pump vault. Ensure that the floats are free from entanglements (e.g., float cords, etc).

❑ Ensure that the tank has enough water to maintain the RO (bottom) float in the up position (Required for Cut-off Test).

❑ The Recirc pump should continue to cycle during the Discharge test.

Discharge Float Test

While in test mode, the Discharge floats will function as described:

High Level Alarm/Override Timer On/Off (top float): This float activates the alarm light (steady) and audible alarm when lifted. Pressing and holding the illuminated "Hold-To-Silence" button on the front of the control panel will silence the audible alarm. The alarm light will remain steady until the float is lowered. This float also activates the override timer when lifted. The override timer controls the pump during high flow conditions. The override timer function will remain active until the set minimum number of override cycles has been completed and the float has lowered.

Timer On/Off (middle float): This float enables the timer function when lifted. The timer function controls the pump during normal flow conditions. Note: The timer will start with its off cycle.

Redundant Off & Low Level Alarm (bottom float): This float turns off the Discharge pump when lowered. This float is a secondary off float, which will operate if the Timer On & Off float fails. This float also activates the alarm light (steady) and audible alarm when lowered. The audible alarm may be silenced by pressing the illuminated "Hold-To-Silence" button on the front of the control panel. The alarm light will remain steady until the float is lifted.

Pump & Valve Operation (for Test Mode Only): The pump dosing cycles will be controlled by the timer. During high flow conditions, the pump dosing cycles will be controlled by the override timer. A complete cycle of the Discharge pump will operate as follows:

- Off Cycle; pump is deactivated.
- On Cycle; pump is activated.
- Drip Flush; pump remains activated while the drip flush valve is open to flush the drip system.
- Spinfilter Flush; pump remains activated while the spinfilter valve is open at the end of the drip cycle to allow for spinfilter flushing.
- Off Delay; pump will remain activated while the drip flush valve is opened.
- Drain; pump is deactivated and the drip flush valve will remain activated to allow for drainage.

To perform the following test, sufficient effluent is required. If there is not enough effluent in the Discharge Tank, turn the Discharge pump circuit breaker off.

To test the functionality of the Discharge floats and ensure that the panel is installed correctly, follow the steps below:

1. RO/Low Level Alarm Float Test

❑ Pull the Discharge float assembly out of the pump vault and position it so that all the floats are in the down position.
- Digital inputs #4, and #5 should NOT be illuminated.
- The alarm light (steady) and audible alarm should activate.

2. Timer Float Test

❑ Lift and secure the bottom and middle floats in the up position.
- Digital input #4 should be illuminated.
- Within a few seconds, the audible alarm should shut off and the alarm light should be flashing.
- The Discharge pump will start in the off cycle (1 min) and then turn on for the on cycle (factory default: 4 min). Digital output #2 and digital input #7 should be illuminated during the on cycle.
- After the on time is complete, the pump should remain activated, and the drip flush valve should be activated to flush the system (factory default: 5 min). Digital input #7 and outputs #2 and #6 should be illuminated.
- After the zone is flushed, the spinfilter valve will open to allow for a spinfilter flush (factory default: 15 sec). Digital input #7 and outputs #2 and #5 should be illuminated during this flush.
- The pump will remain activated while the drip flush valve is opened (factory default: 5 sec). Digital input #7 and outputs #2 and #6 should be illuminated.
- The pump will deactivate and the drip flush valve will remain activated (factory default: 5 min) to allow for drainage. Digital output #6 should be illuminated.

3. High Level Alarm (Recirc. Pump Cut-off)/Override Timer On/Off Float Test

❑ Lift and secure the top float in the up position.
- Digital inputs #4, #5 should be illuminated.
- The audible alarm and alarm light (steady) should activate. Digital outputs #3, and #4 should illuminate.

- The Discharge pump off cycle will shorten to 30 seconds. Zone(s) should be dosed and flushed in the same sequence and time intervals as during the 'Timer Float Test'.

❑ The Recirc. pump should stop cycling.
- Digital input #6 and output #1 should NOT be cycling. (Wait a few minutes to verify.)

❑ Drop the top float and ensure that it is in the down position.
- Within a few seconds, the audible alarm should shut off and the alarm light should be flashing.
- The Discharge pump should complete the minimum override cycles (factory default: 3 cycles) and then return to its normal cycle time.

4. Discharge Pump Cut-off (UV Light Fail) Test

❑ Force the UV light to fail. This must be done without disconnecting power or switching the circuit breaker to OFF.
- The audible and visual alarms should activate. Digital outputs #3, and #4 should illuminate.

❑ Silence the audible alarm by pressing and holding the illuminated "Hold-To-Silence" button, on the front of the panel, until the alarm stops.

❑ The Discharge pump should stop cycling.
- Digital input #7 and output #2 should NOT be cycling. (Wait a few minutes to verify).

❑ Reactivate the UV light.

❑ Discharge pump should start cycling again. (Wait a few minutes to verify; digital output #2 and digital input #7 should be illuminated during the on cycle.)

❑ If the Discharge pump should NOT be cut-off when the UV light fails,
- The VCOM board will need to be connected to directly or through the web, and
- Point #59 will need to be changed from **Y** to **N**.

❑ Reinstall the Discharge float assembly into the pump vault. Ensure that the floats are free from entanglements (e.g., float cords, etc).

❑ Ensure that the tank has enough water to maintain the RO (bottom) float in the up position.

Communication Test

❑ Press and release the "Hold-To-Silence" button 15 times within a one-minute period. This instructs the panel to call the VeriComm Monitoring System.
- A red LED (see Fig. 1, pg. 1 - Modem Activity) should illuminate, indicating that the controller has established communication with the host (this may take a couple of minutes).
- Once the communication session has ended, the modem will automatically disconnect.
- If the LED does not illuminate within the specified time, verify that the phone line has a dial tone. This can be done by hooking up a phone to the line that is going into the panel.

Disable Test Mode (optional)

❑ The panel will automatically disable test mode and return to normal operation after 30 minutes. To disable test mode immediately, hold the "Hold-To-Silence" button on the front of the panel until the audible alarm sounds (approximately 15 seconds).
- Digital input #8 should be illuminated when the "Hold-To-Silence" button is held in.
- When the audible alarm sounds to indicate that the panel is no longer in test mode, release the button.



Subsurface Drip Dispersal and Reuse

Design, Installation and Maintenance Guidelines





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VIII

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INTRODUCTION

Geoflow's WASTEFLOW®[1] drip disperses effluent below ground surface through ½" pressurized pipes. It is designed using the grid concept with supply and flush manifolds at each end of the dripline creating a closed loop system. The grid design provides a complete subsurface wetted area.

The objective with effluent dispersal is usually to disperse the effluent using the minimum area as quickly and safely as possible at an approximately uniform rate throughout the year. If the main purpose of the Geoflow system is to irrigate, then please use the standard irrigation manual for landscape available from Geoflow, Inc.

Subsurface drip is a highly efficient method to dispose of effluent. Small, precise amounts of water are uniformly applied under the soil surface from multiple points.

The main advantages of Geoflow's subsurface drip system for effluent dispersal are:

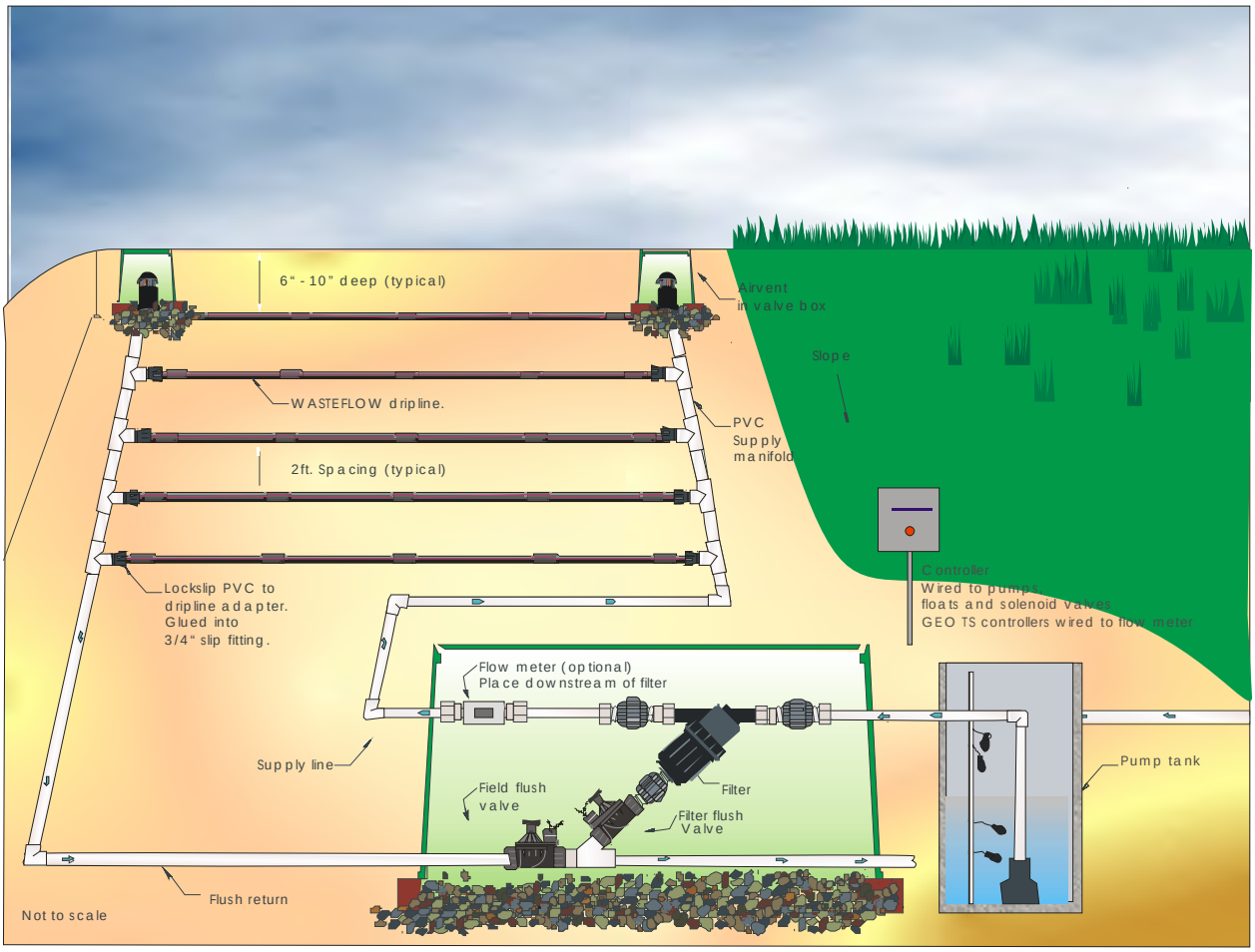
- Human and animal contact with effluent is minimized, reducing health risks.
- Correctly designed systems will not cause puddling or runoff.
- It can be used under difficult circumstances of high water tables, tight soils, rocky terrain, steep slopes, around existing buildings, trees or other vegetation, and on windy sites.
- Disposal of water is maximized by means of evapotranspiration.
- The system requires no gravel. It is easy to install directly into indigenous soils and the natural landscape can be maintained.
- Minimizes deep percolation.
- Consumption of nitrates by the plant material is increased.
- Invisible and vandal proof installations.
- Ten-year warranty for root intrusion, workmanship and materials. Systems are durable with a long expected life of approximately 30 years.
- Non intrusive. It allows use of the space while operating.
- Easily automated.
- Effluent can be re-used for irrigation.

NOTES

- These guidelines are geared towards single family homes with secondary treated effluent. When using primary treated effluent, Geoflow recommends automating all the self flushing valves, and increasing the number of emission points in the dispersal field. For more information on septic tank dispersal, please check our website at www.geoflow.com or telephone Geoflow at 800-828-3388.
- Systems with periodic use need special attention not covered in this guideline.
- Please follow your State and County Regulations for onsite wastewater dispersal. These guidelines are intended to be a guide to users of the Geoflow drip system and should be used only as a supplement to your local regulations.
- Occasionally, in forested area, the dripline is placed on the surface and covered with mulch.

[1] WASTEFLOW® is a registered trademark of A.I.Innovations.

DIAGRAM 1: TYPICAL DRIPFIELD LAYOUT
Single Family Home





SYSTEM COMPONENTS:

See Diagram 1 on page 4.

A typical drip system installation will consist of the elements listed below:

1. WASTEFLOW® DRIPLINE

WASTEFLOW dripline carries the water into the dispersal/reuse area. The dripline is connected to the supply and return manifolds with Compression or Lockslip fittings. Typical spacing between each dripline and between drip emitters is 24" on center.

Twelve-inch spacing is used regularly for soils with very low or high permeability. Dripline is usually buried 6"-10" below ground. Standard coil length is 500-ft. Rolls of alternative lengths, diameters and dripper spacing's may be special ordered.

WASTEFLOW dripline features:

a) nano-ROOTGUARD®[2]

Wasteflow dripline has nano-ROOTGUARD®. The risk of root intrusion with an emitter slowly releasing nutrient rich effluent directly into the soil is well known to anyone who has observed a leaking sewer pipe. All Geoflow drip emitters are guaranteed to be protected against root intrusion with nano-ROOTGUARD. This patented process fuses the root-growth inhibitor, TREFLAN®[3] into each drip emitter during manufacturing. Treflan is registered with the United States EPA for this application. The nano-ROOTGUARD technology holds Treflan for extended time inside the plastic, slowly releasing it in minute quantities to prevent root cells from dividing and growing into the barrier zone. It is chemically degradable, non-systemic, and virtually insoluble in water (0.3 ppm). With an expected life of 30 yearS, nano-ROOTGUARD carries a 15-year warranty against root intrusion.

b) *Geoshield™*[4] protection

Geoflow's WASTEFLOW has an inner lining impregnated with an antimicrobial, Tributyl tin maleate, to inhibit adhesion of biological growth on the inside walls of the tube and on the emitters. It does not have any measurable biological effect on the effluent passing through the tube. This minimizes the velocity required to flush WASTEFLOW dripline. The velocity only needs to move out the fine particles that pass through the 130 micron filter that, if not flushed, will ultimately accumulate at the distal end of each lateral. It is not necessary to scour growth off the inside wall of WASTEFLOW tubing. Since all pumps deliver more volume given less resistance to flow, just opening the flush valve will usually achieve this degree of flushing. When a minimum flushing velocity is requested by regulators, 0.5 feet per second is used with Wasteflow dripline to get the settled particles at the bottom of the pipe back into suspension. This equates to 0.375 gpm per dripline when using standard WASTEFLOW dripline (0.55"ID)

c) Turbulent Flow Path



WASTEFLOW drip emitters are pre-inserted in the tube usually spaced 6", 12", 18", or 24" apart with 24" being the most popular. Angles in the emitter flow path are designed to cause turbulence in order to equalize flow between emitters and keep the emitters clean. Geoflow emitters boast large flow paths, which, coupled with turbulent flow, have proven over the years to be extremely reliable and dependable.

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[2] NANOROOTGUARD is a registered trademark of A.I.Innovations
[3] Treflan is a registered trademark of Dow Agro Sciences
[4] Geoshield is a registered trademark of A.I.Innovations

d) WASTEFLOW Classic and WASTEFLOW PC Dripline
Both WASTEFLOW Classic and WASTEFLOW PC have turbulent flow path emitters with nano-ROOTGUARD and *Geoshield* protection.

The WASTEFLOW PC has the added element of a silicone rubber diaphragm that moves up and down over the emitter outlet to equalize flows regardless of pressure between 7 and 60 psi. To ensure a long life the recommended operating range is 10 to 45 psi.
For WASTEFLOW Classic, the flow rate delivered by the emitter is a function of the pressure at the emitter. The Classic dripline has the advantage of no moving parts or rubber that may degrade over time. Also, when minimum flushing velocities are required, the flows during a dosing cycle and flushing cycle are very similar with the Wasteflow Classic because when the flush valve is opened; the pressure is reduced, causing the flows from the emitters to decline. PC dripline requires significantly higher flow for flushing than dosing as the emitter flow does not go down during the flushing cycle.
We generally recommend using WASTEFLOW Classic, unless the economic advantages to using PC is substantial.

i) WASTEFLOW PC can run longer distances than WASTEFLOW Classic.
ii) Steep slopes. Systems should be designed for the dripline lateral to follow the contour. When this is practical, the extra cost of installing pressure regulators required for WASTEFLOW Classic would likely be less than the incremental cost of WASTEFLOW PC.
iii) Rolling terrain. If the difference in height from trough to peak exceeds six feet then WASTEFLOW PC should be used. Vacuum relief valves must be placed at the top of each rise.

2. CONTROLLERS

Controllers are used for time dosing and time flushing of the filter and dripfields. GEO controllers include a programmable logic controller to increase flexibility and reliability in the field. They can be used on systems ranging in size from one to eight zones at the time this manual was printed. All controllers include a surge arrestor, elapsed time meter and counter. The choice as to which controller best supports your personal preference, capability and price.

3. PUMPS, PUMP TANKS & FLOATS

WASTEFLOW dripfields depend on pumps to dose effluent under pressure to the field. These must be sized according to flow and pressure requirements. Look for submersible effluent pumps from a dependable source. Geoflow does not endorse a single manufacturer, but does advocate you use a pump that is readily serviced in your area. Two (duplex) pumps may be used. These will normally alternate at each signal from the control panel and are often used on commercial or large drip systems.

