SPECIFICATIONS, CALCULATIONS, & SUPPORTING MATERIAL

FOR A GROUND ABSORPTION SEWAGE DISPOSAL SYSTEM

USING SEPTIC TANK, TS-I ADVANCED TREATMENT,

AND A SUBSURFACE DRIP SYSTEM

TO SERVE A 4 BEDROOM RESIDENCE

12300 ASBURY CHAPEL ROAD

HUNTERSVILLE, MECKLENBURG COUNTY, NORTH CAROLINA

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SECTION I -GENERAL

Sandy Yandle is seeking a septic system permit to construct a new 4-bedroom residence located at 12300 Asbury Chapel Road in Huntersville, Mecklenburg County, North Carolina. Due to limited available space, soil conditions and limiting topography, a pre-treatment system and subsurface drip effluent disposal system is proposed on a nose slope to be positioned downslope of the proposed residence. The design flow has been set at 480 GPD.

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. Other components include drip headworks and subsurface disposal. Adrian Pruett, LSS, has evaluated the area for the proposed disposal and repair area. An application rate of 0.80 G/D/SF has been recommended for the primary and repair system, however, with available space, we are proposing that the LTAR be lowered to accommodate a lower loading rate. The Soil Scientist is recommended that the drip tubing be installed with 2-inch bury depth and an approved soil cap be brought in and placed over the drainfield with a uniform thickness of 4 inches after natural compaction. The initial soil cap shall be a uniform thickness of 6 to 8 inches uncompacted.

These specifications and design plans have been prepared for an 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 Waste Water 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, shall have prior instruction on the installation of the various components of the system, and shall have prior approval of the component manufacturers, (Orenco) and (Geoflow) and the approval of the Design Engineer.

Geoflow & Orenco Field Representative 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 four bedroom residence 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 and field dosing 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.

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:
From Interstate 77 North toward Huntersville, take I-485 toward Concord. Take 115 North to Eastfield Road. Turn right on Eastfield Road. Turn left on Asbury Chapel Road. Entrance to the site will be on the right hand side of the road past Promenade Drive.

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	12300 Asbury Chapel Road (PID# 01948163) Huntersville, Mecklenburg County, NC
Water Supply	Well (Private On Site)
Sewage Disposal	On-Site Septic System with One TS-I Recirculating Textile Media Filter & Subsurface Drip Irrigation
Application Rate	0.32 G/D/Sq. Ft. (0.80 G/D/SF Recommended)

PROJECTED WASTEWATER FLOWS

Proposed Use	4 Bedroom Residence
Base Design Flow	480 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 AX20 RT Textile packed bed media filter module
Pretreatment Control Panel	VCOM-AX20B1/PTHTUVSA

DESIGN BASIS - DRIP SYSTEM

Design Flow	480 G/D
Application Rate	0.32 G/D/SF
Area	1,460 SF Minimum (1,460 Sq. Ft. Repair)
Force Main	(1) +/-220 LF 1.50” Dia. SCH 40 PVC
Scour Return Main	(1) +/-220 LF 1.00” Dia. SCH 40 PVC
Drip Lines	One zone with a minimum total of 730 LF Geoflow Wasteflow PC; Drip Line with constant flow rate pressure compensating emitters at 2’ centers; Drip Lines at 2’ centers
Emitters	Zone 1 – 365 emitters @ 0.53 G/H = 3.22 G/M
Operating Pressure Range	10 – 60 PSI
Drip Field Pump	Orenco Systems, Inc. PF Series Pump Model PF100712 3/4 HP/230 V/1 Ph (7.7 G/M @ 133.90 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	3.22 G/M
Dosing Time per Day	149.06 Minutes per Day
Pump Run	12 times per day for 12.42 minutes per dose
Flush Time	Every 37th cycle, system to be flushed.
Discharge Volume	12 runs/day x 12.42 min x 3.22 G/M = 480 G/D
Headworks	Geoflow Model WHWU-V-1F-A-DDS
Solenoid Valves	(1) Geoflow Model SVLV-B-150 (1.50 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 Flow Meter with Flow Rate/Totalizer
Air Vents	Geoflow Model APVBK-1

SECTION IV - COMPONENTS OF SYSTEM

- Four Bedroom residence collection system
- 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 located 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 tested 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 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 four 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-20 RT 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
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. 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 insure 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 silicon 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. Soil Cap: Over the primary and repair drip fields, an approved soil cap shall be placed at a uniform depth of a minimum of 6 to 8 inches (4 inches after natural compaction) to allow for a 6-inch minimum cover over the drip laterals. The soil cap shall be a Group III Soil (Clay Loam or lighter). The soil cap shall extend a minimum of 10 feet beyond the flagged limits of the proposed primary and repair system. Prior to placement of the soil cap, Contractor shall cut all trees within the primary and repair system flush with the ground surface. Once the cap has been placed, the cap shall be tapered in to the existing grade starting at five feet beyond limits of drainfield and extend out from there. The existing ground surface shall be hand raked removing all leaf litter, sticks, etc. prior to installing the drip laterals and placing the soil cap. This shall be done under the direct supervision of the Soil Scientist. Laterals shall be installed first then soil cap placed.

4. 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.

5. Spring Check Valves: Spring check valves shall be flow control PVC spring check valves with rubber flapper and PVC cap as manufactured by Geoflow Model CV-S-15 as supplied by AQWA at (888) 552-2792.

6. 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.

7. Drip System Dosing Pump: For the drip field, an Orenco PF Series Model PF100712 3/4 HP/230 V/1 Ph, capable of pumping 7.7 GPM @ 133.90' 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.

8. 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 remain accessible at all times 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)

9. 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-1F-A-DDS. Product shall be as supplied by AQWA at (888) 552-2792.
10. 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.
11. Spin Clean Filter: The Y filter body shall be molded from glass reinforced black plastic with a 1.50" 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 1.50" 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 1.50-inch filter shall be Geoflow Model Number AP4E-1.5F. Product shall be as supplied by AQWA at (888) 552-2792.
12. 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-050 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 cleared of large diameter and small diameter trees at the hub and other vegetation and debris by system installer only. If a tree is unable to be removed, the contractor shall raise the canopy on tree to a minimum of 8 feet above the existing ground surface so that sunlight can reach the ground surface. If shown on the plan, areas shall be filled with an approved material approved by the consulting Soil Scientist. Drip irrigation lines shall be installed on contour. Drip irrigation lines 2 inches below the existing ground and 6 inches below the 6-8 inch soil cap (4 inches after natural compaction). The tubing shall be installed at a minimum depth of 2 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 soil cap and 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.

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 any and all man-made debris, construction materials, etc. Dispose of legally. Cut all trees in the area of 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 actually beginning construction of the system, verify invert elevations of all tanks, carefully locate, lay out and identify disposal site, manifolds and the drip piping networks, 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. Soil cap shall be placed after drip tubing has been installed.
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 and 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 properly installed.

(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-20 RT textile containing module with cover with recirculation pump and dosing chamber and a single zone 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 12.42 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 12.42 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 A SUBSURFACE DRIP SYSTEM

TO SERVE A 4 BEDROOM RESIDENCE

12300 ASBURY CHAPEL ROAD

HUNTERSVILLE, MECKLENBURG COUNTY, NORTH CAROLINA

February 1, 2017

Prepared for:
Sandy Yandle
803 Southland Road
Huntersville, NC 28078
Phone: (704) 201-5030

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



Project: Asbury Chapel 4 Bedroom Drip Original Date: February 1, 2017
Project#: 2017-02-01-EC Revised Date: February 1, 2017

DESIGN FLOW

480 gpd

SEPTIC TANK: **Use 1,000 Gallon Septic Tank**

Use Orenco #FTPS 0436-28MA Series Biotube Effluent Filter
- See Filter Cut Sheet for Exact Specifications

TANK ANTIFLOATATION

1,000 Gallon Septic Tank *Based on Shoaf Precast Company*

Outer Length	9.00	FT		
Inner Length	8.50	FT		
Outer Width	4.83	FT		
Inner Width	4.33	FT		
Outer Height	5.63	FT		
Inner Height	5.04	FT		
Wt of Water Displaced	15,268.50	LBS		Outer Length x Outer Width x Outer Length x 62.4 Lb/CF (Wt of Water)
Wt of Tank	4,306.50	LBS	Top & Bottom	Outer Length x Outer Width x 150 Lb/CF x 2 (Top & Bottom) x Slab Thickness
	1,827.60	LBS	Ends	Inner Width x Inner Height x 150 Lb/CF x 2 (Ends) x Wall Thickness
	3,214.06	LBS	Sides	Outer Height x Outer Length x 150 Lb/CF x 2 (Sides) x Wall Thickness
	1,027.81	LBS	Baffle	Inner Width x (Inner Height-3 Inches) x 150 Lb/CF x x Wall Thickness
	10,375.98	LBS	Total Tank Wt.	Sum Above four
Wt of Overburden	10,345.34	LBS	15" Cover	Outer Length x Outer Width x 120 Lb/CF (Saturated Soil Wt) x Soil Thickness
Total	20,721.31	LBS		Sum of Total Tank Wt. & Soil Overburden

WATER	**15,268.50**	**<**	**20,721.31**	TANK

**Buoyancy Calculations Account for Fluid in Tank, Do Not Pump When Ground is Saturated or During Extremely Wet Conditions.*

Project: Asbury Chapel 4 Bedroom Drip Original Date: February 1, 2017
Project#: 2017-02-01-EC Revised Date: February 1, 2017

Geoflow Subsurface Dripline Disposal field Calculation

Please fill in the shaded area:			*Notes:*
Residences per field	1	residence	
Gallons per day (gpd)	480	gpd	
Hydraulic loading rate(LTAR)	0.32	gal/ft2-day	Determined by Soil Scientist or Local Health Dept.
Area required	1500	square ft	Area= gpd/LTAR
Wasteflow PC or Classic	PC	dripline	
Emitter spacing	2	ft.	Normally 2 ft. except for heavy clay or septic effluent
Dripline Spacing	2	ft.	Normally 2 ft. except for heavy clay or septic effluent
Pressure	20	psi	Normally 20psi.
Head required at dripfield	46.20	ft. of head	Multiply Req'd Pressure by 2.31
Emitter flow rate	0.53	gph	At 20psi: PC flow rate is 0.53 or 1.02gph, Classic flow rate is 1.30 gph.
			At 15psi: PC flow rate is 0.53 or 1.02gph, Classic flow rate is 1.13 gph

Length of Wasteflow dripline	750	ft	Area/spacing
Number of emitters reqired	375	emitters	Length of Wasteflow/emitter spacing
Total Flow rate (gph)	198.75	gph	Flow rate x number of emitters
Total Flow rate (gpm)	3.31	gpm	Total flow rate / 60 minutes
Flow per square ft. per hour	0.13	gph/sq ft.	Total flow rate / area
Flow per square ft. per day	0.32	gpd/sq ft.	Flow per day / area
Flow per emitter per day	1.28	gpd/emitter	Flow per day / number of emitters
Water depth applied per day	0.51	inches/day	(Daily flow/area) x (231cu in/gal) / (144in/ft2)

FIELD FLOW

Job Description:	*Asbury Chapel 4 Bedroom Drip System*
Contact:	*Adrian Pruett*
Prepared by:	*Piedmont Design Associates, PA*
Date:	*1-Feb-17*

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 hyd

Worksheet 1- Field Flow

Total field

	Total Quantity of effluent to be disposed per day	480	gallons / day
	Hydraulic loading rate	0.32	gallons / sq.ft. / day
	Minimum Dispersal Field Area	1,500	square ft.
	Total Dispersal Field Area	1,600	square ft.

Flow per zone

	Number of Zones	**1**	zone(s)
	Dispersal area per zone	1,600	square ft.
	Choose line spacing between WASTEFLOW lines	2	ft.
	Choose emitter spacing between WASTEFLOW emitte	2	ft.
	Total linear ft. per zone (minimum required)	730	ft. per zone
	Total number of emitters per zone	365	emitters per zone
	Select Wasteflow dripline (16mm)	Wasteflow PC - 1/2gph	dripline
	Pressure at the beginning of the dripfield	40	psi
	Feet of Head at the beginning of the dripfield	92.4	ft.
	What is the flow rate per emitter in gph?	0.53	gph
	Dose flow per zone	**3.22**	**gpm**

Note: A few States or Counties require additional flow for flushing. Please check your local regulations.
Flush velocity calculation below is for PC dripline. Classic dripline requires less flow to flush than PC.
Please refer to Geoflow's spreadsheet "Design Flow and Flush Curves" at www.geoflow.com or call 800-828-3388.

	If required, choose flush velocity	1.2	ft/sec
	How many lines of WASTEFLOW per zone?	5	lines
	Fill in the *actual* length of longest dripline lateral	176	ft.
	Flush flow required at the end of each dripline	0.89	gpm
	Total Flow required to achieve flushing velocity	4.44	gpm
	Total Flow per zone- worst case scenario	**7.66**	**gpm**

Select Filters and zone valves

	Select Filter Type	Vortex Screen Filter	
	Recommended Filter (item no.)	AP4E-1.5F	1in Screen Filter 0-20gpm
	Select Zone Valve Type	None	-
	Recommended Zone Valve (item no.)	0	0

-

Dosing

	Number of doses per day / zone:	12	doses
	Timer ON. Pump run time per dose/zone:	12.24	mins:secs
	Timer OFF. Pump off time between doses	1:47	hrs:mins
	Per Zone - Pump run time per day/zone:	2:28	hrs:mins
	All Zones - Number of doses per day / all zones	12	doses / day

PUMP SIZING

Job Description:	*Asbury Chapel 4 Bedroom Drip System*
Contact:	*Adrian Pruett*
Prepared by:	*Piedmont Design Associates, PA*
Date:	*2/1/2017*

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 hydra

Pressure losses may be grossly overstated, particularly if designing with WASTEFLOW Class

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	3.22	gpm
Flow required to flush field	4.44	gpm
Flow required to dose & flush field	7.66	gpm
Filter	AP4E-1.5F	
No. of Zones	1	zones
Zone valve	-	
Dripline	Wasteflow PC - 1/2gph	
Dripline longest lateral	176.00	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	220 ft.	
Equivalent length of fittings	44 ft.	
Elevation change. (if downhill enter 0)	**26** ft.	
Pressure loss in 100 ft of pipe	1.40 ft.	0.61 psi
Total pressure loss from end of dripline to return tank	*29.7 ft.*	12.86 psi
B. Dripline - Losses through Wasteflow dripline		
Length of longest dripline lateral	**176** ft.	
Minimum dosing pressure required at end of dripline	29.70 ft.	12.86 psi
Loss through dripline during flushing	2.59 ft.	1.12 psi
Total minimum required dripline pressure	*32.28 ft.*	13.98 *psi*
A+B. Minimum Pressure required at beginning of dripfield		
CALCULATED pressure required at beginning of dripfield	*61.98 ft.*	26.83 *psi*
SPECIFIED pressure at beginning of dripfield (from worksht 1)	**92.4 ft.**	40.00 *psi*
Great! SPECIFIED Pressure is greater than CALCULATED Pressure requirement. Go to next step		
C. Drip components - Losses through headworks		
Filter	4.0 ft.	1.75 psi
Zone valve pressure loss (not in diagram)	- ft.	- psi
Flow meter pressure loss (not in diagram)	2.00 ft.	0.87 psi
Other pressure losses	1.21 ft.	0.52 psi
Total loss through drip components	**7.25 ft.**	3.14 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	1-1/2" inch	
Length of supply line	220 ft.	
Equivalent length of fittings	44 ft.	
Height from pump to tank outlet	7 ft.	
Elevation change. (if downhill enter 0)	26 ft.	
Pressure loss/gain in 100 ft. of pipe	0.48 ft.	0.21 psi
Total gain or loss from pump to field	***34.3 ft.***	14.83 psi
Total dynamic head	**133.9 ft.**	57.97 *psi*
Pump capacity * - Field Flush Flow	**7.7 gpm**	57.97 *psi*
- Field Dose Flow	**3.2 gpm**	
- Filter Flush Flow	**- gpm**	- *psi*
Pump Model Number	**Orenco PF100712**	
Voltz / Hp / phase	**230 / 0.75 HP / 1 Ph**	

* Note: Pump capacity flow assumes flow in dripline does not change during a dose cycle. With Wasteflow Classic this can For more accurate flows please see Geoflow's **Flushing worksheet**.

If you need assistance designing for this additional flow, please

a. See Geoflow flushing worksheet or

b. Contact Geoflow at 800-828-3388.

CAROLINA SOIL & SEPTIC CONSULTING, PLLC

P.O. BOX 1703, Mooresville, NC 28115
(704) 202-5791 adrianpruett@yahoo.com
NC Licensed Soil Scientist, SC Professional Soil Classifier,
Certified Septic System Operator, Licensed Septic Installer,
Certified Septic Inspector

January 22, 2017
Project Name: 2016-049

Sandy Yandle
803 Southland Rd.
Huntersville, NC 28078

Saturated Hydraulic Conductivity (Ksat) Soil Evaluation for an onsite wastewater system located on approximately 25.88 acres (Parcel # 01918163) as described and located in Mecklenburg County, North Carolina.

Dear Mr. Yandle:

Carolina Soil & Septic Consulting, PLLC, performed a Saturated Hydraulic Conductivity (Ksat) evaluation on the parcel referenced above as required by Mecklenburg County and 15 A NCAC 18A .1900 "Laws and Rules for Sewage Treatment and Disposal Systems". The evaluation was performed as part of the preliminary planning and design process to evaluate the soil suitability for an onsite subsurface wastewater disposal system. Fieldwork performed on December 22, 2016.

The property was first traversed to observe elements of the landscape (slope, drainage patterns, complex topography, etc.) as well as soil conditions (depth, texture, structure, seasonal wetness, restrictive horizons, back fill, etc.) through the use of hand auger borings. The site was evaluated during moist soil conditions. Backhoe pits were performed and evaluated on September 19, 2016 in conjunction with Mecklenburg County Environmental Health and are on file within their department *(see Mecklenburg County Profile Descriptions)*. These observations of the site were used to identify areas relative to subsurface disposal of wastewater. The soil/site evaluation criteria used is that contained in 15 A NCAC 18A .1900 "Laws and Rules for Sewage Treatment and Disposal Systems".

Requirements for sizing of the subsurface disposal field are as follows: 1) the design flow from the proposed facility (120 gallons/bedroom/day in residences), and 2) the long term acceptance rate (LTAR) of the soil (based on the hydraulic conductivity of the soil, a function of the soil's texture, clay mineralogy, structure, porosity, etc.) The proposed design flow on this site along with the size, shape and topography of the usable soil area will dictate the utility of that area. Another consideration are the required horizontal setbacks from various features such as wells (100'), surface waters (50') or more depending on watershed regulations, property lines (10'), top of embankment (15'), watershed buffers, etc. (*see Attachment 1).*

SITE INFORMATION

The site is located in the northeastern area of Mecklenburg County approximately 4.21 miles southeast of the Town of Huntersville. The proposed onsite wastewater system site is located at the end of a long narrow nose slope landscape position with 5% to 20% slopes, depending on location. The nose slope faces in a general northeasterly direction with a large drainage feature on the north side and a moderately large drainage feature along the south side. Along the sides

of the slope are a few inactive small gullies and eroded areas. Vegetation on the site consists of mostly 10 year mixed hardwoods and underbrush.

An infield on contour layout has been performed and field located by Patterson Land Surveying as required by Mecklenburg County *(See Site Plan)*. Along with the layout being located the house location, tank locations and the long property line closest to the proposed driveway and house have been surveyed. Elevations have also been surveyed recorded for the above mentioned points and locations. All proposed septic lines are a minimum of 25 ft. up slope of the large drainage features, 15 ft. above/side slope of any gully that has an elevation difference of 2 ft. or more and greater than 100 ft. to any surface waters. There are no present structures or wells on the property.

The proposed septic area contains more than sufficient space for both system and repair as required.

SOIL INFORMATION

The site has been described by the United States Department of Agriculture Soil Conservation Service in 1977 and published within the Mecklenburg County Soil Survey in 1980 as a Wilkes loam (WkE), 15 to 25 percent slopes (*see Soil Series Description).* An infield evaluation was performed September 7, 2016 through the use of hand auger borings. The site was identified as suitable for onsite wastewater systems and Mecklenburg County was contacted with the findings. A joint evaluation of the site with Jacob Presley of Mecklenburg County Environmental Health using a mini-excavator and pits was performed September 19, 2016 to confirm suitability of the site *(see Mecklenburg County Soil Profile Descriptions)*. It was determined 4 of the pits evaluated were suitable for an onsite wastewater system using a **shallow 2 in. deep drip irrigation system along with TS-I pre-treatment,** *(see Mecklenburg County Soil Profile Descriptions Pit #10, #11 and #12)*. Soils consisted of 10-18 in. of Sandy Loam surface over a Loamy Sand saprolite with weathered rock to rock within 18-36 in. depending on location *(also see CS&SC Soil Profile Descriptions).*

Due to the shallow nature of the soil and depth to saprolite Saturated Hydraulic Conductivities were required to meet 15A NCAC 18A .1900 "Laws and Rules for Sewage Treatment and Disposal Systems" and by Mecklenburg County Environmental Health Dept.

EVAUATION METHOD

Saturated Hydraulic Conductivities were performed using an Aardvark Constant Head Permeameter, Manual Reading, Model 2840K1, manufactured by Soilmoisture Equipment Corp., Goleta, California.

