Do's and Don'ts for INSIDE the House



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



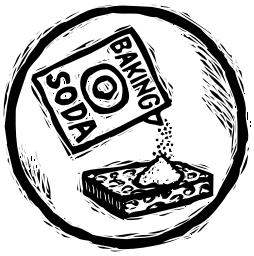
Don't use excessive amounts of water. Using 50 gallons (200 liters) per person per day is typical. If your household does not practice any of the "water conserving tips" below, you may be using too much water.

Do conserve water:

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



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



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

Ammonia-based cleaners:

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

Disinfectants:

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

Drain decloggers:

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

Scouring cleaners & powders:

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

Carpet/upholstery cleaners:

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

Toilet cleaners:

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

Furniture/floor polishes:

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

Metal cleaners:

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

Oven cleaners:

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



Laundry detergents:

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

Do's and Don'ts for OUTSIDE the House



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

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



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

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

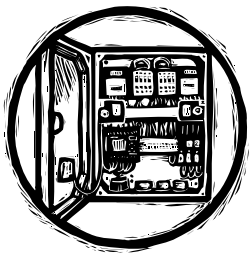


Don't dump RV waste into your wastewater system. It will increase the frequency of required septage pumping. When dumped directly into the pumping vault, RV waste clogs or fouls equipment, causing undue maintenance and repair costs. (Also, some RV waste may contain chemicals that are toxic or that may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



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

At the Control Panel



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

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

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

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

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

IMPORTANT! CAUTION!

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

HOMEOWNER'S MANUAL

Onsite Wastewater Collection & Treatment Systems



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

Orenco Systems®
Incorporated

Changing the Way the World Does Wastewater®

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

IMPORTANT SYSTEM FACTS

Distributor or Dealer:

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

Distributor/Dealer Name

Distributor/Dealer Address

Distributor/Dealer Phone Number(s)

Authorized Service Provider Name

Authorized Service Provider Phone Number(s)

Authorized Installer Name

Authorized Installer Phone Number(s)

Engineer Name (if applicable)

Engineer Phone Number(s)

Regulatory Agency

Regulatory Contact Name

Regulatory Contact Phone Number(s)

Permit # (if applicable)

Property Address

Property Owner Name(s)

Start-Up Date

Control Panel Model # and UL #

AdvanTex® Model # (if applicable)

AdvanTex® Serial # (if applicable)

NSF/ANSI STANDARD 40

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

ABR-OM-1
Rev. 3.4, © 12/11
Orenco Systems®, Inc.

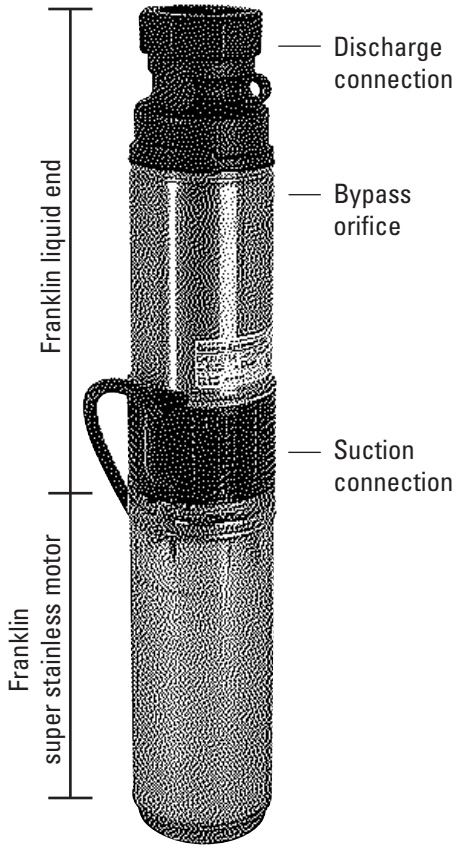
PF Series
High-Head Effluent Pumps

Technical Data Sheet

Applications

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

Orenco's High-Head Effluent Pumps are used in a variety of applications, including pressurized drainfields, packed bed filters, mounds, aerobic units, effluent irrigation, effluent sewers, wetlands, lagoons, and more. These pumps are designed to be used with a Biotube® pump vault.



Features/Specifications

To specify this pump for your installation, require the following:

- Minimum 24-hour run-dry capability with no deterioration in pump life or performance*
- 1/8-inch (3-mm) bypass orifice (patent pending) to ensure flow recirculation for motor cooling and to prevent air bind
- Liquid end repair kits available for better long-term cost of ownership
- TRI-SEAL™ floating impeller design on 10-, 20-, and 30-gpm models; floating stack design on 50-gpm models
- Super stainless Franklin Electric motor, rated for continuous use and frequent cycling
- Type SOOW motor cable (suitable for Class I, Division 1 and Division 2 applications)
- Five-year warranty from date of manufacture against defects in materials or workmanship

* Not applicable to 5-hp models

Standard Models

See specifications chart, pages 2-3, for a complete list.

RECIRCULATION PUMP
PF-300512
DRIP DOSING PUMP
PF100712

Nomenclature

PF □□ □□ □ □-□□

Cord length:
Blank = 10'
20 = 20'
30 = 30'
50 = 50'

Note: Three-phase cords available only in 10-foot or 30-foot lengths.

Voltage (nameplate):
1 = 115 (1/2 hp only)
200 = 200
2 = 230 (220 if 50 Hz)
4 = 460

Frequency:
1 = single-phase 60 Hz
3 = three-phase 60 Hz
5 = single-phase 50 Hz

Horsepower:
05 = 1/2 hp
07 = 3/4 hp
10 = 1 hp
15 = 1-1/2 hp
20 = 2 hp
30 = 3 hp
50 = 5 hp

Nominal flow (gpm):
10
20
30
50

Pump (PF Series)

C SA US LR80980

Orenco Systems® Incorporated

Changing the Way the World Does Wastewater®

800-348-9843
www.orenco.com

NTD-PU-PF-1
Rev. 1.5, 5/08
© Orenco Systems®, Inc.

PF Series High-Head Effluent Pumps (continued)

Specifications

60 Hz

Model	Design gpm (L/sec)	Horsepower (kW)	Phase	Nameplate voltage	Actual voltage	Design flow amps	Max amps	Impellers	Discharge size and material[1]	Length, in. (mm)	Min. liquid level,[2] in. (mm)	Weight,[3] lb (kg)	Rated cycles/day
PF100511	10 (0.6)	0.5 (0.37)	1	115	120	12.7	12.7	6	1 1/4 in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100512	10 (0.6)	0.5 (0.37)	1	230	240	6.3	6.3	6	1 1/4 in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF10053200	10 (0.6)	0.5 (0.37)	3	200	208	3.8	3.8	6	1 1/4 in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100712[4, 5]	10 (0.6)	0.75 (0.56)	1	230	240	8.3	8.3	8	1 1/4 in. GFP	25.9 (658)	17 (432)	30 (14)	300
PF10073200[4, 5]	10 (0.6)	0.75 (0.56)	3	200	208	5.1	5.2	8	1 1/4 in. GFP	25.4 (645)	17 (432)	31 (14)	300
PF101012[4, 5]	10 (0.6)	1 (0.75)	1	230	240	9.6	9.6	9	1 1/4 in. GFP	27.9 (709)	18 (457)	33 (15)	100
PF10103200[4, 5]	10 (0.6)	1 (0.75)	3	200	208	5.5	5.5	9	1 1/4 in. GFP	27.3 (693)	18 (457)	37 (17)	300
PF102012[6, 7, 8]	10 (0.6)	2 (1.49)	1	230	240	12.1	12.1	18	1 1/4 in. SS	39.5 (1003)	22 (559)	48 (22)	100
PF10203200[6, 8]	10 (0.6)	2 (1.49)	3	200	208	8.7	8.7	18	1 1/4 in. SS	37.9 (963)	20 (508)	44 (20)	300
PF200511	20 (1.5)	0.5 (0.37)	1	115	120	12.3	12.5	4	1 1/4 in. GFP	22.3 (566)	18 (457)	25 (11)	300
PF200512	20 (1.5)	0.5 (0.37)	1	230	240	6.4	6.5	4	1 1/4 in. GFP	22.5 (572)	18 (457)	26 (12)	300
PF20053200	20 (1.5)	0.5 (0.37)	3	200	208	3.7	3.8	4	1 1/4 in. GFP	22.3 (566)	18 (457)	26 (12)	300
PF201012[4, 5]	20 (1.5)	1 (0.75)	1	230	240	10.5	10.5	7	1 1/4 in. GFP	28.4 (721)	20 (508)	33 (15)	100
PF20103200[4, 5]	20 (1.5)	1 (0.75)	3	200	208	5.8	5.9	7	1 1/4 in. GFP	27.8 (706)	20 (508)	33 (15)	300
PF201512[4, 5]	20 (1.5)	1.5 (1.11)	1	230	240	12.4	12.6	9	1 1/4 in. GFP	34.0 (864)	24 (610)	41 (19)	100
PF20153200[4, 5]	20 (1.5)	1.5 (1.11)	3	200	208	7.1	7.2	9	1 1/4 in. GFP	30.7 (780)	20 (508)	35 (16)	300
PF300511	30 (1.9)	0.5 (0.37)	1	115	120	11.8	11.8	3	1 1/4 in. GFP	21.3 (541)	20 (508)	28 (13)	300
PF300512	30 (1.9)	0.5 (0.37)	1	230	240	6.2	6.2	3	1 1/4 in. GFP	21.3 (541)	20 (508)	25 (11)	300
PF30053200	30 (1.9)	0.5 (0.37)	3	200	208	3.6	3.6	3	1 1/4 in. GFP	21.3 (541)	20 (508)	25 (11)	300
PF300712	30 (1.9)	0.75 (0.56)	1	230	240	8.5	8.5	5	1 1/4 in. GFP	24.8 (630)	21 (533)	29 (13)	300
PF30073200	30 (1.9)	0.75 (0.56)	3	200	208	4.9	4.9	5	1 1/4 in. GFP	24.6 (625)	21 (533)	30 (14)	300
PF301012[4]	30 (1.9)	1 (0.75)	1	230	240	10.4	10.4	6	1 1/4 in. GFP	27.0 (686)	22 (559)	32 (15)	100
PF30103200[4]	30 (1.9)	1 (0.75)	3	200	208	5.8	5.8	6	1 1/4 in. GFP	26.4 (671)	22 (559)	33 (15)	300
PF301512[4, 5]	30 (1.9)	1.5 (1.11)	1	230	240	12.6	12.6	8	1 1/4 in. GFP	32.8 (833)	24 (610)	40 (18)	100
PF30153200[4, 5]	30 (1.9)	1.5 (1.11)	3	200	208	6.9	6.9	8	1 1/4 in. GFP	29.8 (757)	22 (559)	34 (15)	300
PF302012[4, 5, 7]	30 (1.9)	2 (1.49)	1	230	240	11	11	10	1 1/4 in. SS	35.5 (902)	26 (660)	44 (20)	100
PF30203200[4, 5]	30 (1.9)	2 (1.49)	3	200	208	9.3	9.3	10	1 1/4 in. SS	34.0 (864)	24 (610)	41 (19)	300
PF303012[6, 7, 8]	30 (1.9)	3 (2.23)	1	230	240	16.8	16.8	14	1 1/4 in. SS	44.5 (1130)	33 (838)	54 (24)	100
PF303032[6, 8]	30 (1.9)	3 (2.23)	3	230	240	10	10.1	14	1 1/4 in. SS	44.3 (1125)	27 (686)	52 (24)	300
PF305012[6, 7, 8]	30 (1.9)	5 (3.73)	1	230	240	25.6	25.8	23	1 1/4 in. SS	66.5 (1689)	53 (1346)	82 (37)	100
PF305032[6, 8]	30 (1.9)	5 (3.73)	3	230	240	16.6	16.6	23	1 1/4 in. SS	60.8 (1544)	48 (1219)	66 (30)	300
PF500511	50 (3.2)	0.5 (0.37)	1	115	120	12.1	12.1	2	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500512	50 (3.2)	0.5 (0.37)	1	230	240	6.2	6.2	2	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF50053200	50 (3.2)	0.5 (0.37)	3	200	208	3.7	3.7	2	2 in. SS	20.3 (516)	24 (610)	28 (13)	300
PF500712	50 (3.2)	0.75 (0.56)	1	230	240	8.5	8.5	3	2 in. SS	23.7 (602)	25 (635)	31 (14)	300
PF50073200	50 (3.2)	0.75 (0.56)	3	200	208	4.9	4.9	3	2 in. SS	23.1 (587)	26 (660)	32 (15)	300
PF500734	50 (3.2)	0.75 (0.56)	3	460	480	1.8	1.8	3	2 in. SS	34.8 (884)	25 (635)	31 (14)	300
PF501012	50 (3.2)	1 (0.75)	1	230	240	10.1	10.1	4	2 in. SS	27.0 (686)	26 (660)	35 (16)	100
PF50103200	50 (3.2)	1 (0.75)	3	200	208	5.7	5.7	4	2 in. SS	26.4 (671)	26 (660)	39 (18)	300
PF501512[4]	50 (3.2)	1.5 (1.11)	1	230	240	12.5	12.6	5	2 in. SS	32.5 (826)	30 (762)	41 (19)	100
PF50153200[4]	50 (3.2)	1.5 (1.11)	3	200	208	7	7	5	2 in. SS	29.3 (744)	26 (660)	35 (16)	300
PF503012[4, 5, 7, 8]	50 (3.2)	3 (2.23)	1	230	240	17.7	17.7	8	2 in. SS	43 (1092)	37 (940)	55 (25)	100
PF503032[4, 5, 8]	50 (3.2)	3 (2.23)	3	230	240	10.4	10.4	8	2 In SS	40 (1016)	30 (762)	46 (21)	300
PF50303200[4, 5, 8]	50 (3.2)	3 (2.23)	3	200	208	13.1	13.1	8	2 in. SS	43.4 (1102)	30 (762)	55 (25)	300
PF505032[6, 8]	50 (3.2)	5 (3.73)	3	230	240	16.5	16.5	13	2 in. SS	59.3 (1506)	49 (1245)	64 (29)	300
PF751512	75 (4.7)	1.5 (1.11)	1	230	240	12.1	12.3	4	2 in. SS	33.4 (848)	30 (762)	44 (20)	100

See notes on following page.

© Orenco Systems®, Inc.

PF Series High-Head Effluent Pumps (continued)

50 Hz Model	Design gpm (L/sec)	Horsepower (kW)	Phase	Nameplate voltage	Actual voltage	Design flow amps	Max amps	Impellers	Discharge size and material[1]	Length, in. (mm)	Min. liquid level,[2] in. (mm)	Weight,[3] lb (kg)	Rated cycles/day
PF100552	10 (0.6)	0.5 (0.37)	1	220	230	3.9	4.1	6	1 1/4 in. GFP	23 (584)	17 (432)	26 (12)	300
PF100752	10 (0.6)	0.75 (0.56)	1	220	230	6.2	6.2	9	1 1/4 in. GFP	26.8 (658)	17 (432)	30 (14)	300
PF300552	30 (1.9)	0.5 (0.37)	1	220	230	4.1	4.1	4	1 1/4 in. GFP	22.5 (572)	19 (483)	26 (12)	300
PF300752	30 (1.9)	0.75 (0.56)	1	220	230	6.1	6.1	5	1 1/4 in. GFP	24.8 (630)	19 (483)	29 (13)	300
PF301052	30 (1.9)	1 (0.75)	1	220	230	7.4	7.4	7	1 1/4 in. GFP	28.4 (721)	20 (508)	32 (15)	100
PF301552[4, 5]	30 (1.9)	1.5 (1.11)	1	220	230	9.3	9.3	8	1 1/4 in. GFP	35.4 (899)	24 (610)	40 (18)	100
PF500552	50 (3.2)	0.5 (0.37)	1	220	230	4	4	2	2 in. SS	20.3 (516)	25 (635)	29 (13)	300
PF500752	50 (3.2)	0.75 (0.56)	1	220	230	6.3	6.4	3	2 in. SS	23.7 (602)	25 (635)	31 (14)	300
PF501052	50 (3.2)	1 (0.75)	1	220	230	7.3	7.4	4	2 in. SS	27 (686)	26 (660)	35 (16)	100
PF501552	50 (3.2)	1.5 (1.11)	1	220	230	9.1	9.1	5	2 in. SS	32.5 (826)	30 (762)	42 (19)	100

[1] GFP = glass-filled polypropylene; SS = stainless steel. The 1 1/4-in. NPT GFP discharge is 2 7/8 in. octagonal across flats; the 1 1/4-in. NPT SS discharge is 2 1/8 in. octagonal across flats; and the 2-in. NPT SS discharge is 2 7/8 in. hexagonal across flats. Discharge is female NPT threaded, U.S. nominal size, to accommodate Orenco discharge hose and valve assemblies. Consult your Orenco Distributor about fittings to connect hose and valve assemblies to metric-sized piping.

[2] Minimum liquid level is for single pumps when installed in an Orenco Biotube Pump Vault or Universal Flow Inducer. In other applications, minimum liquid level should be top of pump. Consult Orenco for more information.

[3] Weight includes carton and 10-ft cord.

[4] High-pressure discharge assembly required.

[5] Do not use cam-lock option (Q) on discharge assembly.

[6] Custom discharge assembly required for these pumps. Contact Orenco.

[7] Capacitor pack included with pump. Custom control panel required.

[8] Torque locks are available for all pumps, and are supplied with 3-hp and 5-hp pumps.

Materials of Construction

Discharge:	Glass-filled polypropylene or stainless steel
Discharge bearing:	Engineered thermoplastic (PEEK)
Diffusers:	Glass-filled PPO (Noryl GFN3)
Impellers:	Celcon® acetal copolymer on 10-, 20, and 30-gpm models; 50-gpm impellers are Noryl GFN3
Intake screen:	Polypropylene
Suction connection:	Stainless steel
Drive shaft:	7/16 inch hexagonal stainless steel, 300 series
Coupling:	Sintered stainless steel, 300 series
Shell:	Stainless steel, 300 series
Motor:	Franklin motor exterior constructed of stainless steel. Motor filled with deionized water and propylene glycol for constant lubrication. Hermetically sealed motor housing assures moisture-free windings. All thrust absorbed by Kingsbury-type thrust bearing. Rated for continuous duty. Protected against thermal overload and equipped with surge arrestors for added security.

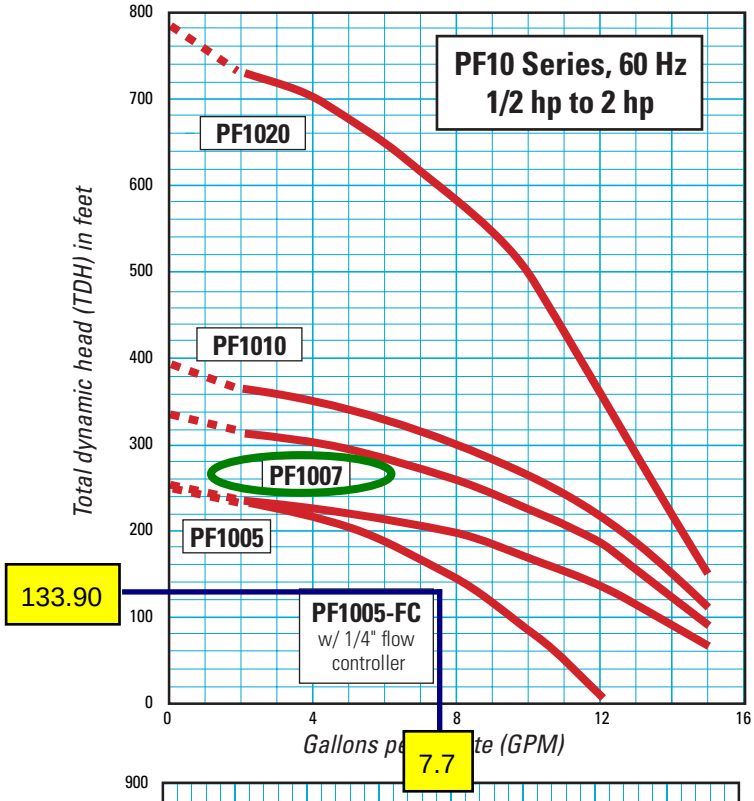
© Orenco Systems®, Inc.

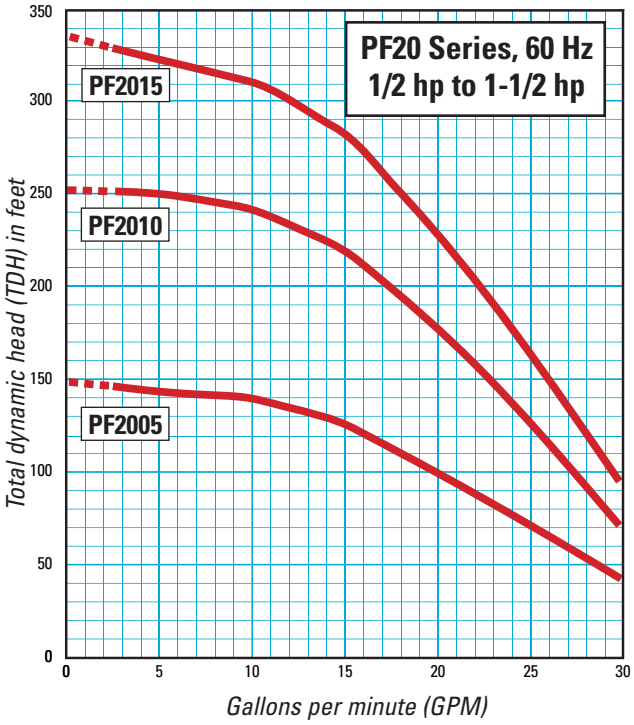
PF Series High-Head Effluent Pumps (continued)

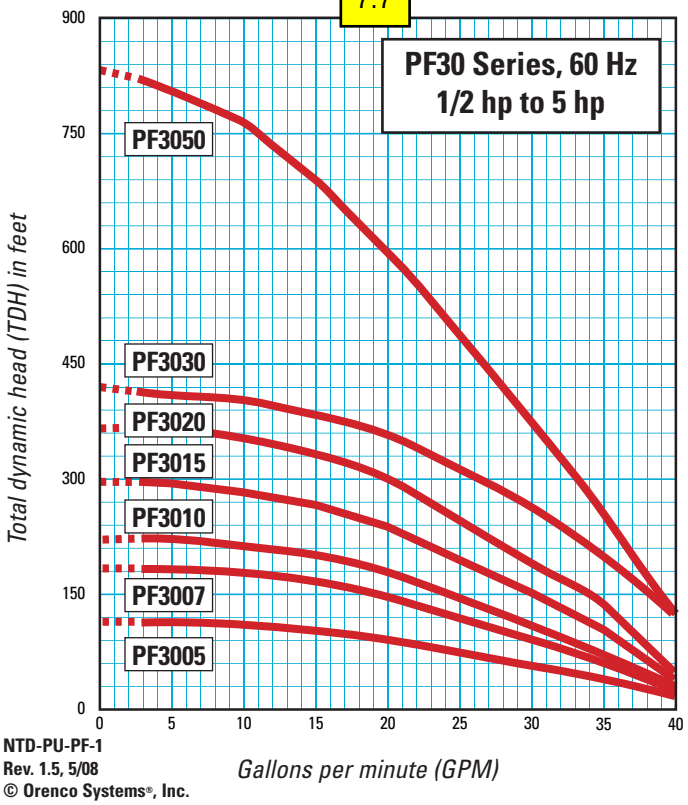
Using a Pump Curve

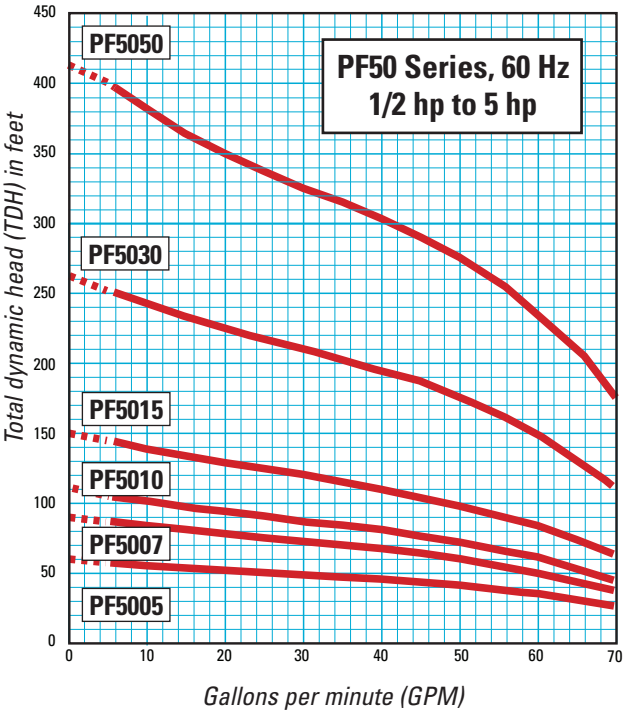
A *pump curve* helps you determine the best pump for your system. Pump curves show the relationship between flow (gpm or L/sec) and pressure (total dynamic head, or TDH), providing a graphical representation of a pump's optimal performance range. Pumps perform best at their *nominal flow rate*—the value, measured in gpm (or L/sec), expressed by the first two numerals in an Orenco pump nomenclature. At low flow rates, TDH varies from pump to pump, so it is represented as a dashed line in the pump curves. For most accurate pump specification, use Orenco's PumpSelect™ software.

60 Hz Models





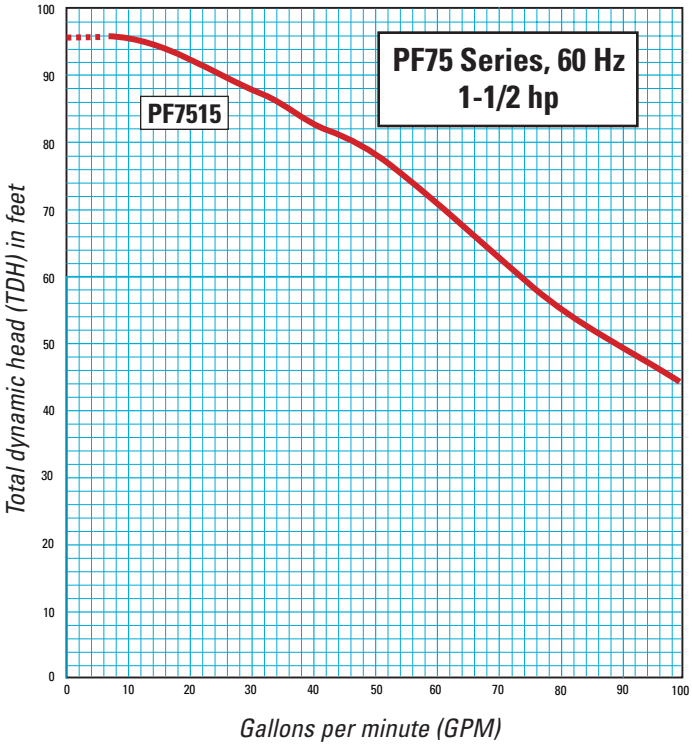




© Orenco Systems®, Inc.

PF Series High-Head Effluent Pumps (continued)

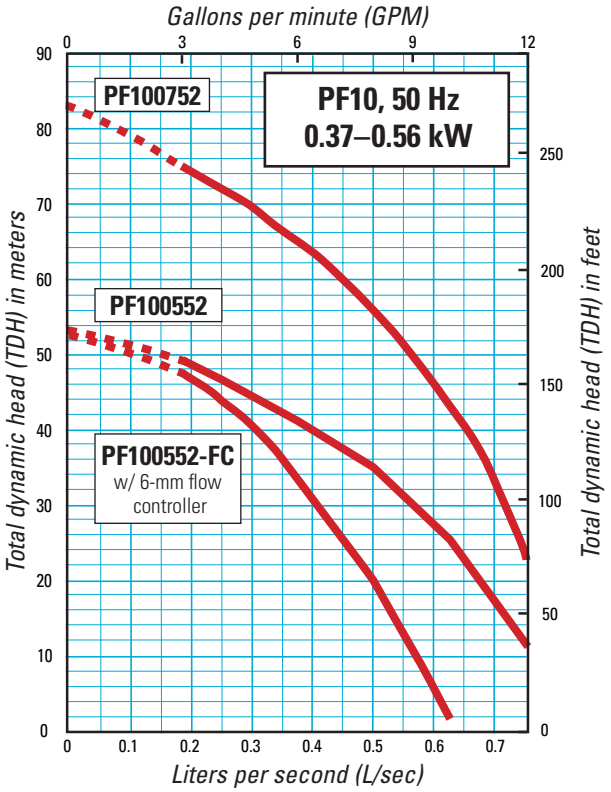
60 Hz Models (continued)

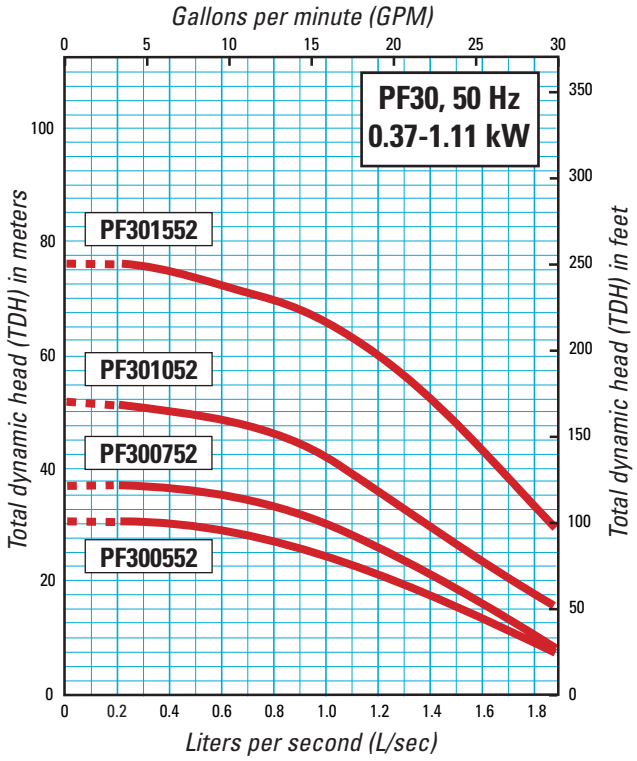


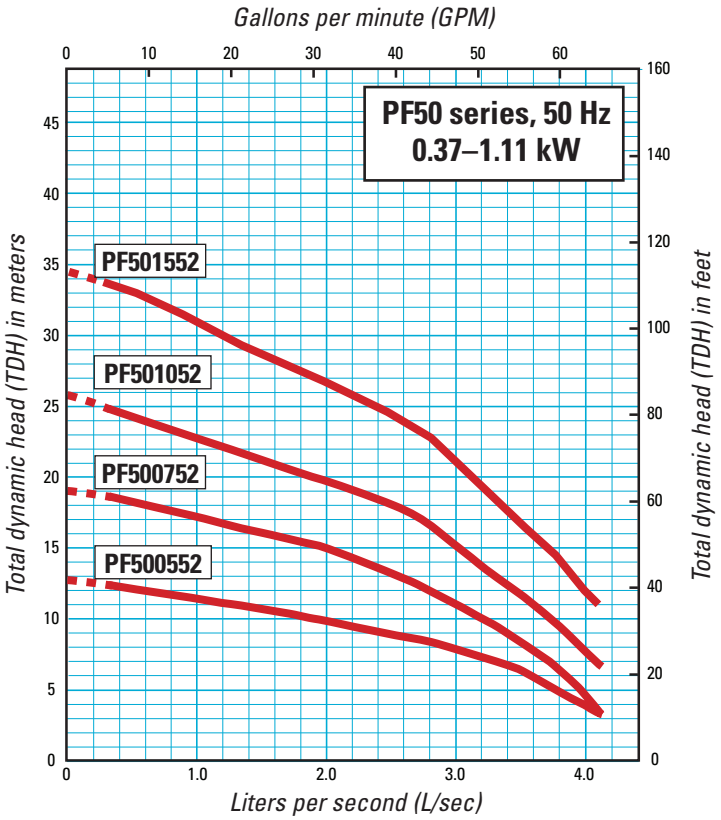
© Orenco Systems®, Inc.

PF Series High-Head Effluent Pumps (continued)

50 Hz Models







© Orenco Systems®, Inc.

Technical Data Sheet

External Splice Box

Orenco Systems® Incorporated
800-348-9843

Applications

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

General

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

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

Standard Models

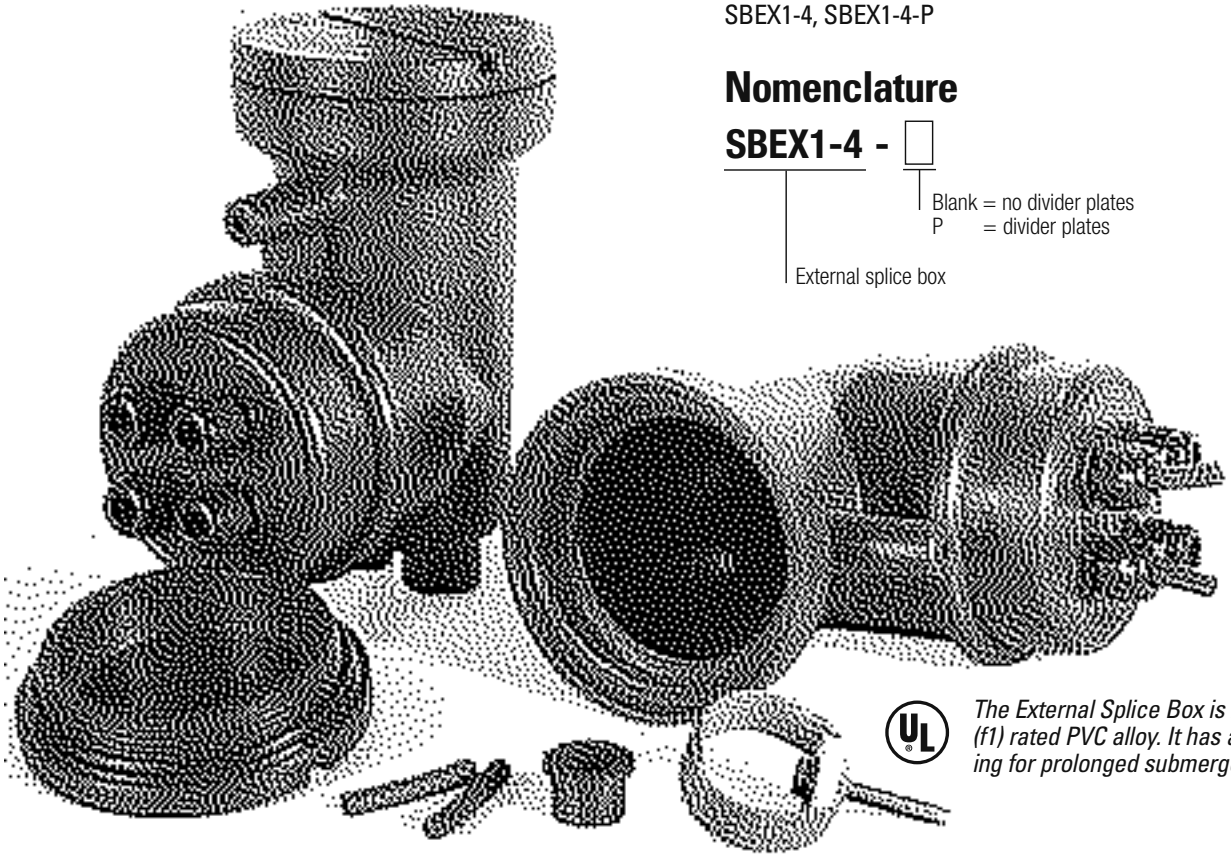
SBEX1-4, SBEX1-4-P

Nomenclature

SBEX1-4 - ☐

Blank = no divider plates
P = divider plates

External splice box



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

© 2012 Orenco Systems® Inc.