Pump tanks are an important part of an onsite system design and serve to equalize flow, settle solids and even continue oxidation in some instances. All treatment systems will have occasional upsets, and an adequately sized pump tank will help increase the time between filter cleaning. Pump tanks should be sized according to your local rules and regulations. We recommend pump tanks for single family homes be at least 1.5 times daily flow. Remember a 500 gallon pump tank may not actually hold 500 gallons because of the loss of useable areal below the pump intake and above the high water cutoff level. Geoflow controllers are set-up for 4 floats with the lowest one in the tank being the *redundant off float.* The *primary timer on/off float* is second from the bottom, followed by the *secondary timer float* third from the bottom and the *high level alarm float* on the top.

4. FILTERS

Geoflow systems require 120 mesh or 130 micron filtration to keep any oversized upstream contaminants from entering the dripline. Geoflow offers a full range of drip filters, with the tried and true Vortex screen filters for small commercial and residential systems; disc filters with anti bacterial protection, and GeoVac suction cleaning filters for larger commercial and industrial systems. We recommend minimum filter size of 1.5inch.

5. SUPPLY MANIFOLD AND LINE

This carries the water from the dosing tank to the dispersal area. Rigid PVC schedule 40 is usually used. Schedule 80 is at times used to either avoid dips in the line that can collect water and freeze, or if pressure of at least 200 psi is required to pump water from the dose tank to the dripfield. To prevent water from freezing, the pipes should slope back to the pump tank, be buried below frost depth and/or be insulated. Refer to the PVC pipe sizing chart in the appendix to determine the best diameter for your application.

6. RETURN MANIFOLD AND LINE

In order to help clean the system, the ends of the drip lines are connected together into a common return line, most often made of rigid PVC. This line will help equalize pressures in the system. Flushing should be done frequently during the installation period. Periodic flushing during operation will help to keep the manifolds clean. Best option is to return flush water to the inlet of the treatment stream. If this is not possible, a two compartment pump tank with diffuser is recommended with pump in separate chamber. To prevent water from freezing, the pipes should slope back to the pump tank, be buried below frost depth and/or be insulated.

7. PRESSURE REGULATOR

Pressure regulators fix the inlet pressure at a given rate. Under normal operating conditions, pressure in the drip lines should be 10 psi to 45 psi. With WASTEFLOW Classic it helps to know exactly what the pressure is in the dripline, so system flow can be easily calculated. With all dripline it is prudent to have a pressure regulator to avoid oversized pumps from blowing out fittings.

8. AIR VACUUM BREAKER

Air vacuum breakers are installed at the high points, above dripline and below grade to keep soil from being sucked into the emitters due to back siphoning or backpressure. This is an absolute necessity with underground drip systems. They are also used for proper draining of the supply and return manifolds in sloping conditions. One is used on the high end of the supply manifold and one on the high point of the return manifold. Additional air vents may be required in undulating terrain. Freezing conditions require the air vacuum breaker be protected with insulation.

9. FILTER FLUSH VALVES

Used to flush debris from the filter cleanout port back to the pretreatment or dosing tank, this can be an electronically activated solenoid valve or a manual valve. If manual, it should be opened for a full flushing at least every six months and left cracked open slightly to flush continuously. Certain States may require automated electronic flushing. Please refer to your State codes.

10. FIELD FLUSH VALVES.

Used to flush out fine particles that have passed through the filter and accumulated on the bottom of the tube at the end of each lateral, the field flush valve can be manual (continuous) or electronic (automatic). Geoflow recommends automatic flush. Continuous flush requires the valve be left cracked open slightly during operation and must be carefully designed and operated to work without increasing the risk of treatment plant upsets (if placed upstream of treatment) or reducing the effectiveness of the pump tank (if placed in drip pump tank). Certain States do require automated electronic flushing. Please refer to your State codes.

11. ZONE VALVES

Used to divide single dispersal fields into multiple zones, these can be hydraulically activated index valves or electrical solenoid valves. Index valves are hydraulically operated, while solenoids use electricity.

12. WASTEFLOW HEADWORKS

WASTEFLOW Headworks is a pre-assembled unit including the filter, valves and pressure gauge in a box or on a skid. It is installed between the pump and the field. Be sure to insulate the box in freezing climates.

DESIGN PARAMETERS:

1. SELECT AREA

Select the area with careful consideration of the soil, the terrain and your State and County regulations. Be sure the field is not in a flood plain or bottom of a slope where excessive water may collect after rain. Surface water should be directed away from the proposed field area. Consider:

- Setbacks from water bodies, driveways, neighbors, wells….
- Restrictive limiting layers? Rock/Clay Shallow ground water? Seasonal high water?
- Is dripfield located at lowest point in the area? Check surrounding hills and valleys
- Is there any surface water coming in form neighbors?
- Is there any construction debris at the site?

2. WATER QUALITY

The source of sewage should be assessed for flow and constituents.

Maximum daily flows should be used for design flow rates and should include peak/safety factors. Pre-treatment facilities may be designed with flow equalization for situations with inconsistent flow characteristics.

Sewage with BOD, TSS or Oils and Grease levels in excess of normal residential sewage must be pre-treated to reduce effluent values for these constituents to residential levels prior to dispersal or custom design of loading rates will be necessary. Sources with very high levels of minerals or other abnormal chemical or physical characteristics require special consideration and custom design. If iron or iron bacteria are prevalent, please be sure to eliminate it upstream of the drip system with ozone, ultraviolet or chemical treatment.

3. SOIL APPLICATION DESIGN

Soil loading rates, as expressed in gallons per day per square ft., should take both percolation tests and soil and site evaluations into consideration. Soils classification date provided by USDA-NRCS can be used as a guideline, but these do not consider site specific variables. Soil loading charts are often provided by State and local health departments. We encourage you to be most conservative in estimating the soil loading rates. Non residential systems with multiple zones need to be more conservative due to the edge effect and larger actual daily flows being used in design rather than inflated flows that are most frequently used in single family home designs.

Note: This section is based on Subsurface Trickle Irrigation System for On-Site Wastewater Disposal And Reuse by B. L. Carlile and A. Sanjines. The basis of the information is from the Texas Health Department regulations. The rules in your County and State may vary.

The instantaneous water application rate of the system must not exceed the water absorption capacity of the soil. A determination of the instantaneous water absorption capacity of the soil is difficult, however, since the value varies with the water content of the soil. As the soil approaches saturation with water, the absorption rate reduces to an equilibrium rate called the "saturated hydraulic conductivity." Wastewater application rates should be less than 10 percent of this saturated equilibrium.

Even though the trickle irrigation system maximizes the soil absorption rate through the low rate of application, thus keeping the soil below saturation, there will be times when the soil is at or near saturation from rainfall events. The design must account for these periods and assume the worst case condition of soil saturation. By designing for a safety factor of 10 or 12, based on the saturated hydraulic conductivity, the system will be under-loaded most of the time but should function without surface failure during extreme wet periods.

By applying wastewater slowly for a few hours daily, particularly if applied in "pulses" or short doses several times per day near the soil surface where the soil dries the quickest would keep the soil absorption rate at the highest value and minimize the potential of water surfacing in poor soil conditions.

As stated previously, this design criterion will under-load the system at all times except when the soil is at or near saturation from rainfall. If designing for an efficient irrigation system, the water supply may not be sufficient to meet the demands of a lawn or landscaped area during peak water demand months. This problem can be overcome by either of two solutions: add additional fresh-water make-up to the system during the growing season to supply the needed water for plants in question; or split the system into two or more fields with necessary valves and only use one of the fields during the peak water demand months and alternate the fields during winter months or extremely wet periods, or use both fields simultaneously if the pump capacity will so allow.

NOTES:

- The chart below is provided as a guide only. States and Counties may have regulations that are different. Check your State guidelines and consult with your local health department.
- Problems with drip dispersal fields occur when soils are misinterpreted. If in doubt, choose the more restrictive soil type from the table above.
- "Soil type" should be based on the most restrictive layer within two feet of the dripline. In many soils 1-ft. vertical separation from the limiting layer has proven successful with secondary treated effluent. Geoflow recommends you follow State and Local guidelines.

TABLE 1

DRIP LOADING RATES CONSIDERING SOIL STRUCTURE.

Table 1 is taken from the State of Wisconsin code and was prepared by Jerry Tyler.
Provided for guidelines and budgeting purposes. Refer to your local regulations and qualified soil scientists to determine best loading rates.

Soil Textures	**Soil Structure**	Maximum Monthly Average **BOD_5<30mg/L TSS<30mg/L** (gallons/ft^2/day)	Maximum Monthly Average **BOD_5>30mg/L TSS>30mg/L** (gallons/ft^2/day)
Course sand or coarser	N/A	1.6	0.4
Loamy coarse sand	N/A	1.4	0.3
Sand	N/A	1.2	0.3
Loamy sand	Weak to strong	1.2	0.3
Loamy sand	Massive	0.7	0.2
Fine sand	Moderate to strong	0.9	0.3
Fine sand	Massive or weak	0.6	0.2
Loamy fine sand	Moderate to strong	0.9	0.3
Loamy fine sand	Massive or weak	0.6	0.2
Very fine sand	N/A	0.6	0.2
Loamy very fine sand	N/A	0.6	0.2
Sandy loam	Moderate to strong	0.9	0.2
Sandy loam	Weak, weak platy	0.6	0.2
Sandy loam	Massive	0.5	0.1
Loam	Moderate to strong	0.8	0.2
Loam	Weak, weak platy	0.6	0.2
Loam	Massive	0.5	0.1
Silt loam	Moderate to strong	0.8	0.2
Silt loam	Weak, weak platy	0.3	0.1
Silt loam	Massive	0.2	0.0
Sandy clay loam	Moderate to strong	0.6	0.2
Sandy clay loam	Weak, weak platy	0.3	0.1
Sandy clay loam	Massive	0.0	0.0
Clay loam	Moderate to strong	0.6	0.2
Clay loam	Weak, weak platy	0.3	0.1
Clay loam	Massive	0.0	0.0
Silty clay loam	Moderate to strong	0.6	0.2
Silty clay loam	Weak, weak platy	0.3	0.1
Silty clay loam	Massive	0.0	0.0
Sandy clay	Moderate to strong	0.3	0.1
Sandy clay	Massive to weak	0.0	0.0
Clay	Moderate to strong	0.3	0.1
Clay	Massive to weak	0.0	0.0
Silty clay	Moderate to strong	0.3	0.1
Silty clay	Massive to weak	0.0	0.0

4. DEPTH AND SPACING

WASTEFLOW systems usually have emitter lines placed on 2 foot (600 mm) centers with a 2 foot emitter spacing such that each emitter supplies a 4 sq. ft (0.36 m^2) area. These lines are best placed at depths of 6-10 inches (150 - 250 mm) below the surface. This is a typical design for systems in sandy and loamy soils with a cover crop of lawn grass. Closer line and/or emitter spacing of 12 inches is used on heavy clay soils or very coarse sands where lateral movement of water is restricted. Using closer spacing should not reduce the size of the field.

5. SOIL LAYERS AND TYPES

The shallow depth of installation is an advantage of the subsurface dripfield since the topsoil or surface soil is generally the most biologically active and permeable soil for accepting effluent. The topsoil also dries the fastest after a rainfall event and will maintain the highest water absorption rate. The quality and homogeneity of the soil may present a problem. If the soil was not properly prepared and there are pieces of construction debris, rocks and non-uniform soils, it is very difficult to obtain uniform water spread. In many cases, particularly if the soil is compacted, soil properties can be greatly improved by ripping and disking.

6. ADDING FILL TO THE DISPERSAL FIELD

Some dispersal sites require additional soil be brought in for agronomic reasons or to increase separation distances from the restrictive layer. Restrictive layers stop or greatly reduce the rate of downward water movement, as a result surfacing may occur during part of the year. In soils with high water tables treatment is minimized due to a lack of oxygen.

Placing drip lines in selected fill material above the natural soil provides an aerated zone for treatment. Dispersal however still occurs in the natural soil and the field size must be based on the hydraulic capability of the natural soil to prevent hydraulic overload.

Any time fill material is to be used, the area to receive the fill should have all surface grasses and other organic material removed or it must be incorporated into the natural soil to prevent an organic layer from forming and restricting downward water movement. Removal must be performed under dry conditions. Divert surface and subsurface water prior to adding fill.

Soils to be used should be determined by a soils expert. Uniform soil material with good structure should be chosen. Avoid platy or massive materials with no structure.

The fill material should be applied in shallow layers with the first 4 to 6 inches incorporated into the natural soil to prevent an abrupt textural interface. Placement of fill should be uniform so preferential bypass flows do not occur. Soil should not be compacted. Continue this process until all fill has been incorporated.

The fill area should be left crowned to shed surface water and may need diversion ditches or some other devices to prevent surface water from infiltrating. The entire fill area should have a vegetative cover to prevent erosion. If possible, allow the fill to set at least seven to ten days before installing WASTEFLOW dripline.

It is generally agreed that fill should not be used on slopes greater than 20% unless means for controlling erosion, such as netting, are used. Consult a soils engineer on a case by case basis.

7. SLOPES OR HILLY SITES

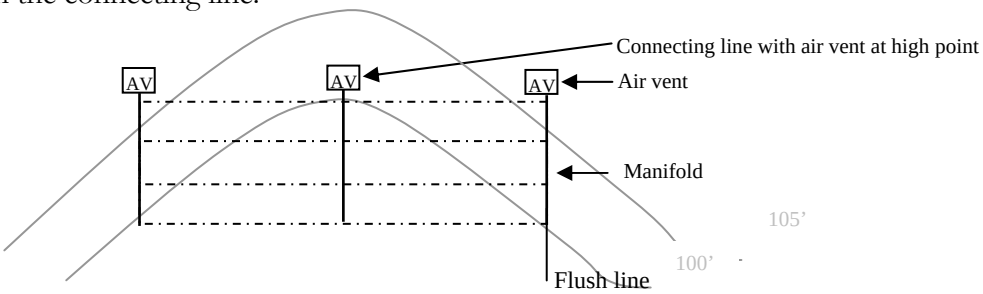
A. High Points and siphoning

A potential problem with buried drip lines is siphoning dirt into the emitters when the pump is switched off. For this reason:

i) At least one vacuum breaker should be installed at the highest point in each zone. It is best practice to install one at the high point of the supply and one at the high point of the return manifold.

ii) Drip lines should be connected at the end to a common return line with a flush valve.

iii) Run dripline along a contour if at all possible. Avoid installing lines along rolling hills where you have high and low points more than 3 ft. off contour along the same line. If the dripline is installed over a ridge, as shown below, connect all the high points together and install a vacuum breaker on the connecting line.



B. Dripline Pressure Tolerances

As water travels through a manifold or uphill, pressure decreases, or conversely, if water moves downhill pressure increases, which can affect the flow variation between the first dripline and the last dripline on the manifold.

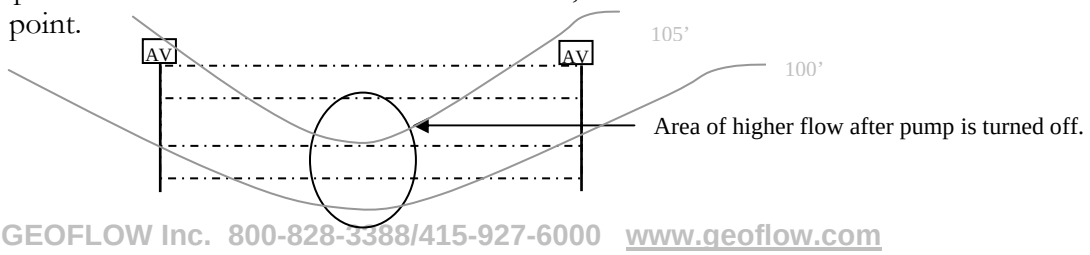
WASTEFLOW Classic: The Classic dripline can be operated in a range of 10 to 45 psi, however too wide a variance in the pressure in a single field will result in too high a variance in flow within that field. As a rule of thumb, if the level variation within a WASTEFLOW Classic zone exceeds six feet, individual pressure regulators should be placed for each six-foot interval.

WASTEFLOW PC: PC dripline can tolerate very large height variations provided the pressure remains within the 7 to 60 psi range, and preferably within 10 to 45 psi.

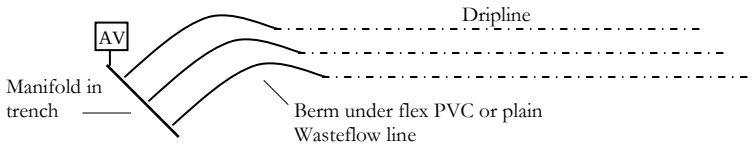
C. Low Head Drainage

At the end of each dosing cycle, consideration must be taken for gravity. Where is the water going to drain when the pump shuts off? Water in the dripline will flow down to the lowest point within the drip zone. This is called "low head drainage." Use the following precautions to mitigate low head drainage.

i. The dripline should run along the contour if at all possible because water will run to the lowest point of the line every time the pump is turned off. If the lowest point in the line is in the middle of the lateral, there will be excess flow at this point.