Evaluation was performed per Soilmoisture Equipment Corporation's Operating Instructions dated January 2016 *(see Attachment 2)*. Modifications to these guidelines include the use of a 6.985 cm (2.75 in.) soil auger that cut an actual hole diameter of 7.62 cm (3 in.) as opposed to using a 10 cm (4 in.) soil auger as recommended. The use of a 6.985 cm auger was approved by the manufacture before Ksat's were performed.

KSAT DATA

Three individual Ksat evaluations were performed within the evaluated area *(see Ksat Data Sheets)*. Due to the shallow depth of the proposed drip tubing, 2 inches, Ksat's could not be ran at trench bottom but instead ran within the treatment zone below trench bottom. The first Ksat evaluation was performed at the end of the long nose slope and is known as Site 1 Hole 1. Site 1 Hole 1 consisted of an 18.5 cm deep auger hole within the wastewater treatment zone of the system. Upon performing the Ksat a 6.5 cm constant head of water was maintained and check with an infield measurement. The total test lasted from 9:45 AM to 12:15 PM with recorded intervals every 10 minutes. A constant Water Consumption Rate was achieved between 11:15 AM and 11:55 AM of 40 ml/minute. A few variations in the data were noted of 10 ml/min as shown within the Ksat Data Sheets. Calculations of the infield collected data determined a Ksat of Site 1 Hole 1 to be 38.92gpd/sqft.

A second Ksat evaluation was performed beside the first location and will be referred to as Site 1 Hole 2.

A 38 cm deep auger hole was excavated into the Saprolite and a Ksat was run with 6.5 cm constant head of water from 12:33 PM to 2:38 PM. Due to the course nature of the soil water readings were taken every 5 minutes. Equilibrium occurred between 12:18 PM and 12:38 PM with a consistent Water Consumption Rate of 80ml/min. After calculating the data it was determined that the Ksat of Site 1 Hole 2 is 77.84gpd/sqft.

A final Ksat was performed on the site located approximately 88 ft. upslope of Site 1 Hole 2. This Ksat evaluation is known as Site 2 Hole 1. A 23 cm deep auger boring was dug into the surface Sandy Loam treatment horizon and a Ksat was ran maintaining 6.5 cm of constant head from 2:56 PM to 5:06 PM. Water readings were recorded on 10 minute intervals for this site and equilibrium was achieved between 4:46 PM and 5:06 PM with a constant Water Consumption Rate of 170ml/min. A Ksat was calculated at 165.411gpd/sqft.

WASTEWATER CONSIDERATIONS

With the field ran Saturated Hydraulic Conductivity levels of the soils and saprolite far exceeding the allowable limits determined by 15A NCAC 18A .1900 Rules, Carolina Soil & Septic Consulting recommends using an application rate of a 0.6gpd/sqft or 1000sqft of drainfield area, whichever is greater. This application rate is the minimum for a Group II soil which has been determined to be between a 0.8gpd/sqft and 0.6gp/sqft by the rules mentioned above.

Also as mentioned above CS&SC recommends a TS-1 Drip Irrigation system to be installed at a depth of 2 inches using the vibratory plow method.

Upon vegetation removal of the site DO NOT remove any of the surface soil. Trees should be removed using the least impact method available up to individual tree removal using an excavator with a thumb to pluck each tree from the area.

Final wastewater design to be completed by Piedmont Design and Associates and approved by Mecklenburg Environmental Health Dept. before installation may occur.

All soils were evaluated based on 15 A NCAC 18A .1900 "Laws and Rules for Sewage Treatment and Disposal Systems".

Carolina Soil & Septic Consulting, PLLC, was pleased to be of service in this matter and look forward to assisting in any site analysis needs you may have in the future. Please feel free to call with any questions or comments.

Sincerely,

Adrian L. Pruett

Encl: -*Attachment 1*
-*Site Plan*
-*Soil Series Description*
-*Mecklenburg County Soil Profile Descriptions*
-*CS&SC Soil Profile Descriptions*
-*Attachment 2*
-*Ksat Data Sheets*



Attachment 1

.1950 Location of Sanitary Sewage Systems

(c) Every sanitary sewage treatment and disposal system shall be located at least the minimum horizontal distance from the following:

(1)	any private water supply source including a well or spring	100 feet
(2)	any public water supply source	100 feet
(3)	streams classified as WS-I	100 feet
(4)	water classified as S.A.	100 feet from mean high water mark
(5)	Other coastal waters	50 feet from mean high water mark
(6)	any other stream, canal, marsh, or other surface waters	50 feet
(7)	any Class I or Class II reservoir normal	100 feet from pool elevation
(8)	any permanent storm water retention pond	50 feet from flood pool elevation
(9)	any other lake or pond	50 feet from normal pool elevation
(10)	any building foundation	5 feet
(11)	any basement	15 feet
(12)	any property line	10 feet
(13)	top of slope of embankments or cuts of 2 feet or more vertical height	15 feet
(14)	any water line	10 feet
(15)	drainage systems:	
	(A) Interceptor drains, foundation drains and storm water diversions	
	(i) upslope	10 feet
	(ii) sideslope	15 feet
	(iii) downslope	25 feet
	(B) Groundwater lowering ditched and devices	25 feet
(16)	any swimming pool	15 feet
(17)	any other nitrification field (except repair area)	20 feet

(b) Ground absorption, sewage treatment and disposal systems may be located closer than 100 feet from a private well supply, except springs and uncased wells located downslope and used as a source of drinking water, repairs, space limitations and other site-planning considerations but shall be located the maximum feasible distance and, in no case, less than 50 feet.

(c) Nitrification fields and repair areas shall not be located under paved areas or areas subject to vehicular traffic. If effluent is to be conveyed under areas subject to vehicular traffic, ductile iron or its equivalent pipe shall be used. However, pipe specified in Rule .1955 (e) may be used if a minimum of 30 inches of compacted cover is provided over the pipe.

Note: Systems over 3000 GPD or an individual nitrification fields with a capacity of 1500 GPD or more have more restrictive setback requirements, see .1950 (a) (17) (d) for specifics.

LOCATION WILKES NC+AL GA SC VA
Established Series
RAG-DTA/Rev. RHB
09/2007

WILKES SERIES

The Wilkes series consists of shallow, well drained soils with moderately slow to slow permeability. They formed in residuum weathered from intermediate and mafic crystalline rocks on uplands in the Piedmont. Near the type location, mean annual air temperature is 59 degrees F., and mean annual precipitation is 45 inches. Slopes range from 4 to 60 percent.

TAXONOMIC CLASS: Loamy, mixed, active, thermic, shallow Typic Hapludalfs

TYPICAL PEDON: Wilkes sandy loam--wooded. (Colors are for moist soil unless otherwise stated.)

Oi--3 to 1 inch; slightly decomposed mixed hardwood and pine forest litter.

Oe--1 to 0 inch; moderately decomposed forest litter.

A--0 to 3 inches; grayish brown (2.5Y 5/2) sandy loam; moderate medium granular structure; very friable; common fine and medium roots; common fine and medium quartz pebbles; strongly acid; abrupt smooth boundary. (2 to 6 inches thick)

E--3 to 6 inches; light brownish gray (2.5Y 6/2) sandy loam; moderate medium and coarse granular structure; very friable; common fine and medium roots; common fine strong brown fragments of weathered rocks; common fine and medium pebbles; strongly acid; abrupt smooth boundary. (0 to 5 inches thick)

Bt--6 to 10 inches; yellowish brown (10YR 5/6) clay; common fine prominent black, green, and faint strong brown bodies, all of which are assumed to be partially weathered primary minerals; weak coarse angular blocky structure; firm, sticky, plastic; few fine roots; few fine pores; common faint clay films on faces of peds; few medium pebbles; A horizon material in old root channels; slightly acid; clear wavy boundary. (3 to 8 inches thick)

Bt/C--10 to 13 inches; yellowish brown (10YR 5/6) clay loam; weak coarse subangular blocky structure; firm, sticky, plastic; common faint clay films on faces of peds(Bt part); common fine prominent black and few fine distinct gray bodies and common thin green bands of partially weathered primary minerals; relic platy structure (C part); common hard schist fragments; slightly acid; abrupt wavy boundary. (0 to 6 inches thick.)

Cr--13 to 48 inches; soft, yellowish brown, green, black, and gray saprolite which crushes to loam; relic platy rock structure; firm; few fine roots in upper part; few large roots in rock fractures; few

distinct clay films line vertical cracks; common fine and medium schist fragments; neutral; abrupt wavy boundary. (24 to 42 inches thick)

R--48 inches; hard schist bedrock.

TYPE LOCATION: Durham County, North Carolina; from Durham-Wake County line, 1/2 mile west on N.C. 98, 3.9 miles southeast on SR 1805 and 1901, 100 feet west of road in wooded area.

RANGE IN CHARACTERISTICS: Solum thickness and depth to weathered bedrock ranges from 10 to 20 inches. Depth to hard rock is 40 to more than 60 inches. Rock fragments of gravel, cobble, and stone size range from 0 to 50 percent in the A horizons and 0 to 35 percent in the B horizon. Dark concretions range from none to common. Soil reaction ranges from strongly acid through slightly acid in the upper horizons and from moderately acid through mildly alkaline in the lower horizon. Clay content averages 18 to 35 percent for the combined A, Bt, and C horizons.

The A or Ap horizon has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 2 to 6. The E horizon, where present, has hue of 10YR to 2.5Y, value of 4 to 6, and chroma of 2 to 8. The A and E horizons are sandy loam, fine sandy loam, or loam in the fine earth fraction. The A horizon in eroded phases is sandy clay loam or clay loam.

The Bt horizon has hue of 5YR to 2.5Y, value of 4 to 6, and chroma of 4 to 8. Mottles, bodies, or streaks of black, greenish, grayish, or whitish saprolite or primary minerals are few to common in most pedons. Texture is loam, sandy clay loam, clay loam, or clay in the fine earth fraction. Thin transitional horizons are present in most pedons.

The BC or CB horizon has hue of 5YR to 2.5Y, value of 4 to 8, and chroma of 3 to 8. Mottles, bodies, or streaks of black, greenish, grayish, or whitish saprolite or primary minerals are none to common. Texture is loam, sandy clay loam, clay loam, or clay in the fine earth fraction.

The C horizon, where present, is loamy saprolite of intermediate or mafic crystalline rock. It is black, greenish, brownish, or grayish in color.

The Cr layer is soft, weathered intermediate or mafic crystalline rock that can be dug with difficulty with a spade.

The R layer (where present) is hard unweathered to slightly weathered intermediate or mafic crystalline rock.

COMPETING SERIES: There are no other series in this family. Soils in related families include the Goldston, Louisa, Louisburg, Montevallo, and Poindexter series. Goldston and Montevallo soils have more than 35 percent rock fragments in the control section. Louisa soils have cyclic pedons and contain more mica throughout the sola. Louisburg soils lack continuous Bt horizons. Poindexter soils have a paralithic contact at depths of more than 20 inches.

GEOGRAPHIC SETTING: Wilkes soils are on gently sloping narrow ridges and sloping to steep side of ridges between intermittent and permanent streams in the southern Piedmont. Slopes are generally between 10 and 25 percent and range from 4 to 60 percent. The soil formed in residuum weathered from diorite, hornblende, schist, and related rocks that are moderately high in

ferromagnesian minerals or from a mixture of felsic and mafic rocks. Mean annual precipitation ranges from 37 to 60 inches, and mean annual air temperature ranges from 58 to 65 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Coronaca, Crawfordville (T), Cullen, Enon, Gaston, Iredell, Mecklenburg, Mocksville, Pittsboro, Poindexter, Sedgefield, Virgilina, Winnsboro, and Wynott series. These soils are all deeper to bedrock than Wilkes soils. Coronaca, Cullen, Enon, Gaston, Mecklenburg, Mocksville, Poindexter, and Wynott soils are well drained and in similar landscape positions Crawfordville(T), Iredell, Pittsboro, Sedgefield, and Virgilina soils have redoximorphic features due to wetness, are moderately well to somewhat poorly drained, and are in flats, depressions, and foot slopes.

DRAINAGE AND PERMEABILITY: Well drained; rapid runoff; moderately slow to slow permeability.

USE AND VEGETATION: About 80 percent of the soil is in trees and pasture. The dominant trees are shortleaf, loblolly, and Virginia pines, eastern red cedar, blackjack oak, and post oak. About 20 percent is cultivated to crops such as small grain, lespedeza, corn, and tobacco.

DISTRIBUTION AND EXTENT: Alabama, North Carolina, Georgia, South Carolina, and Virginia. The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Raleigh, North Carolina

SERIES ESTABLISHED: Jasper County, Georgia; 1916.

REMARKS: Diagnostic horizons and features recognized in the typical pedon are:
Ochric epipedon--the zone from the surface to a depth of 6 inches (A and E horizons)
Argillic horizon--the zone between depths of 6 and 10 inches (Bt horizon)
Paralithic contact--the upper boundary of the Cr horizon at a depth of 13 inches

ADDITIONAL DATA:

TABULAR SERIES DATA:

SOI-5	Soil Name	Slope	Airtemp	FrFr/Seas	Precip	Elevation
NC0031	WILKES	2-60	57-65	180-240	37-60	250-900
NC0134	WILKES	2-60	57-65	180-240	37-60	250-900

SOI-5	FloodL	FloodH	Watertable	Kind	Months	Bedrock	Hardness
NC0031	NONE		>6.0		-	10-20	SOFT
NC0134	NONE		>6.0		-	10-20	SOFT

SOI-5	Depth	Texture	3-Inch	No-10	Clay%	-CEC-
NC0031	0-6	SL L FSL	0-10	80-100	5-20	3-15

NC0031	0-6	SCL CL	0-10	90-100	20-35	10-25
NC0031	0-6	GR-SL GR-L GR-FSL	5-15	60- 75	5-20	3-15
NC0031	6-13	CL C SCL	0-10	80-100	20-45	10-30
NC0031	13-48	WB	-	-	-	-
NC0134	0-6	STV-SL STV-L	3-15	60-75	5-20	3-15
NC0134	0-6	STX-SL STX-L	10-20	60-75	5-20	3-15
NC0134	6-13	SICL ST-C ST-SCL	10-25	80-100	20-45	10-30
NC0134	13-48	WB	-	-	-	-

SOI-5	Depth	-pH-	O.M.	Salin	Permeab	Shnk-Swll
NC0031	0-6	5.1-6.5	0.5-2.0	0-0	2.0-6.0	LOW
NC0031	0-6	5.1-6.5	0.5-1.0	0-0	0.6-2.0	LOW
NC0031	0-6	5.1-6.5	0.5-2.0	0-0	2.0-6.0	LOW
NC0031	6-13	6.1-7.8	0.0-0.5	0-0	0.2-0.6	MODERATE
NC0031	13-48	-	-	-	-	
NC0134	0-6	5.1-6.5	0.5-2.0	0-0	2.0-6.0	LOW
NC0134	0-6	5.1-6.5	0.5-2.0	0-0	2.0-6.0	LOW
NC0134	6-13	5.6-7.8	0.0-0.5	0-0	0.2-0.6	MODERATE
NC0134	13-48	-	-	-	-	

DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH, ENVIRONMENTAL HEALTH SECTION
ON-SITE WATER PROTECTION BRANCH

Sheet __1__ *of* __1__
PROPERTY ID #: 019-181-63
COUNTY: MECKLENBURG

SOIL/SITE EVALUATION
***for* ON-SITE WASTEWATER SYSTEM**
(Complete all fields in full)

OWNER: FRANK TYSON _ APPLICATION DATE_____
ADDRESS: 3601 STARMOUNT AVE., CHARLOTTE, NC 28269 DATE EVALUATED: 12/22/16
PROPOSED FACILITY: 4 BDRM RES. PROPOSED DESIGN FLOW (.1949): 480 GPD PROPERTY SIZE: 25.88 AC
LOCATION OF SITE: 12231 ASBURY CHAPEL RD., HUNTERSVILLE, NC 28078 PROPERTY RECORDED: YES
WATER SUPPLY: X Private ☐ Public ☐ Well ☐ Spring ☐ Other _____
EVALUATION METHOD: X Auger Boring ☐ Pit ☐ Cut TYPE OF WASTEWATER: X 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	
B 1	NS 13%	0-4	B SL GR	FR SS SP SEXP	-10YR 4/3 -10YR 5/6 -10YR 6/6	12”	PS	20”	PS 0.6 GPD/SQFT TO 20”
		4-12	YB SL GR	FR SS SP SEXP					
		12-20	LS SAP M	NS NP NEXP					
		20	WR/ROCK						
B 2	NS 5%	0-8	SL GR	FR SS SP SEXP	-2.5Y 5/4 -2.5Y 7/6 -2.5Y 7/6, COM SAP -2.5Y 7/6	18”	PS	19”	PS 0.6 GPD/SQFT TO 19”
		8-14	SL GR	FR SS SP SEXP					
		14-18	SL GR	FR SS SP SEXP					
		18-19	LS SAP M	FR NS NP NEXP					
		19	WR/ROCK						
3									
4									

DESCRIPTION	INITIAL SYSTEM	REPAIR SYSTEM
Available Space (.1945)	PS	PS
System Type(s)	TS-1 DRIP	TS-1 DRIP
Site LTAR	0.6 GPD/SQFT	0.6 GPD/SQFT

OTHER FACTORS (.1946): NONE
SITE CLASSIFICATION (.1948): PS

EVALUATED BY: ADRIAN L. PRUETT
OTHER(S) PRESENT: NONE

COMMENTS:_____

Department of Environment, Health, and Natural Resources
Division of Environmental Health
On-site Wastewater Section

Sheet: 1 of 3
Property ID: 019-181-63
Lot #: NA
File #: 9523B
AppID: 8358

SOIL/SITE EVALUATION
for ON-SITE WASTEWATER SYSTEM

Owner: Frank Tyson
Address: 3601 Starmount Ave., Charlotte, NC 28269
Proposed Facility: 4BR House
Design Flow (.1949): 480 GPD
Location of Site: 12231 Asbury Chapel Rd, Huntersville, NC 28078
Water Supply: [ ] Public [ ] Individual [ ] Well [ ] Spring [X] Municipal
Evaluation Method: [X] Auger Boring [X] Pit [ ] Cut
Type of Wastewater: [X] Sewage [ ] Industrial Process [ ] Mixed

Applicant: Sanford Yandle
Date Evaluated: 7/22/2016 & 9/19/2016
Property Size: 28 ac
Property Recorded: Unknown

PROFILE #	.1940 Landscape Position/ Slope%	Horizon Depth (IN.)	SOIL MORPHOLOGY .1941 .1941 Structure/ Texture	.1941 Consistence Mineralogy	b PROFILE FACTORS .1942 Soil Wetness/ Color	.1943 Soil Depth (IN.)	.1956 Sapro Class	.1944 Restr Horiz	General Comments	**Profile Class & LTAR**	**Maximum Trench Bottom Depth for 3' Wide Conventional Trench**
Pit	LS	0 - 14	gr SL	SS SP FR SEXP			PS			**PS IV**	
#1	11%	14 - 42	mass SL Sap	SS SP FR/FI SEXP	2 chroma	14	14 - 42	NA	rocky 42"+	**0.3**	**14"**
		42 - 50	mass SL Sap	S P VFI	16 - 37"		US>42				**need cover**
Pit	LS	0 - 4	gr SL	SS SP FR SEXP			PS				
#2	11%	4 - 24	mass LS Sap	SS SP FI SEXP	2 chroma	4	4 - 24	NA		**US**	**NA**
		24 - 42	mass LS Sap	SS SP VFI	at 24"		US>24				
Pit	LS	0 - 4	gr SL	SS SP FR SEXP							
#3	12%	4 - 14	gr SCL	SS SP FR SEXP	2 chroma	14	US	NA		**US**	**NA**
		14 - 27	mass C	VS VP VFI EXP	at 14"						
		27 - 32	mass SL Sap	S P VFI							
Pit	LS	0 - 8	gr SL	SS SP FR SEXP							
#4	11%	8 - 16	sbk C	S P FI SEXP	2 chroma	16	NA	NA		**US**	**NA**
		16 - 36	mass C	S VP VFI EXP	at 16"						
Pit	FS	0 - 13	mass C	S VP VFI EXP	2 chroma						
#5	5%	13	Rock		at 6"	0	US	NA		**US**	**NA**
Pit	LS	0 - 6	gr SL	SS SP FR SEXP			US				
#6	9%	6 - 20	mass C	S VP VFI EXP	2 chroma	6	20 - 29	NA		**possible**	**NA**
		20 - 29	mass SCL	SS SP VFI	at 6 - 20"		PS			**deep**	
		29 - 74	mass SL Sap	SS SP FR/FI SEXP			29 - 74			**trench**	
										placement	
										0.3	

Description	Initial System	Repair System
Available Space (.1945)		
System Type(s)		
Site LTAR (gpd/sq ft)	**US**	**US**

Other Factors (.1946):
Soil Evaluation By: Jacob Presley, LSS, REHS
Others Present:
Site Classification (.1948):
Site Evaluation By:
Others Present:

SOIL/SITE EVALUATION
for ON-SITE WASTEWATER SYSTEM
CONTINUED

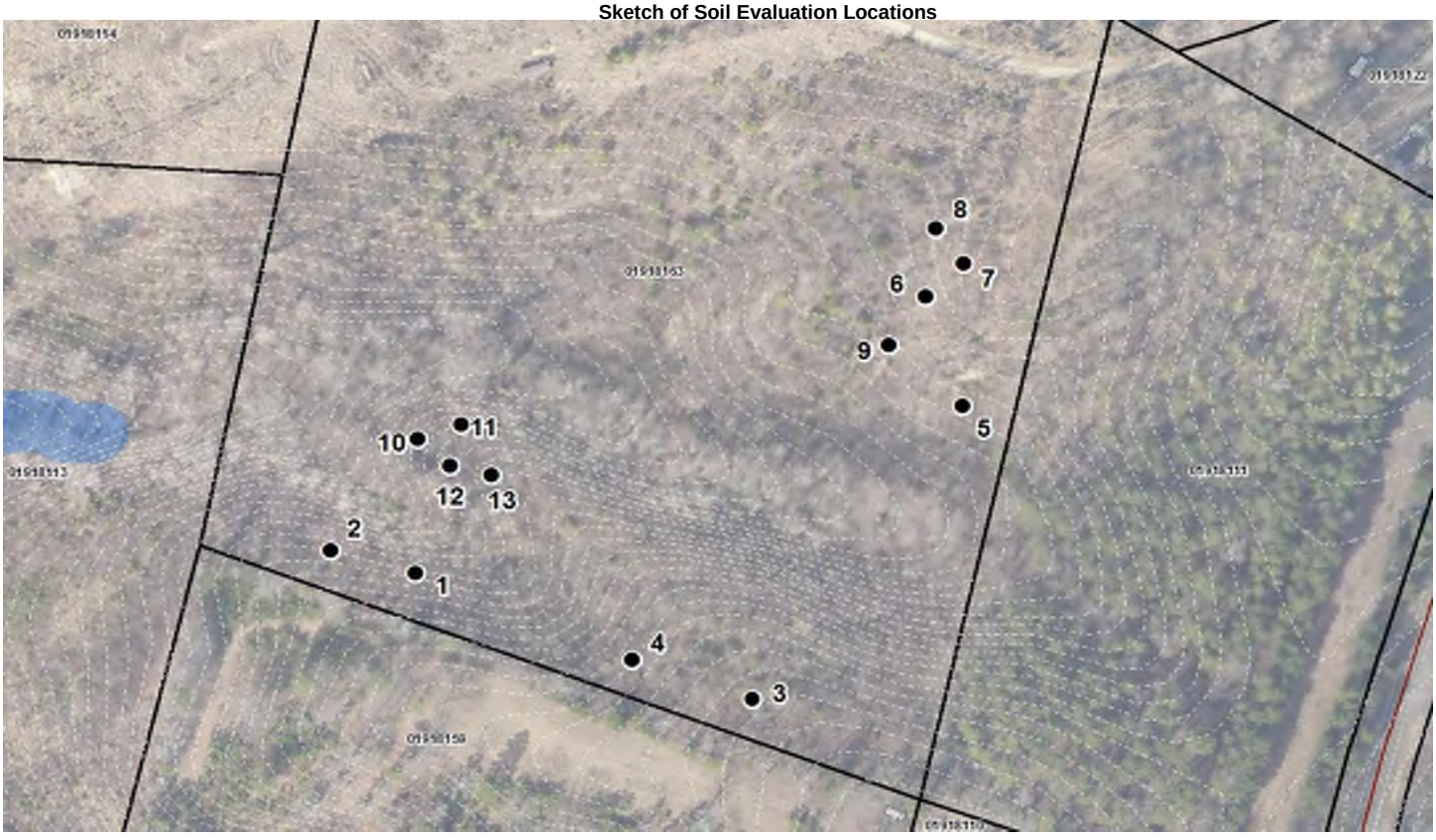
PROFILE #	.1940 Landscape Position/ Slope%	Horizon Depth (IN.)	SOIL MORPHOLOGY .1941 .1941 Structure/ Texture	SOIL MORPHOLOGY .1941 .1941 Consistence Mineralogy	b PROFILE FACTORS .1942 Soil Wetness/ Color	.1943 Soil Depth (IN.)	.1956 Sapro Class	.1944 Restr Horiz	General Comments	**Profile Class & LTAR**	**Maximum Trench Bottom Depth for 3' Wide Conventional Trench**
Pit	LS	0 - 4	gr SL	SS SP FR SEXP			US				
#7	9%	4 - 20	mass C	S VP VFI EXP	2 chroma	6	20 - 26	NA		**possible**	**NA**
		20 - 26	mass SCL	SS SP VFI	at 6 - 20"		PS			**deep**	
		26 - 75	mass SL Sap	SS SP FR/FI SEXP			26 - 75			**trench**	
Pit	LS	0 - 5	gr SL	SS SP FR SEXP							
#8	9%	5 - 42	mass C	S VP VFI EXP	2 chroma	6	NA	NA		**US**	**NA**
					at 6 - 42"						
Pit	FS	0 - 6	gr SL	SS SP FR SEXP	2 chroma						
#9	6%	6 - 38	mass C	S VP VFI EXP	at 6 - 38"	6	NA	NA		**US**	**NA**
Pit	NS	0 - 9	gr SL	SS SP FR SEXP			PS			**PS II**	
#10	11%	9 - 22	mass LS Sap	SS SP FR/FI SEXP	>36"	9	9 - 22	NA		**Drip**	**NA**
		22 - 36	Rock with Saprolite inclusions								
Pit	NS	0 - 10	gr SL	SS SP FR SEXP			PS			**PS II**	
#11	14%	10 - 36	mass LS Sap	SS SP FR/FI SEXP	>48"	10	10 - 36	NA		**Drip**	**NA**
		36 - 48	Rock with Saprolite inclusions								
Pit	NS	0 - 11	gr SL	SS SP FR SEXP			PS			**PS II**	
#12	11%	11 - 18	mass LS Sap	SS SP FR/FI SEXP	>30"	11	11 - 18	NA		**Drip**	**NA**
		18 - 30	Rock with Saprolite inclusions								
Pit	NS	0 - 15	gr SL	SS SP FR SEXP							
#13	11%	15 - 19	abk SC	S P FI SEXP	2 chroma	19	NA	NA		**PS IV**	**NA**
		19 - 48	prism C	S VP VFI EXP	at 36"					**Drip**	

COMMENTS:

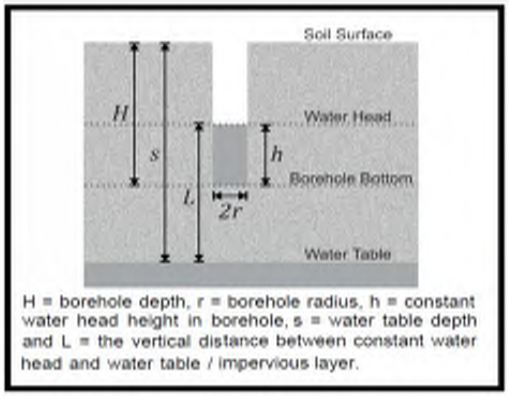
Landscape Position	Group	Texture	.1955 LTAR	Structure
R-Ridge	I	S-Sand	1.2 - 0.8	sg-Single Grain
SS-Shoulder Slope		LS-Loamy Sand		mass-Massive
LS-Linear Slope				cr-Crumb
FS-Foot Slope	II	SL-Sandy Loam	0.8 - 0.6	gr-Granular
NS-Nose Slope		L-Loam		sbk-Subangular Blocky
HS-Head Slope				abk-Angular Blocky
CC-Concave Slope	III	Si-Silt	0.6 - 0.3	pl-Platy
CV-Convex Slope		SiCL-Silty Clay Loam		pr-Prismatic
T-Terrace				Sap-Saprolite
FP-Flood Plain		CL-Clay Loam		**Structure Prefixes**
D-Drainage Way		SCL-Sandy Clay Loam		w-weak
		SiL-Silt Loam		m-moderate
				s-strong
				f-fine
	IV	SC-Sandy Clay	0.4 - 0.1	m-medium
		SiC-Silty Clay		c-coarse
		C-Clay		

Consistence Moist	Consistence Wet	Mineralogy
VFR-Very Friable	SS-Slightly Sticky	SEXP-Slightly Expansive
FR-Friable	S-Sticky	EXP-Expansive
FI-Firm	VS-Very Sticky	
VFI-Very Firm	NP-Non-Plastic	**Classification**
EFI-Extremely Firm	SP-Slightly Plastic	US-Unsuitable
	P-Plastic	PS-Provisionally Suitable
	VP-Very Plastic	S-Suitable
		NA-Not Applicable

Sketch of Soil Evaluation Locations



Soilmoisture Ksat Calculator Site 1 Hole 1 Asbury Chapel Rd.



H = borehole depth, r = borehole radius, h = constant water head height in borehole, s = water table depth and L = the vertical distance between constant water head and water table / impervious layer.

Parameters	Scenario
Q: Steady Flow Rate (ml/min):	40
r: Borehole Radius (cm):	3.81
h: Water head Height (cm):	6.5
H: Depth of Borehole (cm):	18.5
Water Temp ©:	6.7
S: Water Table Depth (cm):	51

Elrick and Reynolds

Soil Type Description		(cm/hr)
I. Compacted, Structure-less, clayey or silty materials	Ksat I:	0.4494
II. Soils which are both fine textured (clayey or silty)	Ksat II:	1.5475
III. Most structured soils from clays through loams; a	Ksat III:	3.0472
IV. Coarse and gravely sands; may also include some	Ksat IV:	4.7086

Radcliffe (new)

		(cm/hr)
I. Compacted, Structure-less, clayey or silty materials	Ksat I:	0.4290
II. Soils which are both fine textured (clayey or silty)	Ksat II:	1.4230
III. Most structured soils from clays through loams; a	Ksat III:	3.0507
IV. Coarse and gravely sands; may also include some	Ksat IV:	4.7671

Glover

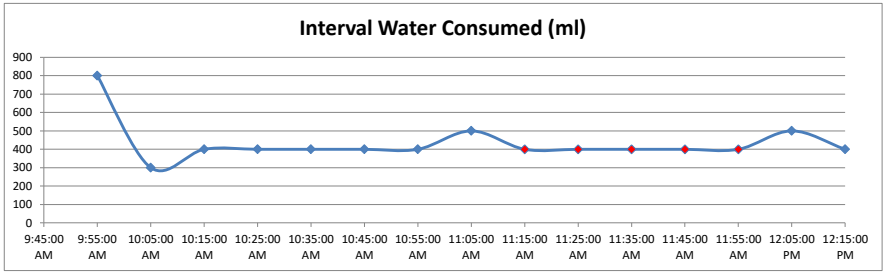
	(cm/hr)	(in/hr)	(gpd/sqft)	25% of (gpd/sqft)	10% of (gpd/sqft)	% of Ksat at 0.6 LTAR	Ksat for 1000qft of Area
Ksat:	6.608	2.602	38.920	9.730	3.892	0.015416146	0.48

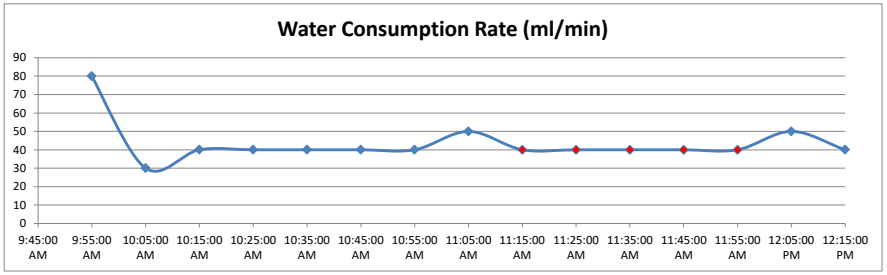
Earth Manual

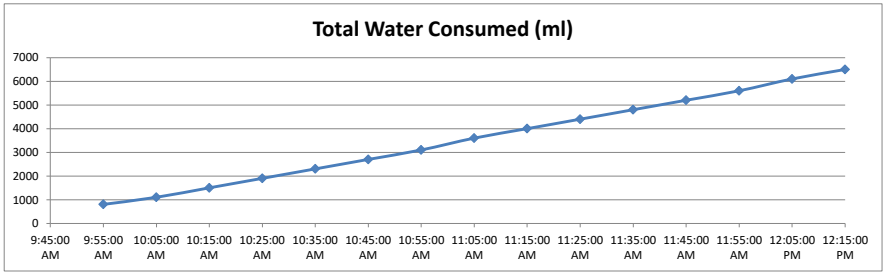
Water Table Condition			(cm/hr)
a. Deep Water Table	(L/h) > 3	Ksat-a:	6.6081
b. Shallow Water Table	1 <= (L/h) <= 3	Ksat-b:	
c. Very Shallow water Table	(L/h) < 1	Ksat-c:	

Soilmoisture Ksat Calculator

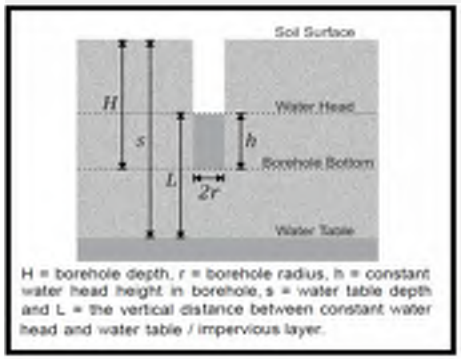
Reading Number	Time	Reservoir Water Level (ml)	Elapsed Time (min)	Interval Water Consumed (ml)	Total Water Consumed (ml)	Water Consumption Rate (ml/min)
1	9:45:00 AM	7500				
2	9:55:00 AM	6700	10.00	800.00	800.00	80.000
3	10:05:00 AM	6400	10.00	300.00	1100.00	30.000
4	10:15:00 AM	6000	10.00	400.00	1500.00	40.000
5	10:25:00 AM	5600	10.00	400.00	1900.00	40.000
6	10:35:00 AM	5200	10.00	400.00	2300.00	40.000
7	10:45:00 AM	4800	10.00	400.00	2700.00	40.000
8	10:55:00 AM	4400	10.00	400.00	3100.00	40.000
9	11:05:00 AM	3900	10.00	500.00	3600.00	50.000
10	11:15:00 AM	3500	10.00	400.00	4000.00	40.000
11	11:25:00 AM	3100	10.00	400.00	4400.00	40.000
12	11:35:00 AM	2700	10.00	400.00	4800.00	40.000
13	11:45:00 AM	2300	10.00	400.00	5200.00	40.000
14	11:55:00 AM	1900	10.00	400.00	5600.00	40.000
15	12:05:00 PM	1400	10.00	500.00	6100.00	50.000
16	12:15:00 PM	1000	10.00	400.00	6500.00	40.000
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Soilmoisture Ksat Calculator Site 1 Hole 2



H = borehole depth, r = borehole radius, h = constant water head height in borehole, s = water table depth and L = the vertical distance between constant water head and water table / impervious layer.

Parameters	Scenario
Q: Steady Flow Rate (ml/min):	80
r: Borehole Radius (cm):	3.81
h: Water head Height (cm):	6.5
H: Depth of Borehole (cm):	38
Water Temp ©:	17.2
S: Water Table Depth (cm):	51

Elrick and Reynolds

Soil Type Description		(cm/hr)
I. Compacted, Structure-less, clayey or silty materials	Ksat I:	0.8989
II. Soils which are both fine textured (clayey or silty)	Ksat II:	3.0950
III. Most structured soils from clays through loams; a	Ksat III:	6.0943
IV. Coarse and gravely sands; may also include some	Ksat IV:	9.4171

Radcliffe (new)

		(cm/hr)
I. Compacted, Structure-less, clayey or silty materials	Ksat I:	0.8581
II. Soils which are both fine textured (clayey or silty)	Ksat II:	2.8459
III. Most structured soils from clays through loams; a	Ksat III:	6.1014
IV. Coarse and gravely sands; may also include some	Ksat IV:	9.5341

Glover

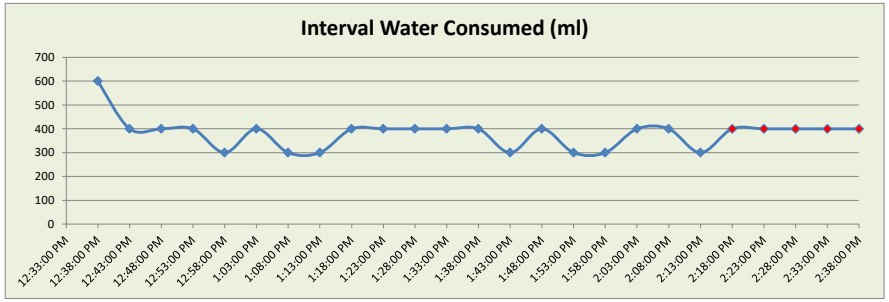
	(cm/hr)	(in/hr)	(gpd/sqft)	25% of (gpd/sqft)	10% of (gpd/sqft)	% of Ksat a 0.6 LTAR	Ksat for 1000sft of Area
Ksat:	13.216	5.203	77.840	19.460	7.784	0.007708073	0.48

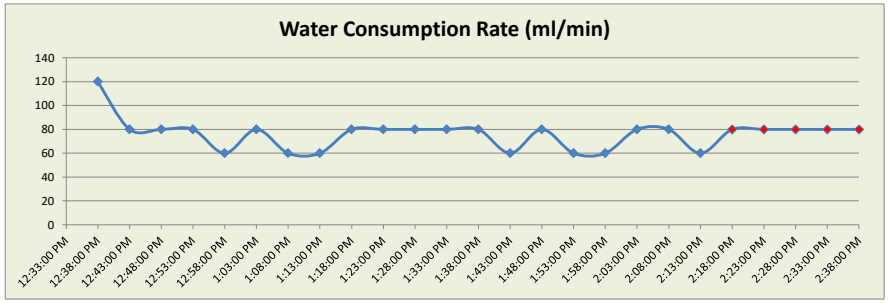
Earth Manual

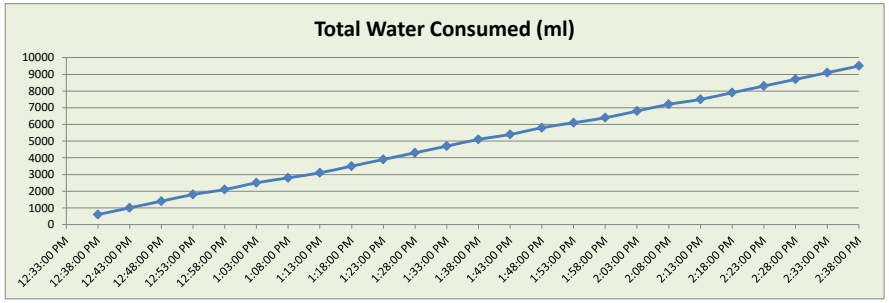
Water Table Condition		(cm/hr)
a. Deep Water Table	(L/h) > 3	Ksat-a:
b. Shallow Water Table	1 <= (L/h) <= 3	Ksat-b: 2.3E-05
c. Very Shallow water Table	(L/h) < 1	Ksat-c:

Soilmoisture Ksat Calculator

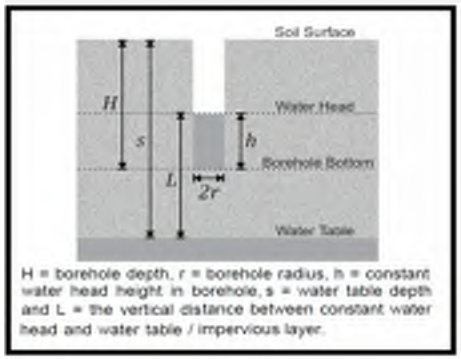
Reading Number	Time	Reservoir Water Level (ml)	Elapsed Time (min)	Interval Water Consumed (ml)	Total Water Consumed (ml)	Water Consumption Rate (ml/min)
1	12:33:00 PM	9500				
2	12:38:00 PM	8900	5.00	600.00	600.00	120.000
3	12:43:00 PM	8500	5.00	400.00	1000.00	80.000
4	12:48:00 PM	8100	5.00	400.00	1400.00	80.000
5	12:53:00 PM	7700	5.00	400.00	1800.00	80.000
6	12:58:00 PM	7400	5.00	300.00	2100.00	60.000
7	1:03:00 PM	7000	5.00	400.00	2500.00	80.000
8	1:08:00 PM	6700	5.00	300.00	2800.00	60.000
9	1:13:00 PM	6400	5.00	300.00	3100.00	60.000
10	1:18:00 PM	6000	5.00	400.00	3500.00	80.000
11	1:23:00 PM	5600	5.00	400.00	3900.00	80.000
12	1:28:00 PM	5200	5.00	400.00	4300.00	80.000
13	1:33:00 PM	4800	5.00	400.00	4700.00	80.000
14	1:38:00 PM	4400	5.00	400.00	5100.00	80.000
15	1:43:00 PM	4100	5.00	300.00	5400.00	60.000
16	1:48:00 PM	3700	5.00	400.00	5800.00	80.000
17	1:53:00 PM	3400	5.00	300.00	6100.00	60.000
18	1:58:00 PM	3100	5.00	300.00	6400.00	60.000
19	2:03:00 PM	2700	5.00	400.00	6800.00	80.000
20	2:08:00 PM	2300	5.00	400.00	7200.00	80.000
21	2:13:00 PM	2000	5.00	300.00	7500.00	60.000
22	2:18:00 PM	1600	5.00	400.00	7900.00	80.000
23	2:23:00 PM	1200	5.00	400.00	8300.00	80.000
24	Water Added	4800				
25	2:28:00 PM	4400	5.00	400.00	8700.00	80.000
26	2:33:00 PM	4000	5.00	400.00	9100.00	80.000
27	2:38:00 PM	3600	5.00	400.00	9500.00	80.000
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Soilmoisture Ksat Calculator Site 2 Hole 1



H = borehole depth, r = borehole radius, h = constant water head height in borehole, s = water table depth and L = the vertical distance between constant water head and water table / impervious layer.