1 REQUIRED

External Splice Box (continued)

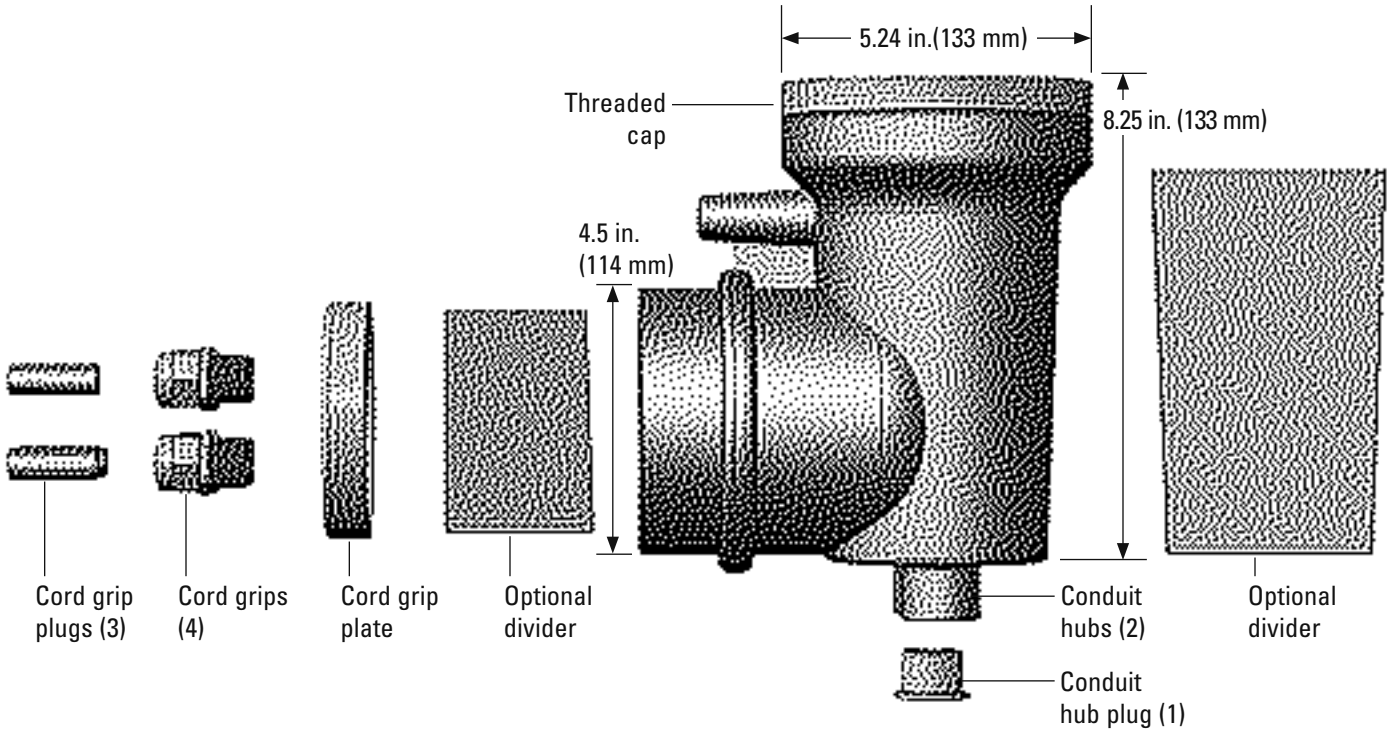
Physical Specifications

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

Materials of Construction

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

** Grommet not shown in illustration below*



© 2012 Orenco Systems® Inc.

Installation Manual

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

Orenco Systems®
Incorporated

814 AIRWAY AVENUE
SUTHERLIN, OREGON
97479-9012

TELEPHONE:
(541) 459-4449

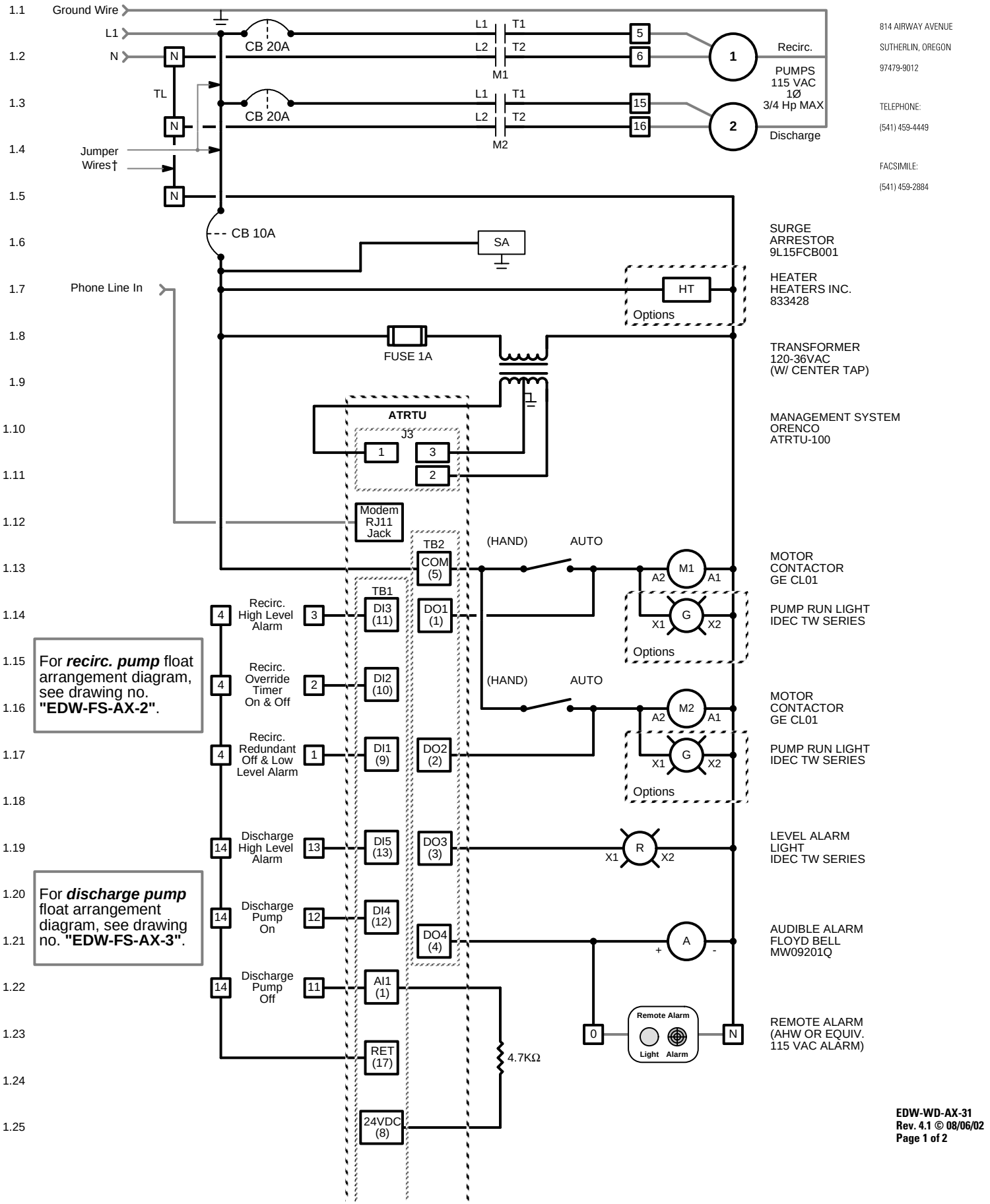
FACSIMILE:
(541) 459-2884

This Manual Contains:

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

EIN-CP-AX-125
Rev 2.0 © 04/28/05

Control Panel Wiring Diagram
AdvanTex™ Treatment Systems
Model VCOM-AXB1 SA, VCOM-AX20B1 SA

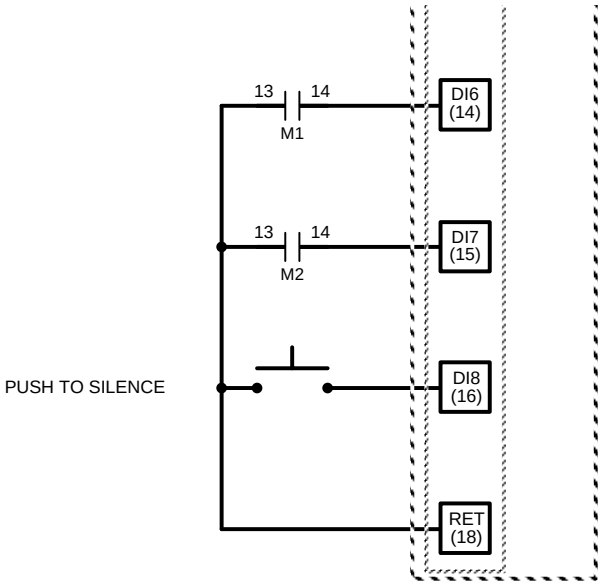


Orenco Systems®
Incorporated

814 AIRWAY AVENUE
SUTHERLIN, OREGON
97479-9012

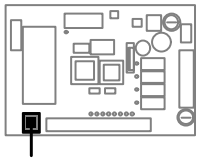
TELEPHONE:
(541) 459-4449

FACSIMILE:
(541) 459-2884



For VCOM-AXB operation description, see drawing no. **"EIN-CP-OP-611"**.

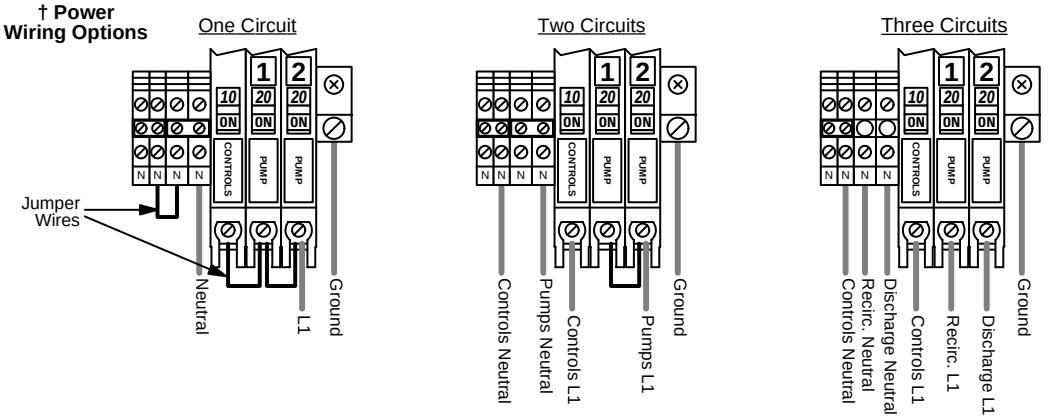
Telephone Line Connection



Orenco Model ATRTU-100

Connect phone line directly to RJ-11 jack on PC board.

† Power Wiring Options



Instructions:

Factory default. Wire as shown.

Remove the jumper wire between the pump 1 and controls circuit breakers and the jumper wire between the neutral blocks.

Remove all jumper wires. Remove the terminal link from the pump neutral blocks.

VCOM Panel Installation

Orenco Systems®
Incorporated
1-800-348-9843

This document contains general installation instructions for VeriComm® control panels. Consult all supplemental documents (Control Panel Wiring Diagram, Float Arrangement Diagram, etc.) before installation. Follow the outlined sequence below.

1 Getting Started

Read all instructions before proceeding with the installation. Improper installation may void warranties.

1. Inspect your order for completeness and inspect each component for shipment damages. If something is missing or damaged, contact your supplier to obtain replacement parts.

2. Check to ensure the instructions and items supplied conform to state and local regulations.

3. A qualified electrician must be employed to install and service the panel and ancillary wiring. The equipment must be installed in compliance with the National Electric Code, as well as state and local codes.



The VCOM panels are part of the VeriComm product line, and work in conjunction with the VeriComm® Monitoring System.

2 Control Panel Placement

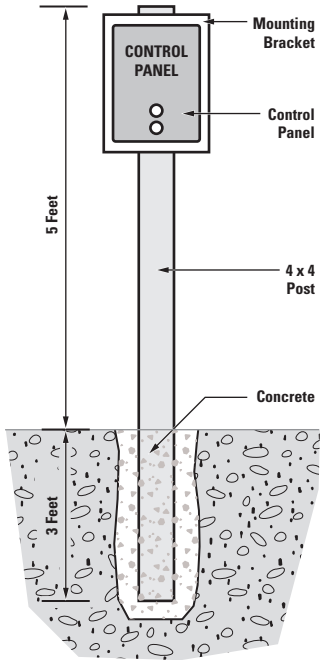
1. Physical installation of the control panel should be within view of the septic tank and located at a convenient height (about five feet above grade).

2. The panel should be securely fastened to a 4 x 4 post that has been concreted into the ground. Alternatively, the panel can be fastened to an exterior wall, subject to the restrictions below:

    - If the panel contains motor contactors, a thumping sound can be heard each time the pump is started or stopped. Therefore, *these panels should not be mounted on an exterior wall* unless it is in a location away from living areas, such as on a garage wall.

3. If possible, position the panel in the shade to protect it from weather. Extreme temperatures can cause inconsistent performance of the electrical components.

4. Check state and local electrical codes for proper placement of panels. Ensure that access to the panel is not obstructed.



© Orenco Systems®, Inc.

3 Float and Pump Installation

1. Install the electrical splice boxes for the floats and pumps before installing the actual floats and pumping equipment. The splice boxes are installed near the top of the riser, using the grommets provided.

2. Install the floats. Thread the float and pump cords through the cord grips into the PVC splice box, leaving adequate length of electrical cord coiled inside the riser to allow easy removal of the pump and float assembly.

3. Tighten the cord grips, using hand pressure or a wrench if necessary, until the cord will no longer move in the cord grip. If the cord grips are not tight enough, the seal will not be watertight, but over-tightening may damage the cord or the cord grip, so use only as much force as necessary.

4. Run the wires from the control panel to the splice box. The wires can be brought through a conduit, or can be buried using suitable direct-burial wire. Conduit that enters the splice box must be sealed, even if the wires are direct-buried, to prevent the infiltration of water into the splice box. Use an electrically approved sealant to plug the wires coming in through the conduit hub. The number of wires required depends on the control panel and the number of floats and pump(s) used.

   Consult the appropriate float arrangement diagram for the control panel and float arrangement being used.

   Wire should be sized at 14 AWG for the floats. Refer to the figure below to determine the proper size for the pump wires. When calculating wire size, the length and size of your branch circuit wires from the service entrance panel to the pump control panel must also be taken into account.

Recommended Breaker & Wire Size

Pump Motor Size	Breaker Size	Wire Size	Max Distance*
120 VAC 1/2 hp	20 amp	10 AWG	105 ft
240 VAC 1/2 hp	15 amp	14 AWG	161 ft
3/4 hp	20 amp	14 AWG	130 ft
1 hp	20 amp	12 AWG	172 ft
1-1/2 hp	20 amp	12 AWG	126 ft

* *This is the maximum distance from this sub-panel to the pump motor for the recommended wire size. Distance is based on 3% maximum voltage drop from sub-panel to load at maximum recognized pump motor amps at 75° C.*

5. All splices made in the splice box should use waterproof wire nuts or butt connectors and heat shrink tubing. Refer to Drawing EIN-SB-SB-1 for instructions on making waterproof splices. Refer to the appropriate float arrangement diagram for instructions on how to connect the floats together.

Note

- Do not remove the colored markers or the paper tags from the float cords. These should be left on the float cord, outside the splice box.
- Do not thread the markers and tags through the cord grips.
- Adequate length of cord should be left within the splice box to allow for easy removal for future disconnecting and re-splicing.
- A cord is secure and the connection watertight when the cord grip is tight enough to prevent slippage.
- Wire that is improperly sized (too small) can cause excessive voltage drop and poor pump performance.
- Splices that are not waterproof may cause a malfunction of the pump controls if water should leak into the splice box.

© Orenco Systems®, Inc.

4 Control Panel Connections

1. Connect the wires coming from the floats to the terminals in the control panel. Refer to the appropriate float arrangement diagram for the correct terminal connections for your system.

2. Connect the wires coming from the pumps to the pump terminals. Refer to the panel wiring diagram for the correct terminal connections for your system.

3. Connect the incoming power to the panel. Power to the panel must be appropriate to the control panel and pump motor (120 VAC, single-phase for a 120 VAC motor, 240 VAC single-phase for a 240 VAC motor, etc.).

4. Ensure that the panel is properly grounded and that the fuse or breaker and wire size, from the main power panel and to the pump, are correctly sized. A separate circuit for the pump controls and each of the pump motors is recommended.

   NOTE: *Voltage for the controls in the panel is always 120 VAC, although the pump voltage may be 120 VAC or 240 VAC.*

5. Use 60° minimum CU conductors only. Torque the terminal blocks to 15 LB-IN and the ground lugs to 45 LB-IN. Torque the circuit breakers to 20 LB-IN for 14-10 AWG wire, 25 LB-IN for 8 AWG wire, and 27 LB-IN for 6-4 AWG wire.

WARNING ▲

Do not service the pump or any electrical wiring in the pump vault without disconnecting the power at the circuit breaker and/or fuse.

Serious injury and/or damage to the system could result if the panel is not properly grounded. Ensure that the fuse, breaker, and wire size—from the main power panel and to the pump—are sized correctly.

The pump vault is a hazardous area and may contain explosive gases. Take appropriate precautions according to local, state, and federal regulations before commencing work in the pump vault.

It is the responsibility of the installer to comply with all local, state, and federal regulations that may govern the installation of systems of this nature. Failure to comply with such regulations may void the manufacturer's warranty and could possibly cause bodily injury.

5 Telephone Line Installation

The VeriComm control panels utilize a common phone line with the homeowner. These panels do not require a dedicated phone line.

1. Install a standard analog line from the homeowner's phone splice box to the VeriComm control panel.
   Recommended Part:
   Outdoor 4-conductor phone cable
   Radio Shack Cat. #: 278-386

2. If an RJ-11 crimping tool is available, crimp an RJ-11 plug directly to the phone wire and move to step 3. Otherwise, terminate the installed phone cable into a modular quick jack inside the panel.
   Recommended Parts:
   Modular quick jack
   Radio Shack Cat. #: 279-355
   2-ft. UL-listed line cord
   Radio Shack Cat. #: 279-334



3. Connect the phone line to the modular jack on the surge arrestor/DSL filter in the panel.

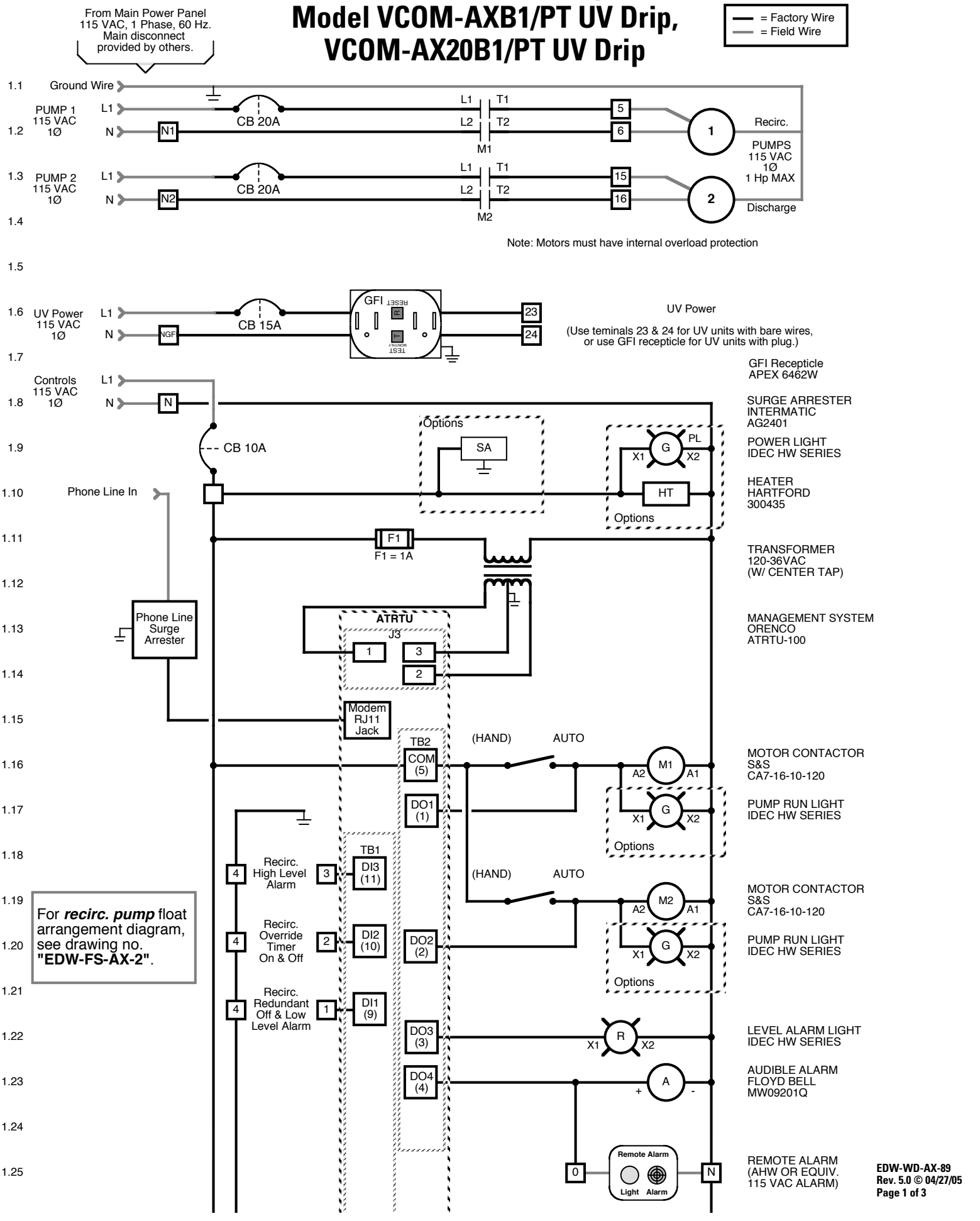
Note ◆

- Phone wires should not be run in the same conduit as power wires.

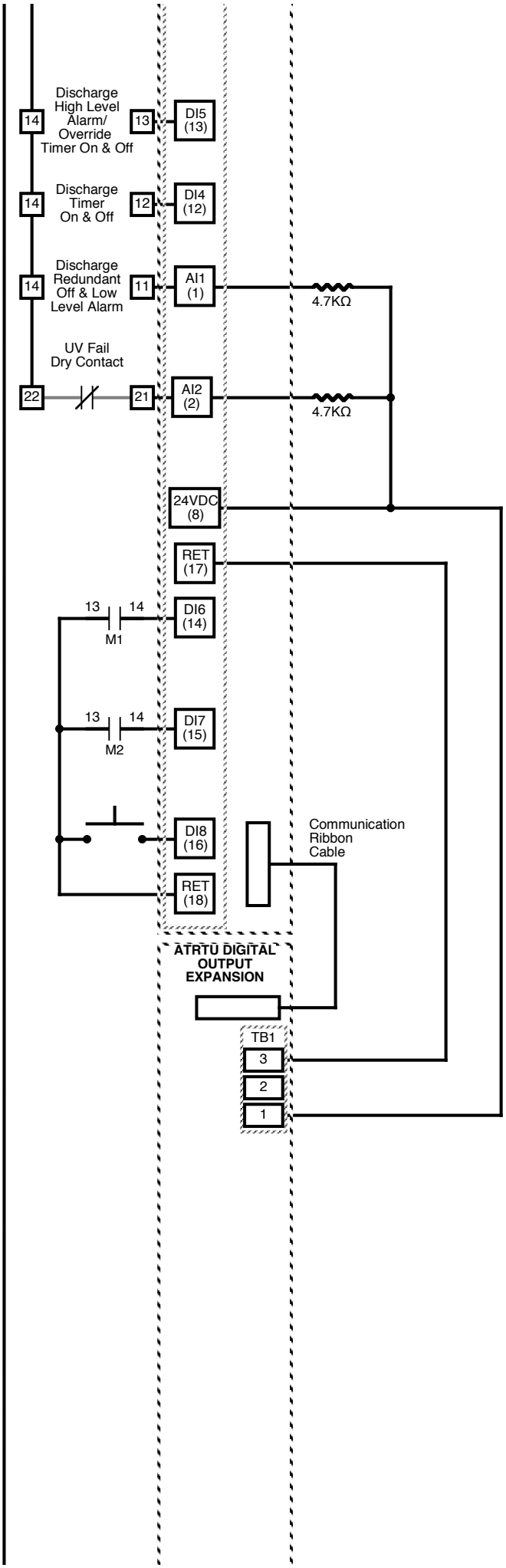
- The phone line surge arrester / DSL filter requires a good connection to ground to be effective. Ensure that this sub-panel is effectively grounded to the service panel.

© Orenco Systems®, Inc.

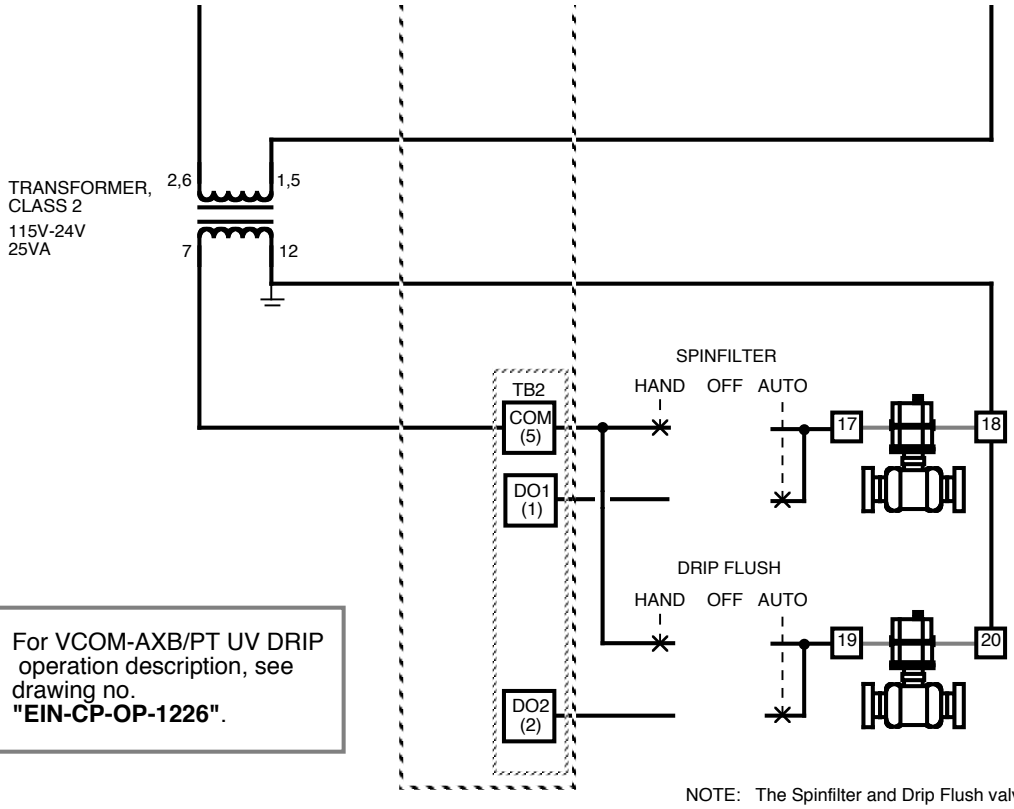
Control Panel Wiring Diagram
AdvanTex® Treatment Systems
Model VCOM-AXB1/PT UV Drip, VCOM-AX20B1/PT UV Drip



For ***discharge pump*** float arrangement diagram, see drawing no. **"EDW-FS-AX-4"**.



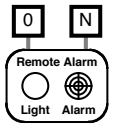
MANAGEMENT SYSTEM
ORENCO
ATRTU-4DO
Rev. A



For VCOM-AXB/PT UV DRIP operation description, see drawing no. **"EIN-CP-OP-1226"**.

NOTE: The Spinfilter and Drip Flush valves must be NORMALLY CLOSED.

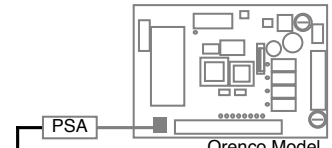
Remote Alarm Connections



Orenco Model AHW or equiv.

Note: 115VAC signal is present during alarm conditions.

Telephone Line Connection

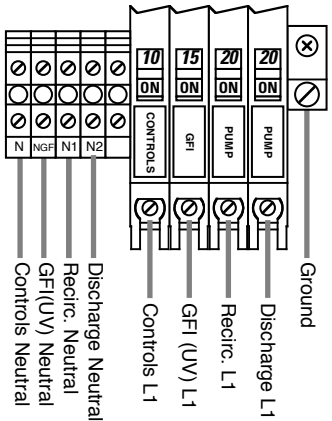


Orenco Model ATRTU-100

Connect phone line to RJ-11 jack on phone line surge arrestor/DSL filter.

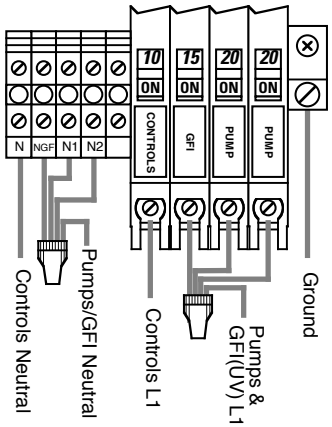
Power Wiring Options

Four Circuits



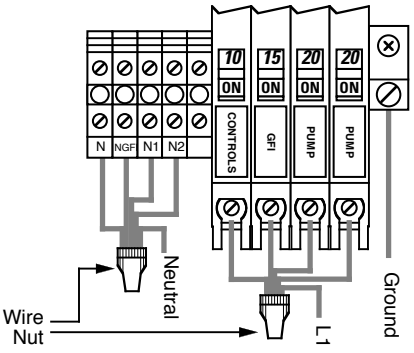
Factory default. Wire as shown.

Two Circuits



Use one wire nut to connect the pole of each pump circuit breaker and GFI breaker together with the incoming L1 power line. Use another wire nut to connect the neutral block of each pump and GFI with the incoming neutral line.

One Circuit

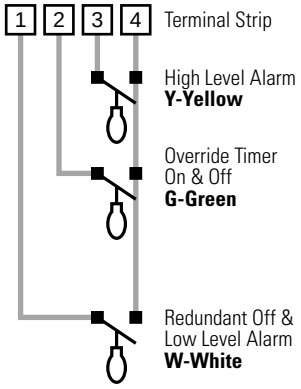


Use one wire nut to connect the pole of each pump circuit breaker together with the controls and GFI breakers and with the incoming L1 power line. Use another wire nut to connect the neutral block of each pump with the controls and GFI neutral blocks and with the incoming neutral line.

Float & Splice Box Wiring Diagram

For use in two pump systems, recirc. side.

Float Arrangement



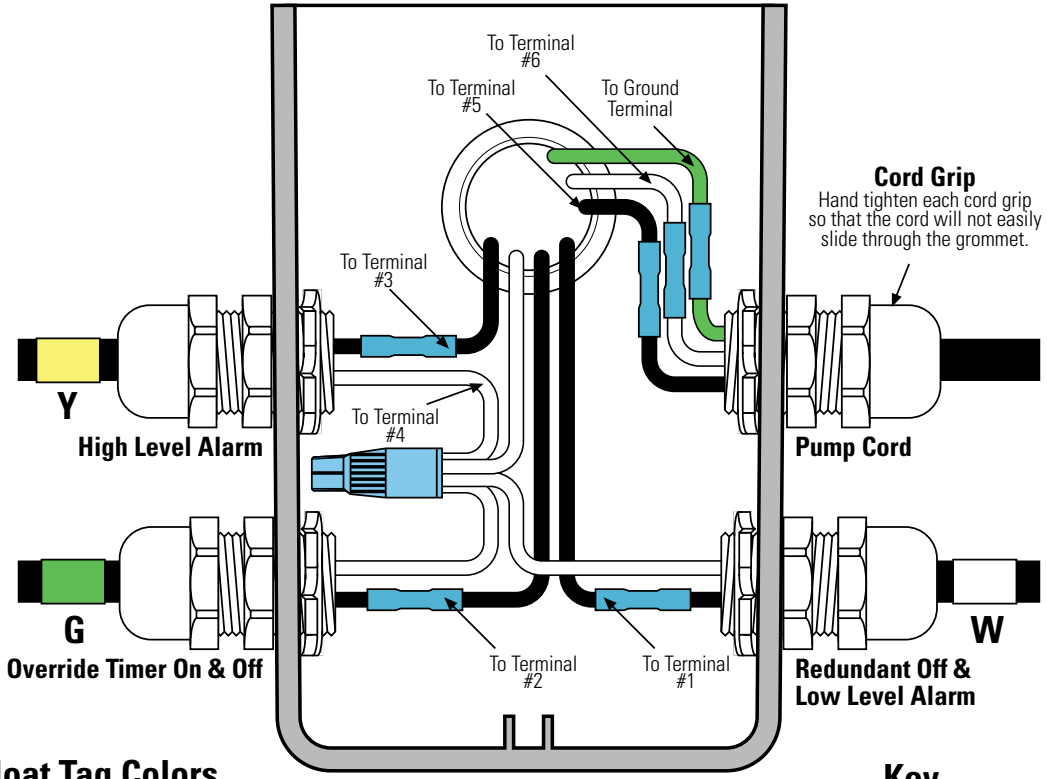
Float Types



Typical Orenco float model: A

Specs: contact - normally open
differential - no minimum
power rating - signal

Splice Box Wiring



Float Tag Colors

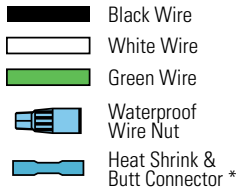
Y	- Yellow	**R**	- Red
P	- Purple	**O**	- Orange
B	- Blue	**E**	- Grey
G	- Green	**W**	- White

Note: Multi-function floats will have more than one marker

Attention: Failure to follow splicing instructions will void warranty

* Refer to drawing EIN-SB-SB-1 for splicing instructions.

Key



Control Panel Series	Float Function Color Code	Splice Box Model	Drawing No.
VCOM-AXB	**YGW/**	**SB4**	**EDW-FS-AX-2**

Orenco Systems®
Incorporated

814 AIRWAY AVENUE

SUTHERLIN, OREGON

97479-9012

TELEPHONE:

(541) 459-4449

FACSIMILE:

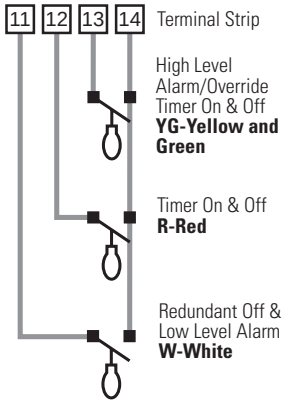
(541) 459-2884

EDW-FS-AX-2
Rev 1.0 ©08/10/01

Float & Splice Box Wiring Diagram

For use in two pump systems, discharge side.

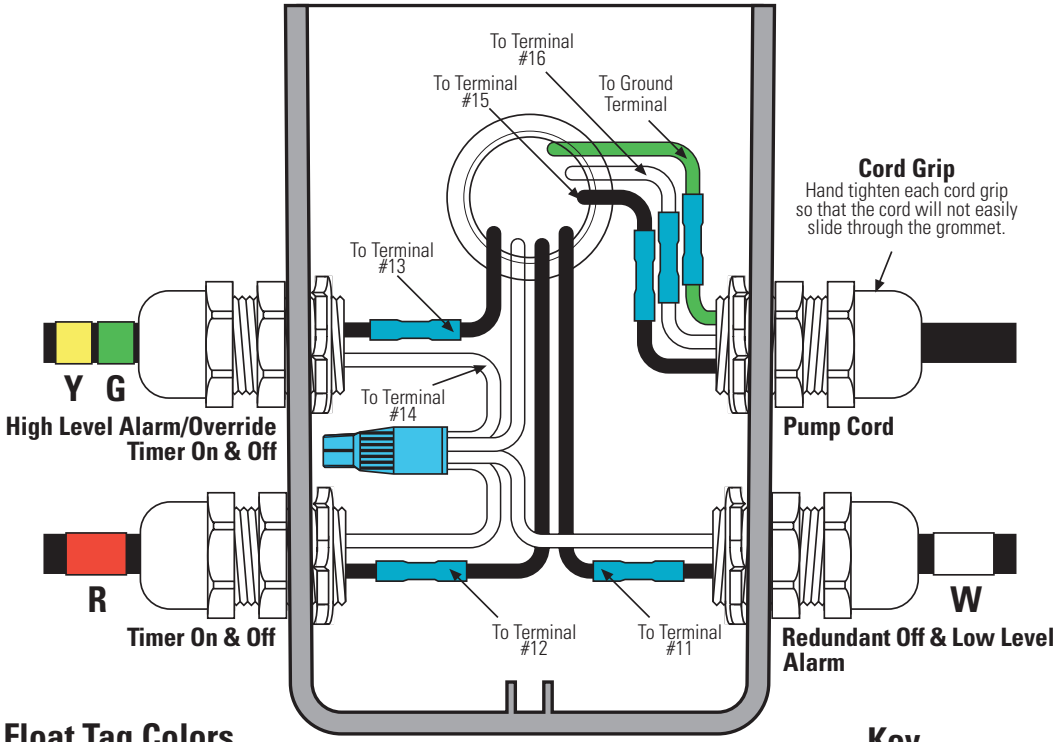
Float Arrangement



Float Types

Typical Orenco float model: A
Specs: contact - normally open
differential - no minimum
power rating - signal

Splice Box Wiring



Cord Grip
Hand tighten each cord grip so that the cord will not easily slide through the grommet.