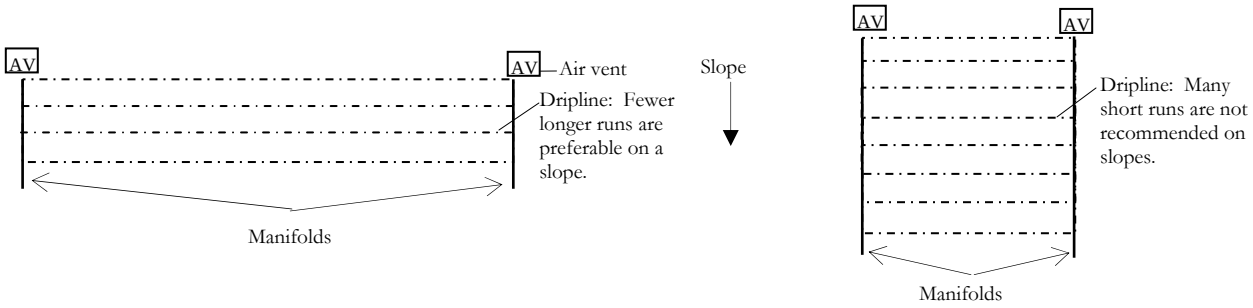
ii Have the dripline pass over an elevated berm between the manifold and beginning of the tubing to reduce gravity flow out of the lateral. In looped systems, elevating the loop will keep the effluent in its respective run.



iii. Use check valves or multiple zones to isolate the drip laterals. Check valves should only be used if there is no risk of freezing in the manifolds. They are placed on the supply and return manifolds coupled with an airvent on the downhill side. If unsure, as a rule of thumb, use a maximum of 1500 ft of Geoflow dripline within each zone or section.

iv. Install short manifolds with fewer longer dripline runs.

v. Slope the supply and return manifolds down to the pump tank so the effluent drains back down to the tank when the pump is turned off. Open the zone valves fully to drain the lines quickly.



Concentrate drip lines at the top of the hill with wider spacing towards the bottom. In the case of compound slopes consult a professional irrigation designer or engineer.

8. MULTIPLE ZONES

Drip dispersal fields can be divided into multiple zones or sections with solenoid valves or index valves for the following reasons:

- Steep slopes with a risk of low head drainage can be subdivided to distribute the water at system shut-down more uniformly in the field.
- Smaller zones reduce the required flow per minute which consequently reduces the size of the pump , valves, filters, supply and return lines.

- Subdividing the field is a tool used to achieve the optimum ranges required to efficiently operate the pumps, filters and valves.
- If the dispersal field is located in multiple areas on the property.
- To accommodate varying soils or vegetation on a single site.

Note. On multiple zones, a single Wasteflow Headworks can be used for filtration and flushing by placing zone valves downstream of the Headworks box. All zones would require a check valve on the individual flush lines upstream of each line joining a common flush line to keep flush water from one zone entering any other zone during the flush cycle. (See Geoflow Design Detail No. 588)

If the effluent has not been through secondary treatment, then each zone should have a dedicated filter or Wasteflow Headworks.

9. FLUSHING DESIGN

Proper flushing of the drip system is critical for proper long term operation. Manual flushing of mains should be facilitated by provision of cleanouts to allow sequential flushing from the pump outward. For the Dripfield Automatic flushing is recommended and should be designed considering the following key points:

- Geoflow's Wasteflow dripline includes GeoShield, a biocide lining to prevent slime accumulation, and the system should be designed to flush at minimum 0.5 fps flow velocity.
- Minimum volume flushed should be 1 volume of dose mains, dose manifold and Dripline.
- Flush time should allow for system pressurization prior to flushing, or add time for pressurization to flush time.
- The flush return should be in a visible location. One option is to position the return over the septic tank inlet tee.
- Ideal location to return field flush flow is to the upstream side of a two compartment drip pump tank. Drip pumps would be in the downstream side of the tank. Flush return flows must not adversely impact treatment system performance; minimize disturbance in the return tank and be sure to not overload secondary treatment.
- Flush frequency at average flows should be minimum 1 per day.

10. WINTERIZATION

Buried drip systems can be safely used in cold climates. However, where severe freezing conditions may be an issue the designer should exercise special care, and some key requirements must be met:

- The dripline itself is made of polyethylene and not susceptible to freezing. It drains through the emitters so it will not be full of water after pumps are turned off.
- All Manifolds and mains must be laid to drain rapidly, and/or buried below frost depth and/or insulated. Be sure drain valve on flush line remains open long enough for entire field to drain. Control system must adequately control drain back
- Remove the check valve at the pump.
- Insulate equipment boxes, including Headworks box or filter and field flush valve boxes as well as zone dosing valves, pressure regulator and air vacuum relief valves. Use closed-cell insulation such as Perlite in a plastic bag. Place metal pins near, or in, the boxes to help locate them when under snow.
- In severe freezing conditions use heat tape or small heaters on PVC and PVC parts.

- When installing PVC supply and return lines and manifolds be sure there are no dips in the lines. This can be avoided by using large diameter pipes (over 2") or by using schedule 80 pipe.
- Air valves must be installed in insulated sealed valve boxes with drain rock sump extending below frost line. The top of air vacuum relief valves must be no higher than soil surface.
- If using an index valve to split field zones, be sure it is capable of self-draining.
- WASTEFLOW lines will self-drain through the emitters into the soil. If the cover crop over the dripfield is not yet adequately established, add hay or straw over the field for insulation.
- Mark the valve box with a metal pin so you can find it in the winter when covered in snow.
- If using manual filter flush valves or manual field flush valves, they should be left cracked open slightly to provide for rapid drainage of the flush line in freezing conditions.
- Fields dosed with relatively small quantities of effluent are more likely to freeze than those dosed with design quantities. If winter use is less than summer use, then only use proportional number of fields to maintain water application rates in the field being dosed.
- Install Dripline with minimum 20cm (8") cover.
- Maintain forest or shrub vegetation in dripfield wherever possible.
- Maintain organic soil cover, where occurring.
- Use organic material to assist in insulation of dispersal area for first winter.
- Trap snow over system, and do not allow packing of snow.
- Do not install near roads or driveways etc.
- Keep effluent warm:
- Install all tanks in insulated "heat island" at house or other location.
- Do not use continuous flush systems.
- Use effluent heaters where seasonal use or cold water use is problematic.

11. LIGHTNING PROTECTION

A direct lightning strike on your valve, controller or wire is going to cause unpreventable damage. It is apparently very difficult to completely prevent electricity from spreading as it jumps across air, runs along electrical wires and may even travel along your water pipes. Power fluctuations can be prevented. The controllers are built to take some electrical surge and pass it through to the ground without damage. This requires a ground wire connected to a grounding stake driven deep into the ground. The best protection would be to use a separate ground wire or rod, not the third ground wire in the building's electrical wiring circuits. If you are installing this system in an area with frequent lightning storms, we advise you to install a separate grounding rod for each field controller installed according to the current version of the National electric Code or as prescribed by local zoning ordinances

12. REUSE FOR IRRIGATION

A good vegetative cover is an advantage to prevent erosion from the field and utilize water applied to the rooting zone. Sites should be planted or seeded immediately after installation. Grasses are particularly suitable for this application. Most lawn grasses will use 0.25" to 0.35" (6.3-8.9mm) of water per day during the peak growing season. This calculates to be about 0.16 to 0.22 gal/ft^2/day. By over-seeding lawns with winter ryegrass, this use efficiency can be continued through much of the

year. For vegetation using 0.16 to 0.22 gal/ft^2/day by evapotranspiration, a sewage flow of 1000 gallons per day would supply the water needs of a landscaped area of 4600 to 6400 sq. ft. without having to add fresh water. For areas larger than this, the plants will suffer water stress during the hot months unless additional fresh water is applied.

13. WATER APPLICATION FORMULA

To determine the rate of application for various drip irrigation designs, use the following formula:

Water application (inches per hour) = (231 x (emitter flow rate gph)) / ((Emitter spacing inches) x (dripline spacing inches))

Example: Dripline with 1.3 gph flow rate emitters spaced 24" apart and dripline spaced 24" apart.

Water application = (231x1.3)/(24x24) = 0.52 inches of water per hour.

WORKSHEET:

The following worksheet is a simplistic guideline and is available as an Excel spreadsheet. It can be downloaded from Geoflow's homepage at www.geoflow.com. To calculate the area required for your drip dispersal system you must know:

1. the quantity of effluent to be disposed of (in gallons per day) and
2. the soil acceptance rate (i.e. gallons per day per square foot).

Make a sketch of the dispersal area with contour lines.

WORKSHEET 1 - DISPERSAL FIELD DESIGN FOR SINGLE ZONE

Worksheet Dispersal Field	Formula
A. Quantity of effluent to be dispersed per day _____ *gpd*	
B. Soil type or hydraulic loading rate _____ *loading rate (gal/sq. ft./day)*	*Based on soil analysis* *Refer to State or Local regulations. If none, refer to Table 2 on page 10*
C. Determine the total area required _____ *square ft*	*Divide gpd by loading rate.* *A/B*
D. Choose the spacing between each WASTEFLOW line and each WASTEFLOW emitter *i)*_____ *ft. between WASTEFLOW lines* *ii)*_____ *ft. between WASTEFLOW emitters*	*Standard spacing is 2 ft.*
E. How many linear feet of dripline in the total area?_____ *ft.*	*(Area / 2) for 2ft. line spacing.* *C/2.0 or* *(Area / 1) for 1 ft. line spacing..* *C/1.0 or* *(Area / 1.5) for 1.5ft line spacing.* *C/1.5*
F. Calculate the number of emitters _____ *emitters*	*(Linear ft. of dripline / 2) for 2 ft emitter spacing.* E/2 *or* *(Linear ft. of dripline / 1) for 1 ft emitter spacing.* E/1 *or* *(Linear ft. of dripline /1.5) for 1.5 ft emitter spacing* E/1.5
G. Choose pressure compensating or Classic dripline _____ *WASTEFLOW Classic dripline or* _____ *WASTEFLOW PC ½ gph dripline* _____ *WASTEFLOW PC 1 gph dripline*	*See page 4 and Appendix 1 for details*

Sketch a layout of the WASTEFLOW lines in the dispersal plot to make sure that the maximum lateral length of each WASTEFLOW line is not exceeded. Count number of laterals for use in flushing velocity below.	*See Maximum Length of Run table in Appendix 1.*
H. Determine dripfield pressure _____ *psi*	*Standard pressure is 20 psi.* *WASTEFLOW Classic systems need between 15 and 45 psi (34.7 and 104 ft.) at the start of the dripfield.* *WASTEFLOW PC systems need between 10 and 45 psi* *(23.1 ft. to 104 ft.) at the start of the dripfield.*
I. Determine feet of head required at dripfield _____ *ft. of head*	*Multiply pressure by 2.31 to get head required.* *H x 2.31*
J. What is the flow rate per emitter? _____ gph / emitter	*See WASTEFLOW flow rates in Appendix 1.*
K. Determine total dose flow for the area _____ *gph* _____*gpm*	*Number of emitters multiplied by the emitter flow rate at the design pressure.* *Gph = No of emitters (F) x gph per emitter (J)* *Gpm = gph/60*
L. Count dripline laterals in the zone _____ *laterals*	*1 lateral = connection form supply line to return line regardless of the number of loops*
M. Determine additional flow required to flush the zone _____ flush velocity _____ *gph* _____*gpm*	*Number of dripline laterals (L) multiplied by flush velocity multiplier:* *Flush Velocity* — *Multiplier* *½ ft/sec.* — *0.37* *1 ft/sec* — *0.74* *2 ft/sec* — *1.48*
N. Total Flow required to flush zone _____ gpm	*M + K in gpm*

PSI = Ft. of head divided by 2.31

WORKSHEET 2 - FRICTION LOSS

Worksheet – Friction Losses	
Friction Loss from dose enable float through Hydraulic Unit	
Total flow rate for the zone (see N above)	_____ gpm
Headloss across headworks / filter (ft.)	_____ ft.
Diameter of supply line (inches)	_____ inches
Length of supply line from pump to hydraulic unit (ft.)	_____ ft.
Supply line equivalent fitting length (ft)	_____ ft.
Supply line friction loss(ft) See PVC friction loss chart in Appendix	_____ ft.
Static head loss from the dose enable float to headworks (ft)	_____ ft.
Total Ft of headloss from pump through hydraulic unit	_____ ft.
Supply lines Friction Losses	
Total Drip line flush flow rate for zone (see N above)	_____ gpm
Size of supply line (inches)	_____ in
Length of supply line (ft)	_____ ft.
Vertical Lift from headworks to dripfield	_____ ft.
Total Supply line friction loss	_____ ft. _____ psi.
Minimum pressure required at beginning of dripfield	_____ ft.
Headloss in Dripline during flushing	
Length of dripline lateral _____ ft.	
Headloss through dripline lateral (See dripline cut sheets in Appendix)	_____ ft.
Pressure at distal end of dripline lateral	_____ ft.
Return lines Friction Losses	
Zone flush flow rate in gpm (see M above)	_____ gpm
Size of return line (inches)	_____ in
Length of return line (ft)	_____ ft.
Vertical Lift from headworks to dripfield	
Total Return line friction loss	_____ ft.
Total Headloss	_____ ft
Note: Pressure from pump to dripfield must be added to pressure required at dripfield. Note: Return line losses must be greater than pressure at distal end of dripline laterals.	

Size of Pump
Flow rate in gpm (N above) (highest flow rate for any zone)
pump model
volts/hp/phase

SYSTEM INSTALLATION

1. INSTALLATION GUIDELINES

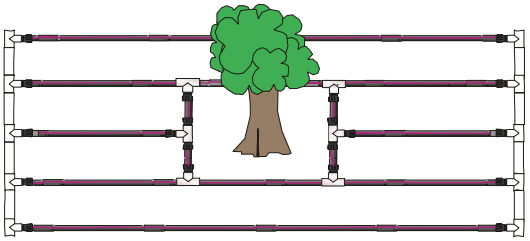
All Geoflow drip systems require:

- - Filtration with 120 mesh/130 micron
- - Filter flush valve
- - Field flush valve
- - 2 Air vents in each zone

All Wasteflow Classic drip systems requires pressure regulation

Handle your dripline and components with care. nano-ROOTGUARD® is temperature sensitive. To assure a long life, store the dripline out of direct sunlight in a cool place.

- All dripfield construction shall be done in accordance with Local rules and regulations.
- Protect the site prior to installation. Construction traffic and material stockpiling can change the soil profile. Fence off entire dripfield prior to any construction. No utilities, cable wire, drain tile, etc shall be located in dripfield.
- System is not to be installed when ground is wet or frozen. When the moisture in the soil is near the plastic limit (soils will ribbon and not easily crumble), it will be prone to smearing.
- Prior to construction note if any water is accessing the location of the dripfield. Dripfield should not be located at the low point of a site. Divert all downspouts and surface waters away from dripfield. If a curtain drain is to be used be sure it is serviceable and properly screened.
- Excavation, filling and grading should have been finished prior to installation of the subsurface drip system. Be sure to minimize soil disturbance when clearing and grubbing the dripfield. Preserve as many trees as possible. Use light track equipment for tree removal and grind out roots to below dripline depth rather than fully removing the entire root.
- Be sure you have everything required for the installation before opening trenches. Pre-assemble as many sets of components as practical above ground and in a comfortable place. Compression or Lockslip adapters should be glued to PVC tees, riser units should be pre-assembled, and the sub-main manifold with tees can be pre-assembled and used to mark the beginning and end of WASTEFLOW lines.



Loop dripline around trees

- For particularly tough soil conditions, soil moisture the day before opening trenches or installing WASTEFLOW. Remember it is much easier to install the system in moist soil. The soil should be moist but still allow the proper operation of the installation equipment and not cause smearing in the trenches. The soil surface should be dry so that the installation equipment maintains traction.
- Mark the four corners of the field. The top two corners should be at the same elevation and the bottom two corners should be at a lower elevation. In freezing conditions the bottom dripline must be higher than the supply and return line elevation at the dosing tank.
- Install the dosing tank. It is critical that the tank is waterproof. If installing a riser, check that it is watertight, and the entry and exit ports are completely sealed. In freezing conditions the

dosing tank should be at the lowest elevation of the entire system. Lid should be placed at grade and water should be able to shed over it.

- Install zone valves; solenoid or hydraulic index valves.
- Install the PVC supply line from the dosing tank, up hill through one lower and one upper corner stake of the dispersal field. Please refer to your State guidelines for depth of burial.
- Paint a line between the two remaining corner stakes.
- Install the Geoflow WASTEFLOW dripline from the supply line trench to the painted line, approximately 6" to 10" deep as specified. Upon reaching the painted line, pull the plow out of the ground and cut the dripline 1' above the ground. Tape the end of the dripline to prevent debris from entering. The tubing expands in warm temperatures and contracts in cold temperatures. If installing during the warmer months, be sure to allow some play in the tubing so it will not pull out of the fittings when it gets cold. Continue this process until the required footage of pipe is installed. Geoflow dripline must be spaced according to specification (2 ft. is standard). Depth of burial of dripline must be consistent throughout the field. Take care not to get dirt into the lines.
- If the system is looped, install the looped ends with Geoflow plain tubing or flex PVC. If in a cold climate be sure to pitch these slightly so they do not hold water and freeze. The loops are to be installed on the outside of the measured field.
- Install the supply header with tees lined up at each Geoflow line. Hook up the Geoflow lines to the supply header. Do not glue WASTEFLOW dripline.