Parameters	Scenario
Q: Steady Flow Rate (ml/min):	170
r: Borehole Radius (cm):	3.81
h: Water head Height (cm):	6.5
H: Depth of Borehole (cm):	23
Water Temp ©:	18.8
S: Water Table Depth (cm):	48.3

Elrick and Reynolds

Soil Type Description		(cm/hr)
I. Compacted, Structure-less, clayey or silty materials	Ksat I:	1.9101
II. Soils which are both fine textured (clayey or silty)	Ksat II:	6.5769
III. Most structured soils from clays through loams; a	Ksat III:	12.9505
IV. Coarse and gravely sands; may also include some	Ksat IV:	20.0114

Radcliffe (new)

		(cm/hr)
I. Compacted, Structure-less, clayey or silty materials	Ksat I:	1.8234
II. Soils which are both fine textured (clayey or silty)	Ksat II:	6.0475
III. Most structured soils from clays through loams; a	Ksat III:	12.9655
IV. Coarse and gravely sands; may also include some	Ksat IV:	20.2600

Glover

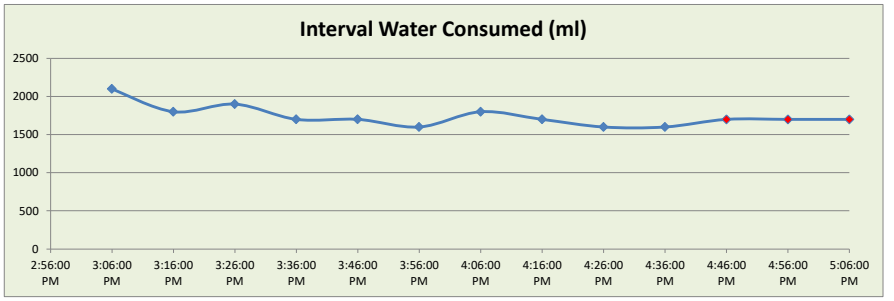
	(cm/hr)	(in/hr)	(gpd/sqft)	25% of (gpd/sqft)	10% of (gpd/sqft)	% Ksat at 0.6 LTAR	Ksat for 1000sqft of Area
Ksat:	28.084	11.057	165.411	41.353	16.541	0.003627328	0.48

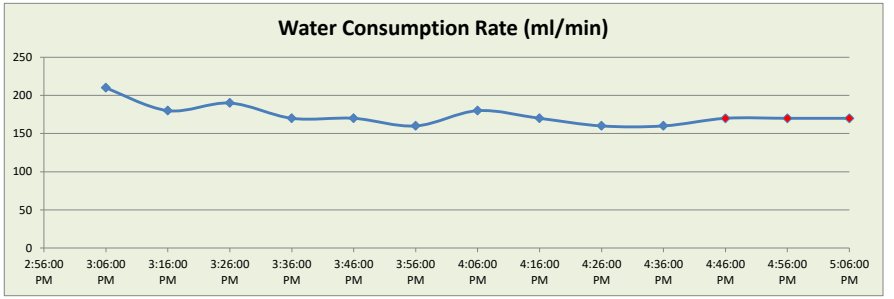
Earth Manual

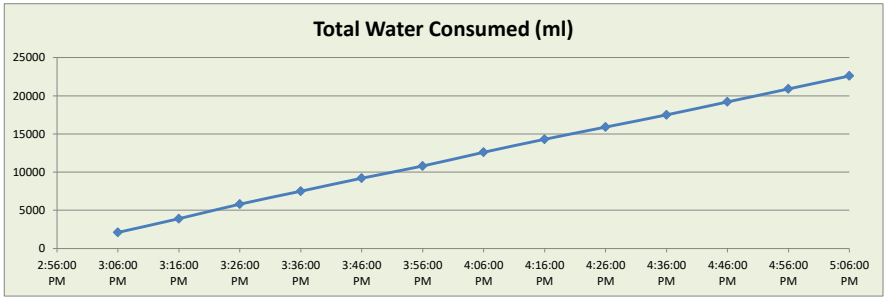
Water Table Condition			(cm/hr)
a. Deep Water Table	(L/h) > 3	Ksat-a:	28.0845
b. Shallow Water Table	1 <= (L/h) <= 3	Ksat-b:	
c. Very Shallow water Table	(L/h) < 1	Ksat-c:	

Soilmoisture Ksat Calculator

Reading Number	Time	Reservoir Water Level (ml)	Elapsed Time (min)	Interval Water Consumed (ml)	Total Water Consumed (ml)	Water Consumption Rate (ml/min)
1	2:56:00 PM	10400				
2	3:06:00 PM	8300	10.00	2100.00	2100.00	210.000
3	3:16:00 PM	6500	10.00	1800.00	3900.00	180.000
4	3:26:00 PM	4600	10.00	1900.00	5800.00	190.000
5	3:36:00 PM	2900	10.00	1700.00	7500.00	170.000
6	3:46:00 PM	1200	10.00	1700.00	9200.00	170.000
7	Water Added	8700				
8	3:56:00 PM	7100	10.00	1600.00	10800.00	160.000
9	4:06:00 PM	5300	10.00	1800.00	12600.00	180.000
10	4:16:00 PM	3600	10.00	1700.00	14300.00	170.000
11	4:26:00 PM	2000	10.00	1600.00	15900.00	160.000
12	Water Added	8600				
13	4:36:00 PM	7000	10.00	1600.00	17500.00	160.000
14	4:46:00 PM	5300	10.00	1700.00	19200.00	170.000
15	4:56:00 PM	3600	10.00	1700.00	20900.00	170.000
16	5:06:00 PM	1900	10.00	1700.00	22600.00	170.000
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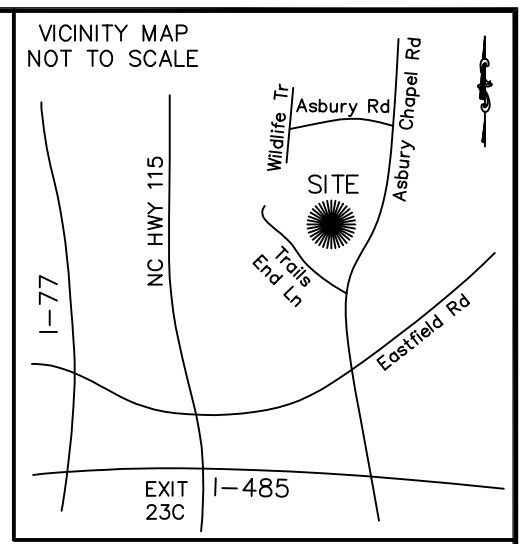






PRELIMINARY PLAN
NOT FOR RECORDATION
CONVEYANCES
AND/OR SALES

VICINITY MAP
NOT TO SCALE



TAX PARCEL
01918116
DEED BOOK 4455
PAGE 751

TAX PARCEL
01918115
DEED BOOK 2585
PAGE 332

TAX PARCEL
01918161
DEED BOOK 8329
PAGE 788

TAX PARCEL
01918114
DEED BOOK 8329
PAGE 791

TAX PARCEL 01918163
DEED BOOK 21206 PAGE 123

TAX PARCEL
01918113
DEED BOOK 22840
PAGE 42

APPROXIMATE EXISTING
DRIVEWAY LOCATION

DRIVEWAY

DRIVEWAY

S12°05'55"W 784.37'

744.85 R
746.72 Y
SITE 1 HOLE 1
744.83 R
747.81 P
747.79 P
746.69 Y
749.67 B
749.60 B
751.77 R
BORE B1
753.26 Y
SITE 1 HOLE 2
753.28 Y
746.66 Y
754.67 P
747.92 P
754.91 P
BORE B2
749.66 B
751.76 R
SITE 2 HOLE 1
754.80 P
751.68 R
753.14 Y

TAX PARCEL
01918111
DEED BOOK 4496
PAGE 217

769.59
TANK

772.50
PROP HOUSE COR

PROPOSED HOUSE BOX

DRIVEWAY

N69°51'05"W 694.62'

32.04'

211.34'

TAX PARCEL 01918159
DEED BOOK 11100 PAGE 571

790.61
1" IPF +0.75

TAX PARCEL
01918110
DEED BOOK 24477
PAGE 891

GRAPHIC SCALE
1" = 100'
100 0 100 200

DEED BOOK 21206
PAGE 123
Dated: 10/13/2006

GENERAL NOTES

1) ALL DIMENSIONS SHOWN ARE IN US SURVEY FEET AND DECIMALS THEREOF AND ARE HORIZONTAL GROUND DISTANCES UNLESS OTHERWISE INDICATED. AREA BY COORDINATE METHOD.
2) THIS EXHIBIT IS BASED ON DEED BOOK 21206 PAGE 123 AS RECORDED AT THE MECKLENBURG COUNTY REGISTER OF DEEDS.
3) BASIS OF BEARINGS: DEED BOOK 21206 PAGE 123, DATED OCTOBER 13, 2006.
4) NO BOUNDARY WORK VERIFIED, LOCATED OR MARKED FOR THIS EXHIBIT. BOUNDARY INFORMATION AS SHOWN HEREON IS PER DEED BOOK 21206 PAGE 123.
5) THIS SURVEY IS OF AN EXISTING PARCEL OR PARCELS OF LAND AND DOES NOT CREATE A NEW STREET OR CHANGE AN EXISTING STREET.

LEGEND

R/W = Right-of-way
— · — · — = System Lines
——·—·—— = Repair Lines
⊠ = PIT

FOR PRELIMINARY PLANNING PURPOSES ONLY. ALL LOTS WILL REQUIRE FINAL APPROVAL BY THE COUNTY HEALTH DEPARTMENT ON A LOT BY LOT BASIS. THIS MAP SHOULD BY USED AS A GENERAL GUIDE, SOME ADJUSTMENTS WILL BE NECESSARY IN THE FIELD DUE TO SOIL VARIABILITY AND COMPLEX TOPOGRAPHIC FEATURES. THIS MAP ONLY REFLECTS EXISTING SOIL SUITABILITY FOR ON-SITE SEPTIC TANK SYSTEMS.

PLEASE REFER TO ATTACHED SOIL REPORT FOR ADDITIONAL SITE SPECIFIC INFORMATION

CAROLINA SOIL &
SEPTIC CONSULTING, PLLC
P.O. BOX 1703
MOORESVILLE, NC 28115
704.202.5791
ADRIAN L. PRUETT, LSS

SITE PLAN & DRAINFIELD AREAS
TAX PARCEL 01918163
DEED BOOK 21206 PAGE 123
FRANK TYSON – OWNER
12300 ASBURY CHAPEL ROAD
TOWN OF HUNTERSVILLE, MECKLENBURG COUNTY, NORTH CAROLINA

JOB # : 17006
FILE: 17006-EXHIBIT
PROJECT MGR.: ALP
FIELD WORK: ALP
DRAWN BY: GHL
DATE: JANUARY 30, 2017

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.



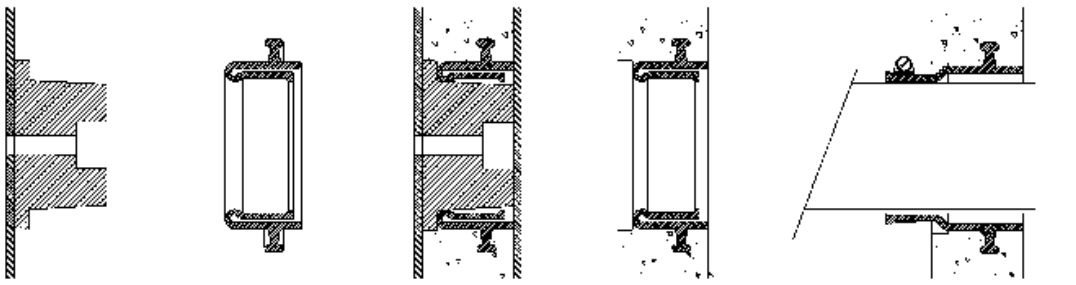
Why It's Better

- 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.

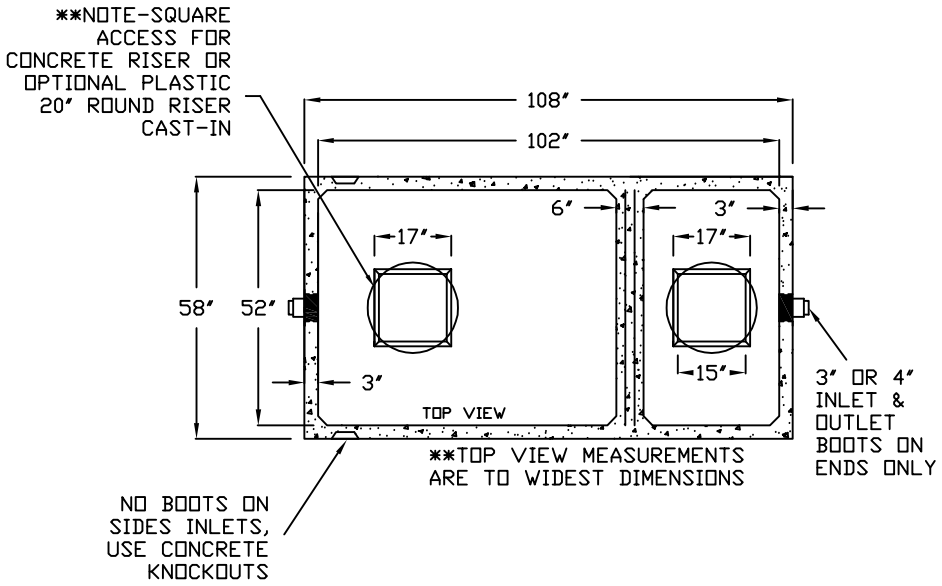
Strip form and mandrel, leaving gasket in place.

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

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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

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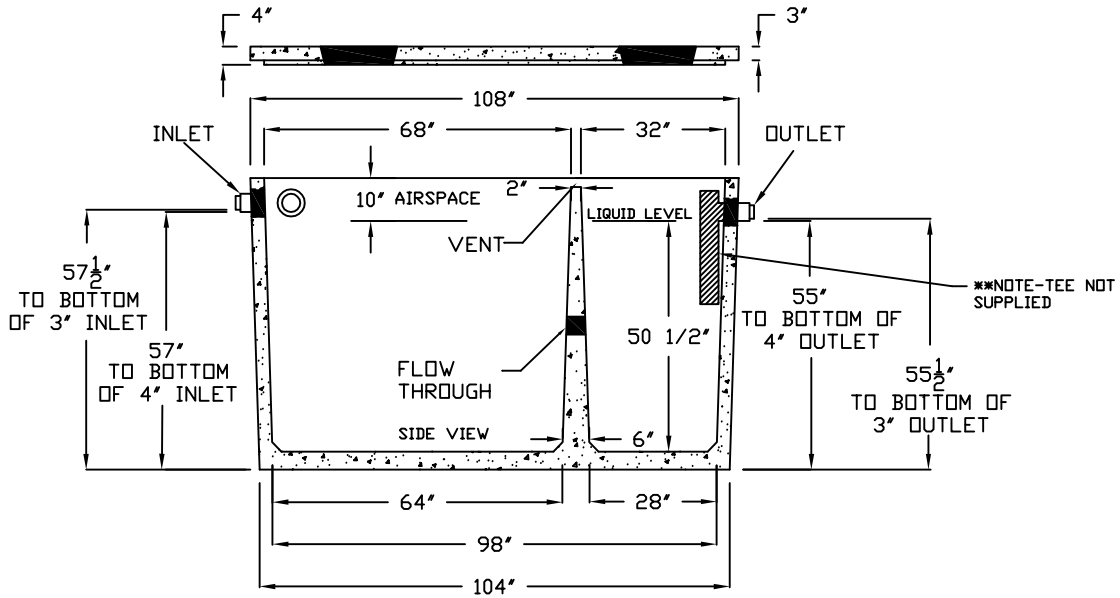


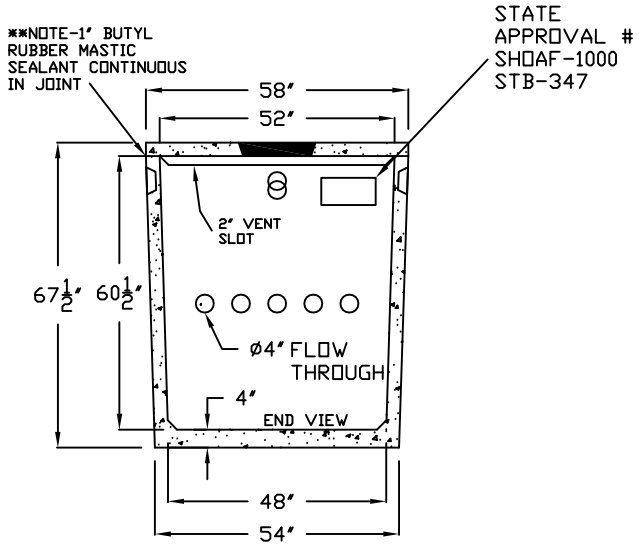
SHOAF PRECAST SEPTIC INC.
4130 WEST US HWY 64
LEXINGTON, NC 27295
PHONE (336) 787-5826
FAX (336) 787-2826

MODEL: TS 1000 STB
NON TRAFFIC
1000 Gallon Septic Tank

WWW.SHOAFPRECAST.COM
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.





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.

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

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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
an ISO 9001:2000 Registered Company

Submittal Data Sheet

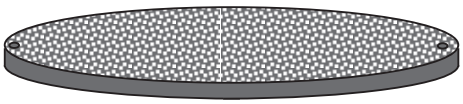
Fiberglass Access Lids

Orenco Systems® Incorporated
1-800-348-9843

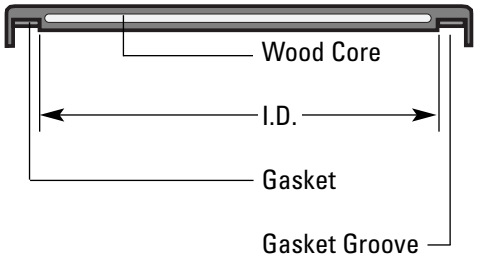
Applications

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

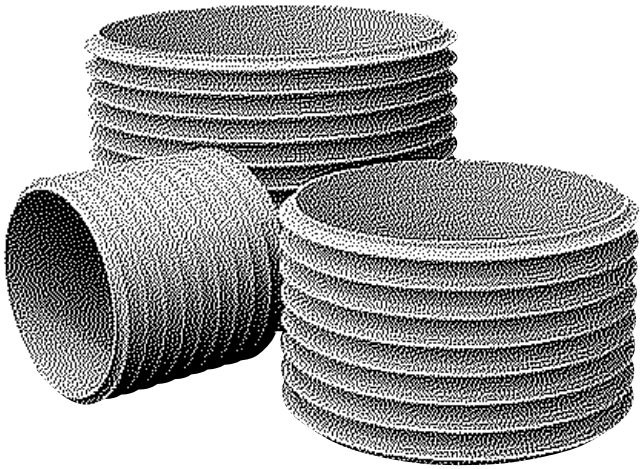
© 2004 Orenco Systems® Inc.

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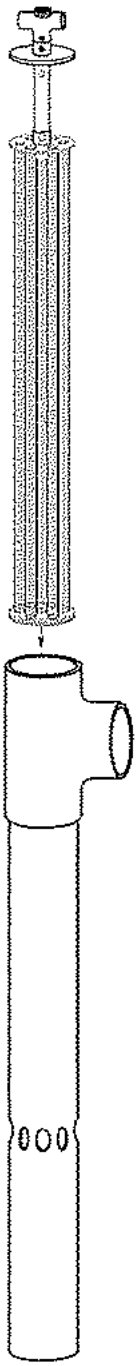
- Add codes for standard options:
  A = float bracket
- Base inlet model
- Cartridge height, 14" standard
- Housing height, 22" standard
- Indicates filter diameter (inches)
  08 = 8"
  12 = 12"
- P = 1/16" filtration
  Blank = 1/8" filtration
- Biotube effluent filter series

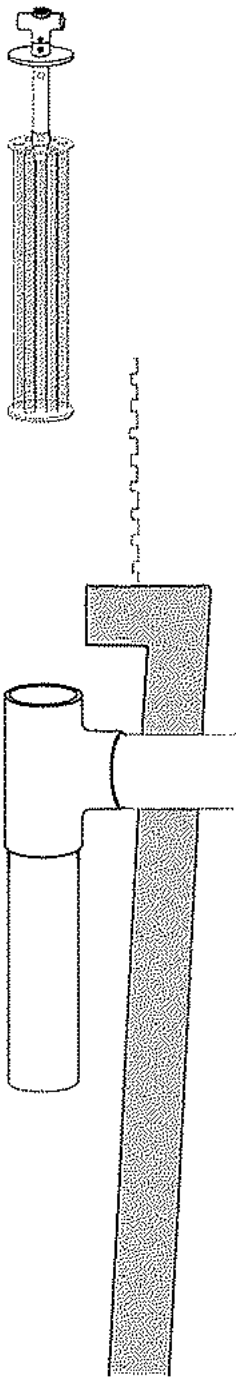
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- For customized options (e.g., NC indicates North Carolina regions)
- Indicates float bracket attached
- Indicates flow modulation plate installed
- Cartridge height (inches)
- Indicates filter diameter (inches)
- W = fits 3034 outlet pipe
  S = fits 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





Installation Manual

AdvanTex®
AX-RT Treatment Systems

Residential Applications



Orenco®
Orenco Systems®, Incorporated
1-800-348-9843
+1-541-459-4449
www.orenco.com

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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.