Float Tag Colors

Y	Yellow	**R**	Red
P	Purple	**O**	Orange
B	Blue	**E**	Grey
G	Green	**W**	White

Note: Multi-function floats will have more than one marker

Attention: Failure to follow splicing instructions will void warranty

* Refer to drawing EIN-SB-SB-1 for splicing instructions.

Key

- Black Wire
- White Wire
- Green Wire
- Waterproof Wire Nut
- Heat Shrink & Butt Connector *

Control Panel Series	Float Function Color Code	Splice Box Model	Drawing No.
VCOM-AXB/PT	**/(YG)RW**	**SB4**	**EDW-FS-AX-4**

Orenco Systems®
Incorporated

814 AIRWAY AVENUE
SUTHERLIN, OREGON
97479-9012

TELEPHONE:
(541) 459-4449

FACSIMILE:
(541) 459-2884

EDW-FS-AX-4
Rev 1.1 © 03/15/04

VCOM-AXB /PT UV DRIP Panel Operation

Orenco Systems® Incorporated
1-800-348-9843

Overview

The VCOM-AXB /PT UV DRIP telemetry-enabled panel is used for remote monitoring and control of the dual pumping operations of time-dosed Recirculating and Discharge pumps with a drip system.

Basic control logic manages the day-to-day functionality of the control panel. The VCOM-AXB /PT UV DRIP system recirculates the blend four to five times; until the recirculating splitter valve (RSV) seats, then small amounts of treated wastewater are pumped into the discharge tank. As the discharge tank fills, effluent is removed through a timed dosing drip system. During peak flow conditions, each tank has more aggressive timer settings to manage the increased demand. The drip system is periodically flushed to prevent clogging.

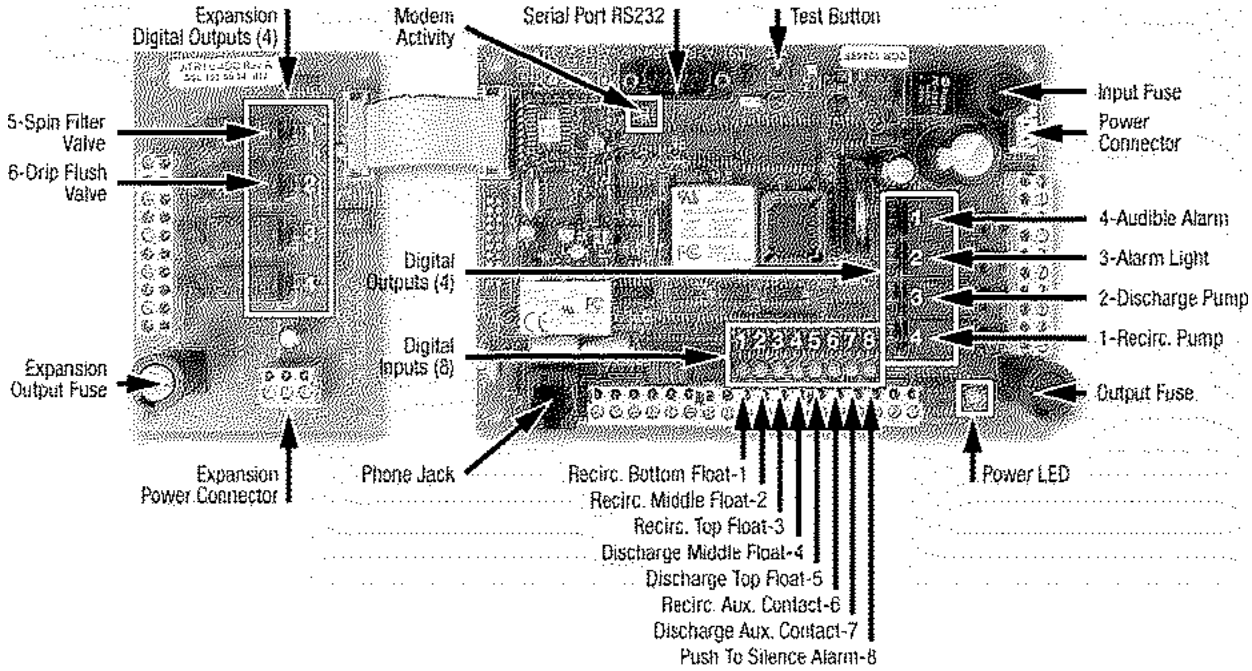
Fault conditions are automatically reported to the VeriComm Monitoring System and not locally at the panel, making the system virtually invisible to the homeowner. However, if fault conditions are not responded to, or the system cannot communicate with the VeriComm Monitoring System, then local alarms may be activated.

To silence local alarms, press the "Hold-To-Silence" button until the audible alarm stops.

The procedures outlined in the remainder of this document are to verify proper installation; they should be conducted in the sequence outlined while in "Test Mode".

Inputs & Output Definitions

The following inputs and outputs are used with your control panel:



Note:

1. Digital inputs are the yellow LEDs horizontally aligned along the bottom of the controller,
2. Digital outputs are the red LEDs vertically aligned on the right side of the controller, and
3. Inputs and outputs are activated by various events (e.g., Floats are activated when the float is in the up position; "Hold-To-Silence" is activated when the push button, located on the front of the panel is pressed).

Analog Inputs (NO LED indications on analog inputs):

1. Analog Input #1 – Discharge Bottom Float.
2. Analog Input #2 – UV Sensor.

Verify System Status

- ❑ Ensure that the panel installation instructions have been completed.
- ❑ Verify that the circuit breakers are in the on position.
- ❑ Verify controller status. The "Power LED" located on the controller (see Fig. 1, pg. 1) will either be:
  - Blinking – indicates that the controller is operating normally, or
  - Solid Off (when power is applied) – indicates that there is a possible problem with:
    1. The input fuse (F1) on the PC board,
    2. The main fuse located inside the panel,
    3. The controls circuit breaker located inside the panel, or
    4. The incoming line voltage.

Enable Test Mode

While in test mode, the alarm light will be flashing if there is NOT an alarm condition present. During an alarm condition the alarm light will be steady.

- ❑ Hold the "Hold-To-Silence" button on the front of the panel until the audible alarm sounds (approximately 15 seconds) to enable test mode.
  - Digital input #8 should be illuminated when the button is held in.
  - When the audible alarm sounds to indicate that the panel is in test mode, release the button.
- ❑ While in test mode, the panel will operate in the following manner.
  - The Call Home function is disabled,
  - Local audible and visual alarms are activated as alarm conditions occur,
  - System Data Logs are suspended, and
  - Timer off cycles are shortened.



1. Control Panel 2. Recirculating Splitter Valve 3. AdvanTex™ Filter
4. Processing Tank 5. Splice Box 6. BioTube® Pump Vault
(Float Assembly, Filter, Pump) 7. Pump Basin (Float Assembly, Pump)

Manual Pump Test

- ❑ Verify that the Recirc pump is submerged in water before continuing. If the RO (bottom) float drops, the alarm will sound.
- ❑ Press down the spring-loaded "MAN/AUTO" switch for the Recirc pump located inside the panel. The Recirc pump should immediately activate. For verification:
  - Digital input #6 should illuminate (see Fig. 1, pg. 1), indicating that the Recirc auxiliary contact is on.
- ❑ Verify that the Discharge pump is submerged in water before continuing. If the RO (bottom) float drops, the alarm will sound.
- ❑ Press down the spring-loaded "MAN/AUTO" switch for the Discharge pump located inside the panel. The Discharge pump should immediately activate. For verification:
  - Digital input #7 should illuminate (see Fig. 1, pg. 1), indicating that the Discharge auxiliary contact is on.

Combined Pump Test

- ❑ Verify that the Recirc and Discharge pumps are submerged in water before continuing.
- ❑ Press down the spring-loaded "MAN/AUTO" switch for both pumps. Digital inputs #6 & #7 should illuminate (see Fig. 1, pg. 1), indicating that the auxiliary contacts are on for both pumps.
- ❑ Measure the voltage and amperage of the pump.
  - Measure the voltage at each of the pump terminals in the panel while both pumps are running. A low voltage condition could indicate that the site wiring is improperly sized.
  - Using a loop ammeter, place the ammeter clamp around the loop of wire located above the pump circuit breaker. (This should be done for each pump.) The amperage should be within the specifications of the pump.

UV Light Status

- ❑ Because UV models vary, some adjustments may need to be made. The alarm light and audible should activate when the UV fails.
- ❑ Ensure that the UV light has been installed correctly and that it has power.
- ❑ Verify that all the float alarms are cleared.
  - The Recirc. RO float is up (digital input #1 should be illuminated).
  - The Recirc. high level alarm float is down (digital input #3 should NOT be illuminated).
  - The Discharge high level alarm float is down (digital input #5 should NOT be illuminated).
  - The Discharge low level alarm float is up (check the float visually).

- ❑ Force the UV light to fail. This must be done without disconnecting power or switching the circuit breaker to OFF.

- ❑ The alarm light, on the front of the panel should change state, e.g. if the alarm light was ON it will turn OFF, vise versa.
  - If the alarm did not change state there is a possible problem with:
    1. The UV light,
    2. The UV sensor contact,
    3. The GFI circuit breaker located inside the panel, or
    4. The GFI outlet located inside the panel.

- ❑ If the alarm light and audible are deactivating when the UV fails:
  - The VCOM board will need to be connected to directly or through the web, and
  - Point #58 will need to be changed from **Y** to **N**.

- ❑ If connection and changes can not be made immediately, then an insulated jumper wire will need to be installed between terminals #15 and #16 before continuing.

Recirc Float Test

While in test mode, the Recirc floats will function as described:

High Level Alarm (top float): This float activates the alarm light (steady) and audible alarm when lifted. Pressing and holding the illuminated "Hold-To- Silence" button on the front of the control panel will silence the audible alarm. The alarm light will remain steady until the float is lowered.

Override On/Off (middle float): This float activates the override timer when lifted. The override timer controls the pump during high flow conditions. The override timer function will remain active until the set minimum number of override cycles has been completed and the float has lowered.

Redundant Off & Low Level Alarm (bottom float):
This float enables the timer function when lifted. The timer function controls the pump during normal flow conditions. Note: The timer will start with its off cycle. This float also disables the pump and activates the alarm light (steady) and the audible alarm when lowered. The audible alarm may be silenced by pressing the illuminated **"**Hold-To-Silence" button on the front of the control panel. The alarm light will remain steady until the float is lowered.

To perform the following test, sufficient effluent is required. If there is not enough effluent in the Recirc Tank, turn the Recirc pump circuit breaker off.

To test the functionality of the Recirc floats and ensure that the panel is installed correctly, follow the steps below:

1. RO/Low Level Alarm Float Test

- ❑ Pull the Recirc float assembly out of the pump vault and position it so that all the floats are in the down position.

- ❑ If the Discharge high level (top) float is lifted (digital input #5 is illuminated), then pull the Discharge float assembly out of the pump vault and position it so the bottom float is up and the other floats are down.
  - Digital inputs #1, #2, #3, and #5 should NOT be illuminated.
  - The alarm light (steady) and audible alarm should activate.

- ❑ Lift and secure the bottom float in the up position.
  - Digital input #1 should be illuminated.
  - Within a few seconds, the audible alarm should shut off and the alarm light should be flashing.
  - The Recirc pump will start to cycle in approximately 36 second intervals, starting with the off cycle.
  - Digital output #1 and digital input #6 should be illuminated during the on cycle.

2. Override Timer Float Test

- ❑ Lift and secure the middle float in the up position.
  - Digital inputs #1 and #2 should be illuminated.
  - The Recirc pump cycle will shorten to 24 second intervals.
  - Digital output #1 and digital input #6 should illuminate when the Recirc pump is on.

3. High Level Alarm Float Test

- ❑ Lift and secure the top float in the up position.
  - Digital inputs #1, #2, and #3 should be illuminated.
  - The audible alarm and alarm light (steady) should activate. Digital outputs #3, and #4 should illuminate.

- ❑ Drop the top float and ensure that it is in the down position.
  - Within a few seconds, the audible alarm should shut off and the alarm light should be flashing.
  - Digital output #4 should NOT be illuminated.
  - The Recirc pump should continue cycling as indicated by digital output #1, and input #6 being illuminated.

4. Returning To Normal Cycle Time

- ❑ Drop the middle float and ensure that it is now in the down position.
  - The Recirc pump should complete the minimum override cycles (default is three) and then return to its normal cycle time.

- The Recirc pump should continue cycling as indicated by digital output #1, and input #6 being illuminated.
- Digital input #1 should remain illuminated, indicating that the bottom float is in the up position.

❑ Reinstall the Recirc float assembly into the pump vault. Ensure that the floats are free from entanglements (e.g., float cords, etc).

❑ Ensure that the tank has enough water to maintain the RO (bottom) float in the up position (Required for Cut-off Test).

❑ The Recirc pump should continue to cycle during the Discharge test.

Discharge Float Test

While in test mode, the Discharge floats will function as described:

High Level Alarm/Override Timer On/Off (top float): This float activates the alarm light (steady) and audible alarm when lifted. Pressing and holding the illuminated "Hold-To-Silence" button on the front of the control panel will silence the audible alarm. The alarm light will remain steady until the float is lowered. This float also activates the override timer when lifted. The override timer controls the pump during high flow conditions. The override timer function will remain active until the set minimum number of override cycles has been completed and the float has lowered.

Timer On/Off (middle float): This float enables the timer function when lifted. The timer function controls the pump during normal flow conditions. Note: The timer will start with its off cycle.

Redundant Off & Low Level Alarm (bottom float): This float turns off the Discharge pump when lowered. This float is a secondary off float, which will operate if the Timer On & Off float fails. This float also activates the alarm light (steady) and audible alarm when lowered. The audible alarm may be silenced by pressing the illuminated "Hold-To-Silence" button on the front of the control panel. The alarm light will remain steady until the float is lifted.

Pump & Valve Operation (for Test Mode Only): The pump dosing cycles will be controlled by the timer. During high flow conditions, the pump dosing cycles will be controlled by the override timer. A complete cycle of the Discharge pump will operate as follows:

- Off Cycle; pump is deactivated.
- On Cycle; pump is activated.
- Drip Flush; pump remains activated while the drip flush valve is open to flush the drip system.
- Spinfilter Flush; pump remains activated while the spinfilter valve is open at the end of the drip cycle to allow for spinfilter flushing.
- Off Delay; pump will remain activated while the drip flush valve is opened.
- Drain; pump is deactivated and the drip flush valve will remain activated to allow for drainage.

To perform the following test, sufficient effluent is required. If there is not enough effluent in the Discharge Tank, turn the Discharge pump circuit breaker off.

To test the functionality of the Discharge floats and ensure that the panel is installed correctly, follow the steps below:

1. RO/Low Level Alarm Float Test

❑ Pull the Discharge float assembly out of the pump vault and position it so that all the floats are in the down position.
- Digital inputs #4, and #5 should NOT be illuminated.
- The alarm light (steady) and audible alarm should activate.

2. Timer Float Test

❑ Lift and secure the bottom and middle floats in the up position.
- Digital input #4 should be illuminated.
- Within a few seconds, the audible alarm should shut off and the alarm light should be flashing.
- The Discharge pump will start in the off cycle (1 min) and then turn on for the on cycle (factory default: 4 min). Digital output #2 and digital input #7 should be illuminated during the on cycle.
- After the on time is complete, the pump should remain activated, and the drip flush valve should be activated to flush the system (factory default: 5 min). Digital input #7 and outputs #2 and #6 should be illuminated.
- After the zone is flushed, the spinfilter valve will open to allow for a spinfilter flush (factory default: 15 sec). Digital input #7 and outputs #2 and #5 should be illuminated during this flush.
- The pump will remain activated while the drip flush valve is opened (factory default: 5 sec). Digital input #7 and outputs #2 and #6 should be illuminated.
- The pump will deactivate and the drip flush valve will remain activated (factory default: 5 min) to allow for drainage. Digital output #6 should be illuminated.

3. High Level Alarm (Recirc. Pump Cut-off)/Override Timer On/Off Float Test

❑ Lift and secure the top float in the up position.
- Digital inputs #4, #5 should be illuminated.
- The audible alarm and alarm light (steady) should activate. Digital outputs #3, and #4 should illuminate.

- The Discharge pump off cycle will shorten to 30 seconds. Zone(s) should be dosed and flushed in the same sequence and time intervals as during the 'Timer Float Test'.

❑ The Recirc. pump should stop cycling.
- Digital input #6 and output #1 should NOT be cycling. (Wait a few minutes to verify.)

❑ Drop the top float and ensure that it is in the down position.
- Within a few seconds, the audible alarm should shut off and the alarm light should be flashing.
- The Discharge pump should complete the minimum override cycles (factory default: 3 cycles) and then return to its normal cycle time.

4. Discharge Pump Cut-off (UV Light Fail) Test

❑ Force the UV light to fail. This must be done without disconnecting power or switching the circuit breaker to OFF.
- The audible and visual alarms should activate. Digital outputs #3, and #4 should illuminate.

❑ Silence the audible alarm by pressing and holding the illuminated "Hold-To-Silence" button, on the front of the panel, until the alarm stops.

❑ The Discharge pump should stop cycling.
- Digital input #7 and output #2 should NOT be cycling. (Wait a few minutes to verify).

❑ Reactivate the UV light.

❑ Discharge pump should start cycling again. (Wait a few minutes to verify; digital output #2 and digital input #7 should be illuminated during the on cycle.)

❑ If the Discharge pump should NOT be cut-off when the UV light fails,
- The VCOM board will need to be connected to directly or through the web, and
- Point #59 will need to be changed from **Y** to **N**.

❑ Reinstall the Discharge float assembly into the pump vault. Ensure that the floats are free from entanglements (e.g., float cords, etc).

❑ Ensure that the tank has enough water to maintain the RO (bottom) float in the up position.

Communication Test

❑ Press and release the "Hold-To-Silence" button 15 times within a one-minute period. This instructs the panel to call the VeriComm Monitoring System.
- A red LED (see Fig. 1, pg. 1 - Modem Activity) should illuminate, indicating that the controller has established communication with the host (this may take a couple of minutes).
- Once the communication session has ended, the modem will automatically disconnect.
- If the LED does not illuminate within the specified time, verify that the phone line has a dial tone. This can be done by hooking up a phone to the line that is going into the panel.

Disable Test Mode (optional)

❑ The panel will automatically disable test mode and return to normal operation after 30 minutes. To disable test mode immediately, hold the "Hold-To-Silence" button on the front of the panel until the audible alarm sounds (approximately 15 seconds).
- Digital input #8 should be illuminated when the "Hold-To-Silence" button is held in.
- When the audible alarm sounds to indicate that the panel is no longer in test mode, release the button.

Subsurface Drip Dispersal and Reuse

Design, Installation and Maintenance Guidelines

Geoflow, Inc.
503 Tamal Plaza
Corte Madera, CA 94925
Toll free: 800-828-3388
Fax: 415-927-0120
www.geoflow.com

October 2007 v.1

TABLE OF CONTENTS

INTRODUCTION 1

DIAGRAM 1: TYPICAL DRIPFIELD LAYOUT 2

SYSTEM COMPONENTS 3

1. Wasteflow® Dripline 3
2. Controllers 4
3. Pumps, Pump tanks & Floats 4
4. Filters 5
5. Supply Manifold and Line 5
6. Return Manifold and Line 5
7. Pressure Regulator 5
8. Air Vacuum Breaker 5
9. Filter Flush Valves 6
10. Field Flush Valves 6
11. Zone Valves 6
12. Wasteflow Headworks 6

DESIGN PARAMETERS 6

1. Select area 6
2. Water Quality 6
3. Soil Application Design 7
   - Table 1 Minimum Surface Area Guidelines 8
   - Table 2 Drip Loading Rates Considering Soil Structure 9
4. Depth and Spacing 10
5. Soil Layers and Types 10
6. Adding Fill to the Dispersal Field 10
7. Slopes or Hilly Sites 11
8. Multiple Zones 12
9. Winterization 13
10. Lightning Protection 13
11. Reuse for Irrigation 14
12. Water Application Formula 14

Worksheet 1 - Dispersal Field Design for Single Zone System 15
Worksheet 2 - Select Pump 17

SYSTEM INSTALLATION 18

Installation Guidelines 18
Table 3 - Subsurface Drip Installation Methods 21
Worksheet 3 - As Built System Description 22

SYSTEM MAINTENANCE 23

Routine and Preventative Maintenance 23
Home Owners Guide For Care and Maintenance of Geoflow Drip Dispersal Field 24
Site inspection list 25
Trouble shooting guide 26

TABLE OF CONTENTS (CONT.)

PRODUCT SHEETS

WASTEFLOW® DRIPLINE..... 29
- Wasteflow Classic
- Wasteflow PC ½ gph
- Wasteflow PC 1 gph

CONTROLLERS..... 33
- Geo Standard
- Geo Touchscreen

FILTERS
- Vortex..... 38
- BioDisc™..... 41
- GeoVac..... 42

FLOW METERS..... 45
- Digital Display
- Pulse Output

HEADWORKS..... 48
- Sporty Vortex
- Sporty GeoDisc
- Ultra Vortex
- Ultra GeoDisc

SOLENOID VALVES..... 50

AIR VENTS..... 52
- 1 inch
- 2 inch

PRESSURE REGULATORS..... 53
- Low Flow
- Medium Flow
- High Flow
- Ultra Flow

CHECK VALVES..... 55
- Ball Check Valve
- Spring Check Valve

DRIP PLOW..... 57

PVC 40 FRICTION LOSS CHART 58

LIMITED WARRANTY

INTRODUCTION

Geoflow's WASTEFLOW®[1] drip system disperses effluent below the ground surface through ½" pressurized pipes. It is designed using the grid concept with supply and flush manifolds at each end of the dripline creating a closed loop system. The grid design provides a complete subsurface wetted area.

The objective with effluent dispersal is usually to disperse the effluent using the minimum area as quickly and safely as possible at an approximately uniform rate throughout the year. If the main purpose of the Geoflow system is to irrigate, then please use the standard irrigation manual for landscape available from Geoflow, Inc.

Subsurface drip is a highly efficient method to dispose of effluent. Small, precise amounts of water are uniformly applied under the soil surface from multiple points.

The main advantages of Geoflow's subsurface drip system for effluent dispersal are:

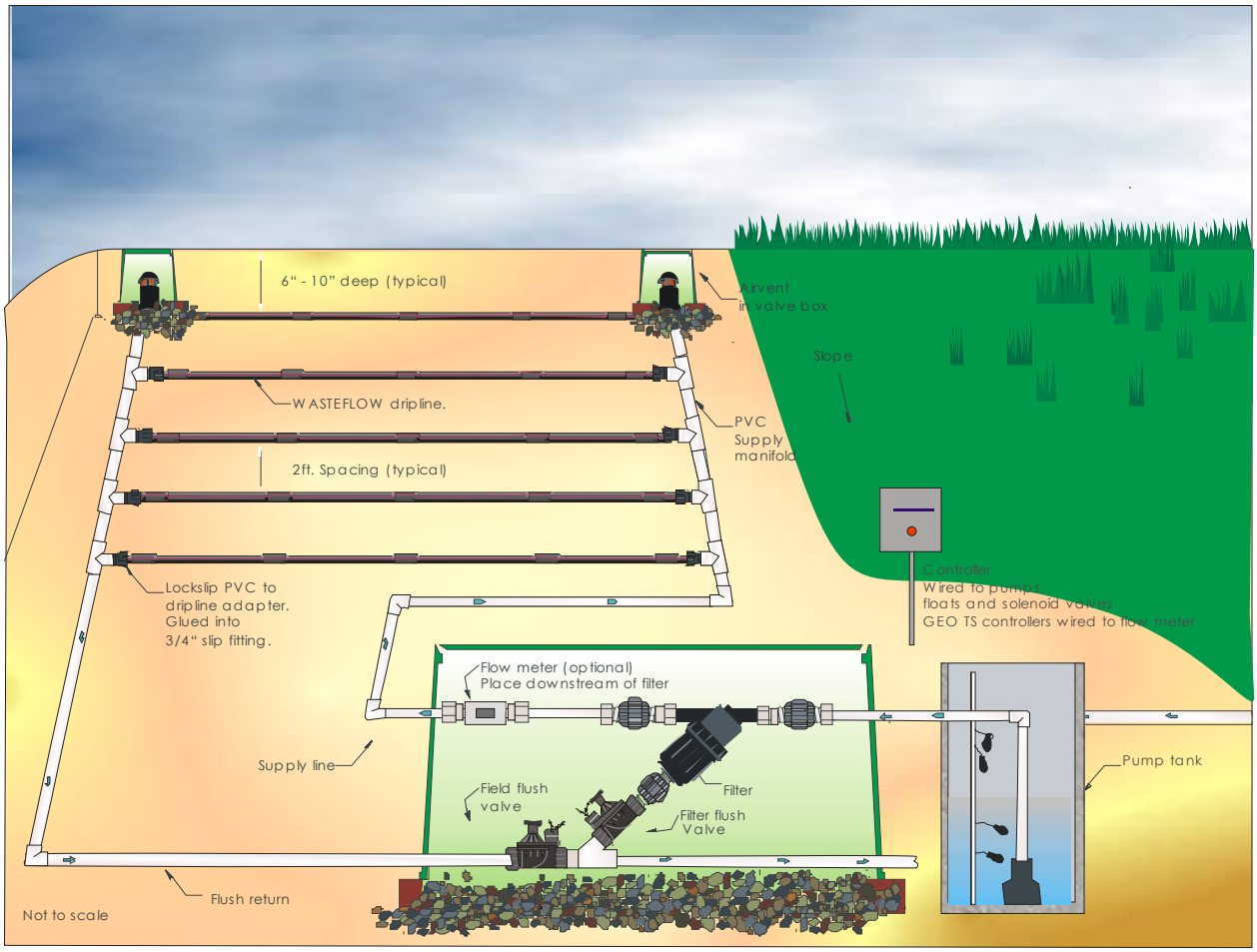
- Human and animal contact with effluent is minimized, reducing health risks.
- Correctly designed systems will not cause puddling or runoff.
- It can be used under difficult circumstances of high water tables, tight soils, rocky terrain, steep slopes, around existing buildings, trees or other vegetation, and on windy sites.
- Disposal of water is maximized by means of evapotranspiration.
- The system requires no gravel. It is easy to install directly into indigenous soils and the natural landscape can be maintained.
- Minimizes deep percolation.
- Consumption of nitrates by the plant material is increased.
- Invisible and vandal proof installations.
- Fifteen-year warranty for root intrusion, workmanship and materials. Systems are durable with a long expected life of approximately 30 years.
- Non intrusive. It allows use of the space while operating.
- Easily automated.
- Effluent can be re-used for irrigation.

NOTES

- These guidelines are for secondary treated effluent. When using primary treated effluent, Geoflow recommends automating all the self flushing valves, and increasing the number of emission points in the dispersal field. For more information on septic tank dispersal, please check our website at www.geoflow.com or telephone Geoflow at 800-828-3388.
- Please follow your State and County Regulations for onsite wastewater dispersal. These guidelines are intended to be a guide to users of the Geoflow drip system and should be used only as a supplement to your local regulations.
- Occasionally, in forested area, the dripline is placed on the surface and covered with mulch.

1 WASTEFLOW® is a registered trademark of A.I.Innovations.

Diagram 1: Typical Dripfield layout





SYSTEM COMPONENTS

See Diagram 1 on page 3.

A typical drip system installation will consist of the elements listed below:

1. WASTEFLOW® DRIPLINE

(See product sheet for specification)

WASTEFLOW dripline carries the water into the dispersal/reuse area. The dripline is connected to the supply and return manifolds with Compression or Lockslip fittings. Typical spacing between each dripline and between drip emitters is 24" on center.

Twelve-inch spacing is used regularly for soils with very low or high permeability. Dripline is usually buried 6"-10" below ground. Standard coil length is 500-ft. Rolls of alternative lengths, diameters and dripper spacings may be special ordered.

WASTEFLOW dripline features:



a.) nano-ROOTGUARD®[2]

In 2008 Wasteflow dripline will have new nano-ROOTGUARD which has an extended expected life of 30 years. The risk of root intrusion with an emitter slowly releasing nutrient rich effluent directly into the soil is well known to anyone who has observed a leaking sewer pipe. All Geoflow drip emitters are guaranteed to be protected against root intrusion with nano-ROOTGUARD. This patented process fuses the root-growth inhibitor, TREFLAN®[3] into each drip emitter during manufacturing. Treflan is registered with the United States EPA for this application. The nano-ROOTGUARD technology holds Treflan for extended time inside the plastic, slowly releasing it in minute quantities to prevent root cells from dividing and growing into the barrier zone. It is chemically degradable, non-systemic, and virtually insoluble in water (0.3 ppm). nano-ROOTGUARD carries a **15-year warranty** against root intrusion.

b.) *Geoshield™[4]* protection

Geoflow's WASTEFLOW has an inner lining impregnated with an antimicrobial, Tributyl tin maleate, to inhibit adhesion of biological growth on the inside walls of the tube and on the emitters. It does not have any measurable biological effect on the effluent passing through the tube. This minimizes the velocity required to flush WASTEFLOW dripline. The velocity only needs to move out the fine particles that pass through the 130 micron filter that, if not flushed, will ultimately accumulate at the distal end of each lateral. It is not necessary to scour growth off the inside wall of WASTEFLOW tubing. Since all pumps deliver more volume given less resistance to flow, just opening the flush valve will usually achieve this degree of flushing. When a minimum flushing velocity is requested by regulators, 0.5 feet per second is used with Wasteflow dripline to get the settled particles at the bottom of the pipe back into suspension. This equates to 0.375 gpm per dripline when using standard WASTEFLOW dripline (0.55"ID)



c.) Turbulent Flow Path

WASTEFLOW drip emitters are pre-inserted in the tube usually spaced 6", 12", 18", or 24" apart with 24" being the most popular. Angles in the emitter flow path are designed to cause turbulence in order to equalize flow between emitters and keep the emitters clean. Geoflow emitters boast large flow paths, which, coupled with turbulent flow, have proven over the years to be extremely reliable and dependable.

---

2 nano-ROOTGUARD is a registered trademark of A.I.Innovations
3 Treflan is a registered trademark of Dow Agro Sciences
4 Geoshield is a registered trademark of A.I.Innovations

d.) Wasteflow Classic and Wasteflow PC Dripline

Both WASTEFLOW Classic and WASTEFLOW PC have turbulent flow path emitters with nano-ROOTGUARD and *Geoshield* protection.

The WASTEFLOW PC has the added element of a silicone rubber diaphragm that moves up and down over the emitter outlet to equalize flows regardless of pressure between 7 and 60 psi. To ensure a long life the recommended operating range is 10 to 45 psi.

For Wasteflow Classic, the flow rate delivered by the emitter is a function of the pressure at the emitter. The Classic dripline has the advantage of no moving parts or rubber that may degrade over time. Also, when minimum flushing velocities are required, the flows during a dosing cycle and flushing cycle are very similar with the Wasteflow Classic because when the flush valve is opened, the pressure is reduced, causing the flows from the emitters to decline. PC dripline requires significantly higher flow for flushing than dosing as the emitter flow does not go down during the flushing cycle.

We generally recommend using WASTEFLOW Classic, unless the economic advantages to using PC is substantial.

i. Wasteflow PC can run longer distances than Wasteflow Classic.

ii. Steep slopes. Systems should be designed for the dripline lateral to follow the contour. When this is practical, the extra cost of installing pressure regulators required for Wasteflow Classic would likely be less than the incremental cost of Wasteflow PC.

iii. Rolling terrain. If the difference in height from trough to peak exceeds six feet then Wasteflow PC should be used. Vacuum relief valves must be placed at the top of each rise.

2. Controllers

(See product sheet for specification)



Controllers are used for time dosing and time flushing of the filter and dripfields. GEO controllers include a programmable logic controller to increase flexibility and reliability in the field. They can be used on systems ranging in size from one to eight zones at the time this manual was printed. All controllers include a surge arrestor, elapsed time meter and counter. In 2007 Geoflow added a new controller with a touchscreen interface. It can vary dose times in each zone, monitor flow, ultraviolet, blower, and other optional inputs.

3. Pumps, Pump Tanks & Floats

Wasteflow dripfields depend on pumps to dose effluent under pressure to the field. These must be sized according to flow and pressure requirements. Look for submersible effluent pumps from a dependable source. Geoflow does not endorse a single manufacturer, but does advocate you use a pump that is readily serviced in your area. Two (duplex) pumps may be used. These will normally alternate at each signal from the control panel and are often used on commercial or large drip systems. Pump tanks should be sized according to your local rules and regulations. Geoflow controllers are set-up for 4 floats with the lowest one in the tank being the *redundant off float*. The *primary timer on/off float* is second from the bottom, followed by the *secondary timer float* third from the bottom and the *high level alarm float* on the top.

4. Filters

(See product sheet for specifications)



Geoflow systems require 120 mesh or 130 micron filtration to keep any oversized upstream contaminants from entering the dripline. Geoflow offers a full range of drip filters, with the tried and true Vortex screen filters for small commercial and residential systems, BioDisc filters with anti bacterial protection, and GeoVac suction cleaning filters for larger commercial and industrial systems.

5. Supply Manifold and Line

This carries the water from the dosing tank to the dispersal area. Rigid PVC schedule 40 is usually used. Schedule 80 is at times used to either avoid dips in the line that can collect water and freeze, or if pressure of at least 20 psi is required to pump water from the dose tank to the dripfield. To prevent water from freezing, the pipes should slope back to the pump tank, be buried below frost depth and/or be insulated. Refer to the PVC pipe sizing chart in the appendix to determine the best diameter for your application.

6. Return Manifold and Line

In order to help clean the system, the ends of the drip lines are connected together into a common return line, most often made of rigid PVC. This line will help equalize pressures in the system. Flushing should be done frequently during the installation period. Periodic flushing will help to keep the manifolds clean. Many designers use the same size return line as they do the supply line for simplicity, or some down size the return line since return flow is lower than supply. To prevent water from freezing, the pipes should slope back to the pump tank, be buried below frost depth and/or be insulated.

7. Pressure Regulator

(See product sheet for specification)

Pressure regulators fix the inlet pressure at a given rate. Under normal operating conditions, pressure in the drip lines should be 10 psi to 45 psi. With WASTEFLOW Classic it helps to know exactly what the pressure is in the dripline, so system flow can be easily calculated. With all dripline it is prudent to have a pressure regulator to avoid oversized pumps from blowing out fittings.

8. Air Vacuum Breaker

(See product sheet for specification)

Air vacuum breakers are installed at the high points, above dripline and below grade to keep soil from being sucked into the emitters due to back siphoning or backpressure. This is an absolute necessity with underground drip systems. They are also used for proper draining of the supply and return manifolds in sloping conditions. One is used on the high end of the supply manifold and one on the high point of the return manifold. Additional air vents may be required in undulating terrain. Freezing conditions require the air vacuum breaker be protected with insulation.

9. Filter Flush Valves

(See product sheet for specifications)

Used to flush debris from the filter cleanout port back to the pretreatment or dosing tank, this can be an electronically activated solenoid valve or a manual valve. If manual, it should be opened for a full flushing at least every six months and left cracked open slightly to flush continuously. Cracking open a manual valve may be used to increase flow through the system to be within the efficient flow rate of the filter and/or pump, if necessary. Certain States may require automated electronic flushing. Please refer to your State codes.

10. Field Flush Valves

(See product sheet for specifications)

Used to flush out fine particles that have passed through the filter and accumulated on the bottom of the tube at the end of each lateral, the field flush valve can be manual or electronic. If manual, it should be opened for full flushing at least every six months and left cracked open slightly to flush continuously and provide for drainage of the flush line in freezing conditions. Cracking open a manual valve can also be used to; increase the flow through the system to be within the efficient flow rate of the filter and/or pump, or to set system pressure instead of a pressure regulator. Certain States do require automated electronic flushing. Please refer to your State codes.

11. Zone Valves

Used to divide single dispersal fields into multiple zones, these can be hydraulically activated index valves or electrical solenoid valves. Index valves are hydraulically operated, while solenoids use electricity.

12. Wasteflow Headworks

(See product sheet for specifications)

WASTEFLOW Headworks is a pre-assembled unit including the filter, valves and pressure gauge in a box or on a skid. It is installed between the pump and the field. Be sure to insulate the box in freezing climates.