  Lockslip Fittings Installations

  i) Hold the fitting in one hand and position the tubing with the other hand.
  ii) Move the sleeve back, and push the tubing onto the exposed stem as far as possible.
  iii) Push the sleeve out over the tubing and thread the sleeve onto tubing, as though tightening a nut to a bolt. Hand tighten. Do not use tools.
  iv) Test the connection to make sure the sleeve threads have gripped the tubing tightly.
- Install the filter headworks between the field and the pump tank on the supply line. Insulate the box in freezing conditions. When using an open bottom headworks box, place a rodent barrier down first. This can be made from bricks, paving stones, chicken wire, 3 layers of filter fabric or a 6" minimum depth of 1" gravel. Support the pipes entering and exiting the headworks with gravel.
- If using a pressure regulator, install it downstream of the filter headworks, just ahead of the dispersal field, on the supply line. Although the pressure regulator can be buried directly into the soil, it is preferable to install it inside a small valve box for easy access. *Insulate the box in freezing conditions.
- Install the floats in the dosing tank and wire up to the timer control. The timer control should be set to pump no more than the design flow, do not set to match the treatment capacity.
- Install the pump. Fill the dosing tank with fresh water and turn on the pump. Check for flow out the ends of all of the Geoflow lines. Let the pump run for about five minutes to flush out any dirt. Shut off the pump and tape the ends of the lines.
- Dig the return header ditch along the line painted on the ground and back to the pre-treatment tank. Start the return header at the farthest end from the dosing tank. The return line must have slope back to the treatment tank, septic tank or pump tank.

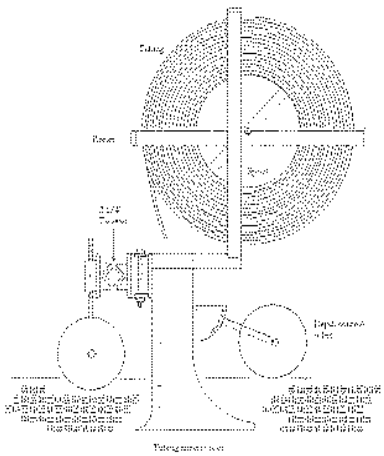
- Install the return header and connect all of the Geoflow lines. Care must be taken not to kink the dripline.
- Install air vacuum breakers at the highest points in the dispersal field. Use pipe dope or Teflon tape and hand tighten. Use a 6" minimum depth of 1" gravel below the boxes to keep rodents out. Insulate in freezing climates.
- Install a ball or solenoid field flush valve on the return line to the pretreatment or pump tank unless a pre-assembled Wasteflow Headworks is being used. If a Headworks was installed on the supply line, connect the return line back through the Headworks box. Support the return pipe before it enters the Headworks with gravel. If using electric solenoid valves, connect the valve common and an individual output wire to the solenoid leads using watertight electrical connectors.
- Allow glue fittings 1 – 2 hours to set. Open the field flush valve and turn on the pump to flush lines then close the valve and check the field and all piping and connections for leaks. Turn off the system
- Check filters and valves for construction debris.
- Turn on the pump and check:
    - Pressure at the air vacuum breaker(s) against design pressure.
    - Check the pressure in the WASTEFLOW Headworks. It should be five psi or higher.
    - If pressure gauges are on each side of the filter, note these for benchmark differential pressure across the filter. If using a manual valve for field flushing, crack it open until at least one PSI is lost or design pressure is reached and leave in that position.
- Flow rates from flow meter or draw down on tank. Compare to design flow.
- Wet spots in the field. If any sections are particularly wet, determine if they are caused by faulty connections, drippers or shallow burial.
- Check that solenoid valves are functioning. Close the internal manual bleed after flushing the system. If solenoid will not close, first clean the solenoid with caution not to lose small spring, and if this fails, open the bonnet and clean the inside.
- Establish vegetation cover as specified.
- Provide owner with final as-built diagrams flow, measurements and pressure readings at startup.
- Provide controller records at startup, including elapsed time meter, pump counts, secondary override counts, high water counts and primary float counts.
- *Solenoid Valve Installation and Operation*
    - Wrap male adapters with 2 wraps of Teflon tape and thread the adapters into the valve inlet and outlet 1 turn past hand tight. CAUTION: over tightening may cause damage to the valve. The solenoid is located on the downstream side of the valve.
    - Flush the laterals by opening the internal manual bleed lever on the downstream side of the solenoid. Turn the flow control stem fully open (counterclockwise) for flow control models.
    - Check that solenoid valves are functioning.

TABLE 2. SUBSURFACE DRIP INSTALLATION METHODS

NOTE: Disturbing the soil may affect the pore structure of the soil and create hydraulic conductivity problems. Please consult with your soil scientist or professional engineer before making the installation technique decision.

INSTALLATION METHOD *	ADVANTAGES	DISADVANTAGES
a) Hand Trenching*	• Handles severe slopes and confined areas • Uniform depth	• Slow • Labor intensive • Disrupts existing turf and ground • Back fill required
b) Oscillating or vibrating plow . Use the type that inserts the dripline directly in place, not one that pulls the dripline through the soil.	• Fast in small to medium installations • Minimal ground disturbance • No need to back fill the trench	• Depth has to be monitored closely • Cannot be used on steeper slopes(>20%) • Requires practice to set and operate adequately • Tends to "stretch" pipe. Shorter runs are required
c) Trenching machine: Ground Hog, Kwik-Trench, E-Z Trench*	• Faster than hand trenching • May use the 1" blade for most installations • Uniform depth	• Slower, requires labor • Disrupts surface of existing turf • Back fill required
d) Tractor with dripline insertion tool - see diagram 2.	• Fast • Little damage to existing turf because of the turf knife • Minimal ground disturbance • Does not stretch drip line • Adaptable to any tractor	• The installation tool is designed specifically for this purpose.
e)Tractor mounted 3-point hitch insertion implement	• Fastest. Up to four plow attachments with reels • A packer roller dumps back soil on top of the pipe	• Suitable for large installations only

* Installation methods are left to the discretion of the contractor and/or the engineer. Other installation methods may be used as long as care is taken to protect the tubing and the soil.



Diag. 2 Installation Tool

WORKSHEET 3 - AS BUILT SYSTEM DESCRIPTION.

1. Site name: _____
2. Site address including State: _____
3. Dripfield designed by: _____
4. Dripfield installed by: _____
5. Date of installation: _____
6. Daily design flow: _____ gpd.
7. Soil loading rate: _____
8. Is there secondary treatment on this job site? _____Yes _____No

   If "Yes" to question 8 above, please name manufacturer and model number:_____
9. Number of zones in dripfield: _____ If more than 1 zone, circle the valve used Hydraulic or Solenoid
10. Amount of dripline installed in each zone:

    Zone 1_____ ft. Zone 2_____ ft. Zone 3_____ ft. Zone 4_____ ft.
11. Wasteflow dripline model number &/or description: _____
12. Flow rate per zone:

    Zone 1_____ gpm. Zone 2_____ gpm. Zone 3_____ gpm. Zone 4_____ gpm.
13. Depth dripline installed below grade: _____ inches
14. Pump manufacturer, model number and number of pumps:_____
15. Filter or Headworks model number &/or description:_____
16. Pressure in each zone:

    Zone 1_____ psi Location pressure measured:_____

    Zone 2_____ psi Location pressure measured:_____

    Zone 3_____ psi Location pressure measured:_____

    Zone 4_____ psi Location pressure measured:_____
17. Size of filter flush valve: _____ inches. Is the filter flush valve manual or automatic? _____
18. Size of field flush valve: _____ inches. Is the field flush valve manual or automatic?_____

    If more than 1 zone, do the zones (a) share 1 flush valve or (b) does each zone have its own flush valve?
19. Was any fill material supplied on the dripfield? _____

    If "yes" to 18 above describe fill quality and quantity added. _____

    _____
20. Please provide owner with as-built drawings, including but not limited to direction of drip lines, location of air vents, pressure regulators if applicable, Headworks (filter and valves) and pump tank.
21. Startup Controller readings:

    ETM____ Pump ct.____ Secondary timer ct.____ High alarm ct.____ Primary ct.____
22. Note how long it takes to drain return line in freezing climates, and set controller

SYSTEM MAINTENANCE

The best way to assure years of trouble free life from your system is to continuously monitor the system and to perform regular maintenance functions. For large systems or systems with a BOD > 30 mg/l automation of maintenance is essential. Inspection and maintenance should be performed every six months.

ROUTINE AND PREVENTATIVE MAINTENANCE

- Clean the filter cartridge. This may be done with a pressure hose. Vortex screen filter cartridge should be cleaned from the outside inwards, while the discs in the disc filter cartridge should be separated and then cleaned. If bacteria buildup is a problem, we advise first trying lye, and if the problem persists, soak the filter cartridge in a chlorine bath - a mixture of 50% bleach and 50% water.
- Open the field flush valve and flush the field for 3-5 minutes by activating the pump in "manual" position. Close the flush valve. On automatic solenoid valves the manual bleed lever should always be in the closed position and the dial on top should be free spinning. This allows it to open when pulsed electrically. Clockwise rotation closes valve.
- With the pump in the "manual" position, check the pressure in the drip field by using a pressure gauge on the Schrader valve located on the air vents and by reading the pressure gauge located in the Wasteflow Headworks box. The pressure should be the same as shown on the initial installation records. On systems with manual flush valves, close the field flush valve completely and then open the valve slightly until there is a 1-2 psi drop or design pressure is reached. This will allow the field to drain after each dose to prevent the manifold lines from freezing.
- Remove the lids on the vacuum breaker and check for proper operation. If water is seen leaking from the top of the vacuum breaker, remove the cap of the vacuum breaker and press down on the ball to allow any debris to be flushed out. Be careful not to come in contact with the effluent.
- Turn off the pump and reset the controller for auto mode.
- Periodically remove and clean the air vents, field flush and filter flush valves.
- Visually check and report the condition of the drip field, including any noticeable wetness.
- Treatment and distribution tanks are to be inspected routinely and maintained when necessary in accordance with their approvals.
- Record the elapsed time meter, pump counter, override counter, high-level alarm and power failures. This information can be obtained from the controller.

HOME OWNERS GUIDE FOR CARE AND MAINTENANCE OF GEOFLOW DRIP DISPERSAL FIELD

A drip dispersal system has been installed on your property for the subsurface dispersal of the effluent from your home.

The drip dispersal system consists of a series of ½" diameter drip tubing installed at a shallow depth of 6-10" below the ground surface. It is designed to effectively disperse the treated effluent in the ground with a combination of soil absorption and plant uptake. Your drip dispersal system will function for many years with only minimal maintenance being required, provided the following recommendations are followed:

- Establish landscaping (preferably a grass cover) immediately. This will stabilize the soil and allow for the grass to take up the water.
- Do not discharge sump pumps, footing drains or other sources of clear water to the system, except for the effluent discharge from your treatment system.
- Maintain all plumbing fixtures to prevent excess water from entering the dispersal system.
- Do not drive cars, trucks or other heavy equipment over the drip dispersal field. This can damage the drip components or the soil and cause the system to malfunction. Lawn mowers, rubber wheeled garden tractors and light equipment can be driven over the drip field.
- Do not drive tent stakes, golf putting holes, croquet hoops etc., into the dispersal field
- Contact your service company if your high water alarm should sound. The pump chamber is sized to allow additional storage after the high water alarm sounds but you should refrain from excessive water usage (i.e., laundry) until the system has been checked.
- After a temporary shut down due to a vacation or other reason, the treatment plant ahead of the drip field filter initially may not function effectively, resulting in the filter blocking. Refer to maintenance guidelines above to clean the filter.

Contact your service company if you notice any areas of excessive wetness in the field. In most cases, this is usually caused by a loose fitting or a nicked dripline and can be easily repaired. Note: There may be some initial wetness over the dripline following the system's installation. This should cease once the ground has settled and a grass cover is established

SITE INSPECTION LIST:

Contractor _____

Site Address _____

Date _____

Site observations

1 Is dripfield located at the lowest point in the site where all waters may pond?
2 Is there any water coming in from neighbors? Downspouts? Irrigation?
3 Construction debris anywhere near the site, or compaction from construction or other causes?
4 How wet is the field before digging?
5 Will effluent drain back to tank in freezing climates? If not, is equipment insulated from freezing?

Pump tank

1 Watertight?
2 At grade. Allow surface water to run off
3 Inlet and outlet lines to be laid in gravel or compacted soils.
4 Float tree designed for easy removal for service and adjustment
5 Float settings correct to design?
6 Pump set a few inches up from the bottom of the tank
7 Waterproof wire nuts used to wire pump junction box

Headworks - Filter and flush valves

1 Waterproof wire nuts used in wiring solenoid valves
2 Is filter large enough to handle flow? Is it appropriate for the treatment unit?
3 Clean filter and valves after construction.
4 Check filter every time system is serviced and clean filter element
5 Clean valves if they do not close properly. See if different valves have different toggles.
6 Insulate in freezing climates
7 Have minimum of 1/2ft depth of 1" gravel under the Headworks for drainage and to keep gophers out
8 Check pressure - across filter (if available)
9 Check pressure - on return line pressure should be as designed. Lower than 5 psi may be too low.

Zone valves

1 Index valves - Requires 10 gpm min. flow, needs to self drain in freezing climate
2 Solenoids - Clean after installation if they do not close properly.

Supply and return lines

1 Make sure they are supported going into and out of the Headworks.
2 No dips
3 Make sure water from dripline does not flow back into supply and return trenches

Dripline

1 On contour
2 Burial depth
3 Check for kinking and local undulations (low areas) in installed dripline
4 Flush lines during construction
5 Is there ponding on surface?
6 Cover crop over field?

Airvents

1 Point of pressure measurement
2 Insulate in freezing climates
3 Make sure they are not in a position for surface or subsurface water to enter the system
4 Check pressure at airvents. Should be as designed. Less than 7psi may be too low.

Return to?

1 Pump tank? Don't churn the tank on return
2 Pretreatment? Can the equipment handle the additional flow?

Controller

1 Check field programmable settings against design
2 Proper wiring of controller….wire floats and valves
3 Keep moisture from running up wire into controller

Notes

1 Use sheet for "As built" in Design Guidelines.
2 Keep a record of start-up pressures and system data screens

Comments:

TROUBLE SHOOTING GUIDE:

Symptom: High water alarm activates periodically (1-2 times/week). During other times the water level in the pump chamber is at a normal level

Possible cause: Peak water usage (frequently laundry day) is causing a temporary high water condition to occur.

Remedy: Set timer to activate the pump more frequently. Be sure to not exceed the total design flow. To avoid this, reduce the duration of each dose.

Remedy: Provide a larger pump tank to accommodate the peak flow periods.

Symptom: High water alarm activates during or shortly after periods of heavy rainfall.

Possible cause: Infiltration of ground/surface water into system.

Remedy: Identify sources of infiltration, such as tank seams, pipe connections, risers, etc. Repair as required.

Symptom: High water alarm activates intermittently, including times when it is not raining or when laundry is not being done.

Possible cause: A toilet or other plumbing fixture may be leaking sporadically but not continuously. Check water meter readings for 1-2 weeks to determine if water usage is unusually high for the number of occupants and their lifestyle. Also determine if water usage is within design range.

Remedy: Identify and repair fixture**.**

Symptom: High water alarm activates continuously on a new installation (less than 3 months of operation). Inspection of the filter indicates it is plugged with a gray colored growth. Water usage is normal.

Possible cause: Slow start-up of treatment plant resulting in the presence of nutrient in the effluent sufficient to cause a biological growth on the filter. This is typical of lightly loaded treatment plants that receive a high percentage of gray water (i.e., from showers and laundry),

Remedy: Remove and clean filter cartridge in a bleach solution. Add a gallon of household bleach to pump tank to oxidize organics. Contact treatment plant manufacturer for advice on speeding up the treatment process possibly by "seeding" the plant with fresh activated sludge from another treatment plant.

Symptom: Water surfaces continuously at one or more isolated spots, each one foot or more in diameter.

Possible cause: Damaged drip line or a loose connection is allowing water be discharged under pressure and therefore at a much greater volume than intended.

Remedy: Dig up drip line. Activate pump and locate leak. Repair as required.

Possible cause: If water is at base of slope, can be caused by low-head drainage.

Remedy: Install check valves and airvents in the manifolds to redistribute water in the system after pump is turned off. This is not advised for freezing climates where manifold drainage is required.

Symptom: A portion of the drip field closest to the feed manifold is saturated while the rest of the field is dry.

Possible cause: Insufficient pump pressure. A pressure check at the return manifold indicates pressure of less than 10 psi.
Remedy: Check filter and pump intake to insure they are not plugged. If they are, clean as require.
Remedy: Leaks in the system may be resulting in loss of pressure. Check for water leaks in connections and fittings or wet spots in the field. Also check air vents to insure they are closing properly. Repair as necessary.
Remedy: Pump is worn or improperly sized. Pressure at feed manifold is less than 15 psi. Verify pressure requirements of system and provide a new or larger pump. As an alternate approach, the drip field may need to be divided into two or more zones.
Possible cause: The duration of each dose is of insufficient length to allow the drip field to become pressurized before the pump shuts off (or runs for only a brief time before turning off).
Remedy: Increase the pump run time and decrease the frequency of doses. Always calculate (or observe during field operation) how long the system takes to fully pressurize and add this time to the design dosing duration.