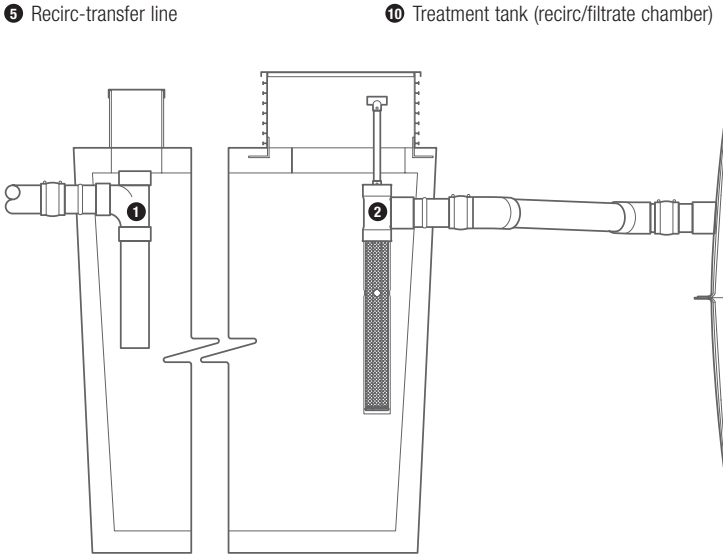


Key Point: For existing septic tanks — the tank's depth of burial must allow for a minimum fall of 1⁄8 inch per foot (10 mm per meter or 1%) from the septic tank's invert of outlet to the AX-RT unit's invert of the inlet. If sufficient fall cannot be met, a grade ring extension must be installed on the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

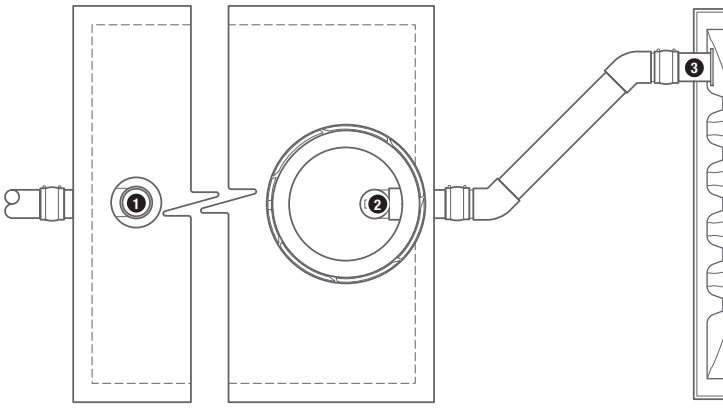
Standard Components (AX20RT-MODE1B shown):

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.

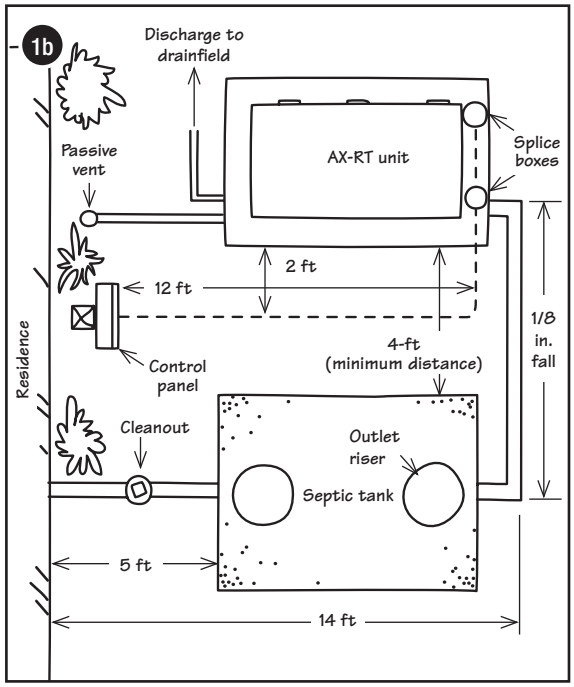
Step 13: Connect the discharge line to the AX-RT outlet.

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

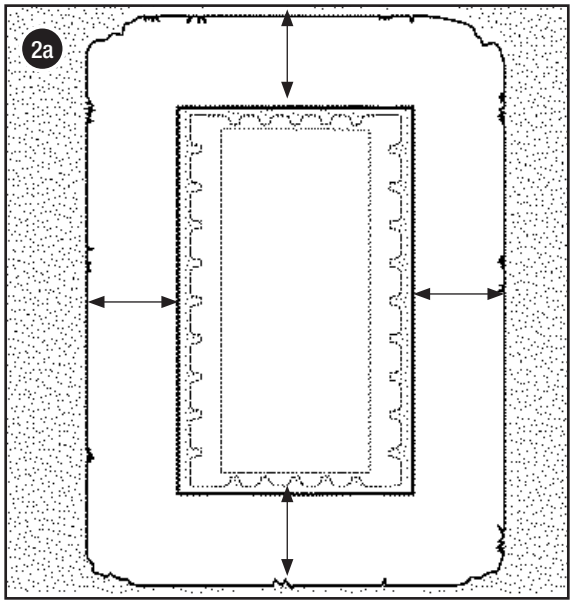
Step 15: Perform an operational test of the AX-RT float switches and pump(s).

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.

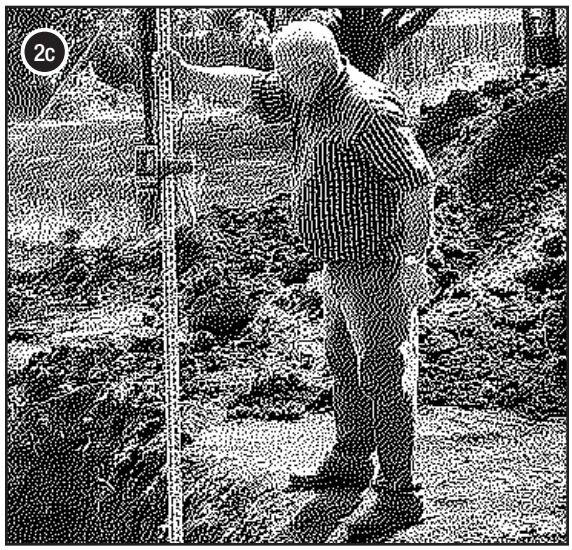
Step 2c: Make sure the bottom of the excavation is suitable for setting the AX-RT unit and (if needed) the tank: stable, smooth, level, and free of debris, rocks, and other sharp objects.

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.

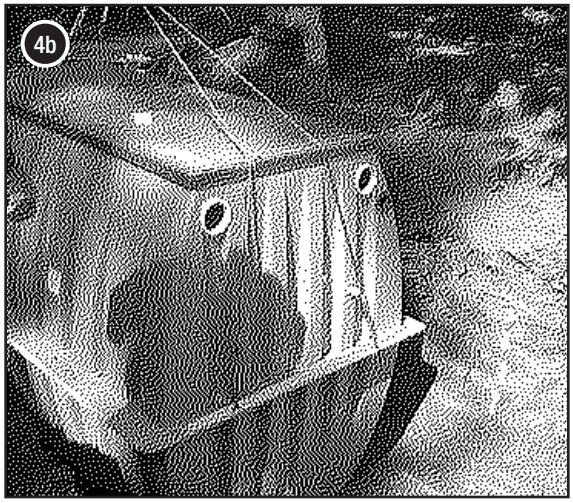
- Use Fiberglass Tank Burial instructions (NIN-TNK-1) to install Orenco's 500-gallon through 2000-gallon (2000-L through 7570-L) Fiberglass Tanks.

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.

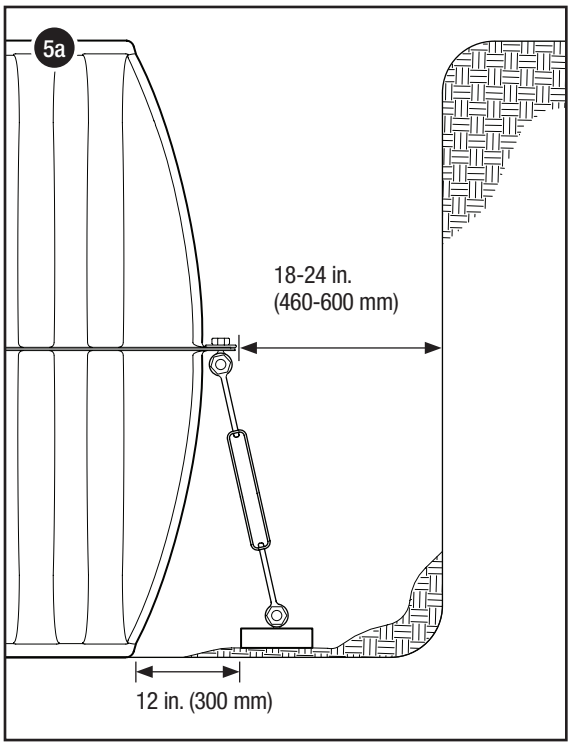
Step 4b: Carefully lift the unit and lower it into the correct position.

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:

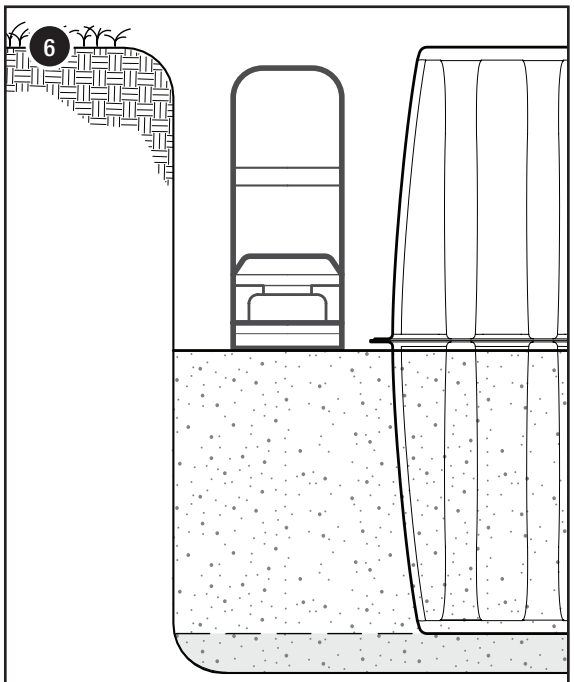
- Do not use native material to backfill if it is primarily sand; very soft or highly expansive clay; or if it contains debris, large (> ¾-in. or 19-mm) rocks, sharp rocks, peat, or muck. In these cases, use ≤ ¾ inch (≤ 19 mm) rounded gravel, crushed stone, or pea gravel as fill material. This material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

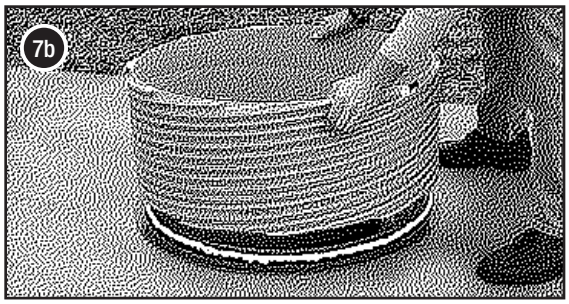
Step 6f: Compact the fill to 2-3 inches (50-75 mm) below the midseam flange.



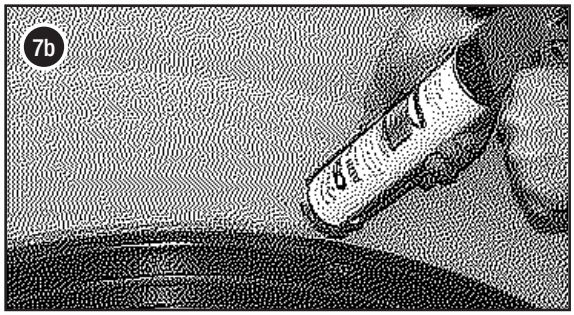
IMPORTANT:

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.

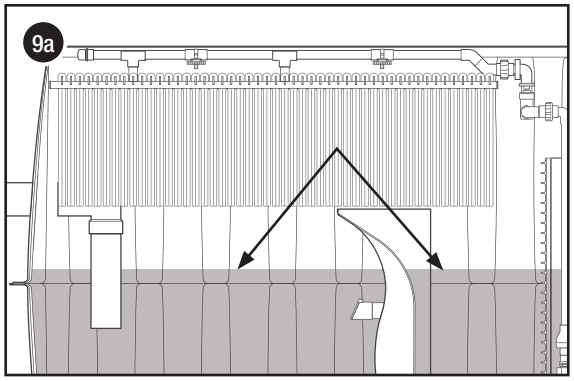
Installation Steps

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.

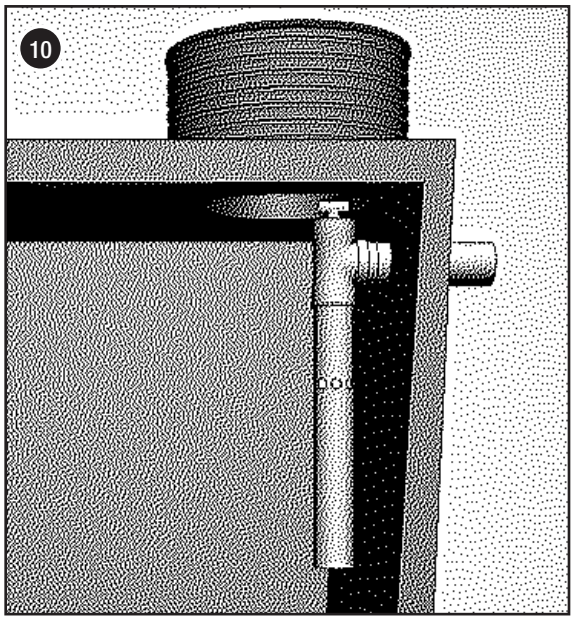
Key Points:

- 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.

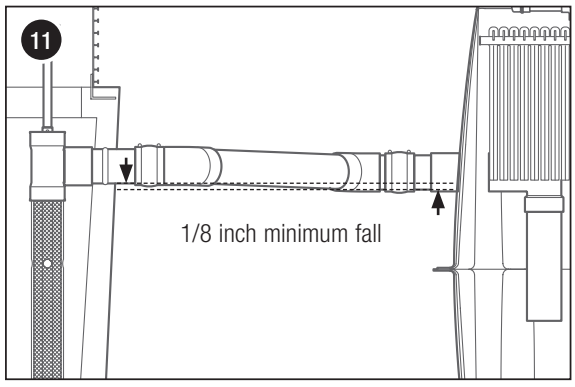
Step 11: Connect Transport Line from Tank to AX-RT

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.

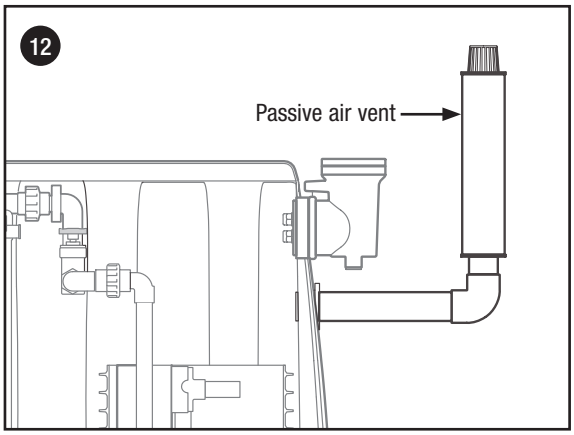
Step 11b: Glue all of the transport line pieces in place.

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:

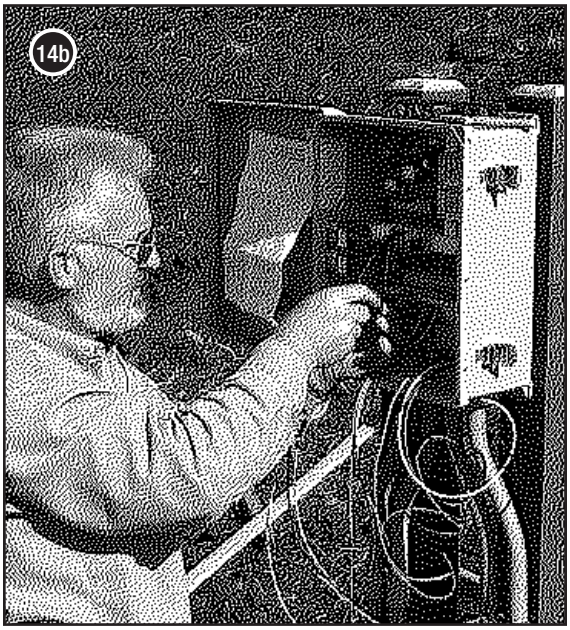
- Install the vent within 20 ft (6 m) of the AX-RT unit, preferably near a wall or other location that will protect it from damage.
- Make sure the vent line is sloped back a minimum of ¼ inch per foot (20 mm per meter) so that it can drain back into the unit.
- Make sure there are no "bellies" in the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

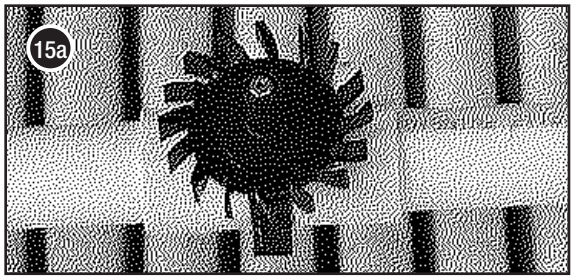
Note: *If the manifold won't pressurize to 3.0-3.5 psi (20.7-24.1 kPa), check for debris, line breaks, or broken valves, and verify that the pump has sufficient power. Contact your Dealer for additional assistance.*

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

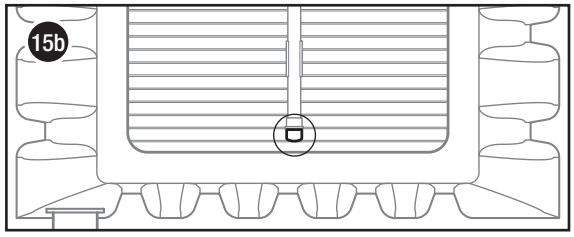
Step 15g: Toggle the recirc pump "AUTO/OFF/MAN" switch to "OFF."

Step 15h: Remove the pressure gauge.

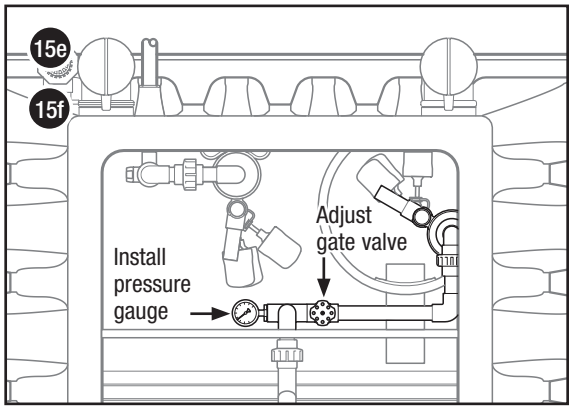
Step 15i: Return the recirc pump "AUTO/OFF/MAN" switch to "AUTO."



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.

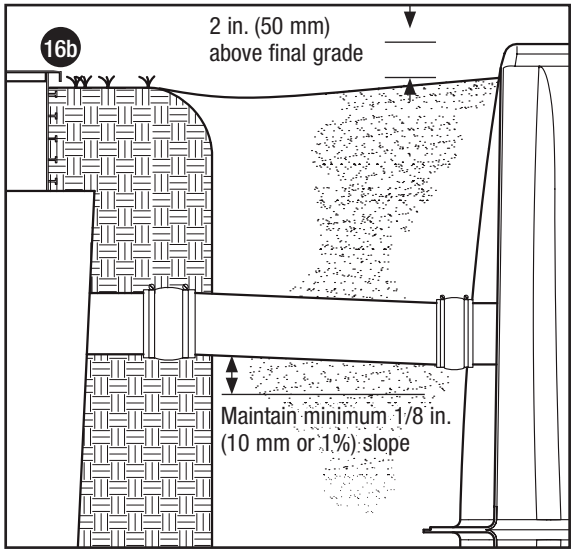
Step 16c: Compact the fill thoroughly with a mechanical compactor.

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

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AdvanTex® O&M MANUAL

PART 1: START-UP AND ROUTINE MAINTENANCE



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

O&M MANUAL

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Changing the Way the World Does Wastewater®

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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.