DESIGN PARAMETERS

1. Select area

Select the area with careful consideration of the soil, the terrain and your State and County regulations. Be sure the field is not in a flood plain or bottom of a slope where excessive water may collect after rain. Surface water should be directed away from the proposed field area.

2. Water Quality

Determine the quality of the water entering the system. Is it secondary treated or primary treated? If using primary treated effluent, please refer to Geoflow's article for direct septic. Be aware of water conditions intrinsic to the area. If iron or iron bacteria are prevalent, please be sure to eliminate it upstream of the drip system with ozone, ultraviolet or chemical treatment. Iron can be recognized as orange stain on plumbing fixtures and may be treated prior to entering the facility.

3. Soil Application Design

Note: This section is based on Subsurface Trickle Irrigation System for On-Site Wastewater Disposal And Reuse by B. L. Carlile and A. Sanjines. The basis of the information is from the Texas Health Department regulations. The rules in your County and State may vary.

The instantaneous water application rate of the system must not exceed the water absorption capacity of the soil. A determination of the instantaneous water absorption capacity of the soil is difficult, however, since the value varies with the water content of the soil. As the soil approaches saturation with water, the absorption rate reduces to an equilibrium rate called the "saturated hydraulic conductivity." Wastewater application rates should be less than 10 percent of this saturated equilibrium.

Even though the trickle irrigation system maximizes the soil absorption rate through the low rate of application, thus keeping the soil below saturation, there will be times when the soil is at or near saturation from rainfall events. The design must account for these periods and assume the worst case condition of soil saturation. *By designing for a safety factor of 10 or 12, based on the saturated hydraulic conductivity, the system will be under-loaded most of the time but should function without surface failure during extreme wet periods.*

By applying wastewater slowly for a few hours daily, particularly if applied in "pulses" or short doses several times per day near the soil surface where the soil dries the quickest would keep the soil absorption rate at the highest value and minimize the potential of water surfacing in poor soil conditions.

As stated previously, this design criterion will under-load the system at all times except when the soil is at or near saturation from rainfall. If designing for an efficient irrigation system, the water supply may not be sufficient to meet the demands of a lawn or landscaped area during peak water demand months. This problem can be overcome by either of two solutions: add additional fresh-water make-up to the system during the growing season to supply the needed water for plants in question; or split the system into two or more fields with necessary valves and only use one of the fields during the peak water demand months and alternate the fields during winter months or extremely wet periods, or use both fields simultaneously if the pump capacity will so allow.

Table 1 shows the recommended hydraulic loading rates for various soil conditions, using a safety factor of at least 12 with regard to the equilibrium saturated hydraulic conductivity rate of the soil. These loading rates assume a treated effluent with BOD and TSS values of less than 30 mg/l is produced in the pre-treatment system and that any anomalies such as iron bacteria have been removed prior to dosing.

Table 1.

Minimum Surface Area Guidelines to Dispose of 100 gpd of Secondary Treated Effluent

Soil Class	Soil Type	Soil Absorption Rates		Design Hydraulic Loading Rate (gal / sq. ft. per day)	Total Area Required sq. ft./ 100 gallons per day
		Est. Soil Perc. Rate minutes/in	Hydraulic Conductivity inches/hr		
I	Coarse- sand	<5	>2	1.400	71.5
I	Fine sand	5-10	1.5-2	1.200	83.3
II	Sandy loam	10-20	1.0-1.5	1.000	100.0
II	loam	20-30	0.75-1.0	0.700	143.0
III	Clay loam	30-45	0.5-0.75	0.600	167.0
III	Silt-clay loam	45-60	0.3-0.5	0.400	250.0
IV	Clay non-swell	60-90	0.2-0.3	0.200	500.0
IV	Clay - swell	90-120	0.1-0.2	0.100	1000.0
IV	Poor clay	>120	<0.1	0.075	1334.0

Dispersal field area calculation:
Total square feet area of dispersal field = Design flow divided by loading rate

NOTES:

1) The above chart is provided as a guide only. States and Counties may have regulations that are different. Check your State guidelines and consult with your local health department.
2) Problems with drip dispersal fields occur when soils are misinterpreted. If in doubt, choose the more restrictive soil type from the table above.
3) "Soil type" should be based on the most restrictive layer within two feet of the dripline. In many soils 1-ft. vertical separation from the limiting layer has proven successful with secondary treated effluent. Geoflow recommends you follow State and Local guidelines.
4) Table 1 above, with only minor modifications over the years, has served us well since 1990 with tens of thousands of systems operating successfully based upon this data. However, thanks to work by Jerry Tyler and his associates at the University of Wisconsin-Madison soil structure has become better understood and can now be used as a comprehensive tool to determine optimal hydraulic loading rates as seen in Table 2.

Table 2

Drip Loading Rates Considering Soil Structure.

Table 2 is taken from the State of Wisconsin code and was prepared by Jerry Tyler.

Soil Textures	Soil Structure	Maximum Monthly Average BOD_5<30mg/L TSS<30mg/L (gallons/ft^2/day)
Course sand or coarser	N/A	1.6
Loamy coarse sand	N/A	1.4
Sand	N/A	1.2
Loamy sand	Weak to strong	1.2
Loamy sand	Massive	0.7
Fine sand	Moderate to strong	0.9
Fine sand	Massive or weak	0.6
Loamy fine sand	Moderate to strong	0.9
Loamy fine sand	Massive or weak	0.6
Very fine sand	N/A	0.6
Loamy very fine sand	N/A	0.6
Sandy loam	Moderate to strong	0.9
Sandy loam	Weak, weak platy	0.6
Sandy loam	Massive	0.5
Loam	Moderate to strong	0.8
Loam	Weak, weak platy	0.6
Loam	Massive	0.5
Silt loam	Moderate to strong	0.8
Silt loam	Weak, weak platy	0.3
Silt loam	Massive	0.2
Sandy clay loam	Moderate to strong	0.6
Sandy clay loam	Weak, weak platy	0.3
Sandy clay loam	Massive	0.0
Clay loam	Moderate to strong	0.6
Clay loam	Weak, weak platy	0.3
Clay loam	Massive	0.0
Silty clay loam	Moderate to strong	0.6
Silty clay loam	Weak, weak platy	0.3
Silty clay loam	Massive	0.0
Sandy clay	Moderate to strong	0.3
Sandy clay	Massive to weak	0.0
Clay	Moderate to strong	0.3
Clay	Massive to weak	0.0
Silty clay	Moderate to strong	0.3
Silty clay	Massive to weak	0.0

4. Depth and Spacing

WASTEFLOW systems usually have emitter lines placed on 2 foot (600 mm) centers with a 2 foot emitter spacing such that each emitter supplies a 4 sq. ft (0.36 m^2) area. These lines are best placed at depths of 6-10 inches (150 - 250 mm) below the surface. This is a typical design for systems in sandy and loamy soils with a cover crop of lawn grass. Closer line and/or emitter spacing of 12 inches is used on heavy clay soils or very coarse sands where lateral movement of water is restricted. Using closer spacing should not reduce the size of the field.

5. Soil Layers and Types

The shallow depth of installation is an advantage of the subsurface dripfield since the topsoil or surface soil is generally the most biologically active and permeable soil for accepting effluent. The topsoil also dries the fastest after a rainfall event and will maintain the highest water absorption rate. The quality and homogeneity of the soil may present a problem. If the soil was not properly prepared and there are pieces of construction debris, rocks and non-uniform soils, it is very difficult to obtain uniform water spread. In many cases, particularly if the soil is compacted, soil properties can be greatly improved by ripping and disking.

6. Adding Fill to the Dispersal Field

Some dispersal sites require additional soil be brought in for agronomic reasons or to increase separation distances from the restrictive layer. Restrictive layers stop or greatly reduce the rate of downward water movement, as a result surfacing may occur during part of the year. In soils with high water tables treatment is minimized due to a lack of oxygen.

Placing drip lines in selected fill material above the natural soil provides an aerated zone for treatment. Dispersal however still occurs in the natural soil and the field size must be based on the hydraulic capability of the natural soil to prevent hydraulic overload.

Any time fill material is to be used, the area to receive the fill should have all surface grasses and other organic material removed or it must be incorporated into the natural soil to prevent an organic layer from forming and restricting downward water movement. Removal must be performed under dry conditions. Divert surface and subsurface water prior to adding fill.

Soils to be used should be determined by a soils expert. Uniform soil material with good structure should be chosen. Avoid platy or massive materials with no structure. Do not use topsoil.

The fill material should be applied in shallow layers with the first 4 to 6 inches incorporated into the natural soil to prevent an abrupt textural interface. Placement of fill should be uniform so preferential bypass flows do not occur. Soil should not be compacted. Continue this process until all fill has been incorporated.

The fill area should be left crowned to shed surface water and may need diversion ditches or some other devices to prevent surface water from infiltrating. The entire fill area should have a vegetative cover to prevent erosion. If possible, allow the fill to set at least seven to ten days before installing WASTEFLOW dripline.

It is generally agreed that fill should not be used on slopes greater than 20% unless means for controlling erosion, such as netting, are used. Consult a soils engineer on a case by case basis.

7. Slopes or Hilly Sites

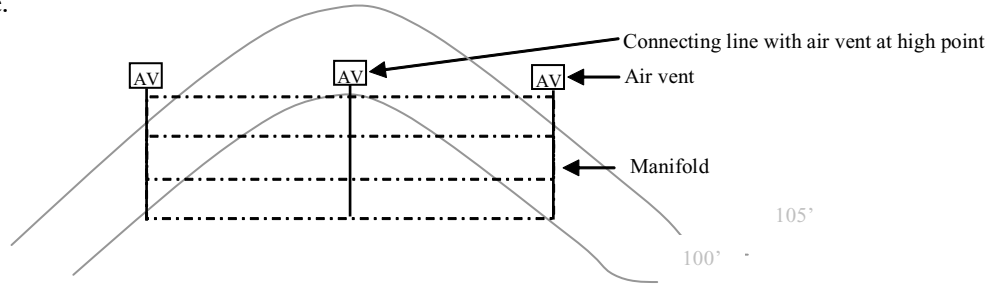
a.) High Points and siphoning

A potential problem with buried drip lines is siphoning dirt into the emitters when the pump is switched off. For this reason:

i) At least one vacuum breaker should be installed at the highest point in each zone. It is best practice to install one at the high point of the supply and one at the high point of the return manifold.

ii) Drip lines should be connected at the end to a common return line with a flush valve.

iii) Run dripline along a contour if at all possible. Avoid installing lines along rolling hills where you have high and low points more than 3 ft. off contour along the same line. If the dripline is installed over a ridge, as shown below, connect all the high points together and install a vacuum breaker on the connecting line.



b.) Dripline Pressure Tolerances

As water travels through a manifold or uphill, pressure decreases, or conversely, if water moves downhill pressure increases, which can affect the flow variation between the first dripline and the last dripline on the manifold.

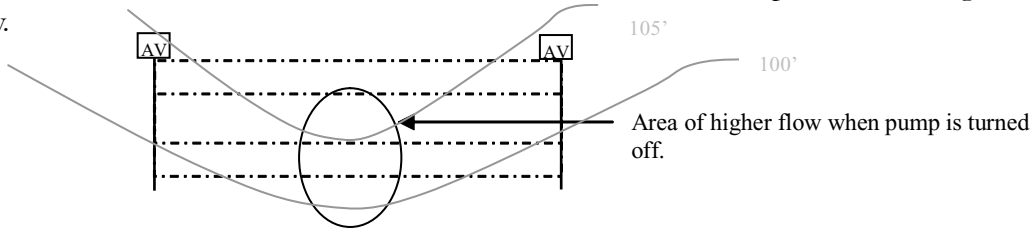
WASTEFLOW Classic: The Classic dripline can be operated in a range of 10 to 45 psi, however too wide a variance in the pressure in a single field will result in too high a variance in flow within that field. As a rule of thumb, if the level variation within a WASTEFLOW Classic zone exceeds six feet, individual pressure regulators should be placed for each six-foot interval.

WASTEFLOW PC: PC dripline can tolerate very large height variations provided the pressure remains within the 7 to 60 psi range, and preferably within 10 to 45 psi.

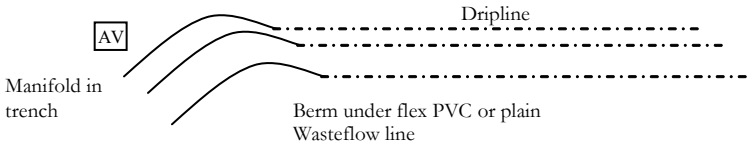
c.) Low Head Drainage

At the end of each dosing cycle, consideration must be taken for gravity. Where is the water going to drain when the pump shuts off? Water in the dripline will flow down to the lowest point within the drip zone. This is called "lowhead drainage." Use the following precautions to mitigate lowhead drainage.

i. The dripline should run along the contour if at all possible because water will run to the lowest point of the line every time the pump is turned off. If the lowest point in the line is in the middle of the lateral, there will be excess flow at this point. See Diagram below.



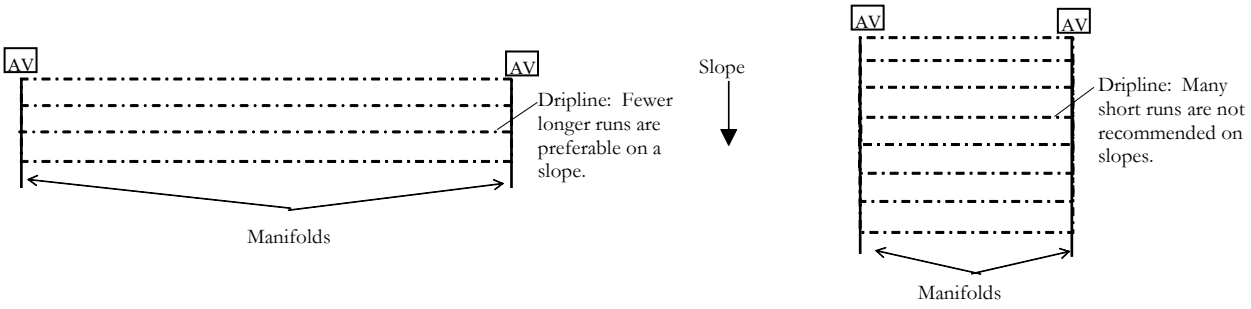
ii Have the dripline pass over an elevated berm between the manifold and beginning of the tubing to reduce gravity flow out of the lateral. In looped systems, elevating the loop will keep the effluent in its respective run.



iii. Use check valves or multiple zones to isolate the drip laterals. Check valves should only be used if there is no risk of freezing in the manifolds. They are placed on the supply and return manifolds coupled with an airvent on the downhill side. If unsure, as a rule of thumb, use a maximum of 1500 ft of Geoflow dripline within each zone or section.

iv. Install short manifolds with fewer longer dripline runs.

v. Slope the supply and return manifolds down to the pump tank so the effluent drains back down to the tank when the pump is turned off. Open the zone valves fully to drain the lines quickly.



Concentrate drip lines at the top of the hill with wider spacing towards the bottom. In the case of compound slopes consult a professional irrigation designer or engineer.

8. Multiple Zones

Drip dispersal fields can be divided into multiple zones or sections with solenoid valves or index valves for the following reasons:

a.) Steep slopes with a risk of lowhead drainage can be subdivided to distribute the water at system shut-down more uniformly in the field.

b.) Smaller zones reduce the required flow per minute which consequently reduces the size of the pump ,valves filters, supply and return lines.

c.) Subdividing the field is a tool used to achieve the optimum ranges required to efficiently operate the pumps, filters and valves.

d.) If the dispersal field is located in multiple areas on the property.

e.) To accommodate varying soils or vegetation on a single site.

Note. On multiple zones, a single Wasteflow Headworks can be used for filtration and flushing by placing zone valves downstream of the Headworks box. All zones would require a check valve on the individual flush lines upstream of each line joining a common flush line to keep flush water from one zone entering any other zone during the flush cycle. (See Geoflow Design Detail No. 588)

If the effluent has not been through secondary treatment, then each zone should have a dedicated filter or Wasteflow Headworks.

9. Winterization

Buried drip systems are not prone to frost damage because, in their design, vacuum release and drain valves are provided. The dripline itself is made of polyethylene and not susceptible to freezing. It drains through the emitters so it will not be full of water after pumps are turned off. Please follow these precautions:

a.) Manifolds, supply lines and return lines must be sloped back to their respective dosing or treatment tanks or buried below frost depth and or insulated. These lines need to drain rapidly. Be sure drain valve on flush line remains open long enough for entire field to drain.

b.) Remove the check valve at the pump.

c.) Insulate equipment boxes, including Headworks box or filter and field flush valve boxes as well as zone dosing valves, pressure regulator and air vacuum relief valves. Use closed-cell insulation such as Perlite in a plastic bag. Place metal pins near, or in, the boxes to help locate them when under snow.

d.) In severe freezing conditions, use heat tape or small heater in the Headworks box.

e.) When installing PVC supply and return lines and manifolds be sure there are no dips in the lines. This can be avoided by using large diameter pipes (over 2") or by using schedule 80 pipe.

f.) The top of air vacuum relief valves must be no higher than soil surface.

g.) If using an index valve to split field zones, be sure it is capable of self-draining.

h.) WASTEFLOW lines will self-drain through the emitters into the soil. If the cover crop over the dripfield is not yet adequately established, add hay or straw over the field for insulation.

i.) Mark the valve box with a metal pin so you can find it in the winter when covered in snow.

j.) If using manual filter flush valves or manual field flush valves, they should be left cracked open slightly to provide for rapid drainage of the flush line in freezing conditions.

k.) Fields dosed with relatively small quantities of effluent are more likely to freeze than those dosed with design quantities. If winter use is less than summer use, then only use proportional number of fields to maintain water application rates in the field being dosed.

10. Lightning Protection



A direct lightning strike on your valve, controller or wire is going to cause unpreventable damage. It is difficult to completely prevent electricity from spreading as it jumps across air, runs along electrical wires and may even travel along your water pipes. Power fluctuations can be prevented. The controllers are built to take some electrical surge and pass it through to the ground without damage. This requires a ground wire connected to a grounding stake driven deep into the ground. The best protection would be to use a separate ground wire or rod, do not rely on the third ground wire in the building's electrical wiring circuits. If you are installing this system in an area with frequent lightning storms, we advise you to install a separate grounding rod. Each field controller must have at least one eight foot copper clad steel ground rod 5/8" in diameter, driven all the way into the ground, as close as possible to the controller. This is to be connected to the grounding lug on the back-plate of the panel. If the rod can't be driven in all the way, cut if off and drive in the remaining piece 2-3' from the other rod and connect the rods together with 6 AWG solid copper wire. Follow local electrical codes. Inputs to the controller are more sensitive than outputs, so Geoflow offers a metal oxide varistor that protects the incoming power. It includes a metal strip for the controller power and relays for the floats. If hit, the metal or the relays are merely replaced. These are wired into the Geo controller.

11. Reuse for Irrigation

A good vegetative cover is an advantage to prevent erosion from the field and utilize water applied to the rooting zone. Sites should be planted or seeded immediately after installation. Grasses are particularly suitable for this application. Most lawn grasses will use 0.25" to 0.35" (6.3-8.9mm) of water per day during the peak growing season. This calculates to be about 0.16 to 0.22 gal/ft^2/day. By over-seeding lawns with winter ryegrass, this use efficiency can be continued through much of the year. For vegetation using 0.16 to 0.22 gal/ft^2/day by evapotranspiration, a sewage flow of 1000 gallons per day would supply the water needs of a landscaped area of 4600 to 6400 sq. ft. without having to add fresh water. For areas larger than this, the plants will suffer water stress during the hot months unless additional fresh water is applied.

12. Water Application Formula

To determine the rate of application for various drip irrigation designs, use the following formula:

Water application (inches per hour) = (231 x (emitter flow rate gph)) / ((Emitter spacing inches) x (dripline spacing inches))

Example: Dripline with 1.3 gph flow rate emitters spaced 24" apart and dripline spaced 24" apart.

Water application = (231x1.3)/(24x24) = 0.52 inches of water per hour.

WORKSHEET:

The following worksheet is a simplistic guideline and is available as an Excel spreadsheet. It can be downloaded from Geoflow's homepage at www.geoflow.com. If you would like a copy sent to you at no charge, phone 800-828-3388.

To calculate the area required for your drip dispersal system you must know:

1. the quantity of effluent to be disposed of (in gallons per day) and
2. the soil acceptance rate (i.e. gallons per day per square foot).

Make a sketch of the dispersal area with contour lines.

WORKSHEET 1 - DISPERSAL FIELD DESIGN FOR SINGLE ZONE SYSTEM

Worksheet Dispersal Field	Formula
A. Quantity of effluent to be dispersed per day _____ *gpd*	
B. Soil type or hydraulic loading rate _____ *loading rate (gal/sq. ft./day)*	*Based on soil analysis* *Refer to State or Local regulations. If none, refer to Table 1 and 2 on page 9 & 10*
C. Determine the total area required _____ *square ft*	*Divide gpd by loading rate. A/B*
D. Choose the spacing between each WASTEFLOW line and each WASTEFLOW emitter *i)*_____ *ft. between WASTEFLOW lines* *ii)*_____ *ft. between WASTEFLOW emitters*	*Standard spacing is 2 ft.*
E. How many linear feet of dripline in the total area?_____ *ft.*	*(Area / 2) for 2ft. line spacing. C/2.0 or* *(Area / 1) for 1 ft. line spacing.. C/1.0 or* *(Area / 1.5) for 1.5ft line spacing. C/1.5*
F. Calculate the number of emitters _____ *emitters*	*(Linear ft. of dripline / 2) for 2 ft emitter spacing. E/2 or* *(Linear ft. of dripline / 1) for 1 ft emitter spacing. E/1 or* *(Linear ft. of dripline /1.5) for 1.5 ft emitter spacing E/1.5*

Worksheet Dispersal Field	Formula
G. Choose pressure compensating or Classic dripline _____ *WASTEFLOW Classic dripline or* _____ *WASTEFLOW PC ½ gph dripline* _____ *WASTEFLOW PC 1 gph dripline*	*See page 4 and Appendix 1 for details*
H. Determine dripfield pressure _____ *psi*	*Standard pressure is 20 psi.* *WASTEFLOW Classic systems need between 15 and 45 psi (34.7 and 104 ft.) at the start of the dripfield.* *WASTEFLOW PC systems need between 10 and 45 psi (23.1 ft. to 104 ft.) at the start of the dripfield.*
I. Determine feet of head required at dripfield _____ *ft. of head*	*Multiply pressure by 2.31 to get head required.* *H x 2.31*
J. What is the flow rate per emitter? _____ gph / emitter	*See WASTEFLOW flow rates in Appendix 1.*
K. Determine total flow for the area _____ *gph* _____ *gpm*	*Number of emitters multiplied by the emitter flow rate at the design pressure.* *Gph = No of emitters (F) x gph per emitter (J)* *Gpm = gph/60*
L. Select pipe diameters for manifolds and submains _____inches	*Based on total flow from (K) above, in gpm. See schedule 40 friction loss charts at the back of the appendixes. Optimum velocity is between 2 and 5 ft. per second.*
M. Select Filter or WASTEFLOW Headworks _____ Filter _____ WASTEFLOW Headworks	*Based on total flow from (K) above, in gpm. See minimum and maximum flow recommendations for each filter in Appendix 2.*
N. Sketch a layout of the WASTEFLOW lines in the dispersal plot to make sure that the maximum lateral length of each WASTEFLOW line is not exceeded.	*See Maximum Length of Run table in Appendix 1.*

Worksheet 2 - Select Pump

Worksheet - Pumps		Formula
O. Minimum pump capacity	_____ gpm	*From (K)*
P. Header pipe size	_____ inches	*From (L)*
Q. Pressure loss in 100 ft. of pipe	_____ psi	*Refer to PVC charts.*
R. Friction head in 100 ft. of pipe	_____ ft. of head	*Multiply psi from (Q) above by 2.31*
S. Static head		
i) Height from pump to tank outlet	_____ft.	*Number of ft.*
ii) Elevation increase or decrease	_____ft.	*Height changes from pump to dripfield*
T. Total static head	_____ft.	*Add (Si) + (Sii)*
U. Friction head		
i) Equivalent length of fittings	_____ft.	*Estimate loss through fittings – usually inconsequential for small systems.*
ii) Distance from pump to field. X 2	_____ft.	*Measure length of sub-main supply & return*
iii) Total equivalent length of pipe.	_____ft.	*Add (Ui) + (Uii)*
iv) Total effective feet.	_____ft.	*(Uii)/ 100 x (R)*
v) Head required at dripfield	_____ft.	*See line (I) in Worksheet 1 above.*
vi) Head loss through filter or Headworks	_____ft.	*See pressure loss for filters in Appendix or see pressure loss for Headworks box in Appendix Multiply pressure by 2.31 to get head loss.*
vii) Head loss through zone valves	_____ft	
V. MINIMUM Total friction head	_____ft	*Add (Uiv) + (Uv) + (Uvi) + (Uvii)*
W. MINIMUM Total Dynamic Head	_____ft.	*Add (T) + (V)From line item (O) above*
X. MINIMUM pump capacity NOTE: Some States and Counties require additional flow for flushing. Please check your local regulations. If you need help on flushing design, see Geoflow's flushing worksheet at www.geoflow.com or call Geoflow at 800-828-3388.	_____gpm	
Y. Choose the pump. _____ _____ model number _____ _____ Manufacturer		*Based on pressure from line (W) above and flow from line (X) above.*

SYSTEM INSTALLATION

1. Installation Guidelines

All Geoflow drip systems require:
- Filtration with 120 mesh/130 micron
- Filter flush valve
- Field flush valve
- 2 Air vents in each zone
- All Wasteflow Classic drip systems require pressure regulation

Handle your dripline and components with care. nano-ROOTGUARD® is temperature sensitive. To assure a long life, store the dripline out of direct sunlight in a cool place.

a) All dripfield construction shall be done in accordance with Local rules and regulations.

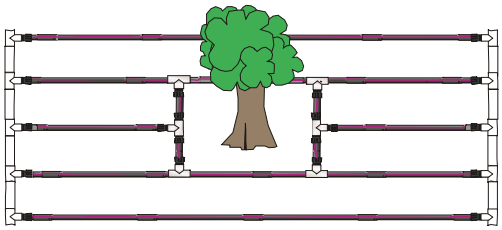
b) Protect the site prior to installation. Construction traffic and material stockpiling can change the soil profile. Fence off entire dripfield prior to any construction. No utilities, cable wire, drain tile, etc shall be located in dripfield.

c) System is not to be installed when ground is wet or frozen. When the moisture in the soil is near the plastic limit (soils will ribbon and not easily crumble), it will be prone to smearing.

d) Prior to construction note if any water is accessing the location of the dripfield. Dripfield should not be located at the low point of a site. Divert all downspouts and surface waters away from dripfield. If a curtain drain is to be used be sure it is serviceable and properly screened.

e) Excavation, filling and grading should have been finished prior to installation of the subsurface drip system. Be sure to minimize soil disturbance when clearing and grubbing the dripfield. Preserve as many trees as possible. Use light track equipment for tree removal and grind out roots to below dripline depth rather than fully removing the entire root.

f) Be sure you have everything required for the installation before opening trenches. Pre-assemble as many sets of components as practical above ground and in a comfortable place. Compression or Lockslip adapters should be glued to PVC tees, riser units should be pre-assembled, and the sub-main manifold with tees can be pre-assembled and used to mark the beginning and end of WASTEFLOW lines.



Loop dripline around trees

g) For particularly tough soil conditions, soil moisture the day before opening trenches or installing WASTEFLOW. Remember it is much easier to install the system in moist soil. The soil should be moist but still allow the proper operation of the installation equipment and not cause smearing in the trenches. The soil surface should be dry so that the installation equipment maintains traction.

h) Mark the four corners of the field. The top two corners should be at the same elevation and the bottom two corners should be at a lower elevation. In freezing conditions the bottom dripline must be higher than the supply and return line elevation at the dosing tank.

i) Install the dosing tank. It is critical that the tank is waterproof. If installing a riser, check that it is watertight, and the entry and exit ports are completely sealed. In freezing conditions the dosing tank should be at the lowest elevation of the entire system. Lid should be placed at grade and water should be able to shed over it.

j) Install zone valves; solenoid or hydraulic index valves.

k) Install the PVC supply line from the dosing tank, up hill through one lower and one upper corner stake of the dispersal field. Please refer to your State guidelines for depth of burial.

l) Paint a line between the two remaining corner stakes.

m) Install the Geoflow WASTEFLOW dripline from the supply line trench to the painted line, approximately 6" to 10" deep as specified. Upon reaching the painted line, pull the plow out of the ground and cut the dripline 1' above the ground. Tape the end of the dripline to prevent debris from entering. The tubing expands in warm temperatures and contracts in cold temperatures. If installing during the warmer months, be sure to allow some play in the tubing so it will not pull out of the fittings when it gets cold. Continue this process until the required footage of pipe is installed. Geoflow dripline must be spaced according to specification (2 ft. is standard). Depth of burial of dripline must be consistent throughout the field. Take care not to get dirt into the lines.

n) If the system is looped, install the looped ends with Geoflow plain tubing or flex PVC. If in a cold climate be sure to pitch these slightly so they do not hold water and freeze. The loops are to be installed on the outside of the measured field.

o) Install the supply header with tees lined up at each Geoflow line. Hook up the Geoflow lines to the supply header. Do not glue WASTEFLOW dripline.

Lockslip Fittings Installations

i. Hold the fitting in one hand and position the tubing with the other hand.
ii. Move the sleeve back, and push the tubing onto the exposed stem as far as possible.
iii. Push the sleeve out over the tubing and thread the sleeve onto tubing, as though tightening a nut to a bolt. Hand tighten. Do not use tools.
iv. Test the connection to make sure the sleeve threads have gripped the tubing tightly.

p) Install the filter headworks between the field and the pump tank on the supply line. Insulate the box in freezing conditions. When using an open bottom headworks box, place a rodent barrier down first. This can be made from bricks, paving stones, chicken wire, 3 layers of filter fabric or a 6" minimum depth of 1" gravel. Support the pipes entering and exiting the headworks with gravel.

q) If using a pressure regulator, install it downstream of the filter headworks, just ahead of the dispersal field, on the supply line. Although the pressure regulator can be buried directly into the soil, it is preferable to install it inside a small valve box for easy access. *Insulate the box in freezing conditions.

r) Install the floats in the dosing tank and wire up to the timer control. The timer control should be set to pump no more than the design flow, do not set to match the treatment capacity.

s) Install the pump. Fill the dosing tank with fresh water and turn on the pump. Check for flow out the ends of all of the Geoflow lines. Let the pump run for about five minutes to flush out any dirt. Shut off the pump and tape the ends of the lines.

t) Dig the return header ditch along the line painted on the ground and back to the pre-treatment tank. Start the return header at the farthest end from the dosing tank. The return line must have slope back to the treatment tank, septic tank or pump tank.

u) Install the return header and connect all of the Geoflow lines. Care must be taken not to kink the dripline.

v) Install air vacuum breakers at the highest points in the dispersal field. Use pipe dope or Teflon tape and hand tighten. Use a 6" minimum depth of 1" gravel below the boxes to keep rodents out. Insulate in freezing climates.

w) Install a ball or solenoid field flush valve on the return line to the pretreatment or pump tank unless a pre-assembled Wasteflow Headworks is being used. If a Headworks was installed on the supply line, connect the return line back through the Headworks box. Support the return pipe before it enters the Headworks with gravel. If using electric solenoid valves, connect the valve common and an individual output wire to the solenoid leads using watertight electrical connectors.

x) Allow glue fittings 1 – 2 hours to set. Open the field flush valve and turn on the pump to flush lines then close the valve and check the field and all piping and connections for leaks. Turn off the system

y) Check filters and valves for construction debris.

z) Turn on the pump and check:

i. Pressure at the air vacuum breaker(s) against design pressure. Check the pressure in the **WASTEFLOW HEADWORKS.** It should be five PSI or higher. If pressure gauges are on each side of the filter, noter these for benchmark differential pressure across the filter. If using a manual valve for field flushing, crack it open until at least on PSI is lost or design pressure is reached and leave in that position.

ii. Flow rates from flow meter or draw down on tank. Compare to design flow.

iii. Wet spots in the field. If any sections are particularly wet, determine if they are caused by faulty connections, drippers or shallow burial.

iv. Check that solenoid valves are functioning. Close the internal manual bleed after flushing the system. If solenoid will not close, first clean the solenoid with caution not to lose small spring, and if this fails, open the bonnet and clean the inside.

aa) Establish vegetation cover as specified.

bb) Provide owner with final as-built diagrams flow measurements and pressure readings at startup.

cc) Provide controller records at startup, including elapsed time meter, pump counts, secondary override counts, highwater counts and primary float counts.

dd) Solenoid Valve Installation and Operation

i. Wrap male adapters with 2 wraps of Teflon tape and thread the adapters into the valve inlet and outlet 1 turn past hand tight. CAUTION: over tightening may cause damage to the valve. The solenoid is located on the downstream side of the valve.

ii. Flush the laterals by opening the internal manual bleed lever on the downstream side of the solenoid. Turn the flow control stem fully open (counterclockwise) for flow control models.

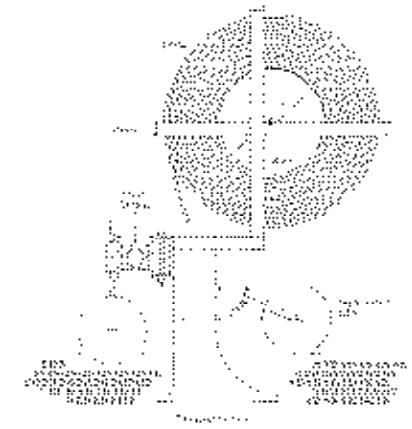
iii. Check that solenoid valves are functioning.

Table 3. Subsurface Drip Installation Methods

NOTE: Disturbing the soil may affect the pore structure of the soil and create hydraulic conductivity problems. Please consult with your soil scientist or professional engineer before making the installation technique decision.

INSTALLATION METHOD *	ADVANTAGES	DISADVANTAGES
a) Hand Trenching*	• Handles severe slopes and confined areas • Uniform depth	• Slow • Labor intensive • Disrupts existing turf and ground • Back fill required
b) Oscillating or vibrating plow . Use the type that inserts the dripline directly in place, not one that pulls the dripline through the soil.	• Fast in small to medium installations • Minimal ground disturbance • No need to back fill the trench	• Depth has to be monitored closely • Cannot be used on steeper slopes(>20%) • Requires practice to set and operate adequately • Tends to "stretch" pipe. Shorter runs are required
c) Trenching machine: Ground Hog, Kwik-Trench, E-Z Trench*	• Faster than hand trenching • May use the 1" blade for most installations • Uniform depth	• Slower, requires labor • Disrupts surface of existing turf • Back fill required
d) Tractor with dripline insertion tool - see diagram 2.	• Fast • Little damage to existing turf because of the turf knife • Minimal ground disturbance • Does not stretch drip line • Adaptable to any tractor	• The installation tool is designed specifically for this purpose.
e)Tractor mounted 3-point hitch insertion implement	• Fastest. Up to four plow attachments with reels • A packer roller dumps back soil on top of the pipe	• Suitable for large installations only

* Installation methods are left to the discretion of the contractor and/or the engineer. Other installation methods may be used as long as care is taken to protect the tubing and the soil.



Diag. 2 Installation Tool

Worksheet 3 - As Built System Description

1. Site name: _____
2. Site address including State: _____
3. Dripfield designed by: _____
4. Dripfield installed by: _____
5. Date of installation: _____
6. Daily design flow: _____ gpd.
7. Soil percolation rate: _____
8. Is there secondary treatment on this job site? _____Yes _____No

   If "Yes" to question 8 above, please name manufacturer and model number:_____

9. Number of zones in dripfield: _____ If more than 1 zone, circle the valve used Hydraulic or Solenoid
10. Amount of dripline installed in each zone:

    Zone 1_____ ft. Zone 2_____ ft. Zone 3_____ ft. Zone 4_____ ft.

11. Wasteflow dripline model number &/or description: _____
12. Flow rate per zone:

    Zone 1_____ gpm. Zone 2_____ gpm. Zone 3_____ gpm. Zone 4_____ gpm.

13. Depth dripline installed below grade: _____ inches
14. Pump manufacturer, model number and number of pumps:_____
15. Filter or Headworks model number &/or description:_____
16. Pressure in each zone:

    Zone 1_____ psi Location pressure measured:_____

    Zone 2_____ psi Location pressure measured:_____

    Zone 3_____ psi Location pressure measured:_____

    Zone 4_____ psi Location pressure measured:_____

17. Size of filter flush valve: _____ inches. Is the filter flush valve manual or automatic? _____
18. Size of field flush valve: _____ inches. Is the field flush valve manual or automatic?_____

If more than 1 zone, do the zones (a) share 1 flush valve or (b) does each zone have its own flush valve?