Symptom: High water alarm begins to activate continuously after a long period (1-2 years) of normal operation. Inspection of the filter indicates it is plugged with a heavy accumulation of sludge.
Possible cause: A buildup of solids in the pump tank due to carryover from the treatment plant.
Remedy: Replace the filter cartridge with a clean cartridge. Check the pump tank and if an accumulation of solids is noted, pump the solids out of the pump tank. Also, check the operation of the treatment plant to insure it is operating properly.

Symptom: Water surfaces at several spots in drip field during dosing periods. Installation is recent, less than 6 months of usage and the soil is a moderate to heavy clay. Possibly, the installation was completed using a non-vibratory plow.
Possible cause: Smearing of the soil may have occurred during installation of drip line. Also, the "cut" resulting from the installation allows an easy path for the water to surface during dosing.
Remedy: In most cases the sod will compact naturally around the drip line and the surfacing will diminish and ultimately cease. To help, reduce the duration of each dose and increase the number of doses/day. Also, it will help to seed the area to encourage the development of a good root zone.

Symptom: Entire area of drip field is wet, soft and spongy. It appears to be totally saturated with water. Situation occurs during dry season when there is little rainfall.
Possible cause: Water being discharged to drip field exceeds design. Excess water may be a result of infiltration, plumbing leaks or excessive water usage.
Remedy: Check water meter, elapsed time meter, pump counter, override counter or high level alarm counter to determine if water usage is in excess of design. Check for leaks or infiltration. Repair leaks as required. Reduce water usage by installing water saving fixture.
Remedy: If water usage cannot be reduced, enlarge drip field as required.
Possible cause: Area of drip field was inadequately sized and is too small.
Remedy: Provide additional soil analysis to verify sizing and enlarge as required.

Valve Troubleshooting

Symptom: Valve will not open manually

Check water supply and any possible master or gate valves to insure they are open.
Check that the valve is installed with the arrow pointing in the downstream direction
Check that the flow control is fully open, counterclockwise.
Turn off the water supply. Remove the solenoid and check for debris blocking the exhaust port.
Turn off the water supply. Remove the cover. Inspect the diaphragm for damage and replace if necessary.

Symptom: Valve will not open electrically

Check voltage at controller for 24 VAC station.
Check voltage across the solenoid lead wires for minimum 21 VAC.
Make sure handle on top of valve is free spinning. Not all the way open or all the way closed.
If the valve still does not operate, electrically replace the solenoid.

Symptom: Valve will not close

Insure the manual bleed lever is in the closed position.
Check for leaks around the flow control, solenoid or between valve cover and body.
Turn off the water supply. Remove the solenoid and check for debris or damage to the exhaust port.
Turn off the water supply. Remove valve cover and inspect for debris under diaphragm or debris in diaphragm ports.

Symptom: Slow leak

Check for dirt or gravel embedded in the diaphragm seat.
Check actuator and exhaust fitting for proper seating.

SUBSURFACE DRIP DISPERSAL KEY COMPONENTS MINIMUM STANDARDS

Component	Standard	Notes
Dripline and blank Dripline	Designed specifically for wastewater use, with purple stripe and a turquoise inner lining or purple color	Do not use non-wastewater tubing or emitters.
	Biocide lining	Required to permit 0.5 fps flushing velocity
	Emitters impregnated with Treflan® or OBPA	Required to prevent root intrusion
Dripline installation depth	6" to 12" (15-30cm)	6" (15cm) standard.
Dripline minimum pressure	10 psi during dosing	Minimum pressure required to get flush water back to flush tank.
Dripline fittings	Lockslip fittings. Using barb couplings if Lockslip does not fit through installation shank.	Reduces risk of tubing splitting.
Flexible pipe for loops	1/2" IPS flexible PVC pipe	To avoid kinking
Air valves	1" for any drip area under 2500 emitters.	To assist in rapid pressurization, siphon break and to prevent suction of fines into emitters. Install in valve box with drain rock or pea gravel base. Install with no high or low points between valve and Dripline.
Supply mains	Design at 2-5 fps velocity for dosing flushing	
Pressure test ports	At manifolds, filter outlet, flush valve inlet.	
Check valves (if used)	To prevent back feed of sub areas from flush main, or to prevent drain down of one area to another.	Preferably ball style check valves provided with unions for service.
Control valves/flush valve	Contamination resistant solenoid operated hydraulic diaphragm valves	Three way solenoid with external piloting and filtration recommended for larger systems.
	Motorized ball valves	Installed above any water level. Preferred for freezing conditions.
Flush return	Preferred, to septic tank inlet tee with air gap for observation.	Must not cause scouring or disturbance in tank. May be returned to treatment plant inlet if appropriate.
Indexing valve (if used)	Install at high point of system or use check valves.	Consider minimum switching flow rate and head loss in hydraulic design.
Filter	Maximum aperture size 130 microns	
	Screen filters, maximum differential of 2 psi at peak flow rate	For small residential systems with STE do not use screen filters smaller than 1.5" to avoid excessive differential

Component	Standard	Notes
	Disc filters to include biocide impregnation in disc material.	To prevent grow through of slime.
	Manual clean disc filters to be sized to allow typical minimum one year operation between cleaning.	Screen filters should be self-flushing or self-cleaning.
	Differential pressure alarm/gage, set point 2psi	Optional. May be replaced by pressure test ports.
Pump relief valve	Pressure Sustaining or Relief valve designed to keep pressure within maximum for headworks and achieve pump cooling flow. To be used where pump maximum pressure in excess of 100 psi.	
Pump chamber	To meet minimum timed dose standards.	
Control panel	Timed dosing, with main dose at average flow, override at design flow and alarm for high level.	No dosing in excess of the Design flow.
	Alarm, audible and visual	For high level (optionally for filter differential)
	Low level cut off and alarm	To protect pump, with alarm.
	Drain down capability	For freezing conditions.
	Automatic flush capability.	Continuous flush is not recommended.
	Data logging capability	Record of events with time, day, date stamp.
Septic Tank treatment	To consistently achieve maximum BOD5 of 150 mg/L, TSS of 50 mg/L Oil and Grease of 15 mg/L	Must be provided with outlet barrier filter to 1/16". Recommended tank size 4 x design flow, minimum 3 x design flow.
Secondary treatment facility	To consistently achieve maximum BOD5 of 30 mg/L, TSS of 30 mg/L Oil and Grease of 15 mg/L	Must be provided with outlet barrier filter to 1/16" if there is risk of sludge escaping from plant.
Tanks	Meeting local and national regulatory standards. Watertight tested, with waterproof risers to grade.	Installed to meet standard practice.
Pipe and plumbing components	Designed and manufactured to resist the corrosive effects of wastewater and common household chemicals, and meet applicable ASTM standards.	
Valve boxes	Provide valve boxes for all valves and pressure test points. With pea gravel or gravel base and positive drainage. Frost protected where necessary. Mark valve box locations.	
Electrical components	Should comply with appropriate local and national regulatory requirements. The installation of all electrical components must comply with local Electrical Code. Control valves must be wired to manufacturer standards.	

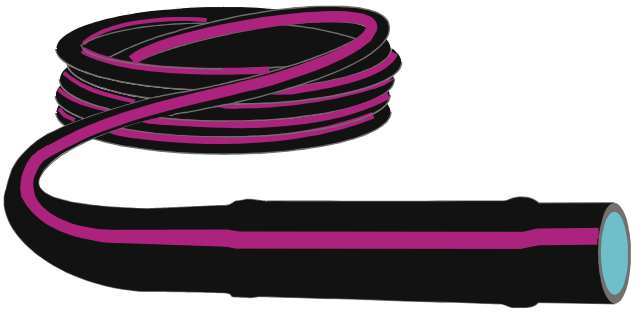
PRODUCT SHEETS

Product	Pages
Wasteflow® dripline	34 - 37
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Ball Check Valves	48 - 49
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WASTEFLOW DRIPLINE

Description

The flexible 1/2" polyethylene dripline has large emitters regularly spaced in the line. With the dripline hidden about six inches below ground, effluent is distributed slowly and uniformly, reducing ponding, even in difficult soils and hilly terrain.



WASTEFLOW is built to last. It is guaranteed to be trouble-free from root intrusion with built-in nano-ROOTGUARD® protection, and the dripline wall is protected from organic growth with the *Geoshield* lining. WASTEFLOW provides uniform distribution. The emitters have a Coefficient of variation of less than .05.

Different flow rates, dripline diameters and emitter spacings can be special ordered.

Use 600 series compression adapters or lockslip fittings to connect the dripline to PVC pipe.

nano-ROOTGUARD® Protection

WASTEFLOW dripline features patented nano-ROOTGUARD technology to prevent roots from clogging the emission points. The pre-emergent, Treflan®, is bound into WASTEFLOW emitters when they are molded to divert roots from growing into the emitter outlet. The system is guaranteed against root intrusion for 15 years.

ANTI BACTERIAL Protection

Geoshield® is incorporated into the inner lining and emitters of WASTEFLOW dripline to prevent bacteria from growing on the walls of the tubing and emitters. It eliminates the need to scour the tubing. It is a tin based formula that defeats the energy system of microbial cells. This means smaller pumps or larger zones can be used with WASTEFLOW dripline than unprotected dripline.

PC vs. CLASSIC

Geoflow, Inc. offers WASTEFLOW dripline in both pressure compensating (WASTEFLOW PC) and non-compensating (WASTEFLOW Classic) models.

We recommend that WASTEFLOW PC be used when the advantages are of substantial economic value.

a) Very long runs.

b) Steep slopes. Systems should be designed for the dripline lateral to follow the contour. If this is possible, the extra cost of pressure regulators required for WASTEFLOW Classic would likely be less than the incremental cost of WASTEFLOW PC.

c) Rolling terrain. If the difference in height from trough to peak exceeds six feet then WASTEFLOW PC should be used. Vacuum relief valves must be placed at the top of each rise.

WASTEFLOW PC and WASTEFLOW Classic can be interchanged to meet filter and zone flow requirements.

- WASTEFLOW is manufactured under US Patents 5332160,5116414 and Foreign equivalents.
- **Geoshield®** is a registered trademark of A.I.Innovations
- WASTEFLOW is a registered trademark of A.I.Innovation
- TREFLAN is a registered trademark of Dow Agro Chemicals.

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WASTEFLOW CLASSIC



Available in 2 standard models

WF16-4-24 WASTEFLOW Classic 24"/1.3gph
WF16-4-12 WASTEFLOW Classic 12"/1.3gph
Alternate flow rates, diameters and spacing available upon request.

Flow Rate vs. Pressure

Pressure psi	Head ft.	ALL WASTEFLOW Classic Dripline
10 psi	23.10 ft.	.81 gph
15 psi	34.65 ft.	1.00 gph
20 psi	46.20 ft.	1.16 gph
25 psi	57.75 ft.	1.31 gph
30 psi	69.30 ft.	1.44 gph
35 psi	80.85 ft.	1.57 gph
40 psi	92.40 ft.	1.68 gph
45 psi	103.95	1.80 gph

Maximum Length of Run vs. Pressure

Flow variation +/- 5%

Pressure psi	Head ft.	Emitter Spacing 24"	18"	12"
10 psi	23.10 ft.	170'	165'	100'
15 psi	34.65 ft.	170'	165'	100'
20 psi	46.20 ft.	170'	165'	100'
25 psi	57.75 ft.	170'	165'	100'
30 psi	69.30 ft.	170'	165'	100'
35 psi	80.85 ft.	170'	165'	100'
40 psi	92.40 ft.	170'	165'	100'
45 psi	103.95 ft.	170'	165'	100'

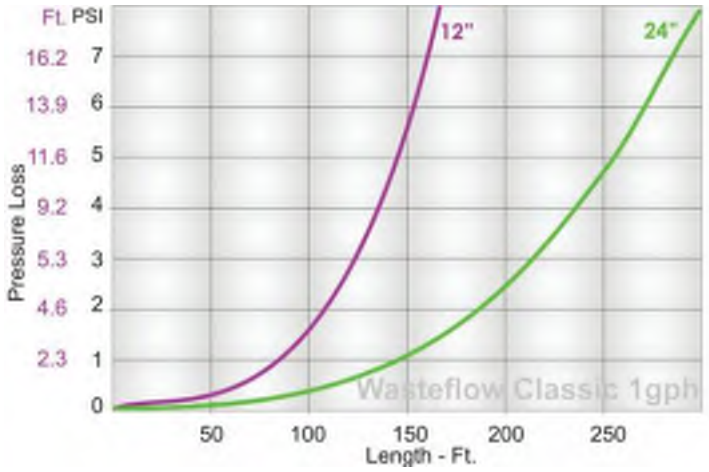
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NOTE:
For rolling terrain use Geoflow's WASTEFLOW PC-SD, our slow drain anti-siphon dripline

WASTEFLOW Classic Specification

The dripline shall consist of nominal sized one-half inch linear low density polyethylene tubing, with turbulent flow drip emitters bonded to the inside wall. The drip emitter flow passage shall be 0.053" x 0.053" square. The tubing shall have an outside diameter (O.D.) of approximately .64-inches and an inside diameter (I.D.) of approximately .55-inches. The tubing shall consist of three layers; the inside layer shall be *Geoshield*® protection, the middle layer shall be black and the outside layer shall be purple striped for easy identification. The dripline shall have emitters regularly spaced 24" (or 12") apart. The turbulent flow emitters shall be molded from virgin polyethylene resin. The turbulent flow emitters shall have nominal discharge rates of 1.16 gallons per hour at 20 psi. The emitters shall be impregnated with Treflan® to inhibit root intrusion for a minimum period of fifteen years and shall be guaranteed by the manufacturer to inhibit root intrusion for this period. WASTEFLOW Classic dripline shall be Geoflow model number WF16-4-24 (or WF16-4-12).

Pressure Loss vs. Length of Run



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WASTEFLOW PC 1/2 gph



Standard products:

WFPC16-2-24 WASTEFLOW PC 24"/.53gph or 2lph
WFPC16-2-18 WASTEFLOW PC 18"/.53gph or 2lph
WFPC16-2-12 WASTEFLOW PC 12"/.53gph or 2lph
Alternative spacing, flow rates and diameters available upon request.

Flow Rate vs. Pressure

Pressure	Head	ALL WASTEFLOW PC 1/2 gph dripline
7-60 psi	16-139 ft.	0.53 gph

Maximum Length of Run vs. Pressure

Allows a minimum of 10 psi in the line.
Recommended operating pressure 10-45 psi.

Pressure psi	Pressure ft.	Emitter Spacing 6"	12"	18"	24"
10 psi	23.10 ft.				
15 psi	34.65 ft.		174'	260'	321'
20 psi	46.20 ft.	120'	229'	330'	424'
25 psi	57.75 ft.		260'	377'	478'
30 psi	69.30 ft.	150'	288'	415'	535'
35 psi	80.85 ft.		313'	448'	576'
40 psi	92.40 ft.	172'	330'	475'	612'
45 psi	103.95 ft.		354'	501'	651'
50 psi	115.5 ft.		363'	523'	675'
55 psi	127.05 ft.		377'	544'	700'
60 psi	138.6 ft.		403'	563'	727'

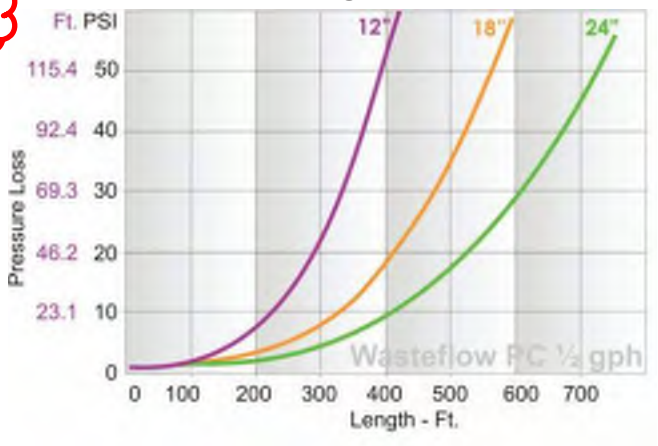
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NOTE:
For rolling terrain use Geoflow's WASTEFLOW PC SD, our slow drain anti-siphon dripline

WASTEFLOW PC ½ gph PC Specification

The dripline shall consist of nominal sized one-half inch linear low density polyethylene tubing, with turbulent flow drip emitters bonded to the inside wall. The drip emitter flow passage shall be 0.032" x 0.045" square. The tubing shall have an outside diameter (O.D.) of approximately .64-inches and an inside diameter (I.D.) of approximately .55-inches. The tubing shall consist of three layers; the inside layer shall be a *Geoshield*® protection, the middle layer shall be black and the outside layer shall be purple striped for easy identification. The dripline shall have emitters regularly spaced 24" (or 18" or 12") apart. The pressure compensating emitters shall be molded from virgin polyethylene resin with a silicone rubber diaphragm. The pressure compensating emitters shall have nominal discharge rates of 0.53 gallons per hour. The emitters shall be impregnated with Treflan® to inhibit root intrusion for a minimum period of fifteen years and shall be guaranteed by the manufacturer to inhibit root intrusion for this period. 0.53 gph WASTEFLOW PC pressure compensating dripline shall be Geoflow model no. WFPC16-2-24 or WFPC16-2-18 or WFPC16-2-12.