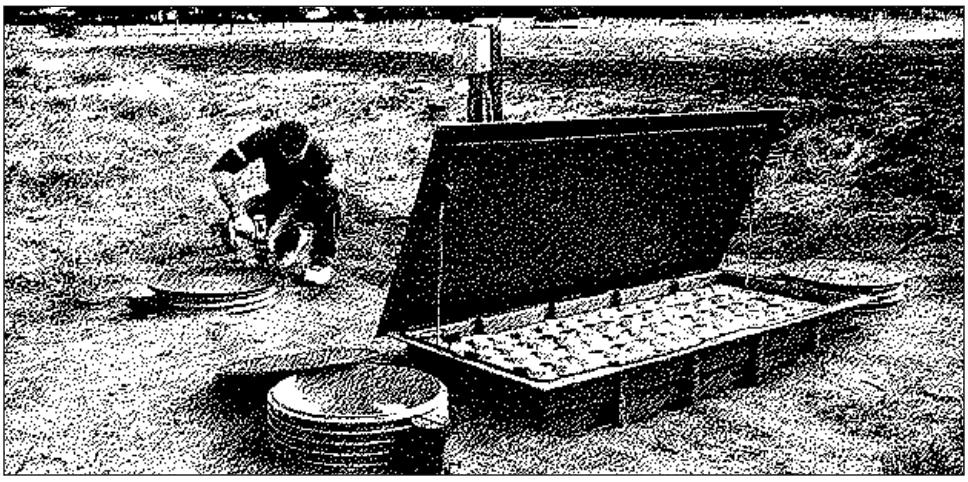
Orenco relies on you to perform the AdvanTex system start-up, do routine (scheduled) maintenance, and respond to calls for unscheduled maintenance (alarm calls). We also rely on you to keep in contact with the homeowners or property owners, review the *Homeowner's Manual* with them, advise them on preventive 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

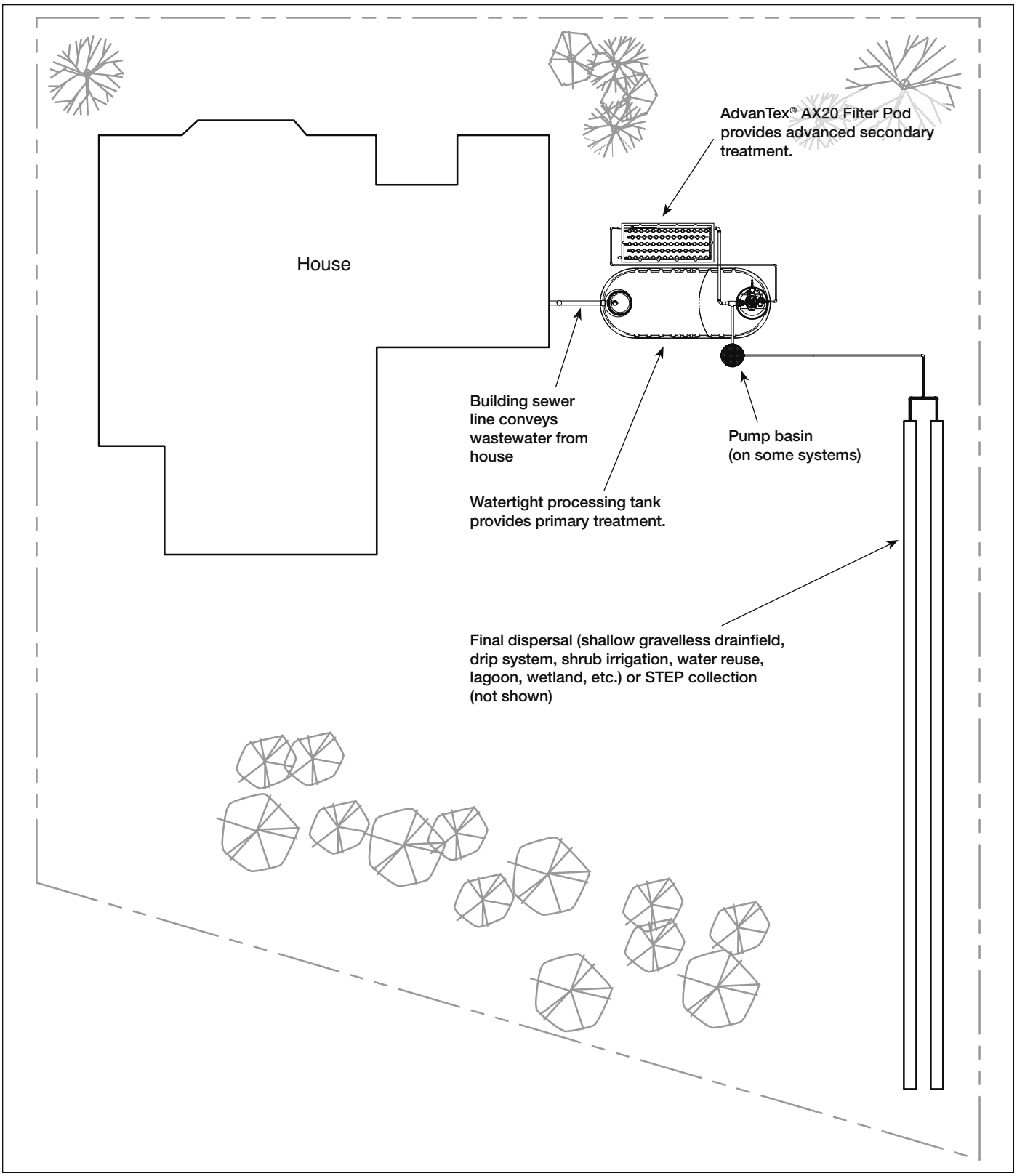
PART 1: START-UP AND ROUTINE MAINTENANCE

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Typical Site Plan for an AdvanTex Treatment System



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How the AdvanTex Treatment System Works

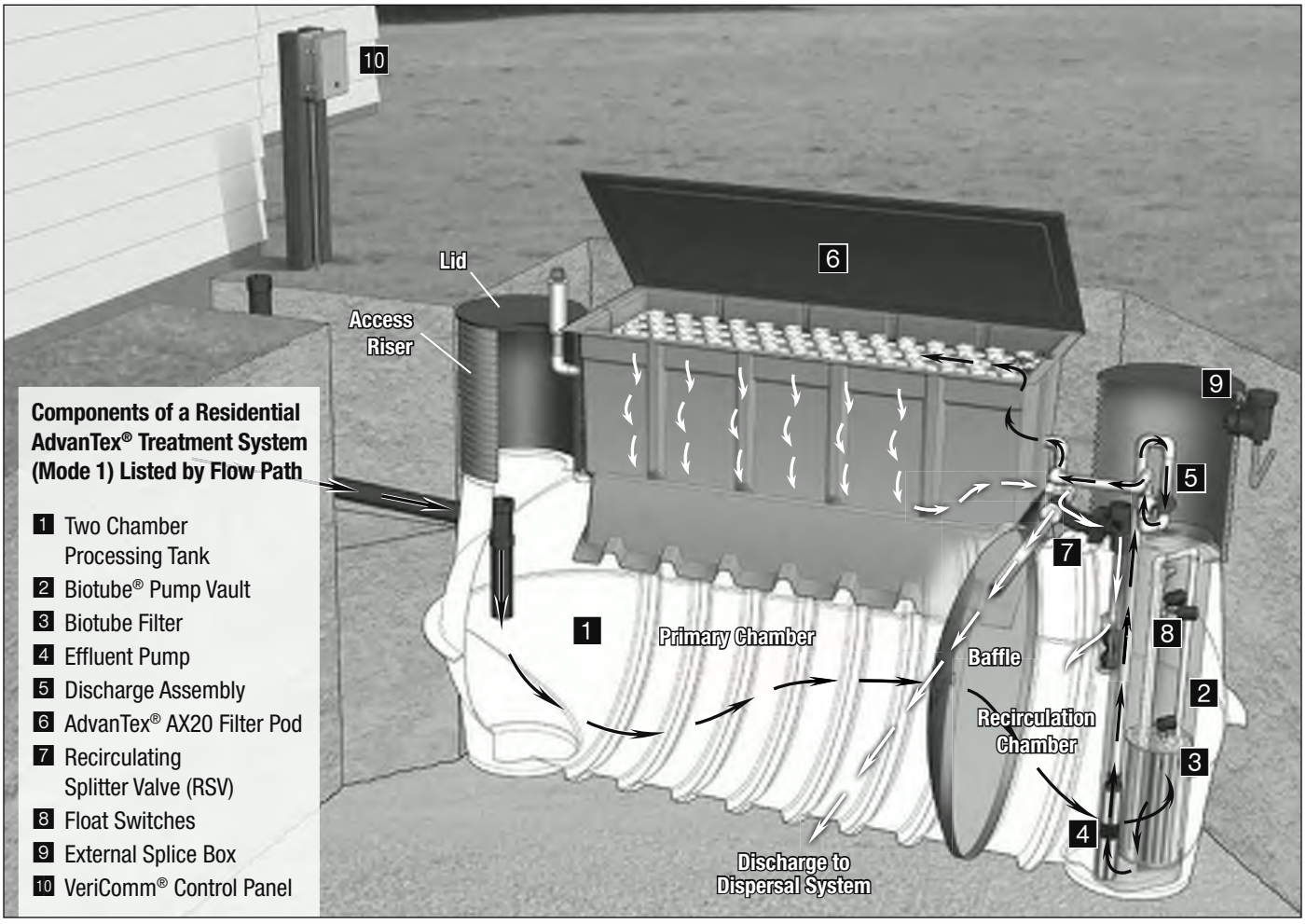
The AdvanTex Treatment System consists of a watertight processing tank and the AX20 textile filter pod. Wastewater from the home flows to the tank, where natural biological and physical processes provide primary treatment. In the primary chamber of the tank, the wastewater separates into three layers: 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
Rev. 5.0, © 1/08

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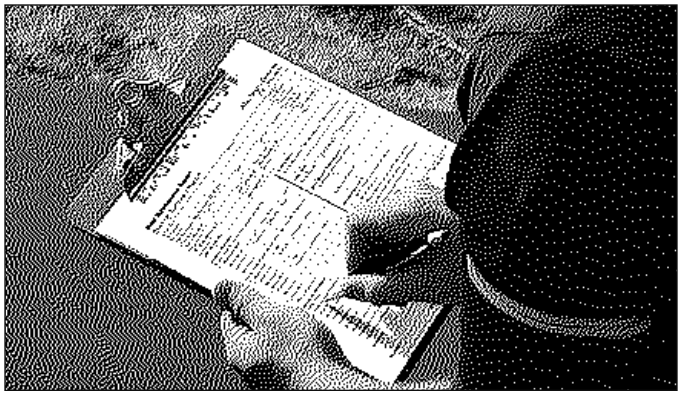
Completing the Start-Up Checklist

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.

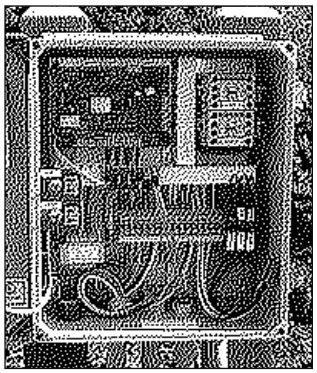
As part of the start-up, you'll also download a computer-generated *Start-Up Summary Report* from advantexservice.com and fax it to the fax number on the bottom of the form. An automated system will add the report to the data file for that system on advantexservice.com. This will confirm that the system 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?

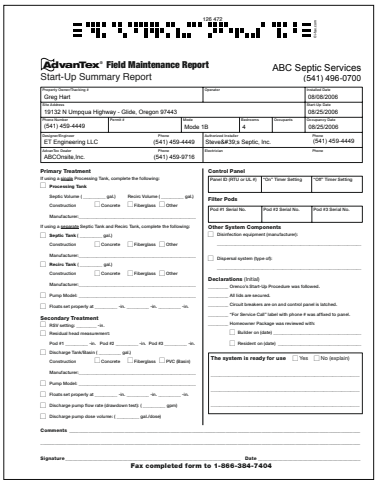


If the installer answers "yes" to these questions, then the system is ready for start-up.

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

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.

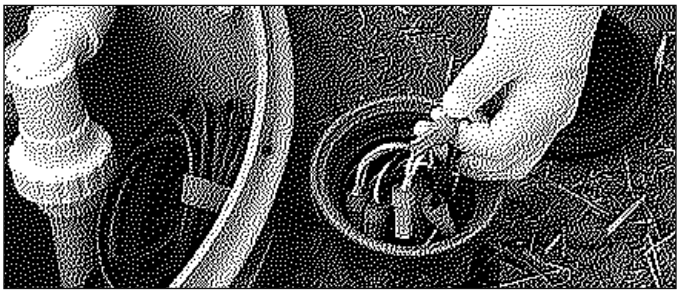
☐ **Floats set properly.**

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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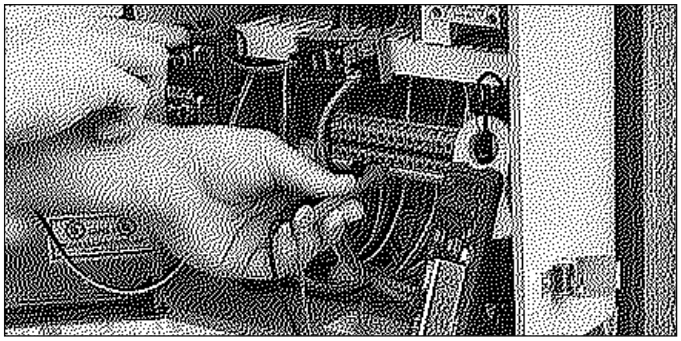
Completing the Start-Up Checklist (continued)

☐ **Pump operates in Manual.**

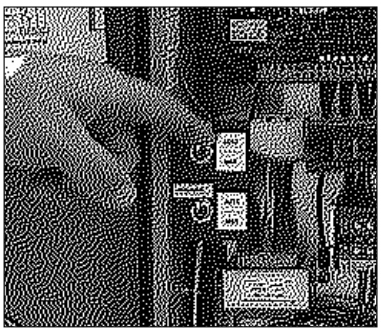
☐ **Pump operates in Automatic.**

☐ **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.

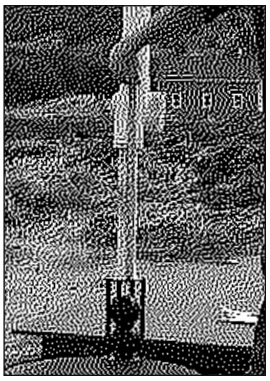


Release the switch back to the AUTO position. Make sure the pump comes on as the timer cycles. Timer cycles are shortened to about 30 seconds in test mode.

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*.

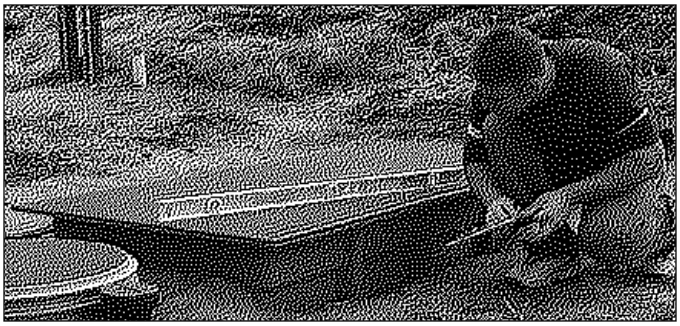


NOTE: *Improper RSV settings are a common installation error, so please check them carefully.*

☐ **All pods installed level.**

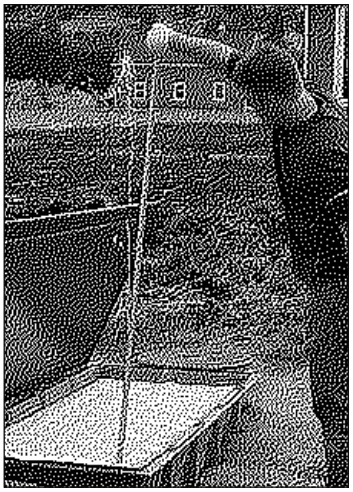
☐ **All piping properly covered and compacted.**

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.

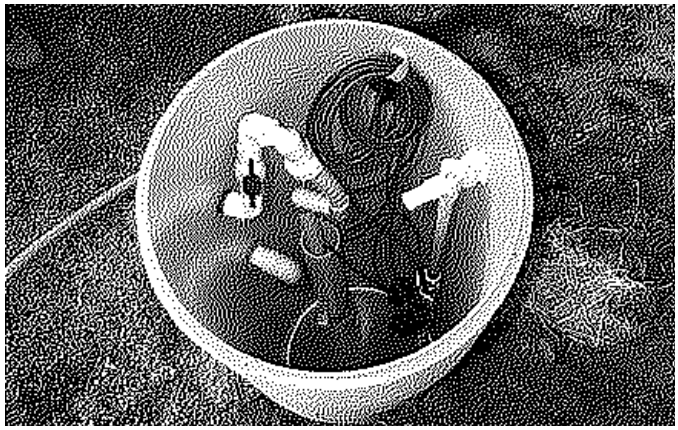
☐ **Pump and discharge plumbing are compatible.**

☐ **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)

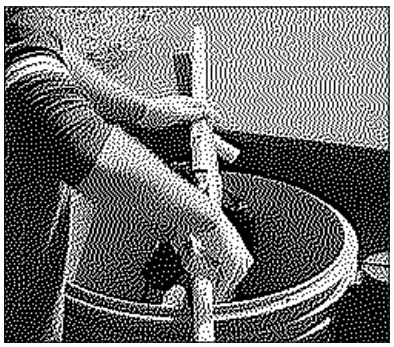


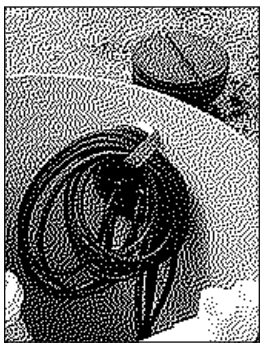
☐ **Discharge floats operate properly.**

☐ **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

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

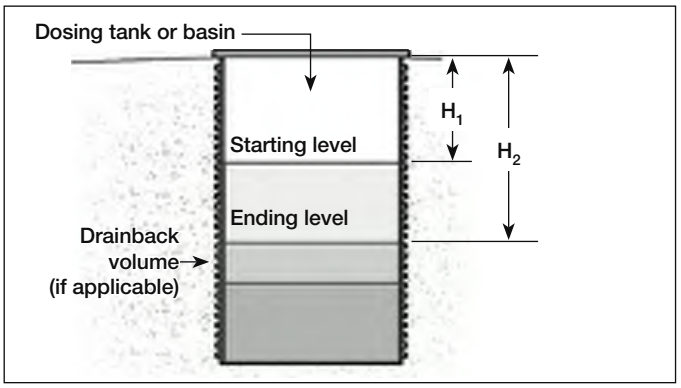
Important: At vericomm.net, enter the gpm value on the "Site Details" page as "Discharge Pump GPM." The VeriComm® panel will use it to automatically calculate and record the system's actual flow rates, which can be used for reports, troubleshooting, and determining timer settings.

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

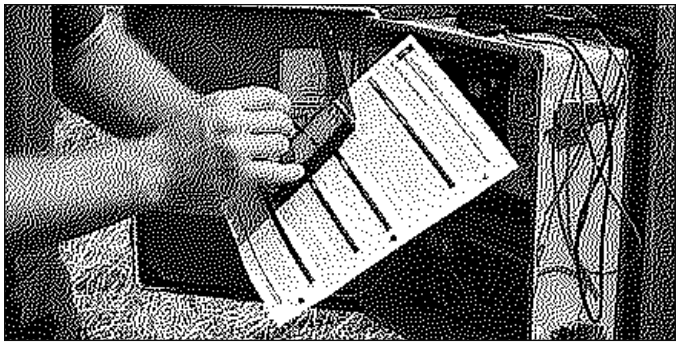


Other System Components

☐ **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*.

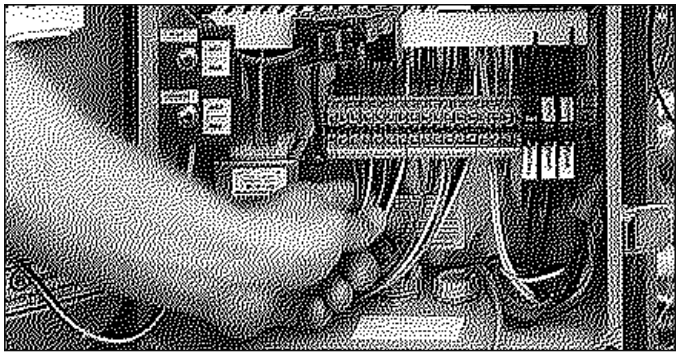


Control Panel

☐ **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.**

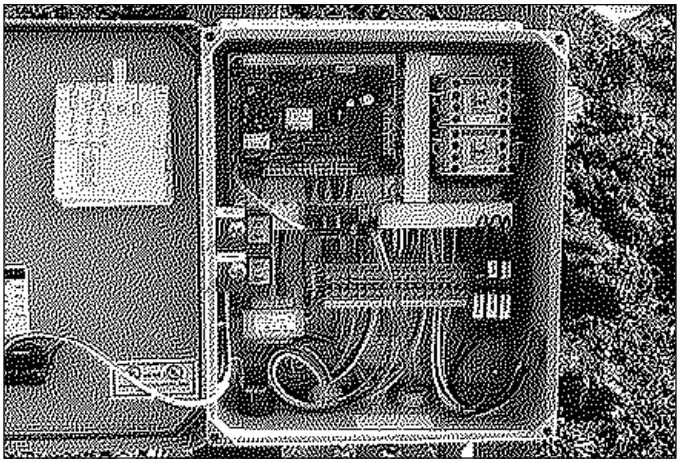
Check the panel to make sure that it is wired according to the diagram clipped inside the panel's door. Gently tug on the wires to make sure they are secured in the terminals.