19. Was any fill material supplied on the dripfield? _____

If "yes" to 18 above describe fill quality and quantity added. _____ _____
_____

20. Please provide owner with as-built drawings, including but not limited to direction of drip lines, location of air vents, pressure regulators if applicable, Headworks (filter and valves) and pump tank.
21. Startup Controller readings:

    ETM____ Pump ct.____ Secondary timer ct.____ High alarm ct.____ Primary ct.____

22. Note how long it takes to drain return line in freezing climates, and set controller

SYSTEM MAINTENANCE

The best way to assure years of trouble free life from your system is to continuously monitor the system and to perform regular maintenance functions. For large systems or systems with a BOD > 30 mg/l automation of maintenance is essential. For smaller systems with a BOD < 30 mg/l inspection and maintenance should be performed every six months.

Routine and Preventative Maintenance

1) Clean the filter cartridge. This may be done with a pressure hose. The screen filter cartridge should be cleaned from the outside inwards, while the discs in the disc filter cartridge should be separated and then cleaned. If bacteria buildup is a problem, we advise first trying lye, and if the problem persists, soak the filter cartridge in a chlorine bath - a mixture of 50% bleach and 50% water.
2) Open the field flush valve and flush the field for 3-5 minutes by activating the pump in "manual" position. Close the flush valve. On automatic solenoid valves the manual bleed lever should always be in the closed position and the dial on top should be free spinning. This allows it to open when pulsed electrically. Clockwise rotation closes valve.
3) With the pump in the "manual" position, check the pressure in the drip field by using a pressure gauge on the schrader valve located on the air vents and by reading the pressure gauge located in the Wasteflow Headworks box. The pressure should be the same as shown on the initial installation records. On systems with manual flush valves, close the field flush valve completely and then open the valve slightly until there is a 1-2 psi drop or design pressure is reached. This will allow the field to drain after each dose to prevent the manifold lines from freezing.
4) Remove the lids on the vacuum breaker and check for proper operation. If water is seen leaking from the top of the vacuum breaker, remove the cap of the vacuum breaker and press down on the ball to allow any debris to be flushed out. Be careful not to come in contact with the effluent.
5) Turn off the pump and reset the controller for auto mode.
6) Periodically remove and clean the air vents, field flush and filter flush valves.
7) Visually check and report the condition of the drip field, including any noticeable wetness.
8) Treatment and distribution tanks are to be inspected routinely and maintained when necessary in accordance with their approvals.
9) Record the elapsed time meter, pump counter, override counter, high-level alarm and power failures. This information can be obtained from the controller.

Home Owners Guide For Care and Maintenance of Geoflow Drip Dispersal Field

A drip dispersal system has been installed on your property for the subsurface dispersal of the effluent from your home.

The drip dispersal system consists of a series of ½" diameter drip tubing installed at a shallow depth of 6-10" below the ground surface. It is designed to effectively disperse the treated effluent in the ground with a combination of soil absorption and plant uptake. Your drip dispersal system will function for many years with only minimal maintenance being required, provided the following recommendations are followed:

- Establish landscaping (preferably a grass cover) immediately. This will stabilize the soil and allow for the grass to take up the water.
- Do not discharge sump pumps, footing drains or other sources of clear water to the system, except for the effluent discharge from your treatment system.
- Maintain all plumbing fixtures to prevent excess water from entering the dispersal system.
- Do not drive cars, trucks or other heavy equipment over the drip dispersal field. This can damage the drip components or the soil and cause the system to malfunction. Lawn mowers, rubber wheeled garden tractors and light equipment can be driven over the drip field.
- Do not drive tent stakes, golf putting holes, croquet hoops etc., into the dispersal field.
- Contact your service company if your high water alarm should sound. The pump chamber is sized to allow additional storage after the high water alarm sounds but you should refrain from excessive water usage (i.e., laundry) until the system has been checked.
- After a temporary shut down due to a vacation or other reason, the treatment plant ahead of the drip field filter initially may not function effectively, resulting in the filter blocking.Refer to maintenance guidelines above to clean the filter.

  Contact your service company if you notice any areas of excessive wetness in the field. In most cases, this is usually caused by a loose fitting or a nicked dripline and can be easily repaired. Note: There may be some initial wetness over the dripline following the system's installation. This should cease once the ground has settled and a grass cover is established.

Site Inspection Sheet

Site Address _____ **Date**_____

Site observations

1 Is dripfield located at the lowest point in the site where all waters may pond?
2 Is there any water coming in from neighbors? Downspouts? Irrigation?
3 Construction debris anywhere near the site, or compaction from construction or other causes?
4 How wet is the field before digging?
5 Will effluent drain back to tank in freezing climates? If not, is equipment insulated from freezing?

Pump tank

1 Watertight?
2 At grade. Allow surface water to run off.
3 Inlet and outlet lines to be laid in gravel or compacted soils.
4 Float tree designed for easy removal for service and adjustment.
5 Float settings correct to design?
6 Pump set a few inches up from the bottom of the tank.
7 Waterproof wire nuts used to wire pump junction box.

Headworks - Filter and flush valves

1 Waterproof wire nuts used in wiring solenoid valves.
2 Is filter large enough to handle flow? Is it appropriate for the treatment unit?
3 Clean filter and valves after construction.
4 Check filter everytime system is serviced, and clean filter element.
5 Clean valves if they do not close properly. See if different valves have different toggles.
6 Insulate in freezing climates.
7 Have minimum of 1/2ft depth of 1" gravel under the Headworks for drainage and to keep gophers out.
8 Check pressure - across filter (if available).
9 Check pressure - on return line pressure should be as designed. Lower than 5 psi may be too low.

Zone valves

1 Index valves - Requires 10 gpm min. flow, needs to self drain in freezing climate.
2 Solenoids - Clean after installation if they do not close properly.

Supply and return lines

1 Make sure they are supported going into and out of the Headworks.
2 No dips.
3 Make sure water from dripline does not flow back into supply and return trenches.

Dripline

1 On contour.
2 Burial depth.
3 Check for kinking and local undulations (low areas) in installed driplines.
4 Flush lines during construction.
5 Is there ponding on surface?
6 Cover crop over field?

Airvents

1 Point of pressure measurement.
2 Insulate in freezing climates.
3 Make sure they are not in a position for surface or subsurface water to enter the system.
4 Check pressure at airvents. Should be as designed. Less than 7psi may be too low..

Return to?

1 Pump tank? Don't churn the tank on return.
2 Pretreatment? Can the equipment handle the additional flow.

Controller

1 Check field programmable settings against design.
2 Proper wiring of controller….wire floats and valves.
3 Keep moisture from running up wire into controller.

Notes

1 Use sheet for "As built" in Design Guidelines.
2 Keep a record of start-up pressures and system data screens.

Comments:

TROUBLE SHOOTING GUIDE:

Symptom: High water alarm activates periodically (1-2 times/week). During other times the water level in the pump chamber is at a normal level.

Possible cause: Peak water usage (frequently laundry day) is causing a temporary high water condition to occur.

Remedy: Set timer to activate the pump more frequently. Be sure to not exceed the total design flow. To avoid this, reduce the duration of each dose.

Remedy: Provide a larger pump tank to accommodate the peak flow periods.

Symptom: High water alarm activates during or shortly after periods of heavy rainfall.

Possible cause: Infiltration of ground/surface water into system.

Remedy: Identify sources of infiltration, such as tank seams, pipe connections, risers, etc. Repair as required.

Symptom: High water alarm activates intermittently, including times when it is not raining or when laundry is not being done.

Possible cause: A toilet or other plumbing fixture may be leaking sporadically but not continuously. Check water meter readings for 1-2 weeks to determine if water usage is unusually high for the number of occupants and their lifestyle. Also determine if water usage is within design range.

Remedy: Identify and repair fixture.

Symptom: High water alarm activates continuously on a new installation (less than 3 months of operation). Inspection of the filter indicates it is plugged with a gray colored growth. Water usage is normal. being done.

Possible cause: Slow start-up of treatment plant resulting in the presence of nutrient in the effluent sufficient to cause a biological growth on the filter. This is typical of lightly loaded treatment plants that receive a high percentage of gray water (i.e., from showers and laundry),

Remedy: Remove and clean filter cartridge in a bleach solution. Add a gallon of household bleach to pump tank to oxidize organics. Contact treatment plant manufacturer for advice on speeding up the treatment process possibly by "seeding" the plant with fresh activated sludge from another treatment plant.

Symptom: Water surfaces continuously at one or more isolated spots, each one foot or more in diameter.

Possible cause: Damaged drip line or a loose connection is allowing water be discharged under pressure and therefore at a much greater volume than intended.

Remedy: Dig up drip line. Activate pump and locate leak. Repair as required.

Possible cause: If water is at base of slope, can be caused by low-head drainage.

Remedy: Install check valves and airvents in the manifolds to redistribute water in the system after pump is turned off. This is not advised for freezing climates where manifold drainage is required.

Symptom: A portion of the drip field closest to the feed manifold is saturated while the rest of the field is dry.

Possible cause: Insufficient pump pressure. A pressure check at the return manifold indicates pressure of less than 10 psi.

Remedy: Check filter and pump intake to insure they are not plugged. If they are, clean as require.

Remedy: Leaks in the system may be resulting in loss of pressure. Check for water leaks in connections and fittings or wet spots in the field. Also check air vents to insure they are closing properly. Repair as necessary.

Remedy: Pump is worn or improperly sized. Pressure at feed manifold in less than 15 psi. Verify pressure requirements of system and provide a new or larger pump. As an alternate approach, the drip field may need to be divided into two or more zones.

Possible cause: The duration of each dose is of insufficient length to allow the drip field to become pressurized before the pump shuts off (or runs for only a brief time before turning off).

Remedy: Increase the pump run time and decrease the frequency of doses. Always calculate (or observe during field operation) how long the system takes to fully pressurize and add this time to the design dosing duration.

Symptom: High water alarm begins to activate continuously after a long period (1-2 years) of normal operation. Inspection of the filter indicates it is plugged with a heavy accumulation of sludge.

Possible cause: A buildup of solids in the pump tank due to carryover from the treatment plant.

Remedy: Replace the filter cartridge with a clean cartridge. Check the pump tank and if an accumulation of solids is noted, pump the solids out of the pump tank. Also, check the operation of the treatment plant to insure it is operating properly.

Symptom: Water surfaces at several spots in drip field during dosing periods. Installation is recent, less than 6 months of usage and the soil is a moderate to heavy clay. Possibly, the installation was completed using a non-vibratory plow.

Possible cause: Smearing of the soil may have occurred during installation of drip line. Also, the "cut" resulting from the installation allows an easy path for the water to surface during dosing.

Remedy: In most cases the sod will compact naturally around the drip line and the surfacing will diminish and ultimately cease. To help, reduce the duration of each dose and increase the number of doses/day. Also, it will help to seed the area to encourage the development of a good root zone.

Symptom: Entire area of drip field is wet, soft and spongy. It appears to be totally saturated with water. Situation occurs during dry season when there is little rainfall.

Possible cause: Water being discharged to drip field exceeds design. Excess water may be a result of infiltration, plumbing leaks or excessive water usage.

Remedy: Check water meter, elapsed time meter, pump counter, override counter or high level alarm counter to determine if water usage is in excess of design. Check for leaks or infiltration. Repair leaks as required. Reduce water usage by installing water saving fixture.

Remedy: If water usage cannot be reduced, enlarge drip field as required.

Possible cause: Area of drip field was inadequately sized and is too small.

Remedy: Provide additional soil analysis to verify sizing and enlarge as required.

Valve Troubleshooting

Symptom: Valve will not open manually

Check water supply and any possible master or gate valves to insure they are open.
Check that the valve is installed with the arrow pointing in the downstream direction
Check that the flow control is fully open, counterclockwise.
Turn off the water supply. Remove the solenoid and check for debris blocking the exhaust port.
Turn off the water supply. Remove the cover. Inspect the diaphragm for damage and replace if necessary.

Symptom: Valve will not open electrically

Check voltage at controller for 24 VAC station.
Check voltage across the solenoid lead wires for minimum 21 VAC.
Make sure handle on top of valve is free spinning. Not all the way open or all the way closed.
If the valve still does not operate, electrically replace the solenoid.

Symptom: Valve will not close

Insure the manual bleed lever is in the closed position.
Check for leaks around the flow control, solenoid or between valve cover and body.
Turn off the water supply. Remove the solenoid and check for debris or damage to the exhaust port.
Turn off the water supply. Remove valve cover and inspect for debris under diaphragm or debris in diaphragm ports.

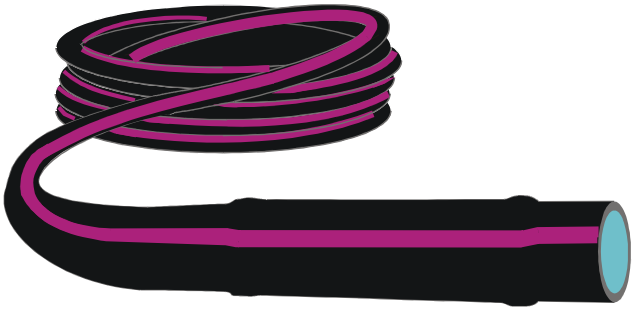
Symptom: Slow leak

Check for dirt or gravel embedded in the diaphragm seat.
Check actuator and exhaust fitting for proper seating.

WASTEFLOW™ Dripline

Description

The flexible 1/2" polyethylene dripline has large emitters regularly spaced in the line. With the dripline hidden about six inches below ground, effluent is distributed slowly and uniformly, reducing ponding, even in difficult soils and hilly terrain. WASTEFLOW is built to last. It is guaranteed to be trouble-free from root intrusion with built-in nano-ROOTGUARD® protection, and the dripline wall is protected from organic growth with the *Geoshield* lining. WASTEFLOW provides uniform distribution. The emitters have a Coefficient of variation of less than .05.



Different flow rates, dripline diameters and emitter spacings can be special ordered.

Use 600 series compression adapters or lockslip fittings to connect the dripline to PVC pipe.

nano-ROOTGUARD® Protection

NEW

WASTEFLOW dripline features patented nano-ROOTGUARD technology to prevent roots from clogging the emission points. The pre-emergent, Treflan®, is bound into WASTEFLOW emitters when they are molded to divert roots from growing into the emitter outlet. The system is guaranteed against root intrusion for 15 years.

BACTERICIDE Protection

Geoshield® is incorporated into the inner lining and emitters of WASTEFLOW dripline to prevent bacteria from forming and eliminates the need to scour the tubing. It is a tin based formula that defeats the energy system of microbial cells.

This means smaller pumps or larger zones can be used with WASTEFLOW dripline than unprotected dripline.

PC vs. CLASSIC

Geoflow, Inc. offers WASTEFLOW dripline in both pressure compensating (WASTEFLOW PC) and non-compensating (WASTEFLOW Classic) models.

We recommend that WASTEFLOW PC be used when the advantages are of substantial economic value.

a) Very long runs.

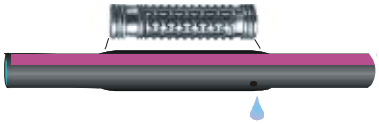
b) Steep slopes. Systems should be designed for the dripline lateral to follow the contour. If this is possible, the extra cost of pressure regulators required for WASTEFLOW Classic would likely be less than the incremental cost of WASTEFLOW PC.

c) Rolling terrain. If the difference in height from trough to peak exceeds six feet then WASTEFLOW PC should be used. Vacuum relief valves must be placed at the top of each rise.

WASTEFLOW PC and WASTEFLOW Classic can be interchanged to meet filter and zone flow requirements.

- WASTEFLOW is manufactured under US Patents 5332160,5116414 and Foreign equivalents.
- **Geoshield®** is a registered trademark of A.I.Innovations
- WASTEFLOW is a registered trademark of A.I.Innovation
- TREFLAN is a registered trademark of Dow Agro Chemicals.

WASTEFLOW Classic



Flow Rate vs. Pressure

Pressure psi	Head ft.	Flow Rate Classic Dripline
10 psi	23.10 ft.	.81 gph
15 psi	34.65 ft.	1.00 gph
20 psi	46.20 ft.	1.16 gph
25 psi	57.75 ft.	1.31 gph
30 psi	69.30 ft.	1.44 gph
35 psi	80.85 ft.	1.57 gph
40 psi	92.40 ft.	1.68 gph
45 psi	103.95	1.80 gph

Maximum Length of Run vs. Pressure

Flow variation +/- 5%

Pressure psi	Head ft.	Emitter Spacing 24”	18”	12”
10 psi	23.10 ft.	170’	165’	100’
15 psi	34.65 ft.	170’	165’	100’
20 psi	46.20 ft.	170’	165’	100’
25 psi	57.75 ft.	170’	165’	100’
30 psi	69.30 ft.	170’	165’	100’
35 psi	80.85 ft.	170’	165’	100’
40 psi	92.40 ft.	170’	165’	100’
45 psi	103.95 ft.	170’	165’	100’

Kd=0.9 Cv < .05

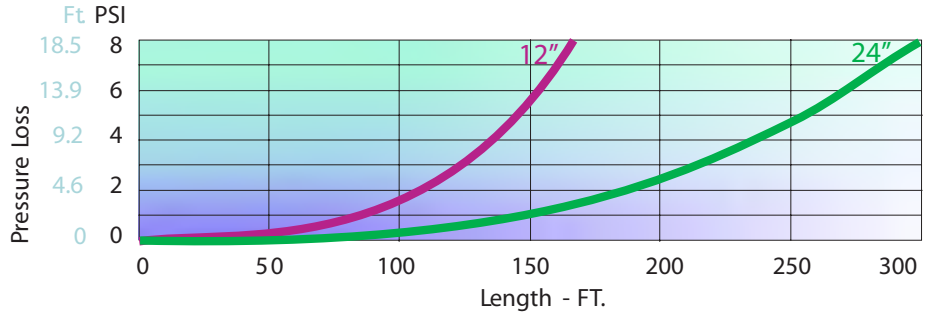
Standard Models:

WF16-4-24 WASTEFLOW Classic 24”/1.3gph
WF16-4-12 WASTEFLOW Classic 12”/1.3gph
Alternate flow rates, diameters and spacing available upon request.

WASTEFLOW Classic Specification

The dripline shall consist of nominal sized one-half inch linear low density polyethylene tubing, with turbulent flow drip emitters bonded to the inside wall. The drip emitter flow passage shall be 0.053” x 0.053” square. The tubing shall have an outside diameter (O.D.) of approximately .64-inches and an inside diameter (I.D.) of approximately .55-inches. The tubing shall consist of three layers; the inside layer shall be *Geoshield*® protection, the middle layer shall be black and the outside layer shall be purple striped for easy identification. The dripline shall have emitters regularly spaced 24” (or 12”) apart. The turbulent flow emitters shall be molded from virgin polyethylene resin. The turbulent flow emitters shall have nominal discharge rates of 1.3 gallons per hour at 20 psi. The emitters shall be impregnated with Treflan® to inhibit root intrusion for a minimum period of fifteen years and shall be guaranteed by the manufacturer to inhibit root intrusion for this period. WASTEFLOW Classic dripline shall be Geoflow model number WF16-4-24 (or WF16-4-12).

Wasteflow Classic 1 gph
Pressure Loss vs. Length of Run



WASTEFLOW PC 1/2 gph



Flow Rate vs. Pressure

Pressure	Head	Flow Rate 1/2 gph PC dripline
7-60 psi	16-139 ft.	0.53 gph

Maximum Length of Run vs. Pressure

Allows a minimum of 10 psi in the line.
Recommended operating pressure 10-45 psi.

Pressure psi	Pressure ft.	Emitter Spacing 6"	12"	18"	24"
10 psi	23.10 ft.				
15 psi	34.65 ft.		174'	260'	321'
20 psi	46.20 ft.	120'	229'	330'	424'
25 psi	57.75 ft.		260'	377'	478'
30 psi	69.30 ft.	150'	288'	415'	535'
35 psi	80.85 ft.		313'	448'	576'
40 psi	92.40 ft.	172'	330'	475'	612'
45 psi	103.95 ft.		354'	501'	651'
50 psi	115.5 ft.		363'	523'	675'
55 psi	127.05 ft.		377'	544'	700'
60 psi	138.6 ft.		403'	563'	727'

Kd = 2.070

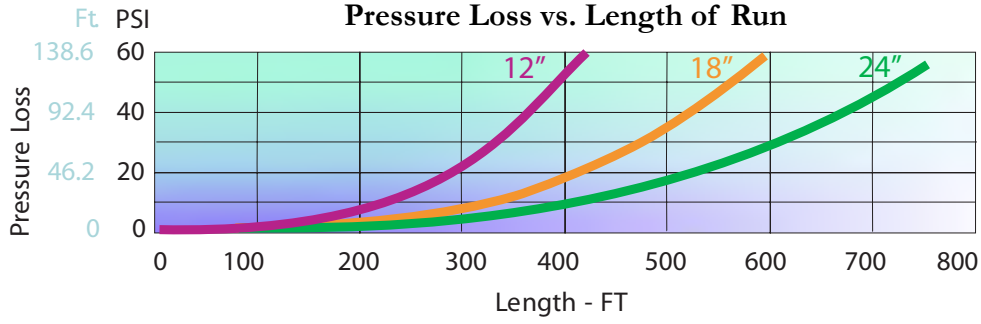
Standard Models:

WFPC16-2-24 WASTEFLOW PC 24"/.53gph or 2lph
WFPC16-2-18 WASTEFLOW PC 18"/.53gph or 2lph
WFPC16-2-12 WASTEFLOW PC 12"/.53gph or 2lph
Alternative spacing, flow rates and diameters available upon request.

WASTEFLOW PC ½ gph PC Specification

The dripline shall consist of nominal sized one-half inch linear low density polyethylene tubing, with turbulent flow drip emitters bonded to the inside wall. The drip emitter flow passage shall be 0.032" x 0.045" square. The tubing shall have an outside diameter (O.D.) of approximately .64-inches and an inside diameter (I.D.) of approximately .55-inches. The tubing shall consist of three layers; the inside layer shall be a *Geoshield*® protection, the middle layer shall be black and the outside layer shall be purple striped for easy identification. The dripline shall have emitters regularly spaced 24" (or 18" or 12") apart. The pressure compensating emitters shall be molded from virgin polyethylene resin with a silicone rubber diaphragm. The pressure compensating emitters shall have nominal discharge rates of 0.53 gallons per hour. The emitters shall be impregnated with Treflan® to inhibit root intrusion for a minimum period of fifteen years and shall be guaranteed by the manufacturer to inhibit root intrusion for this period. 0.53 gph WASTEFLOW PC pressure compensating dripline shall be Geoflow model number WFPC16-2-24 (or WFPC16-2-18 or WFPC16-2-12) .

Wasteflow PC 1/2 gph
Pressure Loss vs. Length of Run



WASTEFLOW PC 1 gph



Flow Rate vs. Pressure

Pressure	Head	Flow Rate 1 gph PC dripline
7-60 psi	16-139 ft.	1.02 gph

Maximum Length of Run vs. Pressure

Allows a minimum of 10 psi in the line.
Recommended operating pressure 10-45 psi.

Pressure		Emitter Spacing			
psi	ft.	6"	12"	18"	24"
10 psi	23.10 ft.	50'	95'	140'	175'
15 psi	34.65 ft.	63'	115'	172'	211'
20 psi	46.20 ft.	74'	146'	210'	265'
25 psi	57.75 ft.	88'	171'	242'	315'
30 psi	69.30 ft.	94'	180'	266'	335'
35 psi	80.85 ft.	103'	199'	287'	379'
40 psi	92.40 ft.	110'	211'	305'	385'
45 psi	103.95 ft.	116'	222'	321'	429'
50 psi	115.5 ft.		232'	334'	431'
55 psi	127.05 ft.		240'	347'	449'
60 psi	138.6 ft.		249'	360'	465'

Kd = 2.070

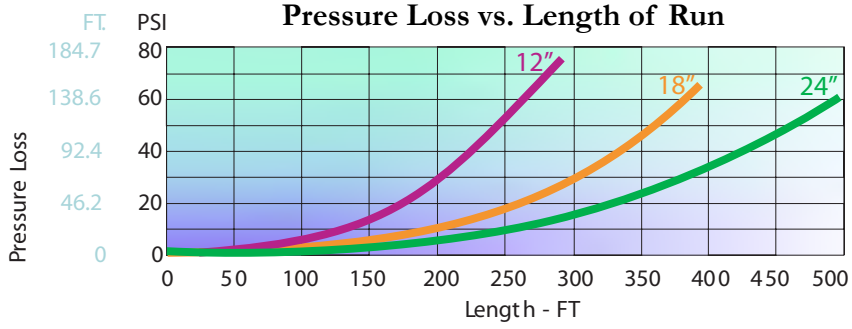
Standard models:

WFPC16-4-24 WASTEFLOW PC 24"/1.02 gph or 4lph
WFPC16-4-18 WASTEFLOW PC 18"/1.02 gph or 4lph
WFPC16-4-12 WASTEFLOW PC 12"/1.02 gph or 4lph
Alternative spacing, flow rates and diameters available upon request.

WASTEFLOW PC 1 gph PC Specification

The dripline shall consist of nominal sized one-half inch linear low density polyethylene tubing, with turbulent flow drip emitters bonded to the inside wall. The drip emitter flow passage shall be 0.032" x 0.045" square. The tubing shall have an outside diameter (O.D.) of approximately .64-inches and an inside diameter (I.D.) of approximately .55-inches. The tubing shall consist of three layers; the inside layer shall be *Geoshield*® protection, the middle layer shall be black and the outside layer shall be purple striped for easy identification. The dripline shall have emitters regularly spaced 24" (or 18" or 12") apart. The pressure compensating emitters shall be molded from virgin polyethylene resin with a silicone rubber diaphragm. The pressure compensating emitters shall have nominal discharge rates of 1.02 gallons per hour. The emitters shall be impregnated with Treflan® to inhibit root intrusion for a minimum period of fifteen years and shall be guaranteed by the manufacturer to inhibit root intrusion for this period. 1.02 gph WASTEFLOW PC pressure compensating dripline shall be Geoflow model number WFPC16-4-24 (or WFPC16-4-18 or WFPC16-4-12) .

Wasteflow PC 1 gph
Pressure Loss vs. Length of Run



Controllers

Geoflow's controllers are the brain in the system, utilizing a programmable logic controller (PLC) to activate the pump(s) cycles, zone valves and flush valves when needed. Telemetry and SCADA control systems available. Please contact Geoflow for custom panel information.



NEW

In 2007 Geoflow introduced a new touchscreen controller called the GeoTS.
Geared towards commercial sites with multiple zones or inputs, the key features of the
Geo TS are:

- 6" Touchscreen. Inputting parameters such as pump times and flush times is in plain English with help menus.
- Each zone can be set independently. Run times can vary from zone to zone, which is particularly beneficial when zones vary in size, soils, vegetation, topography etc.
- Measures flow data per zone. The amount of total water and average gallons per minute are logged by zone when using the flow meter option.

Comparison Chart between Geo standard Logo and Geo Touchscreen

Features	Geo Standard (Geo)	Geo Touchscreen (GeoTS)
Interface	1" Logo with arrows 	6" Touchscreen 
Programmable Logic Controller PLC	Yes	Yes
Programmed for 4-floats	Yes	Yes
Touch-safe panel	No	Yes
Each zone can have different run times	No	Yes
Measure flow rate for each zone	No	Yes
Manual or automatic flushing	Auto or manual	Auto only
Enclosure	Nema 4X fiberglass	Nema 4X fiberglass
HOA switch - pump	Toggle 3-way	Rotary 3-way
HOA switch - solenoids	Toggle	Touchscreen

Continued on next page

Continued from previous page.

Features	Geo Standard (Geo)	Geo Touchscreen (GeoTS)
Lightning arrestor	Yes	Yes
Onscreen help menus	No	Yes
Log Functions - Elapsed time meter (ETM) - Pump events - Filter Flush Counter - Field Flush Counter - Peak timer events - High level alarm events - Power failure events - Push to silence - Add-on parts such as pressure sensor - Flow data (avg GPM & Total Flow by zone)	 Yes Yes Yes Yes Yes Yes Yes No No No	 Yes Yes- time & date stamped Yes- time & date stamped Yes- time & date stamped Yes- time & date stamped Yes- time & date stamped Yes Yes- time & date stamped Yes – if installed Yes- if Geoflow FM Pulse meter is installed
Programmable Parameters Independent zone run times Primary run and rest time Secondary run and rest time Filter Flush time & frequency Field Flush time & frequency Manifold Drain Back Time	 No Yes Yes Yes Yes Yes	 Yes – new feature Yes Yes Yes Yes Yes
Pre-built to accept the following optional parts: Flow meter Remote alarm Blower input Ultraviolet non audible alarm Rain Gauge	 No Yes No No No	 Geoflow FM-pulse meter Yes Yes Yes with N/O contact Yes with Geoflow gauge
Self diagnostics	No	Yes It has diagnosis capabilities for the floats, pumps, contactors and the PLC itself and any auxiliary components or standard features that have a sensor feedback wired to the panel.
Displays current status of equipment	No	Yes Gives the countdown on the screen to next event and what equip. is active.

Choose a GEO controller from the table below:

Step 1. Controller Type

- Choose between Geoflow's standard controller (Geo) and the Geo Touchscreen (Geo TS).

Step 2. No. of Zones

- If the zones are activated by the controller with solenoid valves, find the row that covers the number of zones in the project.
- If the zones are activated with index or Hydrotek valves, then choose a single zone controller. The single zone controllers do allow for index or Hydrotek valves.
- Zones activated with index & solenoid valve combinations can be special ordered.
- If the zones exceed the choices below, larger controllers can be special ordered.

Step 3: Number of pumps.

- Choose one pump (simplex) or two pumps (duplex).

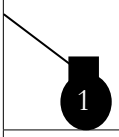
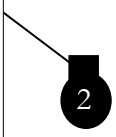
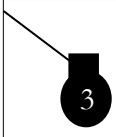
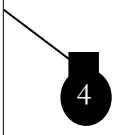
Step 4: Flushing operation.

- Choose manual or electronic field and filter flushing. Geoflow requires all direct septic systems use electronic flushing.
- Manual flushing only available on the Geo 1 controllers. Geoflow recommends using Auto flush panels where maintenance is not mandatory.

Step 5: Treatment option (GeoTS only)

- If the GeoTS panel is capable of monitoring your pretreatment system, and if greater than NSF requirements, can also control your treatment system. If this option is desired choose the row that says "yes".

Step 1 Type	Step 2 Zones	Step 3 Pumps	Step 4 Flushing	Step 5 Treatment	Part Number
Geo	1	Simplex	Manual	-	GEO1-SIM-MAN
			Automatic	-	GEO1-SIM-AUT
		Duplex	Manual	-	GEO1-DUP-MAN
			Automatic	-	GEO1-DUP-AUT
	2 - 4	Simplex	Automatic	-	GEO4-SIM-AUT
		Duplex	Automatic	-	GEO4-DUP-AUT
	5 - 8	Simplex	Automatic	-	GEO8-SIM-AUT
		Duplex	Automatic	-	GEO8-DUP-AUT
Geo TS	1	Simplex	Automatic	-	GEOTS-01-SIM
				Yes	GEOTS-01-SIM-T
		Duplex	Automatic	-	GEOTS-01-DUP
				Yes	GEOTS-01-DUP-T
	2 - 8	Simplex	Automatic	-	GEOTS-08-SIM
				Yes	GEOTS-08-SIM-T
		Duplex	Automatic	-	GEOTS-08-DUP
				Yes	GEOTS-08-DUP-T
	9 - 16	Simplex	Automatic	-	GEOTS-16-SIM
				Yes	GEOTS-16-SIM-T
		Duplex	Automatic	-	GEOTS-16-DUP
				Yes	GEOTS-16-DUP-T
	17 - 24	Simplex	Automatic	-	GEOTS-24-SIM
				Yes	GEOTS-24-SIM-T
		Duplex	Automatic	-	GEOTS-24-DUP
				Yes	GEOTS-24-DUP-T

Floats	Functions
	Float raised – Alarm enable. Activates the audible and visual alarm when raised. Audible alarm may be silenced by pressing the illuminated "PUSH TO SILENCE" button.
	Float raised – Peak Timer enable. The secondary timer will cycle the pump(s) more frequently. The secondary timer function will remain active until the Primary Timer enable float lowers. When the Peak Timer function has been completed and the Primary Timer enable float is reactivated, normal timer operation will resume.
	Float raised – Timer enable. The Primary Timer will control pump cycles, beginning with the off cycle. Note: On duplex panels the pumps will alternate with each timer cycle. The Primary float resets the secondary on/off float when in the down position.
	Float raised – Pump enable. Float lowered – Pump disable. Flashing visual & audible alarm enable. This is a secondary off float that will prevent the operation of the pump if the water level in the tank gets too low. Geo pump will be disabled in both the automatic and manual modes. GeoTS will allow you to run the pump for a short burst regardless of float position. This bottom float also activates the visual and audible alarms. Audible alarm may be silenced by pressing the illuminated "PUSH TO SILENCE" button.

Note: ETM and pump events are recorded whenever contactor is energized.

GEO-1 *MANUAL* **CONTROLLERS**

The Primary Timer (float 2-activated) controls the pump dose cycle during normal operating conditions. During high flow conditions the pump dosing cycles will be controlled by the Peak Timer (float 3 - activated). The Peak Timer off is typically set to trigger more frequent flow than the Primary Timer off setting.

If *duplex pump* option is chosen, the pumps are alternated every pump cycle and never operate simultaneously. There is a selection switch for pump 1, pump 2 or alternation. This allows one pump to be taken out of service for maintenance without affecting the operation of the system.

Pump dosing cycles are controlled by the timers when the H-O-A switch is in the auto position. Under normal conditions the Primary Timer (float 2) will control the pump(s). During high flow conditions, the Peak Timer (float 3) will control the pump(s). The Peak Timer will cycle the pump more frequently than the Primary Timer (field adjustable). The pump will dose for the same amount of time as it does when operated by the Primary Timer but the time in between doses, or the Peak timer "off time", will be 75 % of that of the Primary Timer "off time". Factory settings (operator adjustable) are 1 hr 55 minutes off and 5 minutes on for Primary Timer and Peak Timer is set to 1 hr 25 minutes off (1 hr 55 mins x 75%) and 5 minutes on. Consequently peak doses are more frequent than primary doses.

Hydraulically activated zone valve(s) will index each time the PLC calls for a dose. Each time the pump is turned on another zone is dosed. The controller does not dose all zones sequentially as "one" dose. For example if the Primary Timer is programmed to be off for 1hour on for 5minutes and there are four zones, each zone will get 6 doses - five minutes in length –in a 24-hour period. The controller will dose a single zone every hour and will not dose all zones every hour.

In the event of a *power outage* the Geo-TS controller continues the program where it left off, even if it was in the middle of an event. The Geo-1 resets itself and begins with a flush cycle in field 1.

Geo and GeoTS *AUTOMATIC* **Controllers**

The Primary Timer (float 2 activated) controls the pump dose cycle during normal operating conditions. During high flow conditions the pump dosing cycles will be controlled by the Peak Timer (float 3 activated).

If *duplex pump* option is chosen, the pumps are alternated every pump cycle and never operate simultaneously. There is a selection switch for pump 1, pump 2 or alternation. This allows one pump to be taken out of service for maintenance without affecting the operation of the system. *The Vortex Filter flush valve* will open for 15 seconds (operator adjustable) at the end of the pump cycle to allow the filter to self-flush.

Pump dosing cycles are controlled by the timers when the H-O-A switch is in the auto position. Under normal conditions the Primary Timer (float 2) will control the pump. During high flow conditions, the Peak Timer (float 3) will control the pump. The Peak Timer will cycle the pump more frequently than the Primary Timer. The pump will dose for the same amount of time as it does when operated by the Primary Timer but the time in between doses, or the Peak Timer "off time", will be 75% that of the Primary Timer "off time". Factory settings (field adjustable) are 1 hr 55 minutes off and 5 minutes on for Primary Timer and Peak Timer is set to 1 hr 25 minutes off (1 hr 55 mins x 75%) and 5 minutes on.
Zone valve(s) will open when the PLC calls for a dose or flush. These can be electrically operated solenoid valves (requires any controller other than the Geo-1 or GeoTS-1) or hydraulically activated index valves (used with Geo-1 or GeoTS-1). If hydraulically activated index valves are used in combination with a solenoid field flush valve, a field setting for number of zones and number of zone valves is available. With Geo controllers the total doses of all zones in a 24-hour period must be considered when setting the "off" timer(s). After the pump is deactivated the solenoid valve will remain open to allow for drainage of the supply line. If hydraulically activated index valve is used, be sure to drain the supply line in freezing climates.