Pressure Loss vs. Length of Run



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WASTEFLOW PC 1 gph



Standard Products:

WFPC16-4-24 WASTEFLOW PC 24"/1.02 gph or 4lph
WFPC16-4-18 WASTEFLOW PC 18"/1.02 gph or 4lph
WFPC16-4-12 WASTEFLOW PC 12"/1.02 gph or 4lph
Alternative spacing, flow rates and diameters available upon request.

Flow Rate vs. Pressure

Pressure	Head	ALL WASTEFLOW PC 1 gph dripline
7-60 psi	16-139 ft.	1.02 gph

Maximum Length of Run vs. Pressure

Allows a minimum of 10 psi in the line.
Recommended operating pressure 10-45 psi.

Pressure		Emitter Spacing		
psi	ft.	12"	18"	24"
10 psi	23.10 ft.	95'	140'	175'
15 psi	34.65 ft.	115'	172'	211'
20 psi	46.20 ft.	146'	210'	265'
25 psi	57.75 ft.	171'	242'	315'
30 psi	69.30 ft.	180'	266'	335'
35 psi	80.85 ft.	199'	287'	379'
40 psi	92.40 ft.	211'	305'	385'
45 psi	103.95 ft.	222'	321'	429'
50 psi	115.5 ft.	232'	334'	431'
55 psi	127.05 ft.	240'	347'	449'
60 psi	138.6 ft.	249'	360'	465'

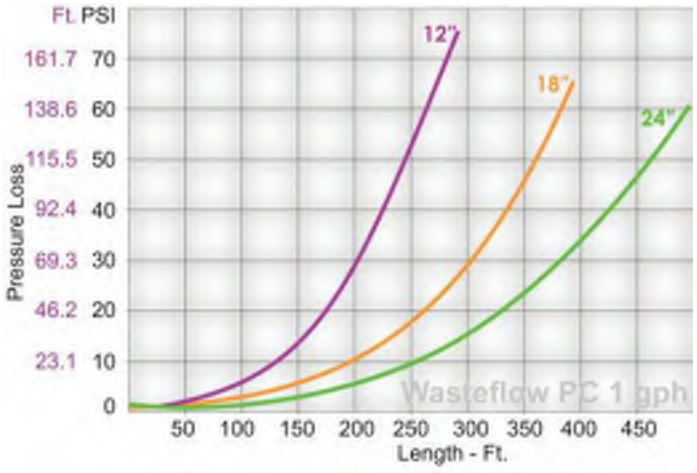
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NOTE:
For rolling terrain use Geoflow's WASTEFLOW PC-SD, our slow drain anti-siphon dripline

WASTEFLOW PC 1 gph PC Specification

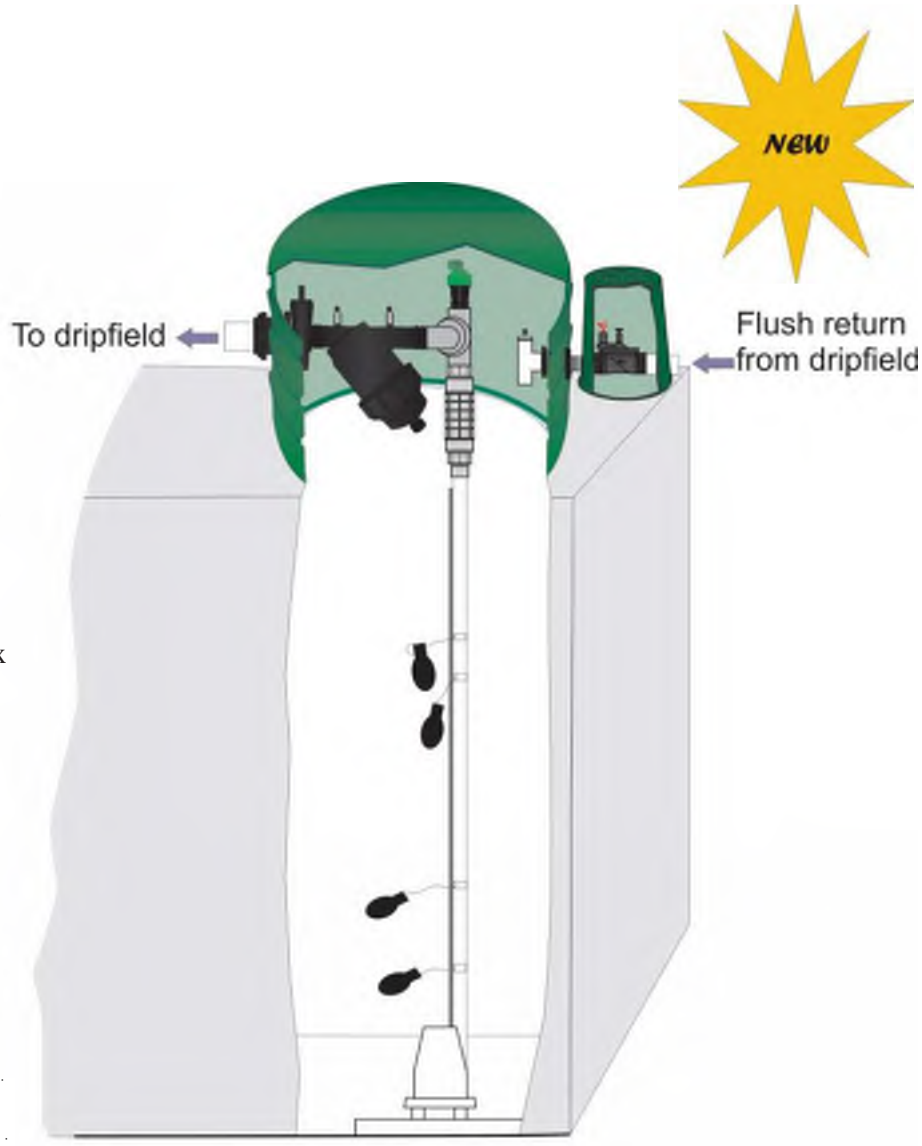
The dripline shall consist of nominal sized one-half inch linear low density polyethylene tubing, with turbulent flow drip emitters bonded to the inside wall. The drip emitter flow passage shall be 0.032" x 0.045" square. The tubing shall have an outside diameter (O.D.) of approximately .64-inches and an inside diameter (I.D.) of approximately .55-inches. The tubing shall consist of three layers; the inside layer shall be *Geoshield*® protection, the middle layer shall be black and the outside layer shall be purple striped for easy identification. The dripline shall have emitters regularly spaced 24" (or 18" or 12") apart. The pressure compensating emitters shall be molded from virgin polyethylene resin with a silicone rubber diaphragm. The pressure compensating emitters shall have nominal discharge rates of 1.02 gallons per hour. The emitters shall be impregnated with Treflan® to inhibit root intrusion for a minimum period of fifteen years and shall be guaranteed by the manufacturer to inhibit root intrusion for this period. 1.02 gph WASTEFLOW PC pressure compensating dripline shall be Geoflow model number WFPC16-4-24 (or WFPC16-4-18 or WFPC16-4-12) .

Pressure Loss vs. Length of Run



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InTank Headworks



Description

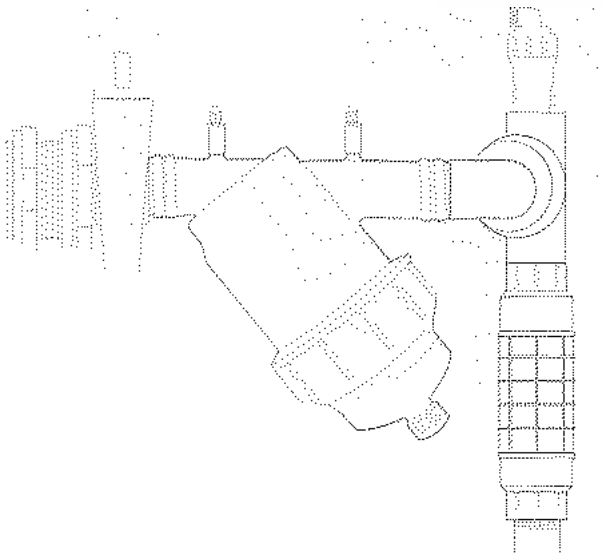
Designed to fit inside the pump tank riser with a quick disconnect fitting for easy removal and servicing. No need to maintain the filter, and flush valve on your hands and knees. The entire filter and pump come out together.

Available with either Geoflow's BioDisc or Vortex Screen filter.

No need to bury a headworks box in the ground.

No animals and flooding damage.

Reduces freezing as it stays warmer inside the pump tank.



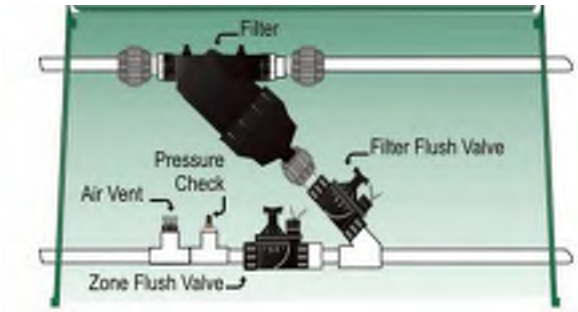
Design patent pending

Geoflow, Inc. **Tel 415-927-6000 / 800-828-3388** **Fax 415-927-0120** **www.geoflow.com**

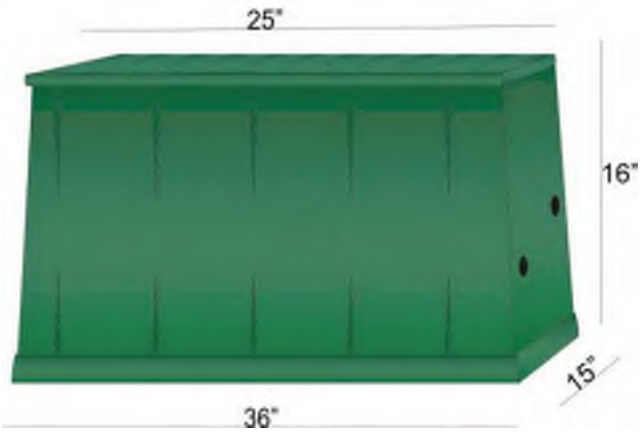
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WHW Sporty Headworks - Disc
In-Ground

Description
The Wasteflow Headwork is a pre-assembled unit including filters, valves, fittings and pressure gauges mounted inside a box for direct burial, or inside a pump tank risier. It is installed between the pump and the field to filter out fine particles from entering the treatment field, and to flush fine particles that may collect in the dripfield. recommended for maximum flow rate of 30gallons per minute and 600 gallons per day.







Process
During a *dosing cycle*, the wastewater exits the pump chamber and enters the inlet fitting of the Sporty Headworks. It passes through the filter before exiting the box and going to the dripfield zone that is open. Both the field flush valve and zone flush valves are closed at this time.

The water enters back into the Headworks through the return line, goes past the point to measure pressure and stops at the field flush valve.

During a *field flush* cycle, water enters the Headworks as above, the filter flush valve remains closed, but the field flush valve opens to allow water to circulate through the dripfield and return back into the return fitting of the headworks, past the pressure gage and through the field flush valve at an increased velocity than during normal dosing. The water passes through the field flush valve and down the flush line in the headworks to exit the headworks for return to the pump tank or pretreatment tank.

When *filter flushing*, the filter valve opens and the field flush valve is closed. While water passes through the filter to the field, part of the water is directed to the base of the filter, pushing solids down the screen, out of the filter, through the open filter flush valve, into the flush line in the ultra headworks to exit the headworks for return to the pump tank or pretreatment tank.

Geoflow, Inc. **Tel 415-927-6000 / 800-828-3388** **Fax 415-927-0120** **www.geoflow.com**

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Components Specification:

Enclosure: The Wasteflow Headworks Sporty enclosure shall be injection molded of structural foam polyethylene with a melt index of 10-12. The box shall be tapered with a top measurement of 25" x 16" and a bottom measurement of 33"x 23". The height shall be a minimum of 15" tall with a minimum wall thickness of 0.320". The body shall have a double wall at the top to cover seat area with a minimum thickness of 0.320". The cover seat area shall have structural support ribs on the underside of the seat. The bottom of the body shall have a 1.0" flange. The cover shall have an average thickness of 0.350".

Pressure Gauges: There shall be 3 points to measure pressure on the Sporty Wasteflow Headworks; one on each side of the filter and one on the return line. The pressure gauge is oil-filled and capable of registering pressure between 0-80 psi.

BioDisc filter (APBIODISC-150): The APBIODISC-150 filter body and discs shall be molded of polyethylene resins. The disc shall include **Geoshield®** anti-bacterial compound to protect the filter element against slime build-up. Filtration shall be 150 mesh/100 micron. The two piece body shall be capable of being serviced by untwisting and shall include an O-ring seal. The seals shall be manufactured from Nitrilo rubber. The inlet and outlet shall be 1.5 inch MPT. The UF disc filter shall be part number APBIODISC-150 as supplied by Geoflow, Inc.

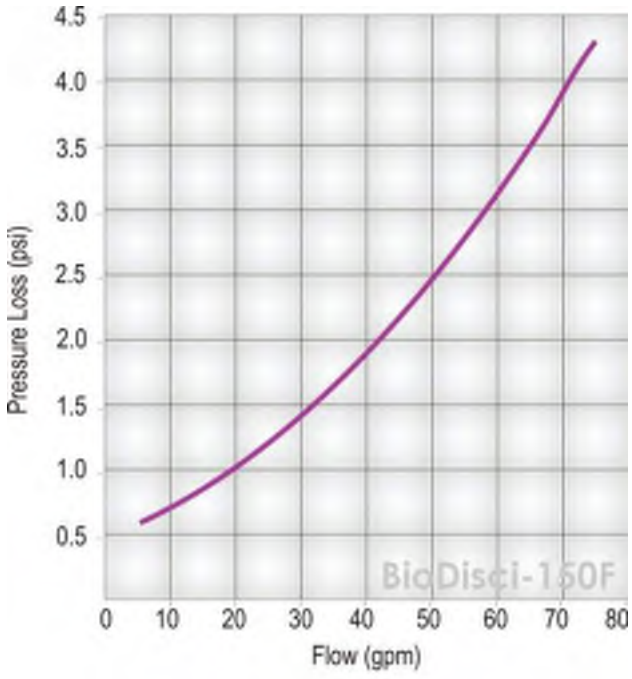
Filter Flush Valve (SVLV-075): The solenoid valve shall be an electrically operated, normally closed, hydraulic valve with a 3/4" FIPT inlet and outlet. The globe shaped valve body is constructed of nylon reinforced molded epoxy resin and is waterproof, with an O-ring seal, and complies with NFC Class II circuit requirements for 24V a.c. operation. Metal parts shall be constructed of stainless steel, and the diaphragm shall be molded of natural rubber. The recommended operating pressure range is between 10-150 psi. Also available with manual flush where approved.

Field Flush Valve (SVLV-100 or SVLV-150):
The solenoid valve shall be an electrically operated, normally closed, hydraulic valve with a 1" FIPT inlet and outlet. The globe shaped valve body is constructed of nylon reinforced molded epoxy resin and is waterproof, with an O-ring seal, and complies with NFC Class II circuit requirements for 24V a.c. operation. Metal parts shall be constructed of stainless steel, and the diaphragm shall be molded of natural rubber. The recommended operating pressure range is between 10-150 psi. Also available with manual flush where approved.

½" Air Relief Valve (ARV-05): Molded plastic air vent with rubber ring shall be used on flush end of the Headworks. It shall be capable of allowing air in at 5 gpm.

Piping, Unions and Fittings shall be schedule 40 or schedule 80 grade PVC.

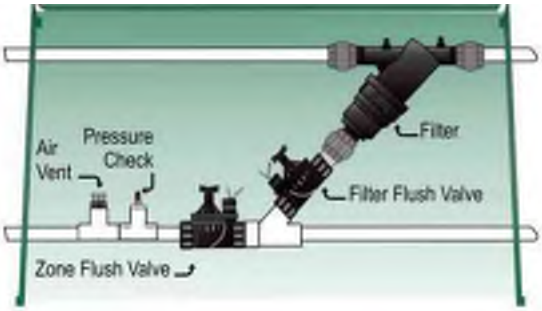
Flow vs. Pressure



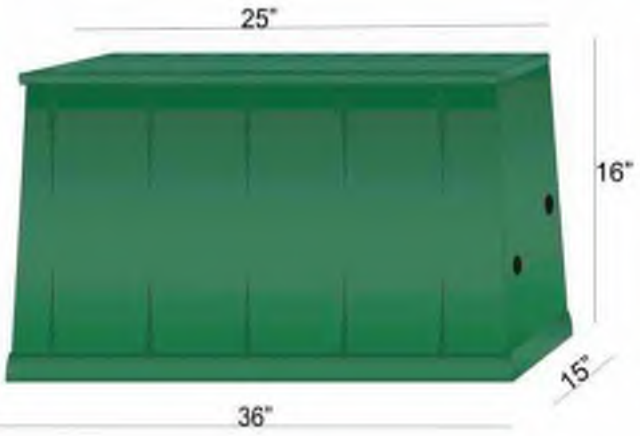
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WHW Sporty Headworks - Screen
In-Ground

Description
The Wasteflow Headwork is a pre-assembled unit including filters, valves, fittings and pressure gauges mounted inside a box for direct burial, or inside a pump tank risier. It is installed between the pump and the field to filter out fine particles from entering the treatment field, and to flush fine particles that may collect in the dripfield. Recommended for maximum flow rate of 30gallons per minute and 600 gallons per day.