☐ **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).**

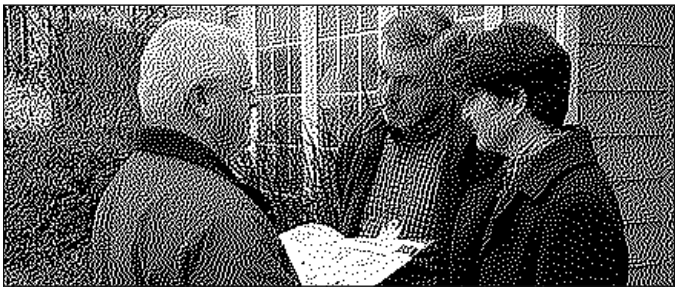
Make sure all circuit breakers are ON. If the panel is in test mode, it will automatically return to normal mode in 30 minutes. To manually return it to normal mode, hold the alarm button on the front of the panel down until the alarm chirps. Close and latch the panel, and lock it if necessary.

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.

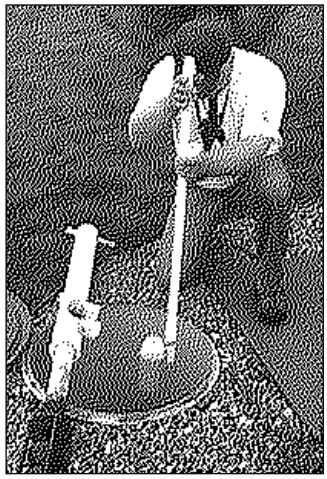
Perform Field Sampling/Observations

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)

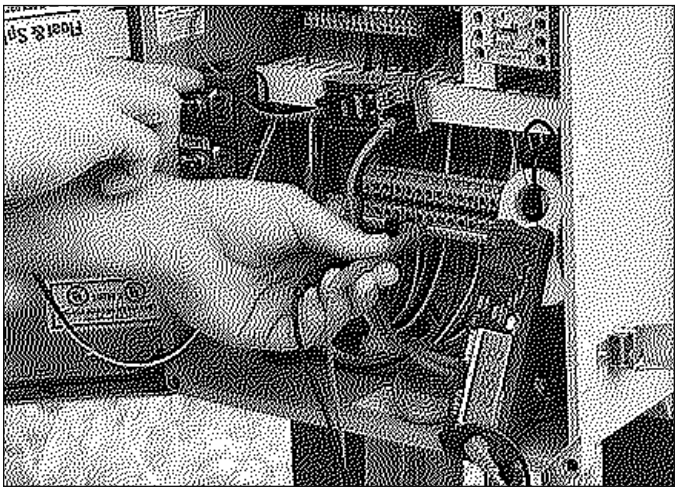
Check Control Panel

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**

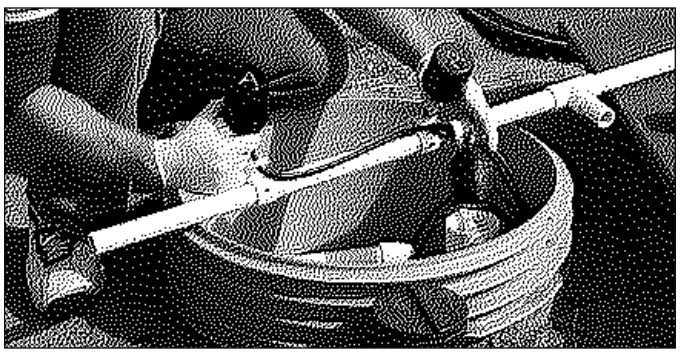
Open the splice box and make sure there is no water in it. If there is, remove the water with a sponge and repair the leak. If you disconnect any connections, do not reuse the wire nuts when you reconnect them — use new ones.



☐ **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.

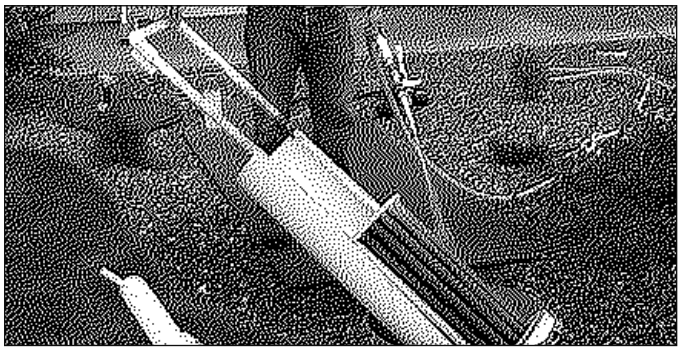
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Performing Scheduled Field Maintenance (continued)

☐ **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.

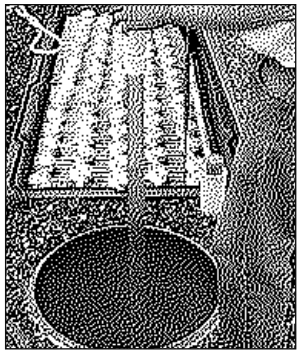


☐ **Recirculating Splitter Valve**

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**

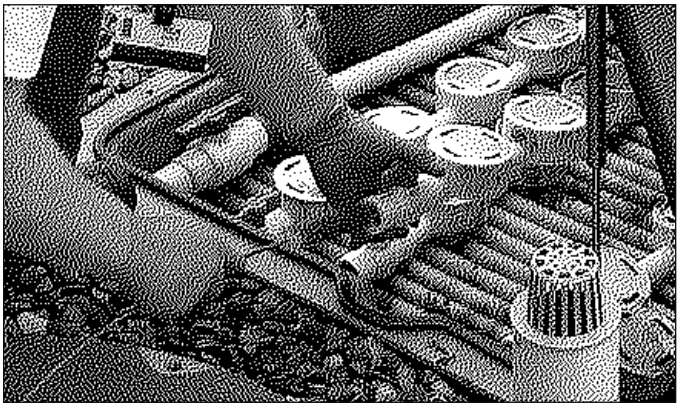
☐ **Bridging/Ponding**

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

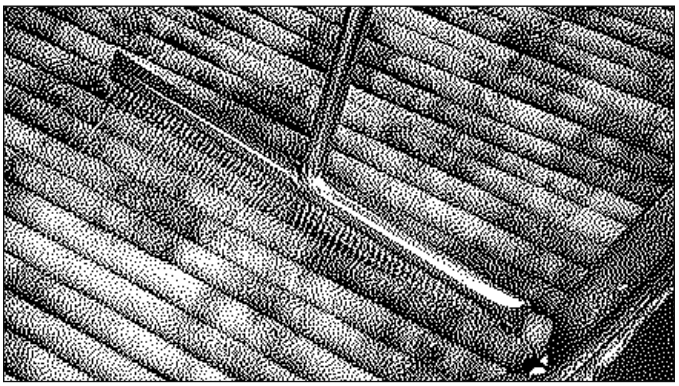
- ☐ Disinfection equipment
- ☐ Dispersal laterals/orifices

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.



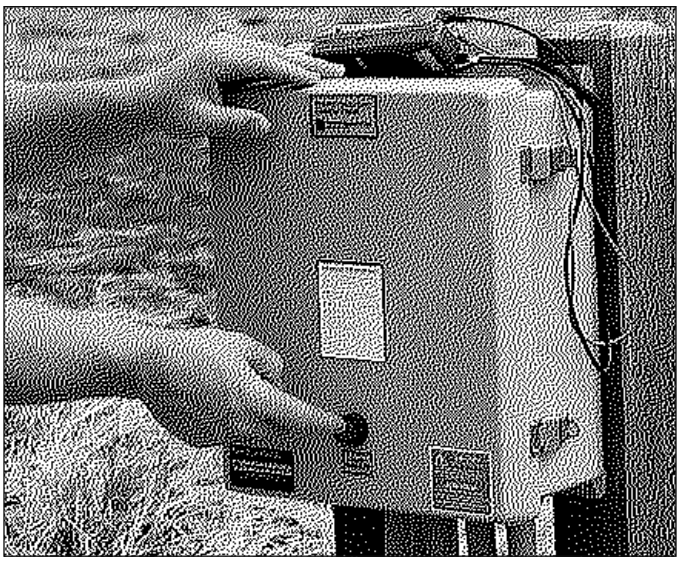
WARNING: *If lid bolts are missing, replace them with spares. If you have no spare lid bolts, fasten the lid with a self-tapping screw, and immediately call your Dealer for replacement bolts. If the lid is unbolted or if the lid or riser are damaged, be sure to securely block access to the tank opening 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.

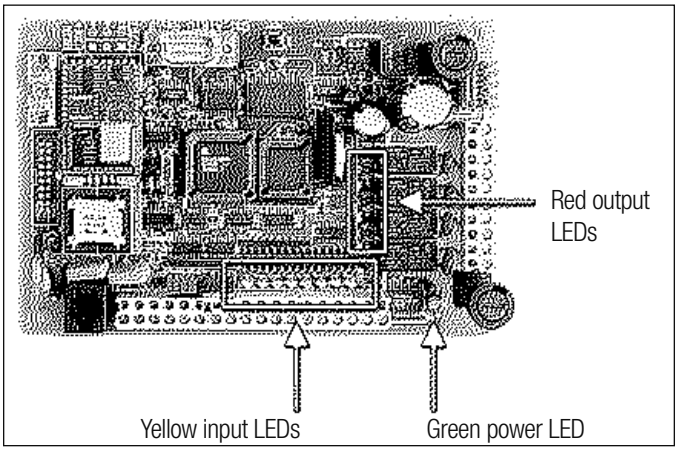
Conditions at Site

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."

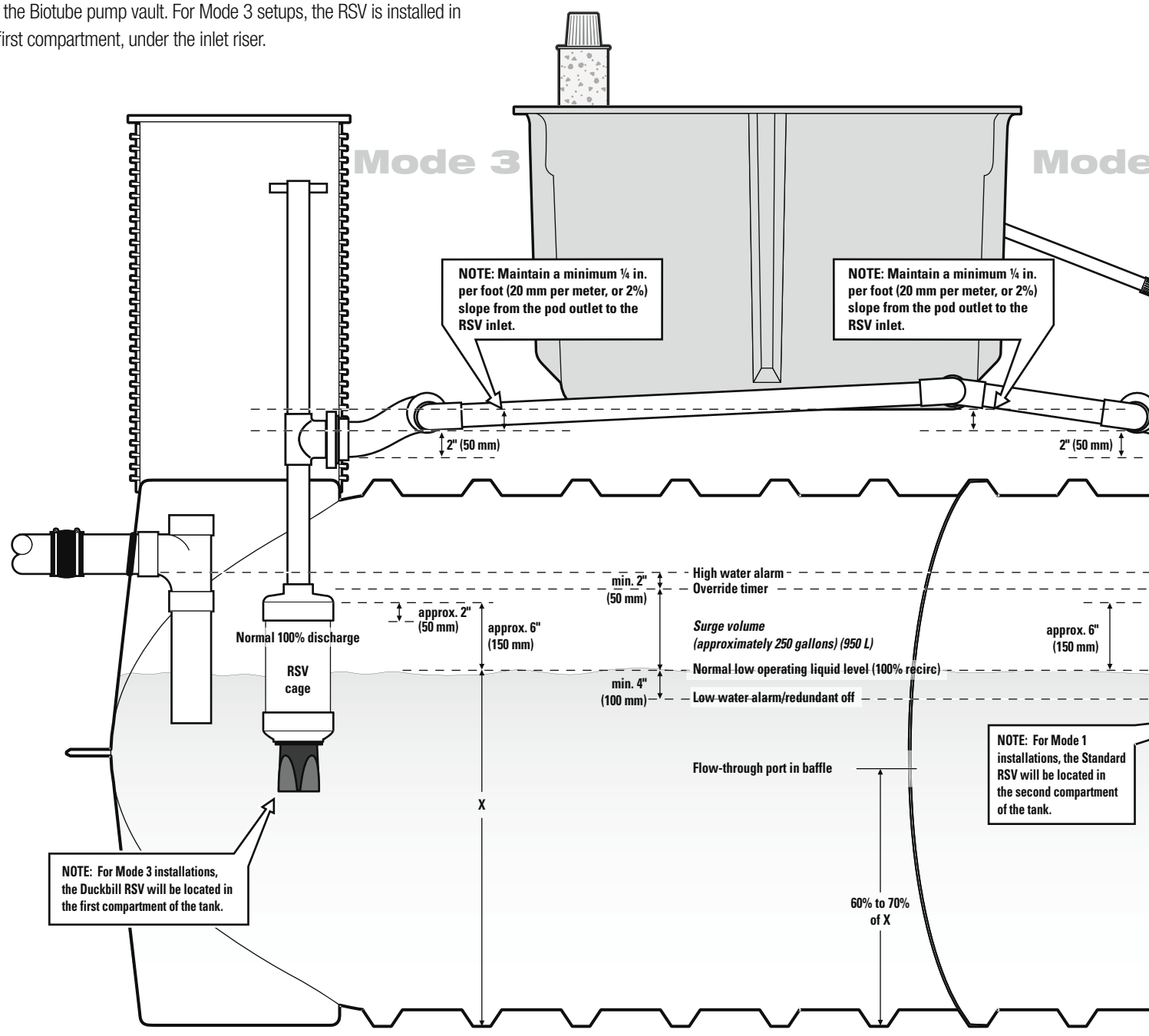
ADDITIONAL PARAMETERS		TYPICAL VALUES	NOTES
CT	Cycle time	20 min	Low flow applications may result in cycle times of an hour or more, which can cause the media to dry out or odors to develop in the recirc tank. If CT is much more than 30 minutes, consult your Dealer or Orenco for suggested adjustments.
	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

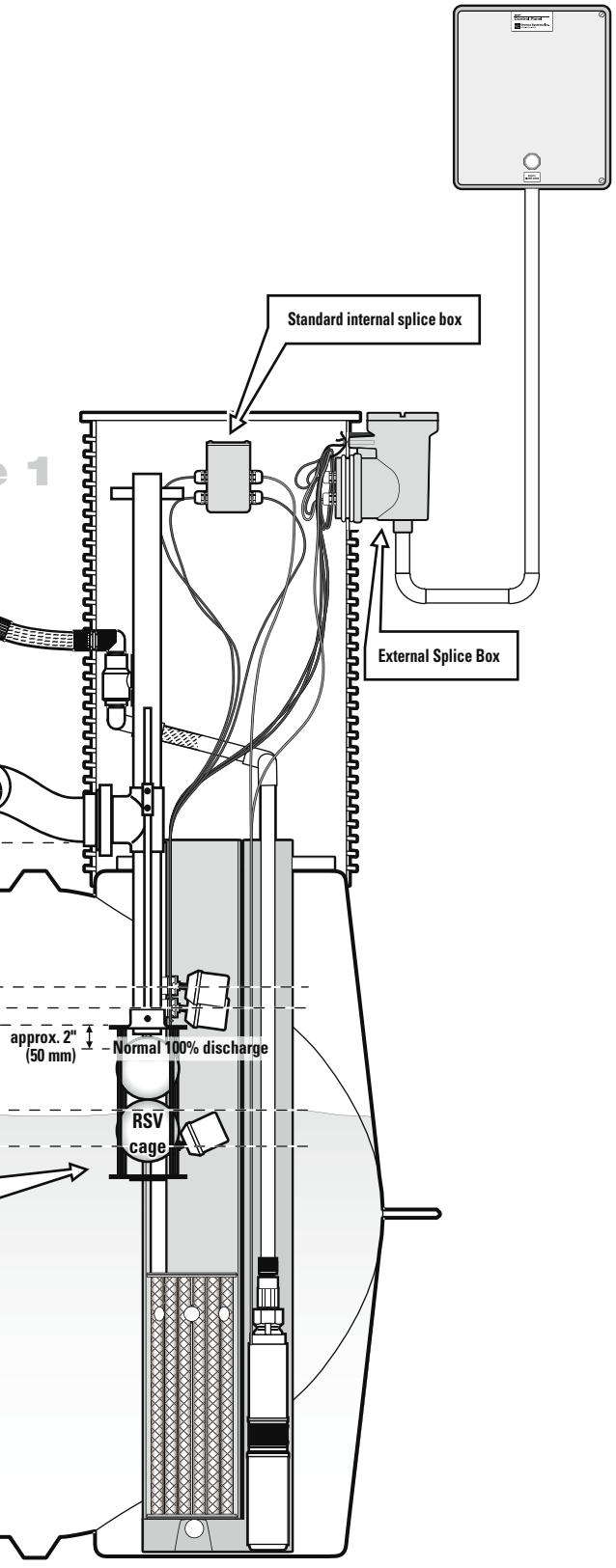
Orenco will provide the float and RSV settings for tanks that are approved for use with AdvanTex Treatment Systems in your area. Service Providers are simply required to verify that the float and RSV settings are correct.

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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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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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.



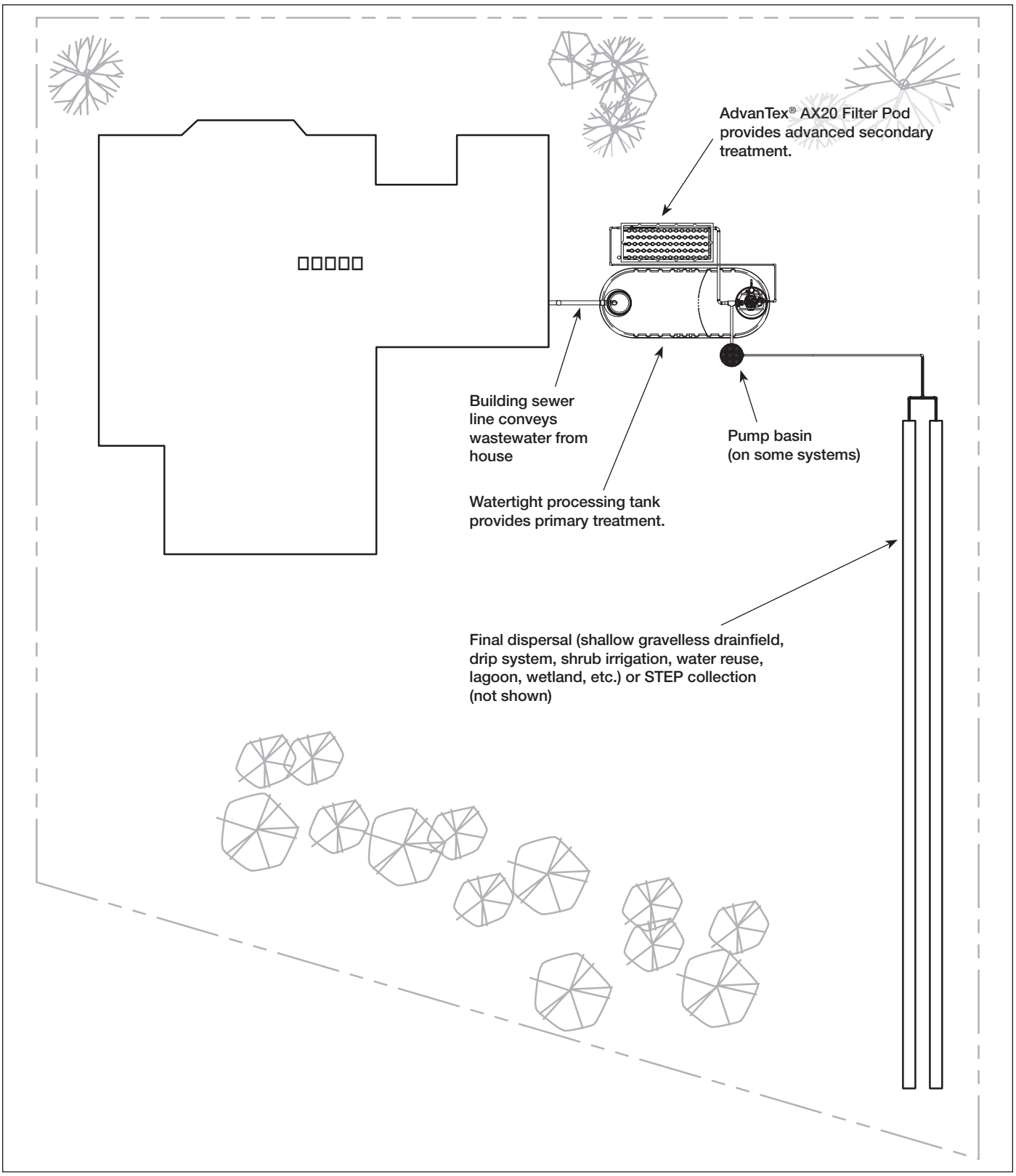
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Typical Site Plan for an AdvanTex® Treatment System



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How the AdvanTex Treatment System Works