Field flush valve will open at the end of the dosing cycle. The pump will continue to run for 5 seconds (field adjustable) to accommodate the opening of this valve. After the pump is deactivated the field flush valve will remain open for five minutes (field adjustable) to allow for drainage of the return line in freezing conditions. It is best to clock the length of time it takes the return flush line to drain and use this to set your drain time.
The activated zone valve remains open at the end of the dose for same "#" minutes as return flush and filter flush valves to accommodate drainage of supply line.

To periodically *flush the dripfield,* after 10 dosing cycles (operator adjustable) the pump will operate for # minutes (field adjustable) with the field flush valve open. The field flush cycle will repeat until all zones have been flushed.

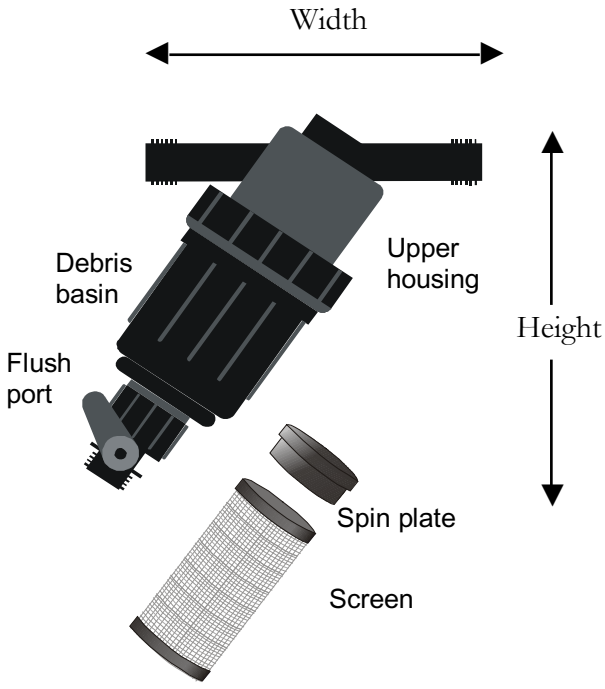
In the event of a *power outage* the Geo-TS controller continues the program where it left off, even if it was in the middle of an event. The Geo-1 resets itself and begins with a flush cycle in field 1.

Description

The Vortex filters are placed between the pump and dripfield to screen out any debris. Spin plates at the top of each screen direct the flow of debris to the base of the screen for easy self cleaning.

Features

- Simple self cleaning filter. Geoflow's Vortex filter depends on a simple forward flush to self clean. Incoming water is forced through a directional nozzle plate onto the inside of the stainless steel screen. A centrifugal motion starts inside the screen chamber, throwing particles outward against the screen. Gravity moves the debris down the screen wall to the ¾" flush outlet at the base of the Vortex Filter.
- It is simple to install and operate, requiring very few moving parts.
- Can be plumbed to self clean periodically with electronically activated solenoid valves, or continuously with slightly opened ball valves.
- Sturdy stainless steel screen proven effective in onsite wastewater applications. A sintering process in which three pieces of stainless steel mesh are transformed into one; a perforated plate, 30m then 150 mesh.
- Body is a two-piece threaded housing with O-ring seal. Molded from high heat ABS and chemical resistant glass reinforced plastic.

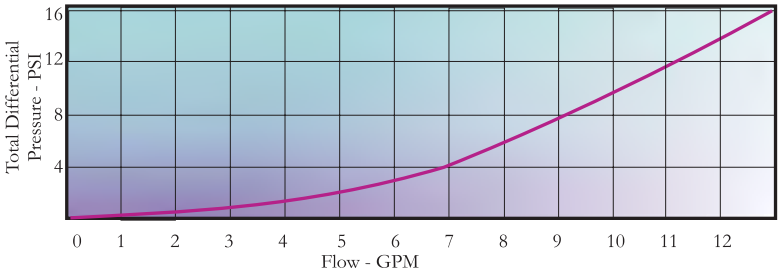


Item Number	Size (MPT)	Max. Flow rate (GPM)	Max. Pressure (psi)	(ft.)	Width	Height	Flush Port (MPT)	Area of Filtration (inches^2)
AP4E-.75F	3/4"	10	80	185	6.0"	6.0"	3/4"	23.4
AP4E-1F	1"	20	80	185	6.0"	7.0"	3/4"	28.4
AP4E-1.5F	1.5"	45	100	231	12"	15.5"	3/4"	60.8
AP4E-2F	2.0"	70	80	185	12"	16.0"	3/4"	60.8

1 REQUIRED

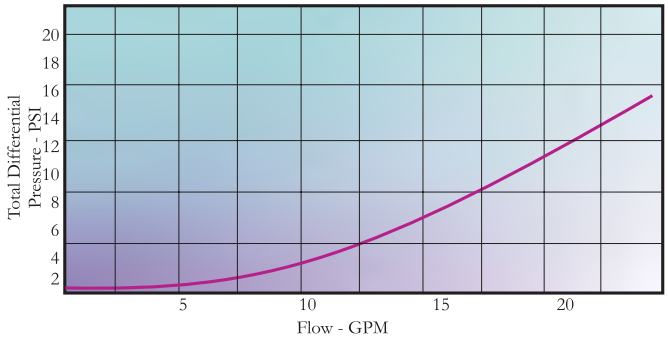
When in doubt, it is best to choose the filter with the larger screen area.

3/4” Vortex Filter AP4E-.75F



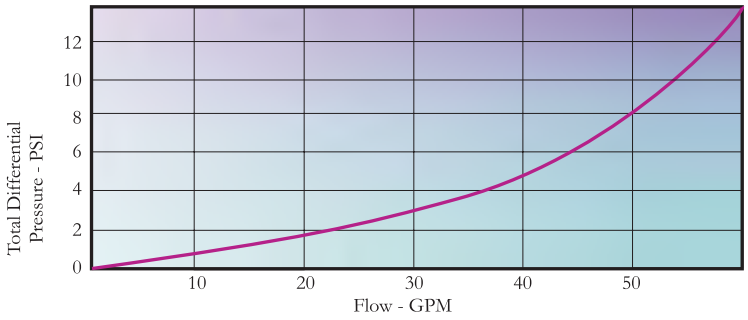
Specification:
The Y filter body shall be molded from glass reinforced engineering grade black plastic with a 3/4 inch male pipe thread (MIPT) inlet and outlet. The two piece body shall be capable of being serviced by untwisting and shall include an O-ring seal. An additional 3/4 inch MIPT outlet shall be capable of periodic flushing. The 150-mesh filter screen is all stainless steel, providing a 23.4 square inch filtration area. The screen collar shall be molded from vinyl. The ¾” filter shall be Geoflow Vortex Filter model number AP4E-75F.

1” Vortex Filter AP4E-1F



Specification:
The Y filter body shall be molded from glass reinforced engineering grade black plastic with a 1 inch male pipe thread (MIPT) inlet and outlet. The two piece body shall be capable of being serviced by untwisting and shall include an O-ring seal. An additional ¾ inch MIPT outlet shall be capable of periodic flushing. The 150 mesh filter screen is all stainless steel, providing a 28.4 square inch filtration area. The screen collar shall be molded from vinyl. The 1” filter shall be Geoflow Vortex Filter model number AP4E-1F.

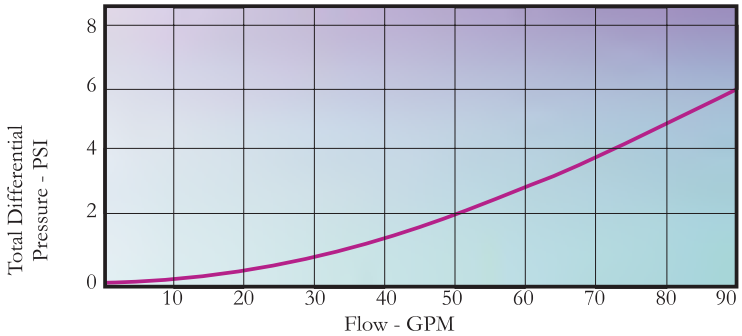
1.5” Vortex Filter AP4E-1.5F



Specification

The Y filter body shall be molded from glass reinforced engineering grade black plastic with a 1.5 inch male pipe thread (MIPT) inlet and outlet. The two piece body shall be capable of being serviced by unscrewing and shall include an O-ring seal. An additional 3/4” MIPT outlet shall be capable of periodic flushing. The 150 mesh filter screen is all stainless, providing a 60.8 square inch filtration area. The outer support shell shall be woven stainless steel wire, and the inner screen shall be made of stainless steel cloth. The inner and outer screens shall be soldered together. The screen collar shall be molded from vinyl. The 1 ½” filter shall be Geoflow model number AP4E-1.5F.

2” Vortex Filter AP4E-2F



Specification

The Y filter body shall be molded from glass reinforced engineering grade black plastic with a 2 inch male pipe thread (MIPT) inlet and outlet. The two piece body shall be capable of being serviced by unscrewing and shall include an O-ring seal. An additional 3/4” MIPT outlet shall be capable of periodic flushing. The 150 mesh filter screen is all stainless, providing a 60.8 square inch filtration area. The outer support shell shall be woven stainless steel wire, and the inner screen shall be made of stainless steel cloth. The inner and outer screens shall be soldered together. The screen collar shall be molded from vinyl. The 2” filter shall be Geoflow model number AP4E-2F.

BioDisc Filter

Description

The BioDisc(TM) filters are placed between the pump and dripfield to trap debris from entering the drip system.

Features

Geoflow's disc filters are protected with anti bacteria. Designed for applications with high organics, the *Geoshield*® is molded into each disc to discourage unwanted growth on the filter element. A single filter can be placed in line, and requires manual cleaning.

Specification

The BioDisc filter body and discs shall be molded of polyethylene resins. The disc shall include *Geoshield*® anti-bacterial compound to protect the filter element against slime build-up. Filtration shall be 120 mesh/130 micron. The two piece body shall be capable of being serviced by untwisting and shall include an O-ring seal. The seals shall be manufactured from Nitrilo rubber. The inlet and outlet shall be ____ inch MPT. The UF disc filter shall be part number BioDisc___ as supplied by Geoflow, Inc.

Part No.	Inlet/ Outlet diameter	Max Flow Rate per Filter	Max Pressure PSI	Max Temp (°F)	Length	Filtration Surface Area	Filtration Size	Weight lbs.
BioDisc-1.5F	1.5”	30 gpm	145psi 335ft.	140	12”	72.7 sq. in.	120 mesh 130 micron	3.3.
BioDisc-2F	2”	60 gpm	145 psi 335 ft.	140	20”	136.9 sq. in.	120 mesh 130 micron	13.2

8.0”

1.5 “ Disc Filter



12”

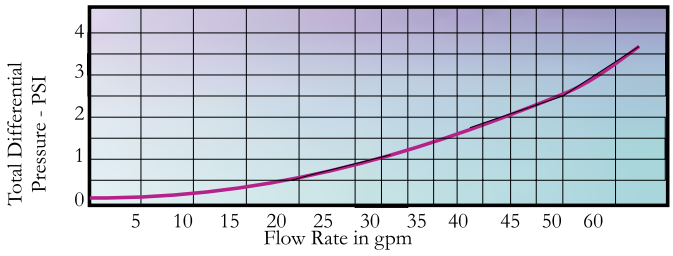
11.5”

2 “ Disc Filter

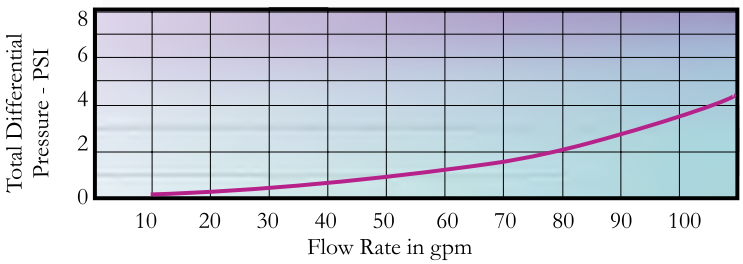


20”

Pressure Loss 1.5” Disc Filter



Pressure Loss 2” Disc FIlter



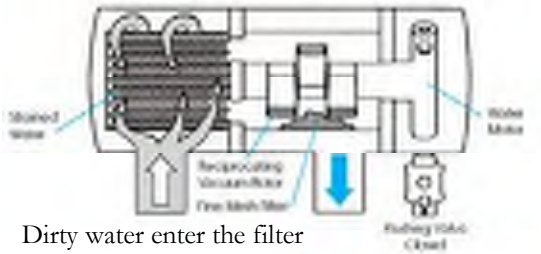
- **BioDisc** is a trademark of A.I.Innovations.
- **Geoshield®** is a registered trademark of A.I.Innovations.

GeoVac Filter

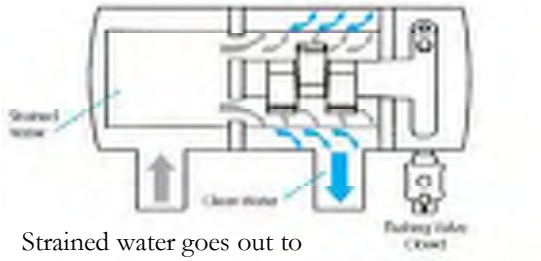
NEW

Description

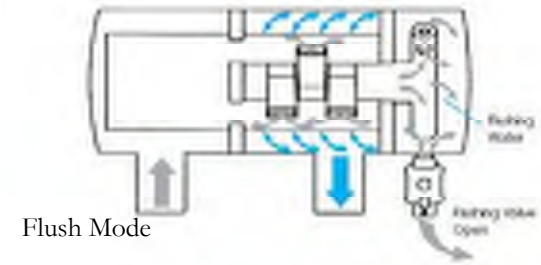
The GeoVac is a stainless steel filter with an automatic, self-cleaning, screen-type water filter for heavy loads of onsite wastewater.



Dirty water enter the filter



Strained water goes out to the drip field



Flush Mode

Filtering Mode

Pressurized water enters the filter inlet and travels through a fine stainless steel screen where contaminants are filtered out. The clean water passes through to the inside of the screen, then out to the drip field.

Flush Mode

A solenoid flush valve is time activated. When the flushing valve opens, the pressure differential is reduced on the area being swept by the reciprocating cleaning nozzles. This causes the clean water to reverse flow through the filter element as the cleaning nozzles rotate across the entire surface of the screen, pushing contaminants off the screen, through the nozzles, through the water motor and out through the flush valve.

The water passing through the angular holes in the motor creates a torsion rotation of the nozzles, thus vacuuming the entire inside diameter of the filter element.

At the end of the flushing cycle, the unit automatically returns to full filtering mode.

During the filter flush cycle the filtration process continues uninterrupted.

Features

The GeoVac avoids the danger of forcing contaminated water back into the system. The GeoVac filter will deliver clean water or no water. The entire filter flushing mechanism and fine screen assembly is modular and can be removed from the filter body without having to detach the filter from supply and delivery manifolds.



6” or 8” Filter with flanged connections

Specifications

Materials for 2” GeoVac	
Tank:	Stainless steel. Type 304, 18-gauge
Vacuum Motor and nozzle assembly	Glass-filled Noryl
Filter Screen	3-layer sintered stainless steel. Type 316
Materials for 3”, 4”, 6”, 8” GeoVac	
Tank:	Stainless steel. Type 304, 18-gauge
Vacuum Motor and nozzle assembly	Engineered grade polymer
Filter Screen	3-layer sintered stainless steel. Type 316

	Model/Part No.				
	GeoVac 75-02	GeoVac 150-03	GeoVac 250-04	GeoVac 500-06	GeoVac 700-08
Max. flow rate (gpm)	75	150	250	500	700
Inlet/Outlet diameter (inches)	2”	3”	4”	6”	8”
Inlet/Outlet connection (included in box)	Grooved	Grooved	Grooved	Flange	Flange
Filter flush min. flow (gpm)	30	40	40	40	50
Filter flush min. time (seconds)	6	10	10	20	20
Min. downstream working pressure (psi)	35	35	35	35	35
Max. working pressure (psi)	125	125	125	150	150
Pressure loss at max. recommended flow rate	1psi/2.31 ft.	1psi/2.31 ft.	1psi/2.31 ft.	1psi/2.31 ft.	1psi/2.31 ft.
Screen area (inches^2)	118	224	448	867	1300
Screen sizes Micron Mesh	100 150	100 150	100 150	100 150	100 150
Max. Temperature (F^o)	180	180	180	180	180
Filter housing diameter (inches)	10”	10”	10”	15”	15”
Flushing outlet diameter (inches) NPT	1”	1”	1”	2”	2”
Supplied with flush valve	1.5”	1.5”	1.5”	2”	2”
Weight (lbs.)	30	55	80	395	435
Length (inches)	16.7”	39.2”	49.4”	60.6”	72.6”
Min. clearance req. on lid end	36”	36”	36”	56”	70”
Min. clearance req. on sensor end	12”	12”	12”	12”	12”

Installation

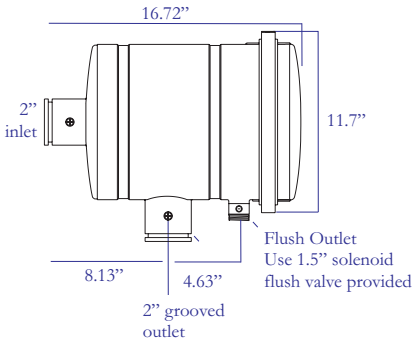
- Flush valve should be placed on the discharge nipple with the arrow pointing downwards.
- The tank can rest on the inlet/outlet nipples or can be mounted on a stand.
- Check the connections on the manifold or stand to make sure they are on the same plane. If improperly aligned the tank could be distorted when the filter connections are tightened.
- The back flush line should not run uphill. This will reduce the required backpressure differential and reduce the cleaning effectiveness.
- The GeoVac filter needs to be insulated against freezing.

Maintenance

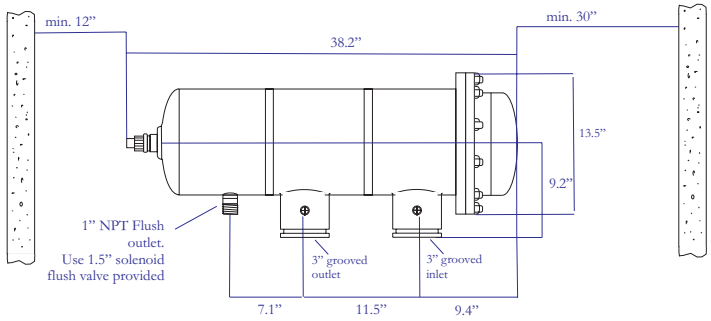
- Manually clean filter element periodically.
- Clean and grease all o-rings with waterproof lubricant.
- Check welds and hydraulic connections.
- Before servicing filter internals, slowly open the filter flush valve and allow the filter to empty out.
- Make sure pump is on manual off so it does not pressurize while servicing.
- Ensure bolts and nuts of covers and all connections are uniformly tightened.

GeoVac Dimensions

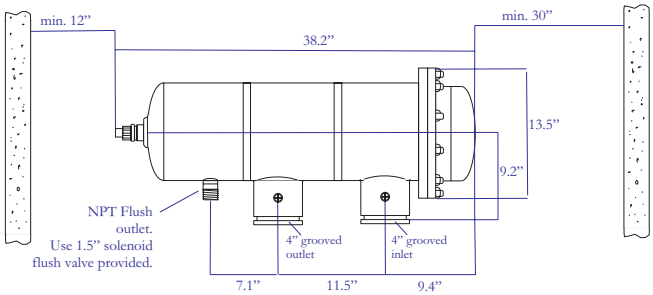
GeoVac 75-02



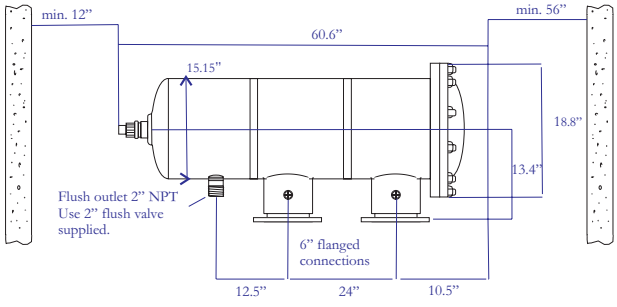
GeoVac 150-03



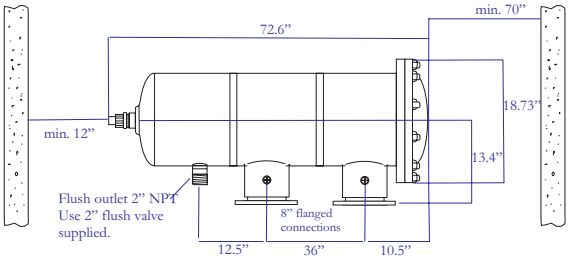
GeoVac 250-04



GeoVac 500-06



GeoVac 700-08



Description

Geoflow's digital flow meters are a turbine style meter with rate/totalizer – designed to measure and display both the rate of flow and total flow. The local display model includes a digital screen, while the Pulse Output Model is outfitted with a pulse access that can be read on your Geo Touchscreen controller.



FLOW METER – Digital Display

This is a stand alone meter with a local display that includes: Rate of Flow, Batch and Cumulative Totals. It is powered by lithium batteries for approximately 9000 hours.

Model No.	FM-DDS-050	FM-DDS-100	FM-DDS-150	FM-DDS-200
Meter size	3/4 " FPT	1" FPT	1.5" FPT	2" FPT
Flow Rate	2-20 gpm	5-50 gpm	10-100 gpm	20-200 gpm
Material - Housing - Bearings - Shaft - Rotor - Rings	 PVC Ceramic Tungsten carbide PVDF Stainless steel	 PVC Ceramic Tungsten carbide PVDF Stainless steel	 PVC Ceramic Tungsten carbide PVDF Stainless steel	 PVC Ceramic Tungsten carbide PVDF Stainless steel
Accuracy	3%	3%	3%	3%
Temp range	32°F-140°F	32°F-140°F	32°F-140°F	32°F-140°F
Max Pressure	150 psi	150 psi	150 psi	150 psi
Typical K factor	2400	540	215	100
Frequency range	48-480 Hz	45-450 Hz	36-460 Hz	33-330 Hz
Weight	0.88 lbs	1.0 lbs.	1.4 lbs.	1.68 lbs.

FLOW METER – Pulse Output Model

The pulse output flow meter is wired directly to the Geo Touchscreen controller, sending data that is logged by the controller and read on the controller screen. It uses no batteries.

Model No.	FM-PLS-100	FM-PLS-150	FM-PLS-200
Meter Size	1" FPT	1.5" FPT	2" FPT
Flow Rate	5-50 gpm	10-100 gpm	20-200 gpm
Material			
Housing	PVC	316 Stainless steel	316 Stainless steel
Bearings	Ceramic	Ceramic	Ceramic
Shaft	Ceramic	Tungsten carbide	Tungsten carbide
Rotor	PVDF	PVDF	PVDF
Rings	Fluorocarbon	316 Stainless steel	316 Stainless steel
Accuracy of reading	+/- 1.5%	+/- 1%	+/- 1%
Typical K factor	540	215	100
Pressure Rating	150 psi	1500 psi	1500 psi
Frequency Range	45-450 Hz	36-360 Hz	33-330 Hz
Shipping Weight	1.9 lbs.	4.6 lbs.	6.8 lbs.
Typical K factor	540	215	100
Wrench flat size	1-5/8"	2- 3/8"	3"

Installation

Although the Geoflow flow meter is designed to withstand outdoor conditions, a cool dry location where the unit can be easily serviced is recommended.

The Geoflow meter can be mounted on horizontal or vertical runs of pipe. Mounting at the twelve o'clock position on horizontal pipe is recommended. Backpressure is essential on downward flows.

The GD Flow Meter accuracy is affected by disturbances such as pumps, elbows, tees, valves in the flow stream. Install the meter in a straight run of pipe as far as possible from any other disturbances. The distance required for accuracy will depend on the type of disturbance.

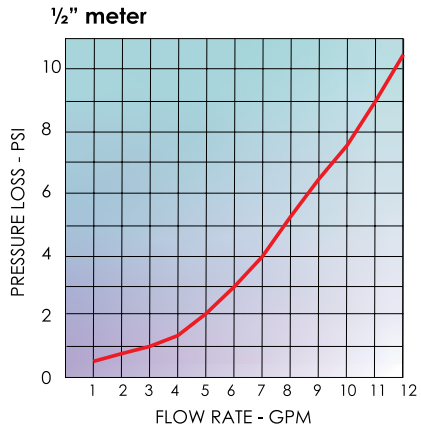
Type of Disturbance	Min. Inlet Pipe Length	Min. Outlet Pipe Length
Flange	10 x Pipe I.D.	5 x Pipe I.D.
Reducer	15 x Pipe I.D.	5 x Pipe I.D.
Elbow	20 x Pipe I.D.	5 x Pipe I.D.
Two Elbows 1 direction	25 x Pipe I.D.	5 x Pipe I.D.
Two Elbows – 2 directions	40 x Pipe I.D.	5 x Pipe I.D.
Pump or gate valves	50 x Pipe I.D.	5 x Pipe I.D.

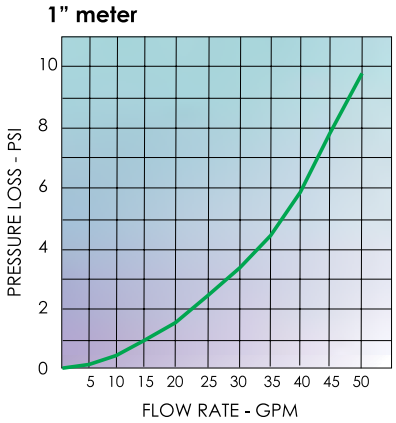
The flow meter is factory calibrated. When measuring total flow, accumulated error over time must be considered. Accuracy is based on laboratory testing of nominal pipe dimensions. Your actual accuracy will vary based on your actual pipe I.D. and other installation factors.

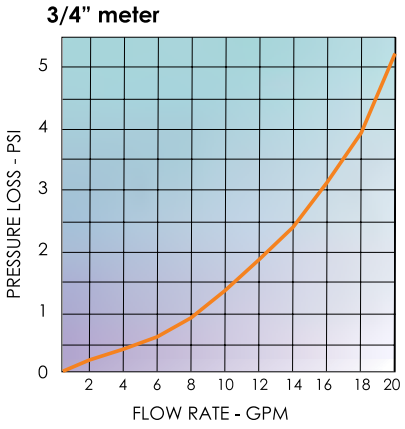
Maintenance

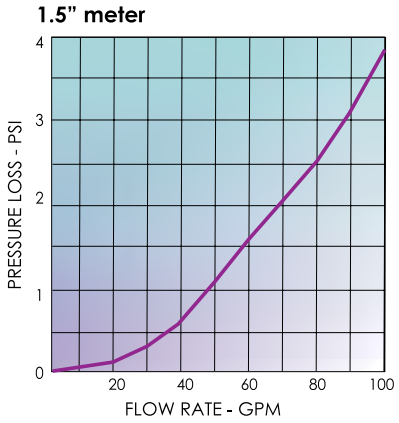
1. Periodically remove the sensor assembly from the pipe fitting and inspect the meter for signs of wear and obstructions. Clean the paddle of any foreign objects. Paddle and axle wear can be caused by chemicals and/or abrasive fluids. Replace the paddle and axle if worn.
2. Inspect O rings. Immediately replace the o-rings at any sign of wear, swelling, cracking or discoloration.
3. Replace the batteries every 12 months.

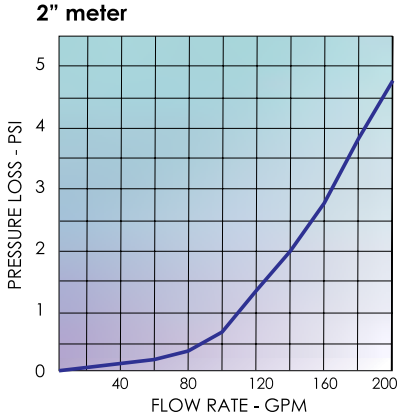
Flow Rate vs. Pressure



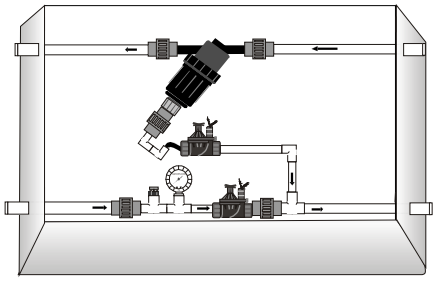








The headwork refers to the components that are placed between the pump tank and the dripfield itself. There are multiple options available, depending on the application, personal preferences or regulatory requirements. The following list is a guide to help choose the best headworks for your needs.



WHW Sporty

The following choices will need to be made:

1) Filter type and size

Geoflow offers 3 filter types;

a) Vortex **(V)** screen filter .75" 1" 1.5" 2"

b) BioDisc **(D)** filter 1.5" 2"

c) GeoVac™ filter. 2" 3" 4" 6" 8"

The Geovac filter is ordered from the filter specification page and always includes connections and filter flush valve. Field flush valves and flow meters can be added separately. See GeoVac filter product sheet for details.

2) Sporty vs. Ultra Headworks

Geoflow offers sporty headworks **(WHWS)** that is simple and ultra headworks **(WHWU)** that can be used for commercial, industrial or residential projects. While all headworks include drip filters, flush valves and pressure readings, the Ultra headworks also includes a digital flow meter. The electrical wiring on the Ultra Headworks is bundled in a junction box for a water resistant connection.

3) Flushing

Will the system be flushed manually **(M)** with a ball valve or automatically with solenoid valves **(A)**. The Ultra headworks are only available with automatic field and filter flushing.

4) Flow Meter

Sporty Headworks: Order a flow meter separately and install it downstream of the headworks.

Ultra Headworks comes with 2 choices; one with a local digital display **(DDS)**, and one with a pulse output **(PLS)** that is displayed on the touchscreen of the Geo-TS controllers.



Sporty Headworks



Ultra Headworks Box



Ultra Headworks

a) Vortex Headworks

Sporty Headworks

Item No.	Filter	Flushing	Dimensions (in.)
WHWS-V-75F-M	3/4" Vortex Filter	Manual Field & Filter	13 x 24 x 15
WHWS-V-75F-A	3/4" Vortex Filter	Automatic Field & Filter	13 x 24 x 15
WHWS-V-1F-M	1" Vortex Filter	Manual Field & Filter	13 x 24 x 15
WHWS-V-1F-A	1" Vortex Filter	Automatic Field & Filter	13 x 24 x 15
WHWS-V-1.5F-M	1.5" Vortex Filter	Manual Field & Filter	17 x 30 x 15
WHWS-V-1.5F-A	1.5" Vortex Filter	Automatic Field & Filter	17 x 30 x 15
WHWS-V-2F-M	2" Vortex Filter	Manual Field & Filter	17 x 30 x 15
WHWS-V-2F-A	2" Vortex Filter	Automatic Field & Filter	17 x 30 x 15

Ultra Headworks

Item No.	Filter	Flushing	Dimensions (in.)	Flow Meter
WHWU-V-75F-A	3/4" Vortex filter	Automatic Flush	25.5 x 25.5 x 22	Specify DDS or
WHWU-V-1F-A	1" Vortex filter	Automatic Flush	25.5 x 25.5 x 22	PLS at the end
WHWU-V-1.5F-A	1.5" Vortex filter	Automatic Flush	25.5 x 25.5 x 22	of the item no.
WHWU-V-2F-A	2" Vortex filter	Automatic Flush	25.5 x 25.5 x 22	

b) BioDisc Headworks

Sporty Headworks (Manual Filter Flush only)

Item No.	Filter	Flushing	Dimensions (in.)
WHWS-D-1.5F-M	1.5" Disc Filter	Manual Field Flush	17 x 30 x 15
WHWS-D-1.5F-A	1.5" Disc Filter	Automatic Field Flush	17 x 30 x 15
WHWS-D-2F-M	2" Disc Filter	Manual Field Flush	17 x 30 x 15
WHWS-D-2F-A	2" Disc Filter	Automatic Field Flush	17 x 30 x 15

Ultra Headworks

Item No.	Filter	Flushing	Dimensions (in.)	Flow Meter
WHWU-D-1.5F-A	1.5" DISC filter	Automatic Flush	25.5 x 25.5 x 22	Specify DDS or
WHWU-D-2F-A	2" DISC filter	Automatic Flush	25.5 x 25.5 x 22	PLS at the end
				of the item no.

c) GeoVac

See GeoVac filter product sheet for details.

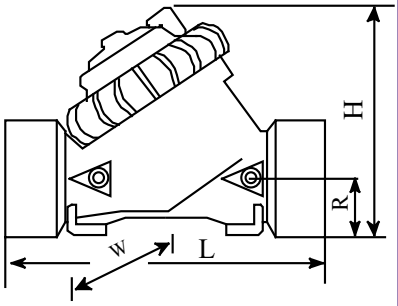
In 2007 Geoflow introduced a new solenoid valve, the SVLV-B. Recognized for its efficiency and productivity, the new SVLV-B valves have been tried and tested in onsite wastewater applications.

Description

The Solenoid Valve is used to flush field and filters and as zone valves. It is electrically operated. It is normally closed, and in the event of a power failure the valve will close. Geoflow does use normally open solenoid valves in the dual filter headworks. These may be special ordered.



New 2007 Model
Globe Valve
1" and 1.5"

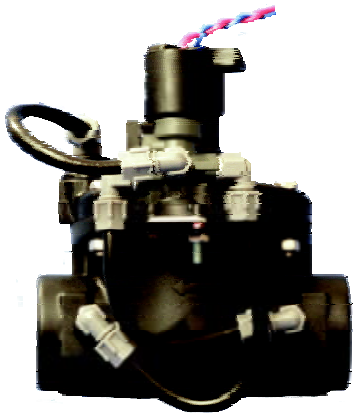
	SVLV-B-100	SVLV-B-150	SVLV-B-200	SVLV-B-300
Inlet/Outlet Size (FNPT)	1"	1.5"	2"	3"
Body Pattern	Globe	Globe	Y	Y
Length (L)	4.3"	6.3"	9.0"	12.2"
Height (H)	4.5"	7.2"	7.4"	11.0"
Width (W)	3.0"	5.0"	5.4"	
R	7/8"	1-3/8"	1-5/8"	4.0"
Weight	12.5 oz	2.2 lbs.	2.97 lbs.	8.8 lbs.
Valve Pattern	Globe	Globe	Wye	Wye
Operating Range	10-150 psi	10-150 psi	7-140 psi	7-140 psi
Max pressure	180° F	180° F	180° F	180° F
Materials				
Body & cover	Nylon reinforced	Nylon reinforced	Glass filled nylon	Glass filled nylon
Metal Parts	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
Diaphragm	Natural Rubber	Natural Rubber	NBR (Buna-N), nylon reinforced fabric	NBR (Buna-N), nylon reinforced fabric
Seals	NBR & NR	NBR & NR	NBR (Buna-N)	NBR (Buna-N)

Installation

The manual bleed lever should always be in the VERTICAL position and the dial on top should be free spinning. Clockwise rotation closes valve.
Pressure Loss through valves (in psi)
Recommended minimum pressure differential: 7 psi

Maximum Length of wire run- Controller to Valve

# Wire	Resistance Ohm/ 1000'	Maximum Run
#18	6.39	800 ft.
#16	4.02	1,275 ft.
#14	2.58	2,000 ft.
#12	1.62	3,200 ft.
#10	1.02	5,100 ft.
#8	0.641	8,000 ft.
#6	0.403	12,750 ft.
#4	0.253	20,500 ft.
#2	0.158	32,500 ft.



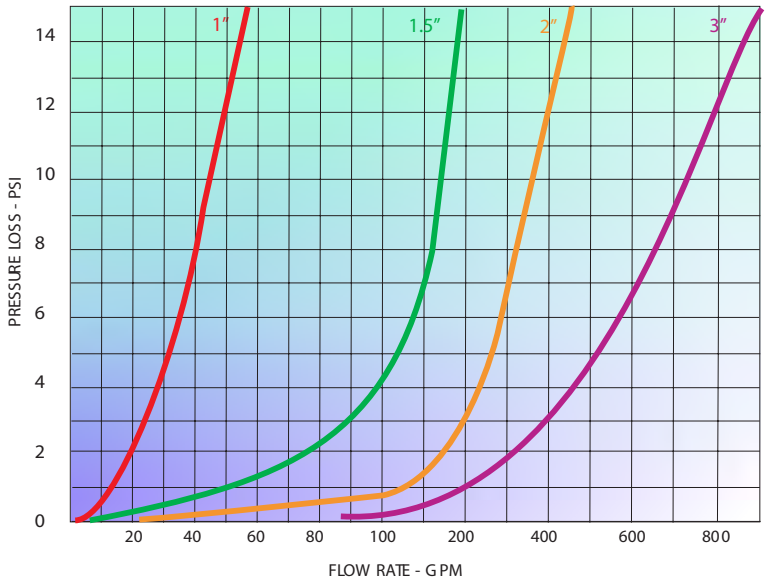
Y Valve
2" and 3"

Electrical data:
Wiring requires a single lead from the controller to each solenoid valve, plus a common neutral to all solenoids. Type UF wire, UL listed, is recommended for all hookups.