Process
During a *dosing cycle*, the wastewater exits the pump chamber and enters the inlet fitting of the Sporty Headworks. It passes through the filter before exiting the box and going to the dripfield zone that is open. Both the field flush valve and zone flush valves are closed at this time.

The water enters back into the Headworks through the return line, goes past the point to measure pressure and stops at the field flush valve.

During a *field flush* cycle, water enters the Headworks as above, the filter flush valve remains closed, but the field flush valve opens to allow water to circulate through the dripfield and return back into the return fitting of the headworks, past the pressure gage and through the field flush valve at an increased velocity than during normal dosing. The water passes through the field flush valve and down the flush line in the headworks to exit the headworks for return to the pump tank or pretreatment tank.

When *filter flushing*, the filter valve opens and the field flush valve is closed. While water passes through the filter to the field, part of the water is directed to the base of the filter, pushing solids down the screen, out of the filter, through the open filter flush valve, into the flush line in the ultra headworks to exit the headworks for return to the pump tank or pretreatment tank.

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Components Specification:

Enclosure: The Wasteflow Headworks Sporty enclosure shall be injection molded of structural foam polyethylene with a melt index of 10-12. The box shall be tapered with a top measurement of 25" x 16" and a bottom measurement of 33"x 23". The height shall be a minimum of 15" tall with a minimum wall thickness of 0.320". The body shall have a double wall at the top to cover seat area with a minimum thickness of 0.320". The cover seat area shall have structural support ribs on the underside of the seat. The bottom of the body shall have a 1.0" flange. The cover shall have an average thickness of 0.350".

Pressure Gauges: There shall be 3 points to measure pressure on the Sporty Wasteflow Headworks; one on each side of the filter and one on the return line. The pressure gauge is oil-filled and capable of registering pressure between 0-80 psi.

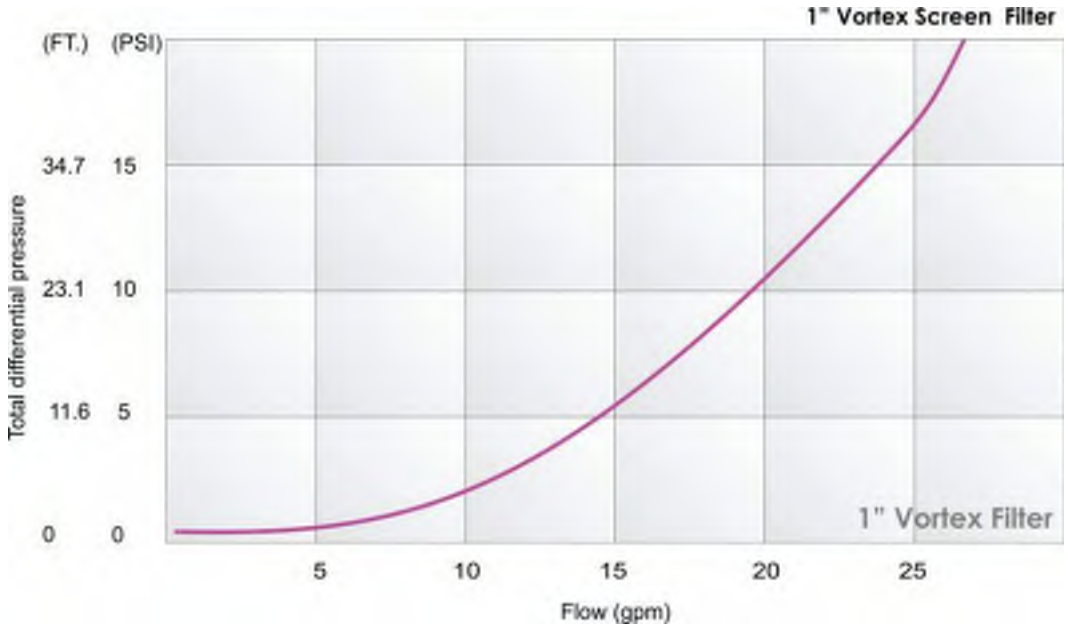
Vortex Screen Filter (AP4E-1F or AP4E1.5F or AP4E2F): The Y filter body shall be molded from glass reinforced engineering grade black plastic with a (*1 or 1.5 or 2 inch*) male pipe thread (MIPT) inlet and outlet. The two piece body shall be capable of being serviced by untwisting and shall include an O-ring seal. An additional ¾ inch MIPT outlet shall be capable of periodic flushing. The 150 mesh filter screen is all stainless steel, providing a filtration area of (*28.4 square inch for AP4E-1F, 60.8 square inch for AP4E-1.5F, 60.8 square inch for AP4E-2F*) . The screen collar shall be molded from vinyl. The filter shall be Geoflow Vortex Screen Filter model number (*AP4E-1F or AP4E1.5F or AP4E2F).*

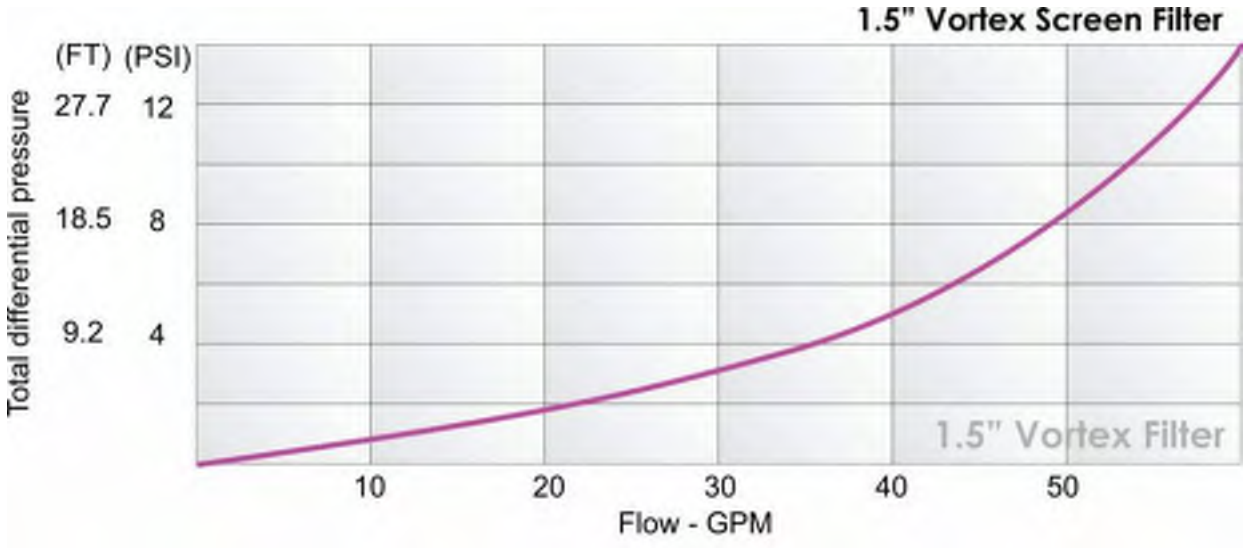
Filter Flush Valve (SVLV-075): The solenoid valve shall be an electrically operated, normally closed, hydraulic valve with a 3/4" FIPT inlet and outlet. The globe shaped valve body is constructed of nylon reinforced molded epoxy resin and is waterproof, with an O-ring seal, and complies with NFC Class II circuit requirements for 24V a.c. operation. Metal parts shall be constructed of stainless steel, and the diaphragm shall be molded of natural rubber. The recommended operating pressure range is between 10-150 psi. Also available with manual flush where approved.

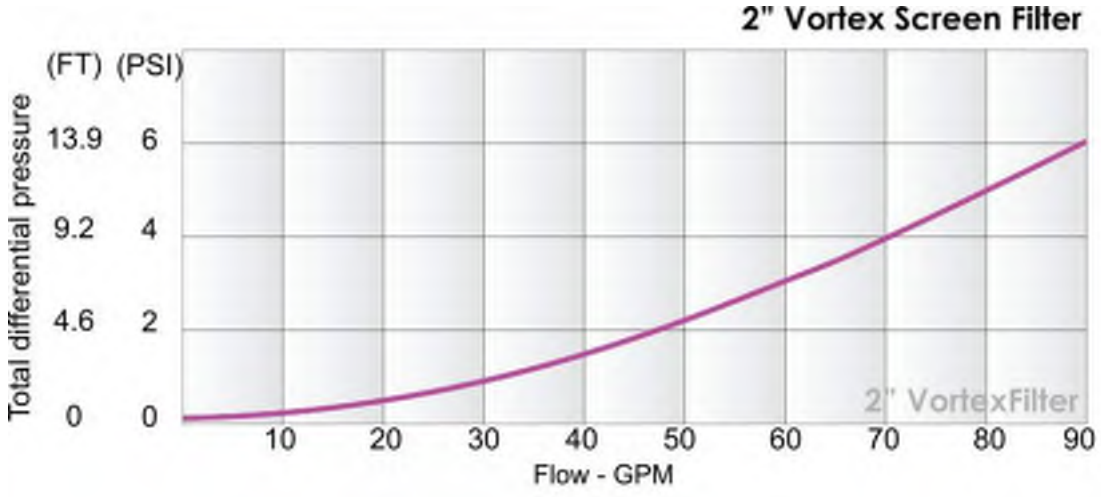
Field Flush Valve (SVLV-100 or SVLV-150): The solenoid valve shall be an electrically operated, normally closed, hydraulic valve with a 1" FIPT inlet and outlet. The globe shaped valve body is constructed of nylon reinforced molded epoxy resin and is waterproof, with an O-ring seal, and complies with NFC Class II circuit requirements for 24V a.c. operation. Metal parts shall be constructed of stainless steel, and the diaphragm shall be molded of natural rubber. The recommended operating pressure range is between 10-150 psi. Also available with manual flush where approved.

½" Air Relief Valve (ARV-05): Molded plastic air vent with rubber ring shall be used on flush end of the Headworks. It shall be capable of allowing air in at 5 gpm. Piping, Unions and Fittings shall be schedule 40 or schedule 80 grade PVC.

Pressure Loss:







Pressure Regulators

Description

The regulators are preset to regulate pressure in the field. These are recommended with Wasteflow Classic and optional with Wasteflow PC. Under normal operating conditions the pressure in the dripline should be:
10 - 45 psi for Wsteflow Classic and Wasteflow PC

Pressure Regulator Specification

Geoflows pressure regulator shall be designed to handle steady inlet pressures of ___ psi and withstand severe water hammer extremes. It shall handle flow rates between ___ gpm and ___ gpm. Flow restriction shall be negligible until the factory preset pressure is reached. Regulatory accuracy shall be within +/- 6%. Inlet and outlet size shall be ¾" FIPT. The body shall be constructed of high impact engineering grade thermoplastics. Regulation shall be accomplished by a fixed stainless steel compression spring enclosed in a chamber separate from the normal water passage. Each regulator shall be water tested for accuracy. Pressure regulator shall be Geoflow model number PMR- ____ - _ F



Low, Medium and High Flow Regulator

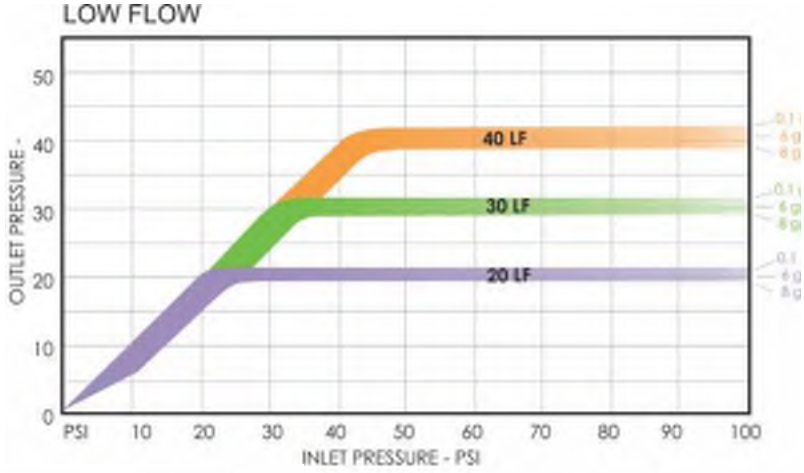


Extra flow regulator- Flows up to 90 gpm

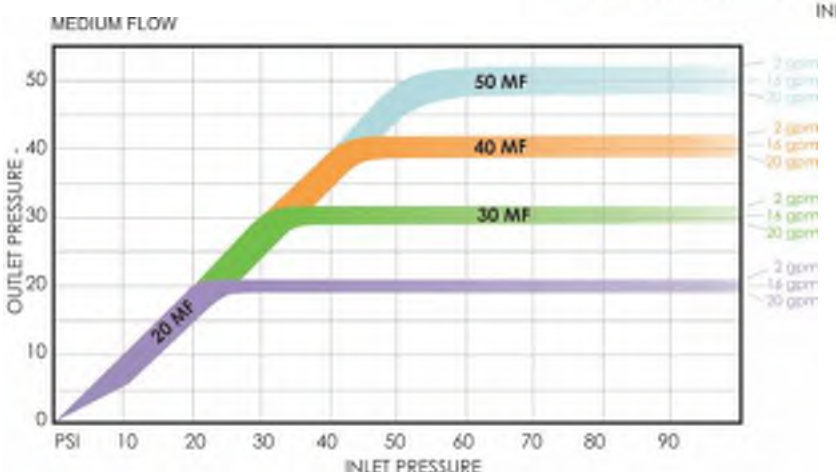
Item No.	Outlet Pressure	Flow Range	Max. Inlet Pressure	Inlet / Outlet
PMR-20-LF	20 psi	1/8-8 gpm	150 psi / 347ft	¾" / ¾" fipt
PMR-20MF	20 psi	2-20 gpm	150 psi / 347ft	1" / 1" fipt
PMR-20-HF	20 psi	10-32 gpm	100 psi / 231ft	1.25" / 1" fipt
PMR-20-XF	20 psi	20-90 gpm	90 psi / 208 ft	3" / 3" ID slip
PMR-30-LF	30 psi	1/8-8 gpm	150 psi / 347 ft	¾" / ¾" fipt
PMR-30MF	30 psi	2-20 gpm	150 psi / 347 ft	1" / 1" fipt
PMR-30-HF	30 psi	10-32 gpm	100 psi / 231 ft	1.25" / 1" fipt
PMR-30-XF	30 psi	20-90 gpm	100 psi / 231 ft	3" / 3" ID slip
PMR-40-LF	40 psi	1/8-8 gpm	150 psi / 347 ft	¾" / ¾" fipt
PMR-40-MF	40 psi	2-20 gpm	150 psi / 347 ft	1" / 1" fipt
PMR-40-HF	40 psi	10-32 gpm	100 psi / 231 ft	1.25" / 1" fipt
PMR-40-XF	40 psi	20-90 gpm	125 psi / 289 ft	3" / 3"ID slip
PMR-50-MF	50 psi	2-20 gpm	150 psi / 347 ft	1" / 1" fipt
PMR-50-HF	50 psi	10-32 gpm	100 psi / 231 ft	1.25" / 1" fipt
PMR-50-XF	50 psi	20-90 gpm	125 psi / 289 ft	3" / 3" ID slip

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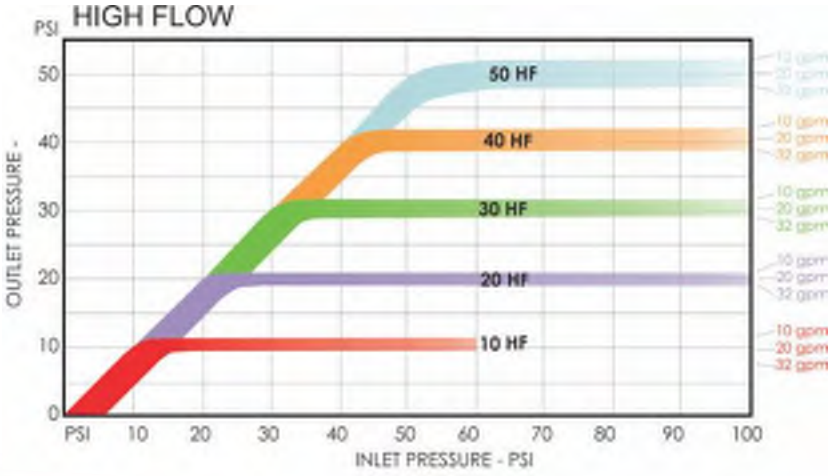
LOW FLOW



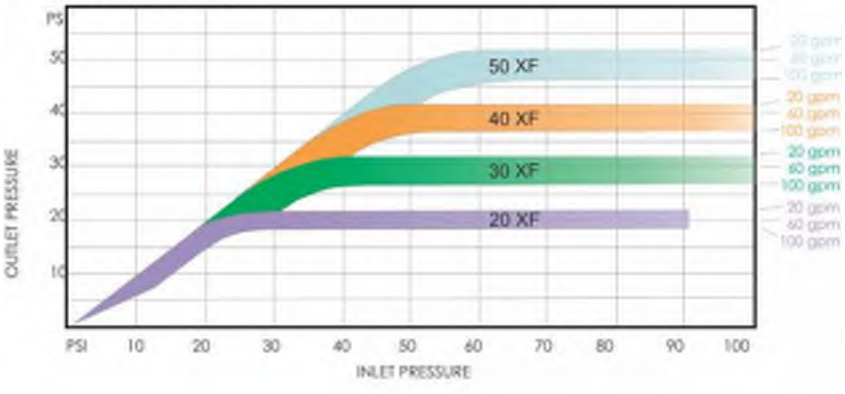
MEDIUM FLOW



HIGH FLOW



EXTRA FLOW



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Lockslip Drip Fittings

Lockslip Fittings

The lockslip fittings shall be molded of high grade plastic. Wasteflow drip tubing shall be pushed over a barb end, then secured with a locking nut. The fitting shall have the ability to be removed and reapplied with the locking nut. The fitting shall be sized to match Geoflow Wasteflow tube. Standard size is 16mm and standard adapters are 600 series.
Available preassembled on 18" flexible PVC riser (LTFLEXR-18) and flexible PVC loop (LTFLEXL-36).