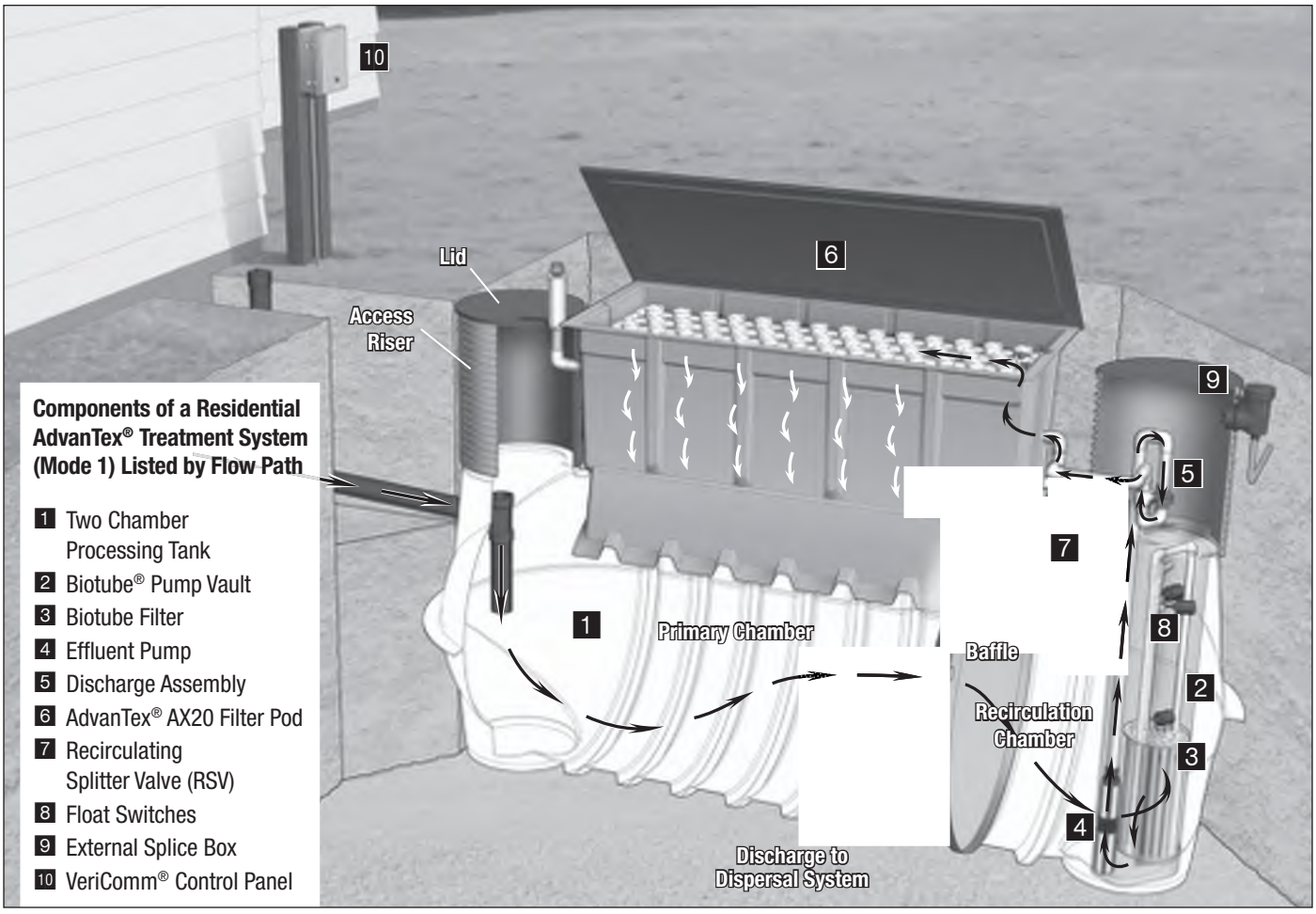
The AdvanTex Treatment System consists of a watertight processing tank and the AX20 textile filter pod. Wastewater from the home flows to the tank, where natural biological and physical processes provide primary treatment. In the primary chamber of the tank, the wastewater separates into three layers: 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 break down the contaminants and eliminate them.

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 designed, installed, and operated, a Residential AdvanTex Treatment System can treat wastewater to 5 mg/L BOD_5 and 5 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 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

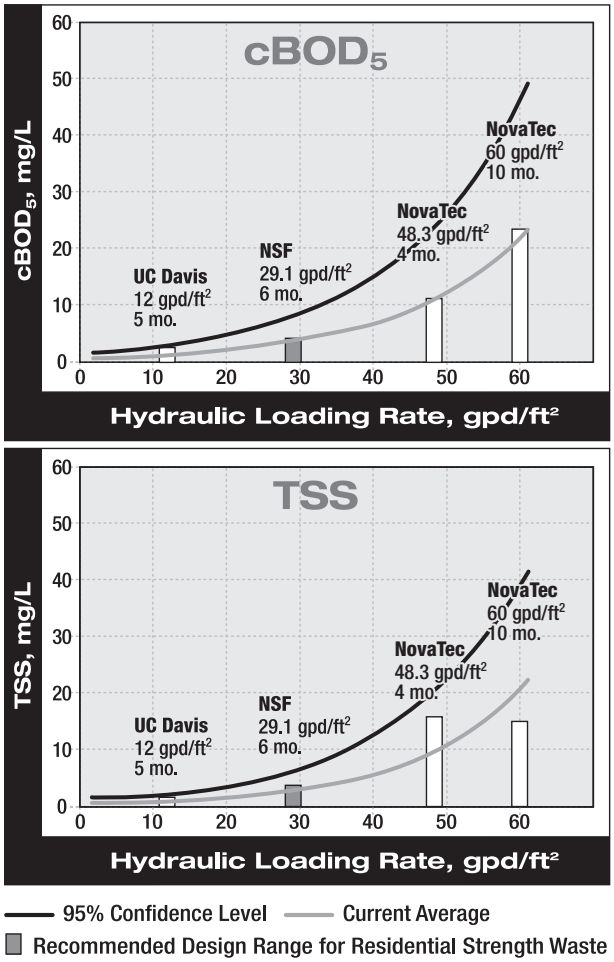
[1] Values are based on testing by Orenco and third parties.

[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.

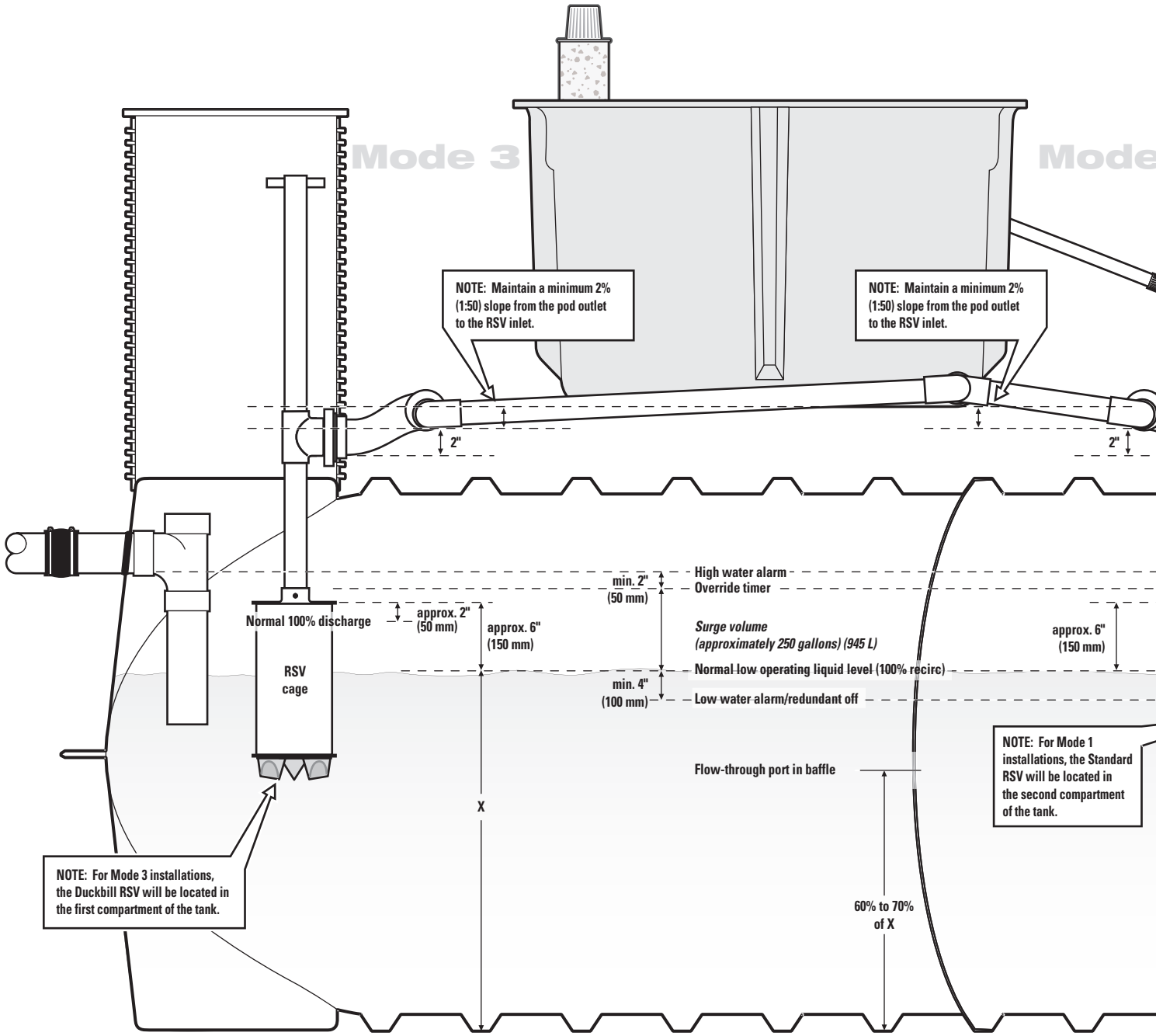
Nevertheless, additional buffering may be necessary to accomplish the level of nitrification desired. In low alkalinity conditions, pH adjustment can be made with the addition of quicklime or hydrated lime, soda ash, or caustic. If the alkali is to be introduced at a process point preceding sedimentation 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

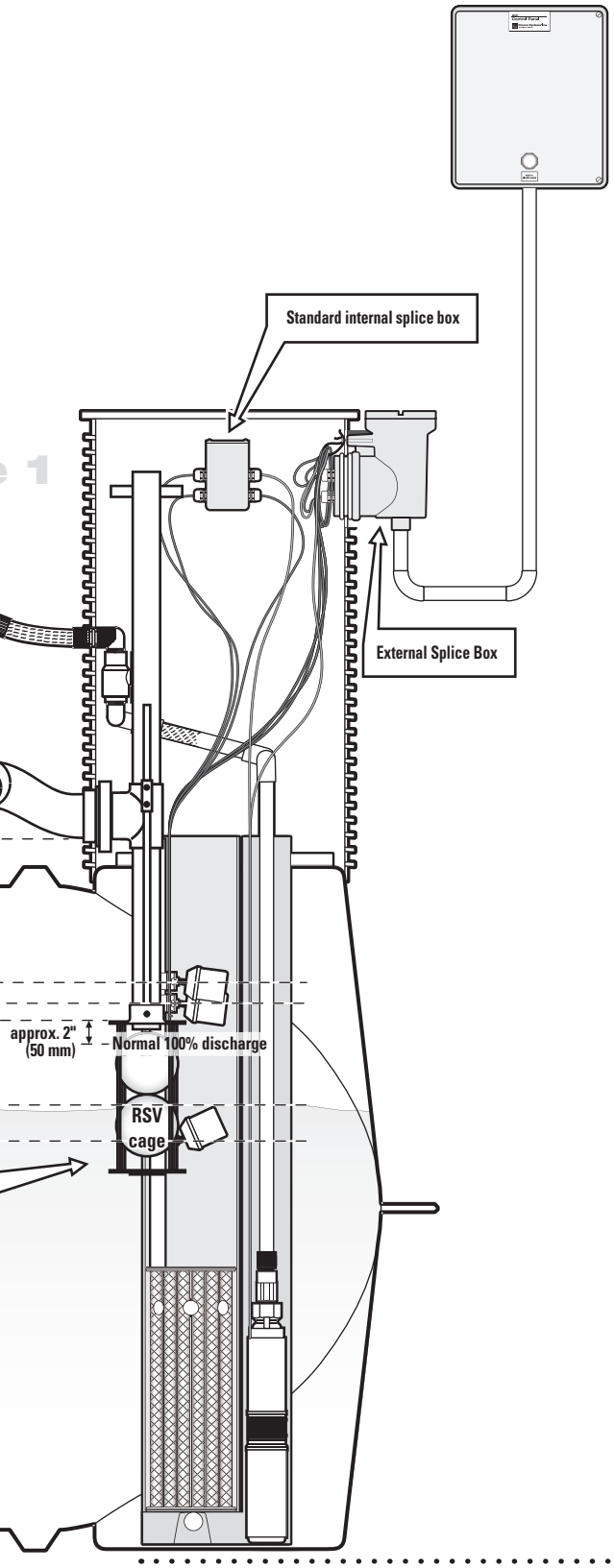
Orenco will provide the float and RSV settings for tanks that are approved for use with AdvanTex Treatment Systems in your area. Service Providers are simply required to verify that the float and RSV settings are correct.

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

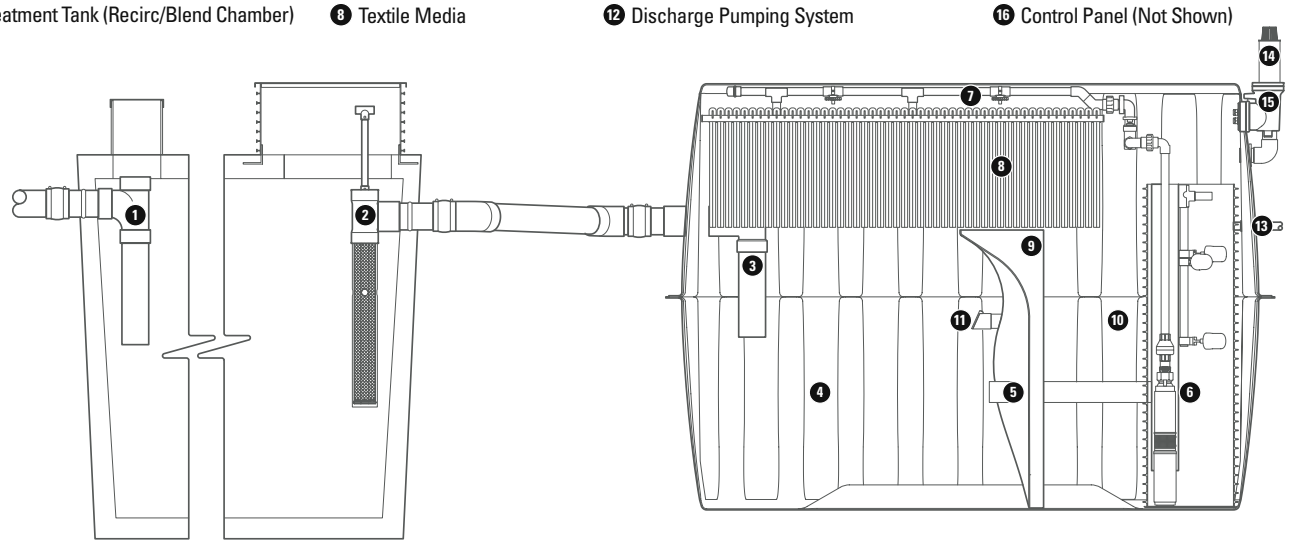
This supplement contains information to help you successfully operate and maintain an AdvanTex® AX-RT Treatment System. The AX-RT operates similarly to the AdvanTex AX20 Treatment System, but there are some differences to be aware of when performing O&M activities. A big difference is that the AX-RT 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.

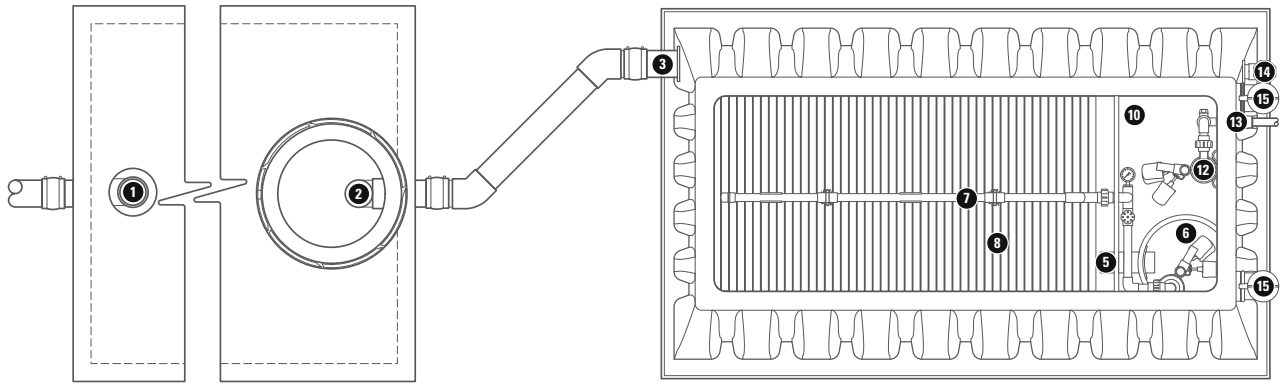
Figure 1. AdvanTex® AX-RT Functional Areas and Components (AX20-RT Shown):

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)

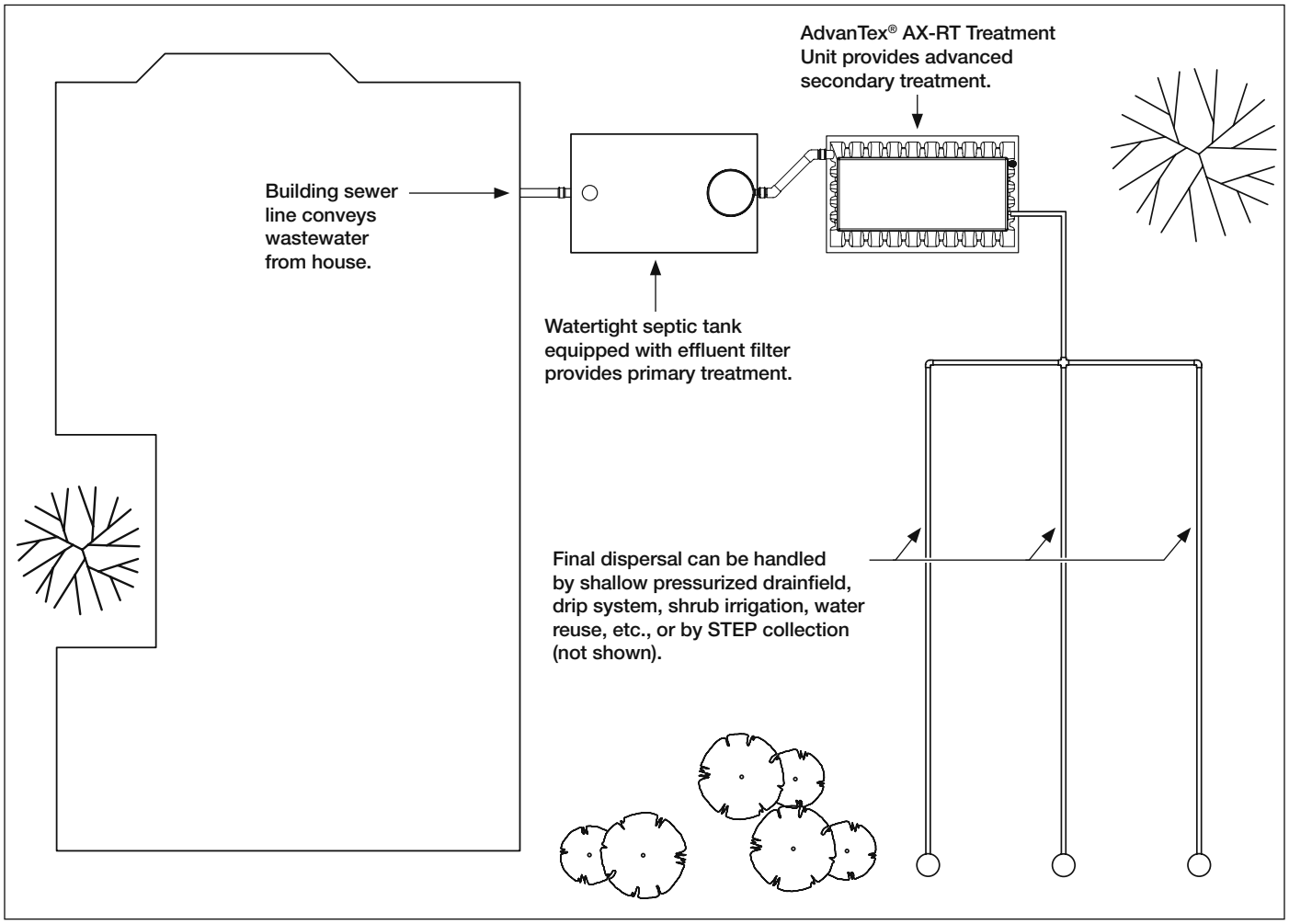
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Introduction to AdvanTex AX-RT, continued

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