Standard 24V ACV (50-60Hz)
Current Holding 0.24A 5.76 VA
Current Inrush 0.46A 11.04VA
Maximum allowable loss 4.8 Volts for the 24V AC system
Contact Geoflow for optional voltages or larger valves

Maximum Voltage loss with a valve with a three way Solenoid is 4.8 volts

Solenoid Valve Flow vs. Pressure Chart



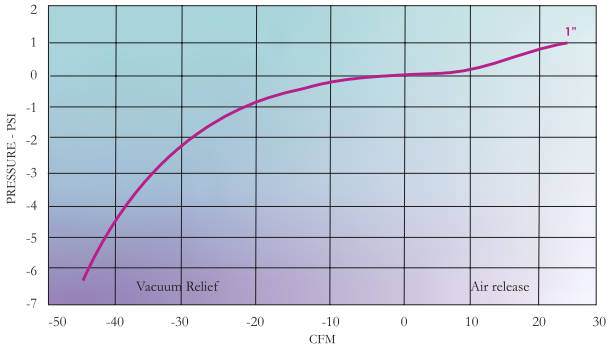
Description

Air release allows air to escape the system at startup and vacuum relief allows air to enter the system during shutdown. Air vents are installed at the high point of the drip field to keep soil from being sucked into the drip emitter due to back siphoning or back pressure. This is an absolute necessity with underground drip systems. They are also used for proper drainage of the supply and return manifolds. Use one on the high point of the supply manifold and one on the high end of the return manifold and any high points in the system. A pre-installed schrader valve allows pressure testing off the air/vacuum breaker.



Item No.	Inlet	Pressure to seal	Max pressure	Height inches	Width inches	Weight Lbs
APVBK-1	1" MPT	5 psi	80 psi	5.5	3.43	.67
APVBK-2	2" MPT	1 psi	200 psi	10.75	3.98	6.62

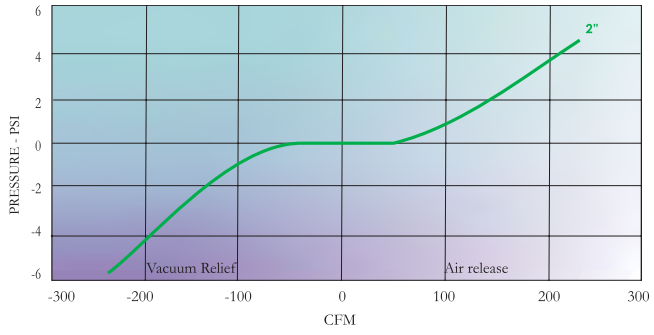
1" Vacuum Relief/Air Release



Specification 1"

The air vacuum breakers provide instant and continuous vacuum relief and non-continuous air release It shall be rated to 80 psi. 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 ¾ inch hose thread. The ball shall be constructed of low density plastic and the internal seat shall be constructed of vinyl. Inlet size shall be 1 inch male pipe thread. The air/vacuum relief valve shall Geoflow Item no. APVBK-1.

2" Vacuum Relief/Continuous Air Release



Specification 2"

The air vent shall provide instant and continuous vacuum relief and air release and continuouis air release. Both the body and the removable dirt cover shall be constructed of molded plastic. It shall be rated to 200 psi. The ball shall be constructed of low density plastic and the internal sear shall be constructed of vinyl. Inlet size shall be 2 inch male pipe thread. Outlet shall be 1.25" socket ell. The air/vacuum relief valve shall Geoflow Item no. APVBK-2.

Pressure Regulators

Description

The regulators are preset to regulate pressure in the field. These are required with Wasteflow Classic and optional with Wasteflow PC. Under normal operating conditions the pressure in the dripline should be: 10 - 45 psi for Wasteflow Classic and Wasteflow PC.

Low, Medium and High Flow Regulator







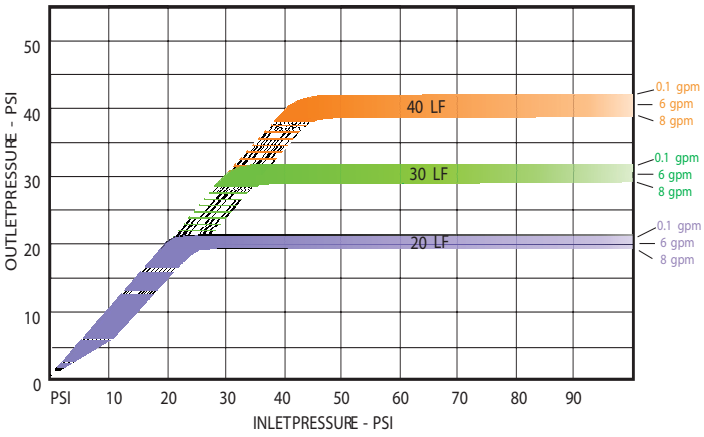
Extra Flow Regulator- flows up to 90 gpm

Pressure Regulator Specification

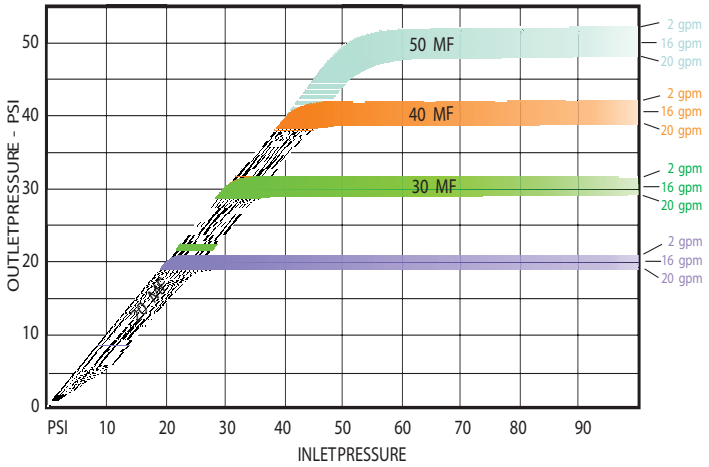
Geoflow's pressure regulator shall be designed to handle steady inlet pressures of ___ psi and withstand severe water hammer extremes. It shall handle flow rates between ___ gpm and ___ gpm. Flow restriction shall be negligible until the factory preset pressure is reached. Regulatory accuracy shall be within +/- 6%. Inlet and outlet size shall be ____" FIPT. The body shall be constructed of high impact engineering grade thermoplastics. Regulation shall be accomplished by a fixed stainless steel compression spring enclosed in a chamber separate from the normal water passage. Each regulator shall be water tested for accuracy. Pressure regulator shall be Geoflow model number PMR-____ - _ F. Refer to table to fill in the blanks.

Item No.	Outlet Pressure	Flow Range	Max. Inlet Pressure Psi	Max. Inlet Pressure ft.	Inlet Size	Outlet Size
PMR-20-LF	20 psi	1/10 - 8 gpm	150	347	¾" fipt	¾" fipt
PMR-20-MF	20 psi	2 - 20 gpm	150	347	1"fipt	1"fipt
PMR-20-HF	20 psi	10 - 32 gpm	100	23	1.25" x 1" fipt	1.25"fipt
PMR-20-XF	20 psi	20 - 90 gpm	90	208	3"ID socket	3"ID socket
PMR-30-LF	30 psi	1/10 - 8 gpm	150	347	¾" fipt	¾" fipt
PMR-30-MF	30 psi	2 - 20 gpm	150	347	1" fipt	1"
PMR-30-HF	30 psi	10 - 32 gpm	100	23	1.25" x 1"fipt	1.25"
PMR-30-XF	30 psi	20 - 90 gpm	100	23	3"ID socket	3"ID socket
PMR-40-LF	40 psi	1/10 - 8 gpm	150	347	¾" fipt	¾" fipt
PMR-40-MF	40 psi	2 - 20 gpm	150	347	1" fipt	1"
PMR-40-HF	40 psi	10 - 32 gpm	100	23	1.25" x 1" fipt	1.25"
PMR-40-XF	40 psi	20 - 90 gpm	125	289	3"ID socket	3"ID socket
PMR-50-LF	50 psi	1/10 - 8 gpm	150	347	¾" fipt	¾" fipt
PMR-50-MF	50 psi	2 - 20 gpm	150	347	1" fipt	1"
PMR-50-HF	50 psi	10 - 32 gpm	100	23	1.25" x 1" fipt	1.25"
PMR-50-XF	50 psi	20 - 90 gpm	125	289	3"ID socket	3"ID socket

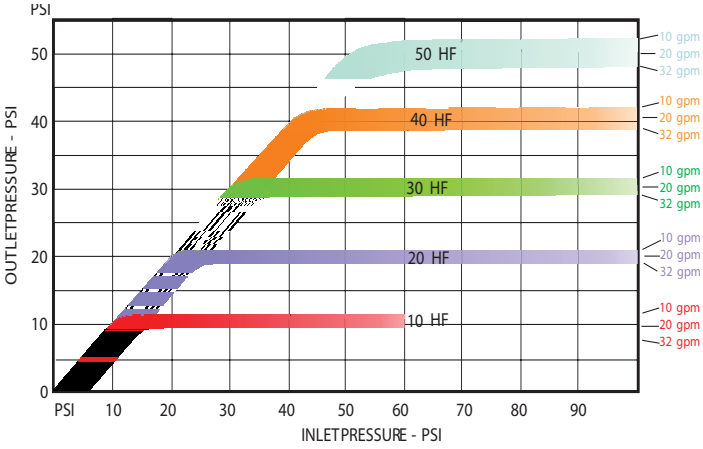
Low Flow



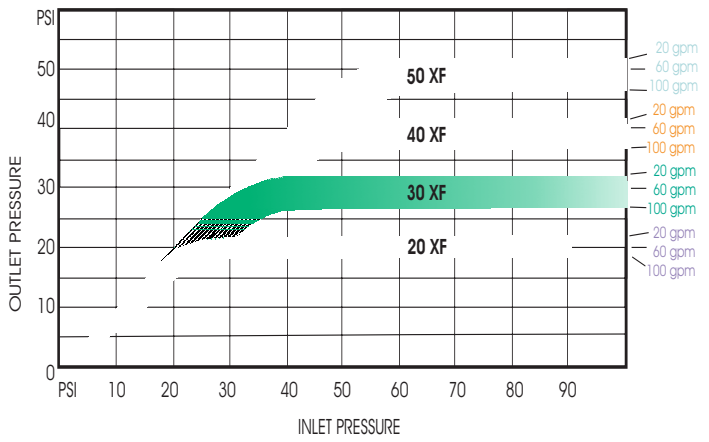
Medium Flow



High Flow



Extra Flow



True Union Ball Check Valve

Ball Check Description

The Ball Check valves prevent backflow or drain down in the system. The true union provides easy access for in-line installation and servicing. The true union ball check is designed for quick positive sealing with minimum turbulence, low restriction, and efficient fluid transfer. It can be installed vertically or horizontally. System pressure will unseat the ball, allowing flow. Backflow or head pressure of 30" or 1 to 2 psi will seat the ball and stop back flow. Each check valve ships with female thread and socket adapters. This valve is manufactured 100% from thermolastic materials, making is less suseptable to corrosion.



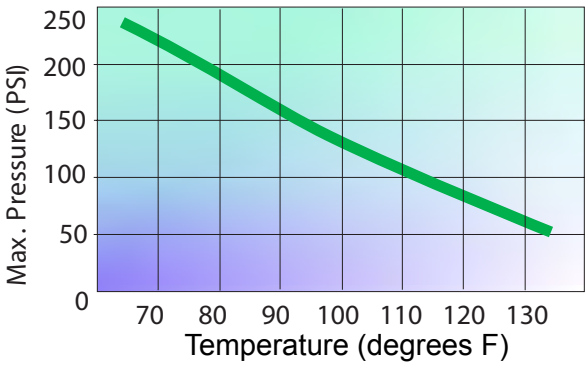
Ball Check Valve

Ball Check Model No.	Inlet/Outlet Size (FPT or socket)	Length (inches)	Height (inches)	Max Temp	Weight (lbs.)
CV-B-05	0.5"	3.50"	2.0"	140 °	0.75
CV-B-10	1.0"	5.09"	2.31"	140 °	1.1
CV-B-15	1.5"	6.59"	3.81"	140 °	2.2
CV-B-20	2.0"	7.53"	4.22"	140 °	3.0

Ball Check Specifications

All thermoplastic check valves shall be True Union Ball type constructed from PVC Type I Cell Classification 12454. Socket end connections are manufactured to ASTM D2467-94. Threaded connections are manufactured to ASTM D2464-88. The O-Ring seat shall be Viton®. All valve components shall be replaceable. The check valve shall be pressure rated at 235 psi, non-shock water at 73° F.

True Union Ball Check Maximum Pressure Rating
at Given Temperature



Ball Check Installation

Connection - Each Geoflow ball check valve ships with female thread and socket adapters. Install in a box for easy access. It is recommended that these check valves be installed no closer than 10 pipe diameters from a pump and no closer than 5 pipe diameters from an elbow.

Spring Check Valve

Spring Check Valve Description:
The spring check valve is used to prevent backflow and siphoning. The ½ pound stainless steel spring maintains a positive seal, even when no back pressure is present. Minimum of 2 psi required to open the valve.



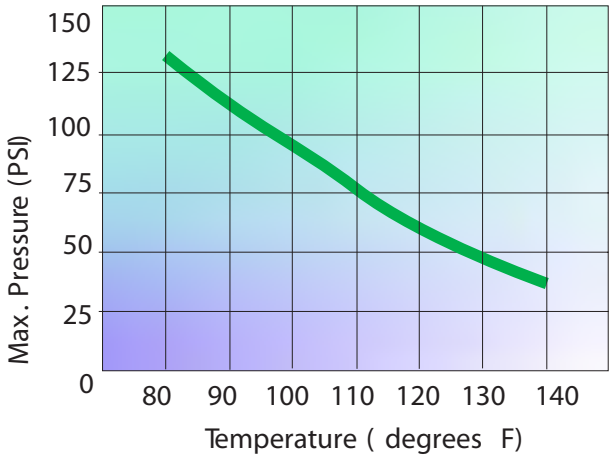
Spring Check Valve

Spring Check Model No.	Inlet/Outlet Size (FPT or socket)	Length (inches)	Height (inches)	Max Temp
CV-S-05	0.5"	4.13"	2.22"	140 °
CV-S-10	1.0"	5.25"	2.88"	140 °
CV-S-15	1.5"	5.9"	3.89"	140 °
CV-S-20	2.0"	7.0"	4.29"	140 °

Spring Check Specifications
Thermoplastic Spring check valves shall be constructed from PVC Type 1, cell class 12454 material conforming to ASTM D-1784. Seals shall be EPDM. Valves shall have socket end connections for solvent weld. All Spring check valves shall be pressure rated at 150 psi at 73 degrees F. All spring check valves shall require 2 psi to open.

Spring Check Installation
Connection - FIPT slip connections. Install in a box for easy access. It is recommended that these check valves be installed no closer than 10 pipe diameters from a pump and no closer than 5 pipe diameters from an elbow.

Spring Check
Maximum Pressure Rating at Given Temperature



Drip Plow

Description

The drip plow is a state of the art direct burial plow that pulls dripline below ground with minimum disturbance to the soils. Developed by an industry professional who formerly installed industrial cable and drip irrigation lines, this plow is built with meticulous care to details for ease of use.

Features

- Heavy duty. Solid parts are carefully welded and worked for a clean, professional plow that is built to last for many years.
- Large chute that easily allows fittings to slide through.
- Two levelers mounted on the assembly to easily make alignments as needed. Shank drafts down and lifts soil up so there is little damage to the structure. The angle of the shaft does not wedge sideways and compress or smear the soil.
- Sod cutter included.
- Unique tubing hold to keep coils from slipping off the reel.
- Mounts to toolbar. Gang one, two three or four in a row for multi-row installations.
- Tubing reel has tension setting.
- Depth control.
- Articulates. Hinges to make tight curves.





PVC 40 FRICTION LOSS CHART

	½" pipe		¾" pipe		1" pipe		1 ¼" pipe		1 ½"pipe	
	Velocity FPS	Pressure Drop PSI	Velocity FPS	Pressure Drop PSI	Velocity FPS	Pressure Drop PSI	Velocity FPS	Pressure Drop PSI	Velocity FPS	Pressure Drop PSI
1	1.05	0.43	0.60	0.11	0.37	0.03				
2	2.11	1.55	1.2	0.39	0.74	0.12	0.43	0.03		
3	3.17	3.27	1.8	0.83	1.11	0.26	0.64	0.07	0.47	0.03
4	4.22	5.57	2.41	1.42	1.48	0.44	0.86	0.11	0.63	0.05
5	5.28	8.42	3.01	2.15	1.86	0.66	1.07	0.17	0.79	0.08
6	6.33	11.81	3.61	3.01	2.23	0.93	1.29	0.24	0.95	0.11
8	8.44	20.10	4.81	5.12	2.97	1.58	1.72	0.42	1.26	0.20
10	10.55	30.37	6.02	7.73	3.71	2.39	2.15	0.63	1.58	0.30
15			9.02	16.37	5.57	5.06	3.22	1.33	2.36	0.63
20					7.42	8.61	4.29	2.27	3.15	1.07
25					9.28	13.01	5.36	3.42	3.94	1.63
30					11.14	18.22	6.43	4.80	4.73	2.27
35							7.51	6.38	5.52	3.01
40							8.58	8.17	6.30	3.88
45							9.65	10.16	7.09	4.80
50							10.72	12.35	7.88	5.83
60									9.46	8.17
70									11.03	10.87

	2" pipe		2 ½" pipe		3" pipe		4" pipe		6" pipe	
	Velocity FPS	Pressure Drop PSI	Velocity FPS	Pressure Drop PSI	Velocity FPS	Pressure Drop PSI	Velocity FPS	Pressure Drop PSI	Velocity FPS	Pressure Drop PSI
6	0.57	0.03								
8	0.76	0.06	0.54	0.02						
10	0.96	0.09	0.67	0.04						
15	1.43	0.19	1.01	0.08	0.65	0.03				
20	1.91	0.32	1.34	0.13	0.87	0.05				
25	2.39	0.48	1.67	0.20	1.08	0.07				
30	2.87	0.67	2.01	0.28	1.30	0.10				
35	3.35	0.89	2.35	0.38	1.52	0.13	0.88	0.03		
40	3.82	1.14	2.64	0.48	1.73	0.17	1.01	0.04		
45	4.30	1.42	3.01	0.60	1.95	0.21	1.13	0.05		
50	4.78	1.73	3.35	0.73	2.17	0.25	1.26	0.07		
60	5.74	2.42	4.02	1.02	2.60	0.35	1.51	0.09		
70	6.69	3.22	4.69	1.36	3.04	0.47	1.76	0.12		
80	7.65	4.13	5.36	1.74	3.47	0.60	2.02	0.16		
90	8.60	5.13	6.03	2.16	3.91	0.75	2.27	0.20		
100	9.56	6.23	6.70	2.63	4.34	0.91	2.52	0.24	1.11	0.03
125	11.95	9.42	8.38	3.97	5.42	1.38	3.15	0.37	1.39	0.05
150			10.05	5.56	6.51	1.93	3.78	0.51	1.67	0.07
175					7.59	2.57	4.41	0.68	1.94	0.09
200					8.68	3.40	5.04	0.90	2.22	0.12

GEOFLOW LIMITED WARRANTY

A. WASTEFLOW® PERFORMANCE WARRANTY

GEOFLOW products which contain nano-ROOTGUARD® are warranted to remain free of root intrusion for a period of fifteen (15) years from the date of delivery to the buyer, provided such product is stored and installed according to the manufacturer's instructions. Any such products that may be clogged by intrusion of roots shall in the first ten years be replaced 100% by Geoflow. And thereafter, for the eleventh (11th) to fifteenth (15th) years, at the price of such replacement less 20% per year. This warranty is expressly limited to providing the buyer with a replacement for any defective product or part and does not include the cost of installation of the replacement and in no case shall GEOFLOW be liable for any special incidental or consequential damages. In addition, the terms of our Basic Warranty set out below, apply to all WASTEFLOW products.

B. BASIC WARRANTY

All GEOFLOW products are warranted to be free from defects in material and workmanship for a period of two (2) years from the date of delivery to the buyer, provided that the product is correctly installed and maintained by qualified persons according to the manufacturer's recommendations. Geoflow shall have the option to repair or replace all, or part of the defective product, or refund all or part of the purchase price within the warranty period. Technical support is provided when the drip package includes exclusively genuine Geoflow controllers, headworks, valves and filters installed in conjunction with Geoflow dripline. If Geoflow provides technical support for products at no charge to the buyer, it shall be given at buyer's sole risk without any express or implied warranty, and Geoflow shall not be responsible or liable for the results thereof.

WARRANTY TERMS & CONDITIONS

CLAIMS: All claims must be made in writing to GEOFLOW, Inc. within fifteen (15) days after the defect was discovered.

THESE WARRANTIES DO NOT COVER: Conditions caused by others including but not limited to: abuse, misuse, neglect, carelessness, damage by animals or chemicals, accident or disaster: unauthorized alterations, modifications or repairs; transportation or installation; water pressure in excess of or short of recommended amounts; improper or inadequate water treatment or filtration; or failure to follow storage, installation, operation and maintenance instructions.

LIMITATIONS: These warranties constitute the exclusive warranties made by GEOFLOW for its products and is expressly in lieu of all other warranties, express or implied, including any warranty of merchantability or fitness for a particular purpose. These are the only warranties made by GEOFLOW and GEOFLOW does not authorize any employee, dealer, agent, representative or other person to create for it any other obligation or liability.

LIMITATION OF REMEDIES: As indicated above, in no case shall GEOFLOW be liable for any special incidental or consequential damages based upon breach of warranty, breach of contract, negligence, strict tort, or any other legal theories. Some states do not allow limits on warranties or remedies for breach in certain transactions. In such states the limits of this paragraph and the preceding paragraph may not apply. This warranty gives you specific legal rights, and you may have other rights, which vary from state to state.

GEOFLOW reserves the right to make changes and improvements in their products without incurring any obligation to similarly alter products previously purchased.

CHOICE OF LAW: These warranties and any liability of GEOFLOW hereunder shall be governed by, construed and enforced according to the laws of the State of California. Any disputes arising out of or relating to these warranties, not resolved by mutual agreement, shall be submitted to final and binding arbitration before JAMS, or its successor.

10/19/2007

Geoflow, Inc.
506 Tamal Plaza
Corte Madera, CA 94925
Toll Free: 800-828-3388
Tel: 415-927-6000
Fax: 415-927-0120
www.geoflow.com

October 2007 v.1

GEOFLOW
SUBSURFACE DRIP SYSTEMS

GEOFLOW, INC. MAINTENANCE AND OPERATION GUIDELINES

Adapted from Geoflow Design and Installation Manual dated Feb 2001.
See complete Design and Installation Manual online at www.geoflow.com or
telephone 800-828-3388 for a free copy.

Geoflow, Inc.

May 5, 2001

AS-BUILT SYSTEM DESCRIPTION:

1. Site Name: _____
2. Site Address including State: _____

   _____
3. Dripfield Designed by: _____
4. Dripfield Installed by: _____
5. Date of Installation: _____
6. Daily design flow: _____ gpd
7. Soil percolation rate: _____
8. Is there secondary treatment on this job site?_____Yes _____No

   If "Yes" to question 8 above, please name manufacturer and model number _____
9. Number of zones in dripfield _____

   If more than 1 zone, please describe valve (size, manufacturer, part number, type) _____
10. Amount of dripline installed in each zone.

    Zone 1 _____ft. Zone 2 _____ ft. Zone 3 _____ft. Zone 4 _____ft.
11. Wasteflow dripline model number &/or description. _____
12. Flow rate per zone.

    Zone 1_____ gpm Zone 2 _____ gpm Zone 3_____ gpm Zone 4 _____ gpm
13. Pump manufacturer, model number and number of pumps _____
14. Vortex filter model number &/or description _____

    If more than one zone, do the zones (a) share one filter or (b) each have their own filter? _____
15. Pressure in each zone:

Zone 1_____ psi Location pressure measured _____

Zone 2_____ psi Location pressure measured _____

Zone 3_____ psi Location pressure measured _____

Zone 4_____ psi Location pressure measured _____

16. Size of feed manifold inches. _____ Depth of feed manifold _____ inches.
17. Size of flush manifold inches. _____ Depth of flush manifold _____ inches.
18. Size of filter flush valve _____ inches. Is filter flush valve manual or automatic? _____
19. Size of field flush valve _____ inches. Is the field flush valve manual or automatic? _____

    If more than one zone, do the zones (a) share one flush valve or (b) each have their own flush valves? _____
20. Was any fill material supplied on the dripfield? _____

    If "yes" to 19 above please describe fill quality and quantity added. _____

    _____
21. Please provide owner with as-built drawings, including but not limited to direction of drip lines, location of air vents, location of pressure regulators if applicable, location of Headworks (filter and valves) and location of pump tank.

SYSTEM COMPONENTS :
A typical drip system installation will consist of the elements listed below:

1. Wasteflow® Dripline
WASTEFLOW lines carry the water into the dispersal/reuse area. Wasteflow lines are connected to the supply and return with Compression or Lockslip fittings. Standard spacing between lines and emitters is 24" on center. The dripline has no joints that may pull apart during installation and is ideal for tractor mounted burying machines. It is sold in 500-ft rolls. For export 400-m rolls are available. Rolls of alternative lengths may be special ordered.

Wasteflow dripline features:
a) Rootguard®
The risk of root intrusion with an emitter slowly releasing nutrient rich effluent directly into the soil is well known to anyone who has observed a leaking sewer pipe. Geoflow has an exclusive license for rootguard, to protect emitters from root intrusion. Rootguard carries a 10-year warranty against root intrusion.
b) Turbulent flow path
Wasteflow drip emitters are pre-inserted in the tube 6", 12" or 24" apart with 24" being the most popular. Angles in the emitter flow path are designed to cause turbulence in order to equalize flow between emitters and keep the emitters clean. Geoflow emitters boast large flow paths, which, coupled with turbulent flow, have proven over the years to be extremely reliable and dependable.
c) Antibacterial
Geoflow's Wasteflow has an inner lining impregnated with a antibacterial, Ultra Fresh DM-50, to inhibit bacterial growth on the walls of the tube and in the emitter.
d) Wasteflow Classic and Wasteflow PC Dripline
For Wasteflow Classic the flow rate delivered by the emitter is a function of the pressure at the emitter. Wasteflow PC will have a constant flow rate at all pressures from 7 to 60 psi - to ensure a long life the recommended operating range is 10 to 45 psi.

WASTEFLOW Classic Specification
The dripline shall consist of nominal sized one-half inch linear low density polyethylene tubing, with turbulent flow, drip emitters bonded to the inside wall. The drip emitter flow passage shall be 0.053" x 0.053" square. The tubing shall have an outside diameter (O.D.) of approximately .64-inches and an inside diameter (I.D.) of approximately .55-inches. The tubing shall consist of three layers; the inside layer shall be a bacterial protection, the middle layer shall be black and the outside layer shall be purple striped for easy identification. The dripline shall have emitters regularly spaced 24" (or 12") apart. The turbulent flow emitters shall be molded from virgin polyethylene resin. The turbulent flow emitters shall have nominal discharge rates of 1.3 gallons per hour at 20 psi. The emitters shall be impregnated with Treflan® to inhibit root intrusion for a minimum period of ten years and shall be guaranteed by the manufacturer to inhibit root intrusion for this period. WASTEFLOW Classic dripline shall be Geoflow model number WF16-4-24 or WF16-4-12.

WASTEFLOW PC Specification
The dripline shall consist of nominal sized one-half inch linear low density polyethylene tubing, with turbulent flow, drip emitters bonded to the inside wall. The drip emitter flow passage shall be 0.032" x 0.045" square. The tubing shall have an outside diameter (O.D.) of approximately .64-inches and an inside diameter (I.D.) of approximately .55-inches. The tubing shall consist of three layers; the inside layer shall be a bacterial protection, the middle layer shall be black and the outside layer shall be purple striped for easy identification. The dripline shall have emitters regularly spaced 24" (or 12" or 6") apart. The pressure compensating emitters shall be molded from virgin polyethylene resin with a silicone rubber diaphragm. The pressure compensating emitters shall have nominal discharge rates of 0.53 gallons per hour. The emitters shall be impregnated with Treflan® to inhibit root intrusion for a minimum period of ten years and shall be guaranteed by the manufacturer to inhibit root intrusion for this period. WASTEFLOW PC pressure compensating dripline shall be Geoflow model number WFPC16-2-24 or WFPC16-2-12 or WFPC16-2-06.

2. Controllers
Controllers are used for time dosing and auto-flushing of the filter and dripfields. GEO controllers include a programmable logic control interface for field modifications. They can be used on systems ranging in size from one to four zones at the time this manual was printed. All controllers include a surge arrestor, elapsed time meter and counter. For larger systems please inquire about our Wasteflow Manager controller that has monitoring and telemetry capabilities.

Controller Description
The following have been used in the standard GEO controller. Refer to paperwork supplied with controller for more detailed operating instructions.
Panel Components:
Programmable logic module for timing and controls.
Contactor and circuit breaker for pump (see panel description for max hp ratings and other specifications).
Hand-Off-Auto (H-O-A) switches for pump and valve operation.
Connections/contacts for normally closed 24 VAC valves. (Contacts for normally open valves special order)
Elapsed time meter and cycle counter for pump monitoring built in to PLC.
Circuit breaker for control power.
Surge arrestor for lightening protection.
12" x 10" NEMA 4 X fiberglass enclosure.
Float functions:
Redundant Off and Low level Alarm Float. It is a secondary off float that will prevent the operation of the pump if the timer on and off float fails. This float turns off the pump when lowered. Pumping will be disabled in both the automatic and manual modes. This float also activates the audible and visual alarm. Pressing the illuminated PUSH TO SILENCE button will silence the audible alarm. The alarm light will remain on until the float is raised. When raised, this float will enable operation of the pump. Timer On & Off float. Activates timer. Timer will control pump cycles, beginning with the off mode.
Over-ride timer On & Off float. Activates the over-ride timer. Over-ride timer will control pump cycles. The over-ride timer will finish at least one complete cycle even if the over-ride float drops.High-level alarm float. Activates the audible and visual alarm when raised. Audible alarm may be silenced by pressing the illuminated PUSH TO SILENCE button. The alarm light will remain on until the float is lowered.
NOTE: We recommend the use of normally open mercury control floats.
Pump and Valve Operation:
Pump dosing cycles are controlled by the timers when the H-O-A switch is in the auto position. Under normal conditions the "primary" timer will control the pump. During high flow conditions, the over-ride timer will control the pump. The over-ride timer will cycle the pump more frequently than the primary timer. The pump will dose for the same amount of time but the time in between doses, or the over-ride timer "off time", will be one half that of the primary timer "off time". (For example, if your primary timer settings are one hour fifty-four minutes off and five minutes on then your over-ride timer settings would be approximately fifty-five minutes off and five minutes on.)
The Vortex Filter flush valve will open for 1 minute (field adjustable) at the end of the pump cycle to allow the filter to self-flush. When the Vortex Filter flush is complete, the pump will remain activated for 15 seconds (field adjustable) to accommodate the opening of the field flush valve.
The field flush valve will open during the 15 seconds the pump is still activated after filter flush cycle. After the pump is deactivated the flush valve will remain open for one minute (field adjustable) to allow for drainage of the return line.
For severe freezing conditions allow adequate time for the manifold to drain completely.
To periodically flush the dripfield, after 10 dosing cycles (field adjustable) the pump will operate for 5 minutes (field adjustable) with the field flush valve opened and the field flush valve will stay open until all zones have been flushed. This operation will also occur after a power outage.
Wiring Control voltage input is 115 VAC for all GEO 1 and GEO 4 series panels. Output to valve(s) is 24 VAC

3. Pumps
Wasteflow dripfields depend on pumps to supply effluent and pressure to the field. These must be sized according to flow and pressure requirements. Look for effluent pumps from a dependable source. Geoflow does not endorse a single manufacturer, but does advocate you use a pump that is readily serviced in your area.

4. Filters
Geoflow systems use a self-cleaning Vortex Filter with a stainless screen 150 mesh / or 100 micron filter element. The self-cleaning action is efficient over a range of flow rates depending on the filter size. The clean-out port is at the base and can be opened and closed manually or automatically. If using a manual flush valve, please keep the valve cracked open slightly at all times for continuous flushing. The controller will fully open automatic flush valves.

Filter specification
3/4" Filter. The Y filter body shall be molded from glass reinforced engineering grade black plastic with a 3/4 inch male pipe thread (MIPT) inlet and outlet. The two-piece body shall be capable of being serviced by untwisting and shall include an O-ring seal. An additional 3/4 inch MIPT outlet shall be capable of periodic flushing. The 150-mesh filter screen is all stainless steel, providing a 2 3.4 square inch filtration area. The screen collar shall be molded from vinyl. The filter shall flush flows from 4-11 gpm. The 3/4" filter shall be Geoflow Vortex Filter model number AP4E-75.1" Filter. The Y filter body shall be molded from glass reinforced engineering grade black plastic with a 1 inch male pipe thread (MIPT) inlet and ou tlet. The two-piece body shall be capable of being serviced by untwisting and shall include an O-ring seal. An additional 3/4 inch MIPT outlet shall be capable of periodic flushing. The 150-mesh filter screen is all stainless steel, providing a 28.4 square inch filtration area. The screen collar shall be molded from vinyl. The filter shall flush flows from 7-28 gpm. The 1" filter shall be Geoflow Vortex Filter model number AP4E-100. 1.5" Filter. The Y filter body shall be molded from glass reinforced engineering grade black plastic with a 1.5 inch male pipe thread (MIPT) inlet and outlet. The two-piece body shall be capable of being serviced by untwisting and shall include an O-ring seal. An additional 3/4" MIPT outlet shall be capable of periodic flushing. The 150-mesh filter screen is all stainless steel, providing a 60.8 square inch filt ration area. The outer support shell shall be woven stainless steel wire, and the inner screen shall be made of stainless steel cloth. The inner and outer screens shall be soldered together. The screen collar shall be molded from vinyl. The 3hole filter shall flush flows of 34-42 gpm and the 4-hole filter shall flush flows of 45-55 gpm. The 1 1/2" filter shall be Geoflow model number AP4E-150-3 or AP4E-150-42" Filter. The Y filter body shall be molded from glass reinforced engineering grade black plastic wit h a 2 inch male pipe thread (MIPT) inlet and outlet. The two-piece body shall be capable of being serviced by untwisting and shallinclude an O-ring seal. An additional 3/4" MIPT outlet shall be capable of periodic flushing. The 150-mesh filter screen is all stainless steel, providing a 60.8 square inch filtration area. The outer support shell shall be woven stainless steel wire, and the inner screen shall be made of stainless steel cloth. The inner and outer screens shall be soldered together. The screen collar shall be molded from vinyl. The 3-hole filter shall flush flows from68-84 gpm and the 4-hole filter shall flush flows of 90-110 gpm. The 2" filter shall be Geoflow model number AP4E-200-3 or AP4E-200-4.

5. Supply Manifold
This carries the water from the dosing tank to the dispersal area. Rigid PVC is usually used and must be designed to slope back to the pump tank in freezingconditions. The velocity in the manifold should be between 2 feet per second and 5 feet per second (fps). Refer to PVC pipe sizing chart in the appendix to determine the best diameter for your application.

6. Return Manifold
In order to help clean the system, the ends of the drip lines are connected together into a common return line, most often made of rigid PVC. This line will help equalize pressures in the system. Flushing should be done frequently during the installation period. Periodic flushing under full system pressure will guarantee a long system life. The return manifold should be installed to drain the line back to the pretreatment tank in freezing climates.