Lockslip Slip Adapters

The slip adapter is used to connect Wasteflow drip tubing to a PVC fitting. The adapter glues into a 3/4" slip fitting. The drip tubing end requires no glue. The lockslip adapter shall be Geoflow part number LTSLIP-600

Lockslip Threaded Adapters

The threaded adapter is used to connect Wasteflow drip tubing to a PVC fitting. The adapter has 3/4" MPT fitting on one side a dripline adapter on the other side. This fitting requires no glue. The lockslip adapter shall be Geoflow part number LTMPT-600

Lockslip Couplings

The coupling is used to connect Wasteflow drip lines together. The adapter glues into a 3/4" slip fitting. This fitting requires no glue. The lockslip coupling shall be Geoflow part number LTC-600

Lockslip Elbows

The elbow is used to connect Wasteflow drip lines or Wasteflow plain tube together in a 90 degree configuration. This fitting requires no glue. The lockslip elbow shall be Geoflow part number LTEL-600

Lockslip Tees

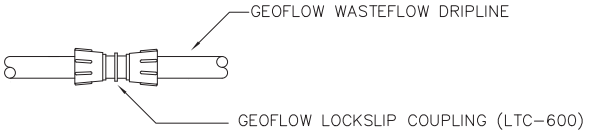
The tee is used to connect Wasteflow drip lines or Wasteflow plain tube together in a tee degree configuration. This fitting requires no glue. The lockslip tee shall be Geoflow part number LTTEE-600

The PVC Glue / Cement:

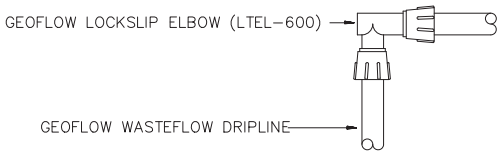
Saddle to PVC manifold	IPS # 719
Flex PVC to Saddle or Fitting	IPS # 795
If the fitting is made of PVC	IPS # 711
ABS fittings into PVC Fittings (i.e. compression adapters)	IPS # 793

Instructions for solvent welding PVC fittings please visit http://www.weldon.com/howtovideo

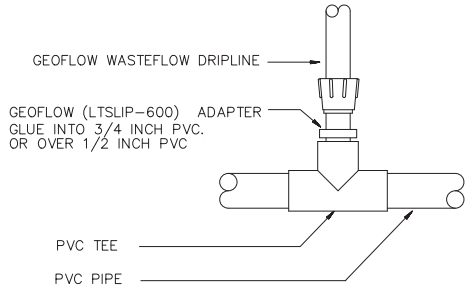
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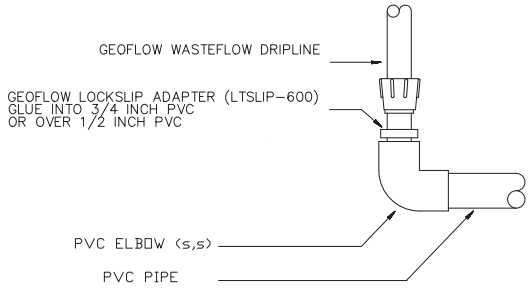
501LS GEOFLOW LOCKSLIP COUPLING (LTC-600)
SECTION
Not To Scale
06-08 GEOFLOW ?



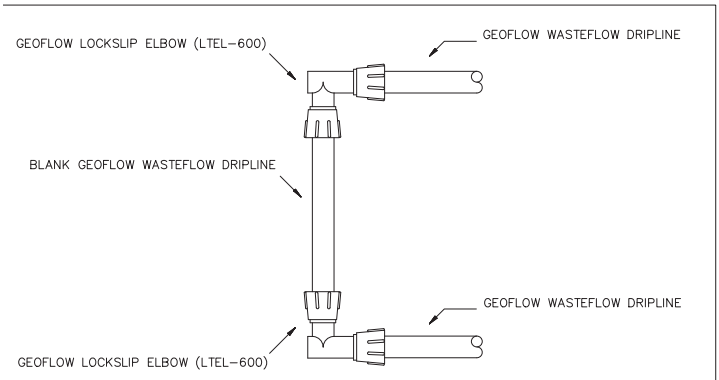
502LS GEOFLOW LOCKSLIP ELBOW (LTEL-600)
SECTION
Not To Scale
06-08 GEOFLOW ?



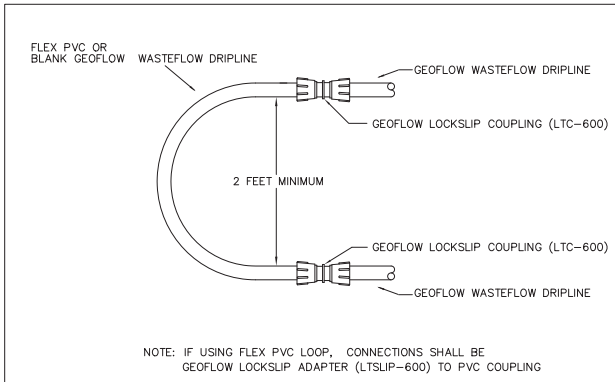
504LS GEOFLOW MANIFOLD CONNECTION (PVC TO ADAPTER)
SECTION
Not To Scale
06-08 GEOFLOW ?



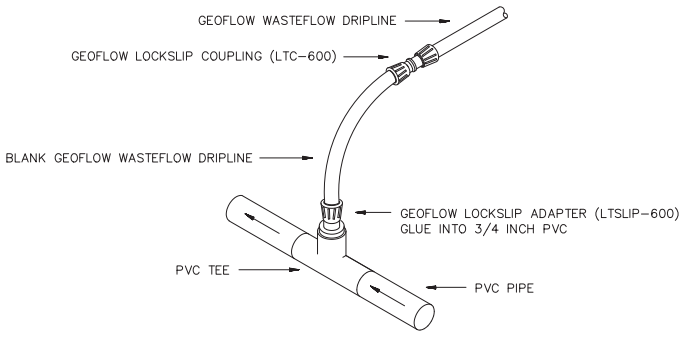
506LS GEOFLOW MANIFOLD CONNECTION (PVC TO ADAPTER)
SECTION
Not To Scale
06-08 GEOFLOW ?



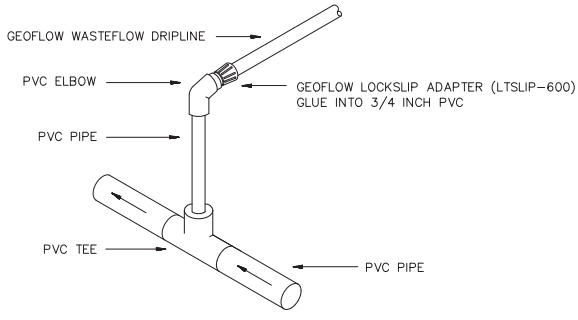
507LS A GEOFLOW LOCKSLIP ELBOW LOOP
SECTION
Not To Scale
06-08 GEOFLOW ?



507LS B GEOFLOW LOCKSLIP COUPLING LOOP
SECTION
Not To Scale
06-08 GEOFLOW ?



511 GEOFLOW MANIFOLD CONNECTION (END FEED)
SECTION
BLANK GEOFLOW WASTEFLOW DRIPLINE RISER
Not To Scale
06-08 GEOFLOW ?



512 GEOFLOW MANIFOLD CONNECTION (END FEED)
SECTION
PVC RISER
Not To Scale
06-08 GEOFLOW ?

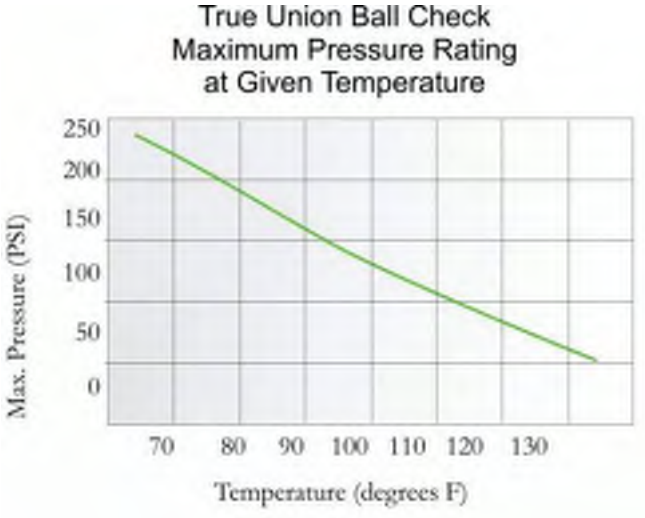
Ball Check

Description

The Ball Check valves prevent backfl ow or drain down in the system. The true union provides easy access for inline installation and servicing. The true union ball check is designed for quick positive sealing with minimum turbulence, low restriction, and efficient fluid transfer. It can be installed vertically or horizontally. System pressure will unseat the ball, allowing flow. Backflow or head pressure of 30" or 1 to 2 psi will seat the ball and stop back fl ow. Each check valve ships with female thread and socket adapters. This valve is manufactured 100% from thermolastic materials, making is less suseptable to corrosion.



Model No.	Inlet/ Outlet (FPT or socket)	Length (inches)	Height (inches)	Max Temp (F)	Weight (lbs.)
CV-B-05	0.5"	3.50"	2.00"	140 °	0.75
CV-B-10	1.0"	5.09"	2.31"	140 °	1.1
CV-B-15	1.5"	6.59"	3.81"	140 °	2.2
CV-B-20	2.0"	7.53"	4.22"	140 °	3.0



Specification

All thermoplastic check valves shall be True Union Ball type constructed from PVC Type I Cell Classifi cation 12454. Socket end connections are manufactured to ASTM D2467-94. Threaded connections are manufactured to ASTM D2464-88.

The O-Ring seat shall be Viton®. All valve components shall be replaceable. The check valve shall be pressure rated at 235 psi, non-shock water at 73° F. The ball check valve shall be Geoflow part number CV-B-X.

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INSTALLATION, OPERATION & MAINTENANCE

- Systems should always be depressurized and drained prior to installing or maintaining your True Union Ball Check Valves.
- Temperature effect on piping systems should always be considered when the systems are initially designed. Piping systems must be designed and supported to prevent excess mechanical loading on valve equipment due to system misalignment, weight, shock, vibration, and the effects of thermal expansion and contraction.
- Because PVC and CPVC plastic products become brittle below 40ºF, Geoflow recommends caution in their installation and use below this temperature.
- Due to differential thermal expansion rates between metal and plastic, transmittal of pipe vibration, and pipe loading forces DIRECT INSTALLATION OF METAL PIPE INTO PLASTIC CONNECTIONS IS NOT RECOMMENDED. Wherever installation of plastic valves into metal piping systems is necessary, it is recommended that at least 10 pipe diameter in length of plastic pipe be installed upstream and downstream of the plastic valve to compensate for the factors mentioned above.

- SOCKET CONNECTION: Socket end connections are manufactured to ASTM D2467 (PVC) and F-439 (CPVC). Solvent cementing of socket end connections to pipe should be performed per ASTM specifications D2855-87. Cut pipe square. Chamfer and deburr pipe. Surfaces must be cleaned and free of moisture, oil, dirt and other foreign material. Remove Union-nuts and end connectors from valve body. Slide Union-nuts, with threads facing valve, onto pipe to which the end connector is to be cemented. Apply primer to inside socket surface of end connector. Never allow primer or cement to contact valve ball or end connector o-ring sealing surfaces, as leaking may result. Use a scrubbing motion. Repeat applications may be necessary to soften the surface of the socket. Next, liberally apply primer to the male end of the pipe to the length of the socket depth. Again apply to the socket, and without delay apply cement to the pipe while the surface is still wet with primer. Next apply cement lightly, but uniformly to the inside of the socket. Apply a second coat of cement to the pipe, and assemble end connector to the pipe, rotating the end connector 1/4 turn in one direction as it is slipped to full depth on to the pipe. The end connector should be held in position for approx. 30 seconds to allow the connection to "set". After assembly wipe off excess cement. Follow cement manufacturers guidelines for proper "cure-time", based on the pipe size that you are joining.

- THREADED CONNECTION: Threaded end connections are manufactured to ASTM specifications D2464. F437 and ANSI B1.20.1. Due to the variable quality and tolerances of plastic male threaded nipples, Colonial no longer recommends the use of PTFE (Teflon®) tape. We recommend using the following thread sealant: IPS WELD-ON All Seal™. To provide a leak proof joint, the pipe should be threaded into the end connection "hand tight". A strap wrench may be used to tighten the joint an additional 1/2 turn past hand tight. Tightening beyond this point may induce excessive stress that could cause failure.

Air Vent / Vacuum Relief Valve

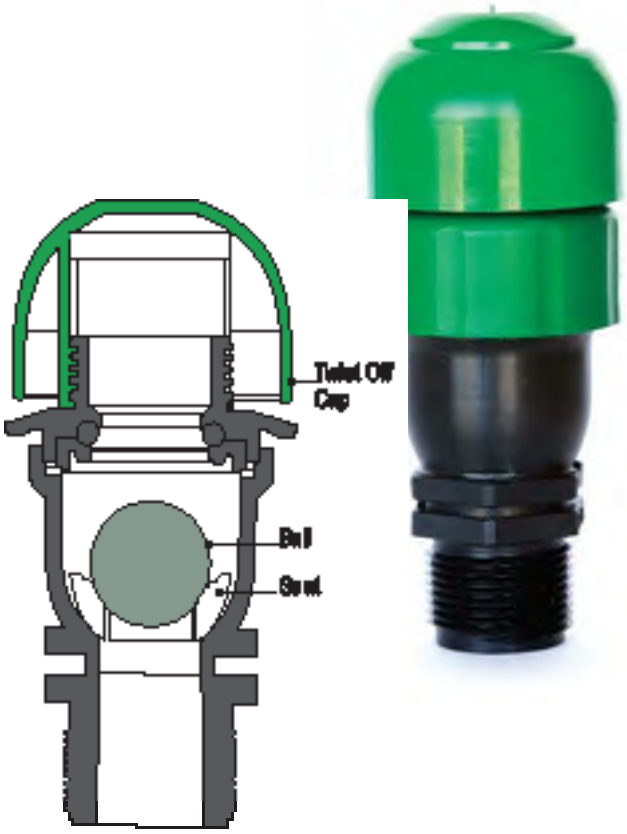
UPDATED

Description

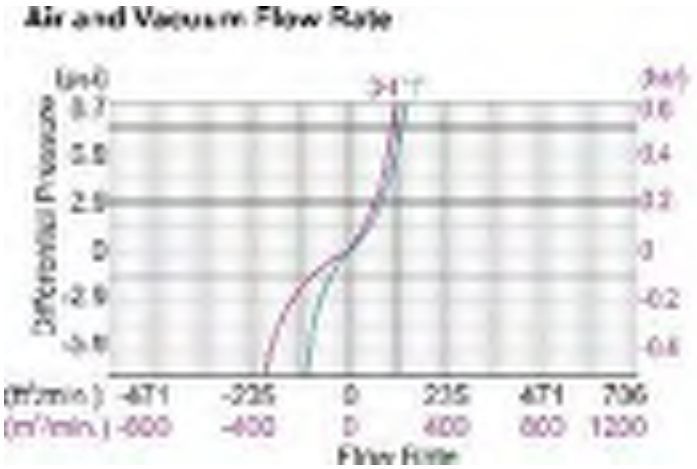
Air release occurs when air escape the system at startup and vacuum relief allows air to enter during shutdown. The air vent vacuum breakers are installed at the highest points in the drip field to keep soil from being sucked into the emitters due to back siphoning and back pressure. This is an absolute necessity with underground drip systems. They are also used for proper drainage of the supply and return manifolds. Use one on the high point of the supply manifold and one on the high point of the return manifold and any high points of the system.

Features

Geoflow's new kinetic air vacuum breakers have a twist off cap that is easy to take apart for cleaning. No need to remove the valve to maintain it. The large clear passageway allows lots of air to flow in and out easily. The protected mushroom cap is ideal for wastewater, directing spray downward.



Part No.	APVBK75m	APVBK100m
Inlet	3/4"	1"
Max. Flow Rate	30 gpm	
Max Pressure	80 psi/185 ft.	80 psi/185 ft.
Max Temp	140 oF	140 oF
Height	5"	5.5"
Weight	1 oz.	1.2 oz.



Specification

The Air Vacuum Breaker bady and ball shall be made of molded plastic. The ball shall be removable for easy cleaning. The Air Vacuum Breaker shall be part number APVBK75m or APVBK100m as supplied by Geoflow, Inc.

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