7. Pressure Regulator
Pressure regulators fix the inlet pressure at a given rate and a re recommended with Wasteflow Classic. Under normal operating conditions, pressure in the drip lines should be:
10 psi to 45 psi for Wasteflow Classic and
7 psi to 60 psi for Wasteflow PC

8. Air Vacuum Breaker
Air vacuum breakers are installed at the high points to keep soil from being sucked into the emitters due to back siphoning or b ackpressure. This is an absolute necessity with underground drip systems. They are also used for proper draining of the supply and return manifolds in freezing conditions. Use one on the high end of the supply manifold and one on the high point of the ret urn manifold. Additional air vents may be required depending on terrain. Maximum flow per vacuum breaker is 50 gpm. Freezing conditions require the air vacuum breaker be protected with insulation.
Air Vacuum Specification
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 3/4 inch hose thread. The ball shall be constructed of low density plastic and the internal seat shall be constructed of vinyl. The air vacuum relief valve shall seal at 5 psi. Inlet size shall be a 1-inch male pipe thread. The air vent shall be Geoflow item number APVBK-1

9. Filter Flush Valves
Used to flush debris from the filter cleanout port back to the pretreatment tank, this can be an electronically activated solenoid valve or a manual ball valve. If manual, it should be opened for a full flushing at least every six month s and left cracked open slightly to flush continuously. Cracking open a manual valve may be used to increase flow through the system to be within the efficient flow rate of the filter and/or pump, if necessary. Certain States may require automated electronic flushing. Please refer to your State codes.
Flush valve specification and description
The Solenoid Valve is electrically operated and used to flush the dripfield and Vortex filter. It is normally closed, and in the event of a power failure the valve closes. Unique Dual Ported Diaphragm greatly minimizes clogging. In operation, the diaphragm ports constantly flex, inhibiting sand, silt and debris from blocking the valve action. The porting design also permits equal pressure on both sides of the diaphragm wall, regardless of line pressure when valve is not operating, and nearly equal pressure across the wall when operating. The DW Valve diaphragm is made of nylon fabric reinforced Buna-N rubber; a grooved rib interlocks with cover and body to prevent leakage. Nylon exhaust orifice is non-corrosive and has an opening sized larger than the diaphragm ports so that any pieces of sand or silt passing through the diaphragm will not be trapped beneath the solenoid actuator. The solenoid is constructed of molded epoxy resin having no carbon steel components exposed thereby eliminating possible external corrosion and deterioration. Solenoid is completely waterproof, with an O-ring seal, and complies with NEC Class II circuit requirements for 24V a.c. operation (also operates on 12 volts d.c. up to 75 psi). The actuator is teflon coated stainless steel and brass with a molded-in place rubber exhaust port seal; a stainless steel spring assures positive seating. High strength plastic glass-filled body and cover designed to operate in heavy duty commercial applications. Stainless steel 1/4 inch cover bolts and mating brass body inser ts make re-assembly easy. Shock cone on diaphragm seat eliminates water hammer in all except extreme cases.
Flow control. A brass, non-rising type flow control stem for throttling the valve from full open to close positions.

Manual bleed lever. An easy-to-use, hand operated control bleeds valve to downstream; has stops for open and closed positions.
Cold water working pressure: 150 psi

10. Field Flush valves.
Used to flush out fine particles which have passed through the filter and accumulate on the bottom of the tube at the end of eac h lateral. The field flush valve can be manual or electronic. If manual, it should be opened for full flushing at least every six months and left cracked open slightly to flush continuously and provide for drainage of the flush line in freezing conditions. Cracking open a manual valve can also be used to increase the flow through the system to be within the efficient flow rate of the filter and/or pump if necessary. Certain States do require automated electronic flushing. Please refer to your State codes.

Flush valve specification and description
See specifications and description for filter flush valves above.

FREEZING OPERATIONS

Buried drip systems are not prone to frost damage because, in their design, vacuum release and drain valves are provided. Please adhere to the following precautions:

a) Manifolds, supply lines and return lines must be sloped back to their respective dosing or treatment tanks. Under extreme conditions return and supply manifold should be insulated or buried below frost line. Be sure drain valve on flush line remains open long enough for entire field to drain.

b) Remove the check valve at the pump or provide alternate method for draining supply manifolds. Check with pump manufacturer before removing check valve from pump to be sure that it does not affect warranty.

c) Insulate equipment boxes, including Headworks box or filter and field flush valve boxes as well as zone dosing valves, pressure regulator and air vacuum relief valves. Use closed-cell insulation such as perlite in a plastic bag.

d) The top of air vacuum relief valves must be no higher than soil surface.

e) If using an index valve to split field zones, be sure it is capable of self-draining.

f) WASTEFLOW lines will self-drain through the emitters into the soil. If the cover crop over the dripfield is not yet adequately established, add hay or straw over the field for insulation.

g) Mark the valve box with a metal pin so you can find it in t he winter when covered in snow.

h) If using manual filter flush valves or manual field flush valves, they should be left cracked open slightly to provide for quick and complete drainage of the flush line in freezing conditions.

SYSTEM MAINTENANCE:

The best way to assure years of trouble free life from your system is to consistently monitor the system and perform regular maintenance functions. For large systems or systems with a BOD > 20 mg/l automation of maintenance is essential.
For smaller systems with a BOD < 20 mg/l semi-annual inspection and maintenance is adequate.

1) Remove the spin filter and install a clean cartridge. Clean the used filter cartridge back at the shop with a pressure hose. The filter cartridge should be cleaned from the outside inwards. If bacteria buildup is a problem we advise first trying lye, and if the problem persists, soak it in a chlorine bath. Soak the filter cartridge in a mixture of 50% bleach and 50% water.

2) Open the field flush valve.

3) Manually turn on the pump.

4) Flush the system for approximately five minutes.

5) Close the field flush valve.

6) Check for proper pressures in the field and if a ball valve is used reset the field flush valve for 1-psi loss.

7) Remove the lids on the vacuum breaker and check for proper operation.

8) Visually inspect the field for any irregularities.

9) Turn off the pump and reset the controller for auto mode.

10) Periodically remove and clean the field flush and filter flush valves.

ROOTGUARD® is a registered trademark of A.I.Innovations.

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

INNOVATIVE WASTEWATER SYSTEM APPROVAL

INNOVATIVE WASTEWATER SYSTEM NO: IWWS 2015-01-R1

Issued To:	Orenco Systems, Inc. 814 Airway Avenue Sutherlin, Oregon 97479 Telephone: (877) 371-3172; Fax: (541) 459-2884 http://www.orenco.com
Contact:	Nicholas Noble, Government Relations Manager
For:	AdvanTex® AX-RT Treatment Systems Models AX20-RT and AX25-RT
Approval Date:	April 24, 2015 June 15, 2015 Sampling Revisions

In accordance with General Statute 130A-343, 15A NCAC 18A .1969 and .1970, a proposal by Orenco Systems, Inc. for an approval of subsurface wastewater systems utilizing the AdvanTex AX-RT Treatment systems has been reviewed, and found to meet the standards of an innovative system when all of the following conditions are met:

I. General

A. Scope of this Innovative Approval
   1. Design, installation, use, and operation and maintenance guidelines for AdvanTex AX-RT Treatment systems to meet TS-I or TS-II effluent standards pursuant to Rule 15A NCAC 18A .1970. Refer to Rule .1970(a) Table VIII – Effluent Quality Standards for Advanced Pretreatment Systems for treatment performance levels.
   2. Operation, maintenance, and monitoring requirements for AdvanTex AX-RT Treatment systems and associated subsurface systems to ensure the treatment performance standards are met.

B. This Innovative System Approval is applicable to domestic strength sewage systems (non-industrial wastewater) utilizing AdvanTex AX-RT Treatment systems that have a design flow not exceeding 3,000 gallons per day (gpd).

   Use of AdvanTex AX-RT Treatment systems for facilities with an influent waste strength that exceeds domestic septic tank quality effluent standards pursuant to Rule 15A NCAC 18A .1970(b) may be proposed by Orenco Systems, Inc. and a North Carolina Professional Engineer to the Department for review and approval on a case-by-case basis, prior to permitting by the local health department (LHD). The system design must include the proposed raw wastewater

strength (BOD_5, COD, TN, TSS, fats, oils and grease, etc.), the expected organic loading rate (in pounds of BOD), and hydraulic loading rate on the pretreatment system, and the calculations, references, and any other needed information to support the proposed design.

C. Any site utilizing these systems shall have wastewater with sufficient alkalinity to facilitate biological treatment processes. The influent shall not have a pH or toxins that significantly inhibit microbial growth.

D. Use of AdvanTex AX-RT Treatment systems that have a design flow exceeding 3,000 gpd may be permitted on a case-by-case basis after approval by the Department in accordance with the Large Systems State Review/Approval Process (Rule 15A NCAC 18A .1938).

E. This Innovative Approval is not applicable for proposed weekly rental homes located in coastal North Carolina. Those properties should utilize an AdvanTex AX20 or AX100 system covered under a separate Innovative approval (IWWS-2004-03-R4).

II. System Description

The AdvanTex AX-RT series uses the same recirculating textile filter technology as the AX20 and AX100 that have been previously approved (IWWS 2004-03-R4), combining the textile filter media and recirculation/processing tank into a single, complete, self-contained multi-compartment unit. The recirculating treatment tank receives filtered effluent from the primary septic tank and is topped with a standard AX20 lid and hinge assembly. Textile media is suspended from the top of the treatment unit, with typically 60% positioned over the recirculation/blend chamber and the remainder (40%) positioned over a final filtrate chamber separated from the recirculation/blend chamber by a baffle wall. Filtrate is either recirculated back to the recirculation-blend chamber through a low-level equalization swing-check valve in the baffle wall, or discharged by controlled-dosing using a discharge pump, or by gravity.

Both the AX20-RT and AX25-RT utilize the same single multi-compartment unit. The AX20-RT has 524 square feet of textile filter media, and the AX25-RT has 624 square feet of media.

III. Siting Criteria

AdvanTex AX-RT Treatment systems and associated drainfields shall be sited and sized in accordance with Rule .1970 for TS-I or TS-II systems. Drip irrigation systems used with AdvanTex AX-RT Treatment systems shall be sited and sized in accordance with the manufacturer-specific drip approval. The AX-RT Treatment systems and associated drainfields shall meet all applicable horizontal setback requirements and be located to prevent surface/subsurface water inflow/infiltration.

IV. System Sizing

The system sizing criteria shall be based upon the long term acceptance rate specified in the appropriate portion of the rules or Innovative and Experimental approval for the type of ground absorption system to be used.

V. Special Site Evaluation

A special site evaluation may be required based on the proposed ground absorption system. Refer to manufacturer specific drip approvals and Rule .1970(p).

VI. Design Criteria

A. The system consists of a septic tank and an AdvanTex AX-RT fixed-film media treatment system as specified in Table 1 below.

Table 1 – AX-RT System and Septic Tank Volume		
Design Daily Flow (gpd)	Minimum Septic Tank Volume (gallons)	AdvanTex AX-RT
≤ 500	1,000	AX20-RT
501-600	1500	AX25-RT

A single-bulb UV system shall be provided for TS-II systems. AX20-RT TS-II systems may be configured with an integrated UV and pumping chamber. AX25-RT TS-II systems require the UV unit to be installed after the RT unit and a separate approved pump tank. See Attachment A for example drawings of unit configurations.

1. All tanks shall be approved by the Department and Orenco Systems, Inc. specifically for the use with AdvanTex Treatment systems. As part of this approval, all tanks (septic and recirculating) will have an inlet sanitary tee that is visible and accessible from the riser opening. The inlet tee shall have an inner diameter not less than 4 inches. An access riser not less than 20 inches in diameter will be provided to access the inlet tee. The top of the riser shall be a minimum of 2 inches above finished grade and water shall be diverted away from the riser as necessary to prevent water from accumulation.
2. The septic tank shall be equipped with a Department approved, appropriately sized Orenco effluent filter on the outlet end.
3. The recirculating pumps are Orenco 4-inch turbine effluent pumps. Specifications for the pumps that accompany the different configurations are listed in Table 2.

Table 2 – AX-RT Recirculating Pump Specifications				
AdvanTex Filter Unit	Number of Recirculation Pumps	Flow Rate (gpm)	Pump Nominal Horse Power	Voltage
AX20-RT	1	15	1/2	115V or 230V
AX25-RT	1	30	1/2	115V or 230V

4. The discharge pumps (as applicable with some AX-RT and AX20-RT-UV configurations) are Orenco 4-inch turbine effluent pumps. Pump specifications for the different configurations are listed in Table 3.

Table 3 – AX-RT Discharge Pump Specifications		
Model	Pump	Pump Nominal Flow Rate (gpm)
AX20-RT	Bottom Intake	10, 20, 30, 50
AX20-RT-UV	Bottom Intake	10, 20, 30, 50
AX25-RT	Bottom Intake	10, 20, 30, 50

Possible float settings for AX-RT's with integrated field dosing pumps are listed in Table 4.

Table 4 – AX-RT Float Settings and Dose Volumes			
		AX20-RT or AX25-RT	AX20 RT UV+
On Float*	Off Float*	Dose Vol (gal)	Dose Vol (gal)
35	24	117	49
35	20	159	66
35	18	180	75
35	16	202	84
35	12	244	102
35	10	265	111
35	8	286	119

*Floats measured in inches from bottom of RT

+AX25-RT for TS-II requires UV unit in separate chamber or separate dosing tank.

5. The AdvanTex AX-RT is equipped with a set of vertical geotextile sheets with low-pressure pipe wastewater distribution spin nozzles above the sheets. The low-pressure pipe distribution spin nozzles operate at 4 psi (this measurement is used in lieu of residual head) and are designed to operate at a flow rate of 6 gpm. One air vent for the RT is required, and is located on the pod and ultimately connected to the building sewer.
6. Filtrate from the AdvanTex AX-RT percolates through the geotextile by gravity into either the recirculation tank or the discharge chamber and ultimately through the ultraviolet (UV) disinfection system dependent upon the recirculation tank level.
7. To enhance nitrogen removal a portion of the nitrified wastewater shall be diverted back to the septic tank where conditions are most optimal for denitrification. The daily volume of nitrified wastewater delivered back to the septic tank shall be determined on a case-by-case basis by the designer authorized in writing by Orenco Systems Inc. and shall not exceed 50% of the daily volume pumped to the AdvanTex filters. Diverting wastewater back to the inlet riser of the septic tank shall be accomplished by installing a stub connection at the recirculating pump hose and valve assembly to divert a portion of each dose to the septic tank inlet riser. A flow control disk with appropriately-sized orifice is installed by the manufacturer in a union in the septic tank return line to control the proportion of flow returned to the septic tank. A ball valve followed by an elbow to direct flow down into the tank shall be placed on the return line inside of the septic tank inlet riser. This ball valve allows the denitrification return line to be shut off for any operational reasons.
8. The UV system shall be rated for the appropriate discharge rate from the AdvanTex unit. Audible and visible alarms for bulb failure will be provided.
9. The UV disinfection system (optional for TS-I, required for TS-II) will be one of the following:
   a. The Orenco UV Unit, or
   b. Other UV systems specifically approved by the Department and Orenco Systems, Inc.
10. AdvanTex Treatment systems will utilize the TCOM or VeriComm® Telemetry Control Panel. The control panel is in a NEMA 4X enclosure, and shall be located within 30 feet and in line of sight of the recirculation tank. Separate control and alarm circuits shall be provided. The Telemetry Control Panel shall be connected to an active phone line capable of dialing a 1-800 number, or be equipped with a wireless bridge connecting it to a wireless internet router, and shall remain active for the life of the Advanced Treatment System. The Operator in Responsible Charge (ORC) of the system authorized in writing by Orenco

Systems, Inc. must be able to access the panel directly on site and shall be available to the LHD with 24-hour notice in the event that the LHD needs to access the control panel.

11. All access riser hatches shall be secured by approved tamper-resistant stainless steel bolts supplied by the manufacturer. Riser construction, attachment to tanks and security systems shall be pre-approved by the Department in accordance with the Orenco Systems, Inc. approvals for septic tank and pump tank risers, as applicable.
12. The instructions for anti-floatation in the AdvanTex AX-RT Treatment System Installation Manuals shall be followed. Orenco Systems, Inc, can submit a pre-engineered anti-buoyancy design by a NC Professional Engineer for approval by the Department that could be used instead of site specific anti-buoyancy designs for sites that meet the limitations of the pre-engineered design.
13. The panel controlling the drainfield dosing pumps shall be provided by Orenco Systems, Inc. and designed to meet the daily, 7-day, and 30-day monitoring requirements of Rule .1970, unless the drainfield panel is provided by a distribution system manufacturer other than Orenco Systems, Inc. The other manufacturer's panel shall meet these same monitoring requirements, and its alternate use for this purpose shall have the written concurrence of Orenco Systems, Inc. and the designer authorized in writing by Orenco Systems, Inc.
14. A spigot or sampling port shall be placed on the force main from the final dosing tank to provide for effluent sampling. In the event a system is installed using a gravity trench, a sampling basin shall be installed between the final treatment device and the drainfield.
15. The 7-day and 30-day readings will be stored in the VeriComm control panel records. The ORC authorized in writing by Orenco Systems, Inc. will be able to access this information when they are at the site. The VeriComm panel, TCOMM Telemetry control panel, or approved equal shall be used for pressure manifolds, LPP systems, and drip irrigation systems.

B. AdvanTex AX-RT Treatment systems shall be designed by a designer authorized in writing by Orenco Systems, Inc. or a North Carolina Professional Engineer. Systems over 1,000 gpd shall be designed by a North Carolina Professional Engineer. The design shall also be reviewed and written recommendation provided by the Orenco Representative for North Carolina or the Orenco NC dealer/distributor.

VII. Installation and Testing

A. A preconstruction conference shall be required to be attended by the designer authorized in writing by Orenco Systems, Inc., engineer (if applicable), installer authorized in writing by Orenco Systems, Inc., and LHD prior to beginning construction of the AdvanTex AX-RT Treatment system.

B. All AdvanTex AX-RT Treatment systems shall be installed according to directions provided by Orenco Systems, Inc. Additionally, all AdvanTex AX-RT Treatment systems and components used with, but not manufactured by Orenco Systems, Inc., shall be installed in accordance with all applicable regulations and manufacturer instructions.

C. All individuals/companies installing AdvanTex AX-RT Treatment systems shall be in possession of all necessary permits and licenses before attempting any portion of a new or repair installation. The company/individual must be a Level IV installer and authorized in writing by Orenco Systems, Inc.

D. Watertightness of the tanks shall be tested by either of the following protocols: 24-hour

hydrostatic test or a vacuum test.

1. Hydrostatic Test[1, 2]
    a. Temporarily seal the inlet and outlet pipes.
    b. Fill tank with clean water to a point at least two inches above the pipe connections or the seam between the tank and the riser, whichever is highest.
    c. Measure the water level.
    d. Allow the tank to sit for 24 hours.
    e. Re-measure the water level.
    f. If the water level change is ½-inch or less or one percent of the liquid tank capacity, the tank passes the leak test.
    g. If the water level change is greater than ½-inch, any visible leaks can be repaired and the tank may be topped off with water and allowed to sit for a minimum of one hour.
    h. The tank passes the leak test if there are no visible leaks (flowing water or dripping in a steady stream) and no measureable drop in water level after one hour. Otherwise, the tank fails the leak test.
2. Vacuum Test[3]
    a. Temporarily seal the inlet and outlet pipes.
    b. A vacuum of four (4) inches of mercury should be pulled on the tank and held for five (5) minutes.
    c. During the testing, the tank manufacturer or their representative can seal the tank if it is found to be leaking.
    d. If the tank is repaired, the vacuum must be brought back up to four inches and held for five minutes.

E. The distribution of flow to the AdvanTex AX-RT and to the septic tank shall be measured during start-up and set in accordance with the system design with start-up settings recorded.

F. Specified site preparation steps and construction specifications for the ground absorption system shall be strictly adhered to, including specified depth of trenches in relation to site limiting conditions, cover material specifications (if needed), trench installation method, etc.

G. The installer authorized in writing by Orenco Systems, Inc., the engineer or designer authorized in writing by Orenco Systems, Inc., and the ORC authorized in writing by Orenco Systems, Inc. shall conduct an inspection/start-up of the AdvanTex AX-RT Treatment system and all associated system components. The LHD personnel will attend and observe the inspection/start-up. During the inspection/start-up to include:
    1. System watertightness testing.
    2. Control panel operation and alarm settings.
    3. Pump model numbers and time clock settings.
    4. Air vent on the pod installed and functional.
    5. Pressure head (PSI) on the AX-RT wastewater distribution system.
    6. Return flow to the septic tank set per design and recorded, when applicable.
    7. Riser hatches have tamperproof bolts, and/or riser lock ring.

---

[1] Victor D'Amato and Ishwar Devkota, *Development of Prefabricated Septic and Pump Tank Construction and Installation Standards for North Carolina.*

[2] National Precast Concrete Association, *Best Practices Manual Precast Concrete On-Site Wastewater Tanks*, Second Edition, October 2005, 24.

[3] National Precast Concrete Association, *Best Practices Manual Precast Concrete On-Site Wastewater Tanks*, Second Edition, October 2005, 24.

VIII. Operation, Maintenance, Monitoring and Reporting

A. AdvanTex AX-RT Treatment systems shall be classified, at a minimum, as a Type Va system in accordance with Table V(a) of Rule .1961(b). Management and inspection shall be in accordance with Rules .1961 and .1970.

B. All Orenco AdvanTex AX-RT Treatment systems require an operation and maintenance agreement between the system owner and Orenco Systems, Inc., its authorized representative, or with an operator authorized in writing by Orenco Systems, Inc. as per Rule .1970. The system shall be inspected according to Rule .1961 by a certified subsurface operator authorized in writing by Orenco Systems Inc. The ORC shall be either an employee of Orenco Systems, Inc. or authorized in writing by Orenco Systems, Inc. to operate and maintain the system. The operator authorized in writing by Orenco Systems, Inc. must have proper equipment and training to access and program VeriComm or TCOM Control panels on site.

C. All AdvanTex AX-RT Treatment systems shall be maintained according to the latest version of Orenco Systems, Inc.'s O&M Manual.

D. At each AdvanTex AX-RT Treatment system inspection, the ORC authorized in writing by Orenco Systems, Inc. shall, at a minimum, observe, monitor, and record the following:
   1. Wastewater level in all the tanks.
   2. Sludge, scum, and grease levels in all tanks.
   3. Clogging of effluent filter in Biotube® pump package.
   4. Watertightness of tanks, risers and pipe penetrations at the tanks.
   5. Operation of pumps, floats, valves, electrical controls, and alarms.
   6. Drainfield pump delivery rate (drawdown test), determination of the average pump run time, and drainfield dosing volume.
   7. Any structural damage, accessibility issues, adequate ventilation, excess odors, ponding of effluent, insect infestations, vegetative growth over the drainfield, or surfacing of effluent on the drainfield area.
   8. Sample of AdvanTex AX-RT Treatment system effluent collected from the sampling point to check for effluent clarity and odor and a sample of influent, as required.
   9. Readings from pump cycle counters and run time meters and any water meter readings.
   10. Current operational set up for TS-II nitrogen removal enhancement (percent returned to septic tank) and recommendation for modifications (if needed).
   11. System operating conditions, from the review of VeriComm or TCOMM stored data for indication of 7-day and 30-day flows and flow variances, clogging of filter distribution system, or other abnormal conditions.

E. The ORC authorized in writing by Orenco Systems, Inc. shall also conduct additional observations, measurements, monitoring, and maintenance activities as specified in the Operation Permit and as recommended by the manufacturer.

F. Sampling and Testing
   1. All sampling shall be done in accordance with Rule .1970(n)(3) and (5). AdvanTex AX-RT Treatment systems shall be sampled annually (semi-annually for systems with a design flow of 1,501 to 3,000 gpd).
   2. TS-II systems influent shall be analyzed for TKN.
   3. Effluent for all systems shall be tested for effluent $CBOD_5$ and NH_4-N and shall be tested in the field for turbidity. Systems specified to meet the TS-II standard shall have the effluent

analyzed for TN (TKN and NO_3-N). Systems specified to meet the TS-II standard with design flows of 1,501 to 3,000 gpd shall also have the effluent analyzed for fecal coliform.

4. Additional sampling of effluent or influent may be determined to be necessary by the ORC authorized in writing by Orenco Systems, Inc. during a system inspection to assist with troubleshooting or to verify system performance.
5. Effluent samples for drip disposal systems or other pressurized dispersal systems shall be collected from a tap on the drainfield forcemain (prior to spin filters for drip systems). The preferred location of the tap is in the pump tank discharge assembly. The sampling shall not commence until at least 30 seconds of continuous discharge through the sample tap has been completed.
6. Influent samples shall be taken from outlet side of the septic tank. Care shall be taken to collect the sample from below the scum layer with as little solids as possible.
7. Adjustments in the monitoring schedule and number of parameters sampled may be proposed by Orenco Systems, Inc. and approved by the Department pursuant to Rule .1970(n)(3)(B) or (C).

G. Notification and Performance of Maintenance and Repairs
   1. The ORC authorized in writing by Orenco Systems, Inc. shall alert the LHD, Orenco Systems, Inc., and the system owner within 48 hours of needed maintenance or repair activities including, but not limited to landscaping, tank sealing, tank pumping, pipe or control system repairs, media replacement, and/or adjustments to any other system component.
   2. System troubleshooting and needed maintenance shall be provided to maintain the pump delivery rate and average pump run time within 25% of initial measurements conducted during system startup. The ORC authorized in writing by Orenco Systems, Inc. shall notify the system owner, Orenco Systems, Inc., and the LHD whenever the pump delivery rate efficiency or average pump ran times are not within 25% of initial measurements conducted prior to system start-up.
   3. The septic tank will be pumped as needed upon recommendation of the ORC authorized in writing by Orenco Systems, Inc. and in accordance with the AdvanTex AX-RT Treatment System operation and maintenance instructions. However, at a minimum, the septic tank will be pumped whenever the solids level exceeds 25% of the tank's total liquid working capacity or the scum layer is more than four inches thick.
   4. The tanks shall be pumped by a properly permitted septage management firm, and the septage handled in accordance with 15A NCAC 13B .0800.
   5. The ORC authorized in writing by Orenco Systems, Inc. shall notify the LHD, Orenco Systems, Inc., and system owner in writing whenever repairs are indicated. All maintenance activities shall be recorded in the ORC reports provided to the system owner, Orenco Systems, Inc. and the LHD.

H. Reporting
   1. The ORC authorized in writing by Orenco Systems, Inc. shall provide a completed written report to the system owner, Orenco Systems, Inc., and the LHD within 30 days of each inspection. At a minimum, this report shall specify:
      a. The date and time of inspection,
      b. System operating conditions according to Section VII.D, VII.E, and VII.F.
      c. Results from any laboratory analysis of any influent and effluent samples,
      d. Maintenance activities performed since the last inspection report,
      e. An assessment of overall system performance,
      f. A list of any improvements or maintenance needed,

g. A determination of whether the system is malfunctioning, and the specific nature of the malfunction,
h. Any changes made in system settings, based on recommendations of the manufacturer, and
i. A summary report of data retrieved from the VeriComm or TCOMM panel verifying actual daily, 7-day, and 30-day flows, flow variances, and other operating conditions.

IX. Responsibilities and Permitting Procedures

A. Prior to the installation of an AdvanTex AX-RT Treatment system at a site, the owner or owner's agent shall file an application at the LHD for the proposed use of this system. After the LHD conducts a soil and site evaluation, the LHD may issue an Improvement Permit or an Authorization to Construct or amend a previously issued Authorization to Construct allowing for the use of an AdvanTex AX-RT Treatment system.

B. The Improvement Permit and Authorization to Construct shall contain all conditions the site approval is based upon, including the proposed use of the Innovative system. The operation permit will include all conditions as specified in the Improvement Permit and Authorization to Construct.

C. When a special site evaluation is required pursuant to Rule .1970(p)(1) or a drip approval, as applicable, an evaluation and written, sealed report from a Licensed Soil Scientist regarding the site shall be provided to the LHD. The report shall contain the information specified in Rule .1970(p)(2) and "Requirements for Submittals of Soil Reports and Pretreatment and/or Dispersal System Designs". The LHD may request the assistance of their Regional Soil Scientist in evaluating this report prior to Improvement Permit issuance.

D. The AdvanTex AX-RT Treatment system shall be designed by one of the following: a designer authorized in writing by Orenco Systems, Inc. or a North Carolina Professional Engineer. Systems over 1,000 gpd or as otherwise required for drip irrigation systems, shall be designed by a Professional Engineer. All design submittals shall be accompanied by a certification letter from Orenco Systems Inc., or its North Carolina authorized representative.

E. Prior to the issuance of an Authorization to Construct for an AdvanTex AX-RT Treatment system, a design submittal prepared by a designer authorized by Orenco Systems, Inc. or North Carolina Professional Engineer shall be submitted for review and approval by the LHD. The design submittal shall include the information specified in "Requirements for Submittals of Soil Reports and Pretreatment and/or Dispersal System Designs".

F. It is recommended that local authorized environmental health practitioners attend a design training session offered by the manufacturer/authorized representative prior to permitting the system. Also, at the request of the LHD, a Regional Engineer will review the design.

G. The designer authorized by Orenco Systems, Inc. shall certify in writing that the system was installed in accordance with the approved design prior to Operation Permit issuance.

H. A North Carolina Professional Engineer shall certify in writing that a system designed by an engineer was installed in accordance with the approved plans and specifications prior to Operation Permit issuance.

I. For sites required to be evaluated by a Licensed Soil Scientist or Professional Geologist (see Section V and IX.C), the LHD may specify as a condition on the Improvement Permit and Authorization to Construct that a Licensed Soil Scientist or Professional Geologist oversee critical phases of the drainfield installation and certify in writing that the installation was in accordance with their specified site/installation requirements prior to the Operation Permit issuance.

J. The ORC authorized in writing by Orenco Systems, Inc. shall be present during the final inspection of the system prior to the issuance of the operation permit. The ORC shall be certified as a NC Subsurface Operator and authorized in writing by Orenco Systems, Inc.

K. The LHD issues the Operation Permit after the following:
   1. Field verification of installation completion;
   2. Receipt of written documentation from the designer authorized in writing by Orenco Systems,Inc., or the engineer, as applicable, that the system has been designed, installed, and is operating in accordance with the approved plans; and
   3. All necessary legal documents have been completed, including the contract between the system owner and the ORC authorized in writing by Orenco Systems, Inc.

L. On an annual basis, Orenco Systems Inc., shall provide a report to the On-Site Water Protection Section including the number and location of new system installations during the previous year, and effluent data and operator reports for each operational AdvanTex AX-RT Treatment system installed in North Carolina under this Innovative Approval. Effluent data should be compiled and submitted electronically. If available, a web-based system for data posting of laboratory results should be utilized. These reports shall provide information to the Department based upon the monitoring data and observations made from the Innovative systems installed pursuant to this Approval. This should include an assessment of system performance in relation to the established treatment performance standards; an assessment of physical and chemical properties of the materials used to construct the system, in terms of strength, durability, and chemical resistance to loads and conditions experienced; recommended areas of applicability for the system; and any conditions and limitations related to the use of the system. The report shall also include an updated list of authorized designers, installers, and ORCs.

X. Repair of Systems

The provisions of 15A NCAC 18A .1961 (c) shall govern the use of the AdvanTex AX-RT Treatment system for repairs to existing malfunctioning wastewater systems.

Approved By: _____ Date: _____

AX25RT Treatment System - Pump Discharge

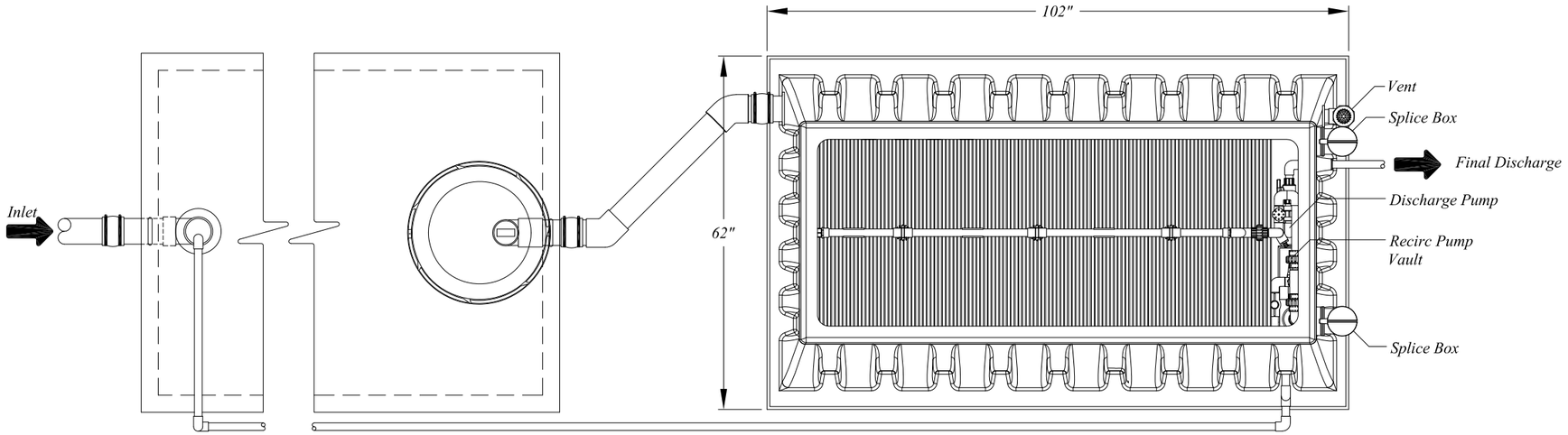
Filter Tank Dry Weight: 950 lbs

Design Notes

For residential strength waste up to 6 bedrooms.

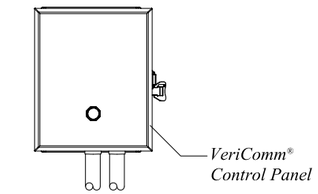
Installation to be performed by an AdvanTex Authorized Installer only.

Start-up and service to be performed by an AdvanTex Authorized Service Provider only.

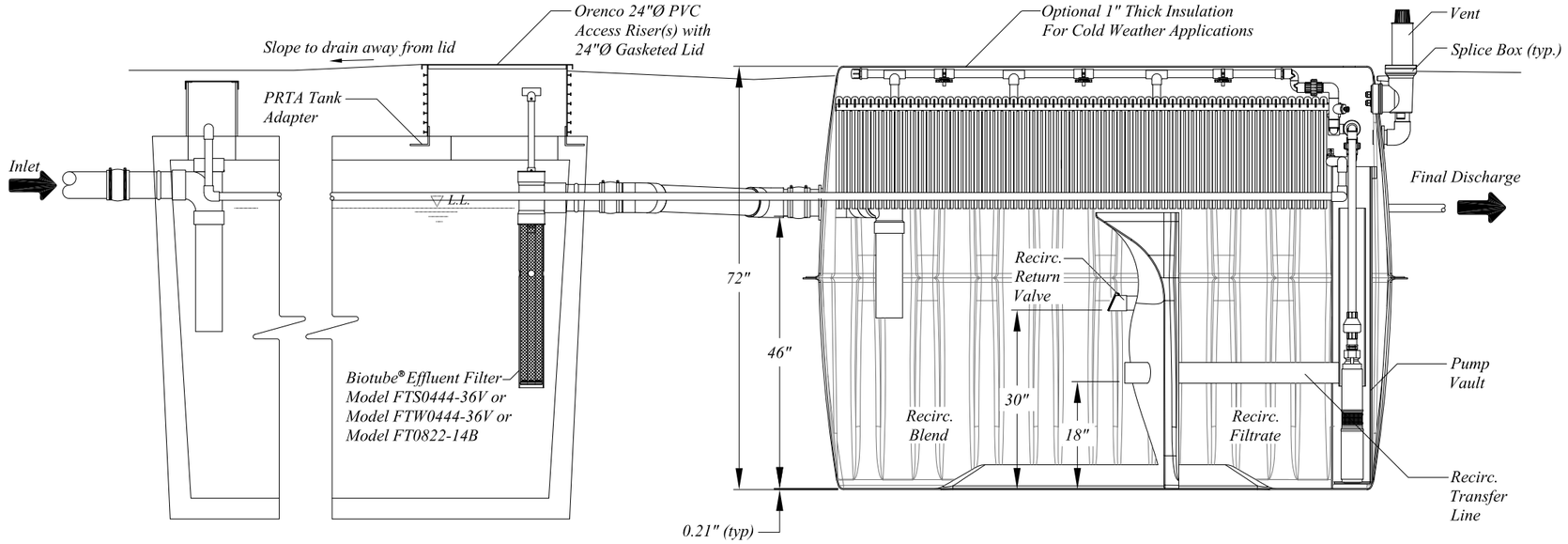


** Primary Tank - Top View*

AX25 800 gal. Recirc. Tank - Top View

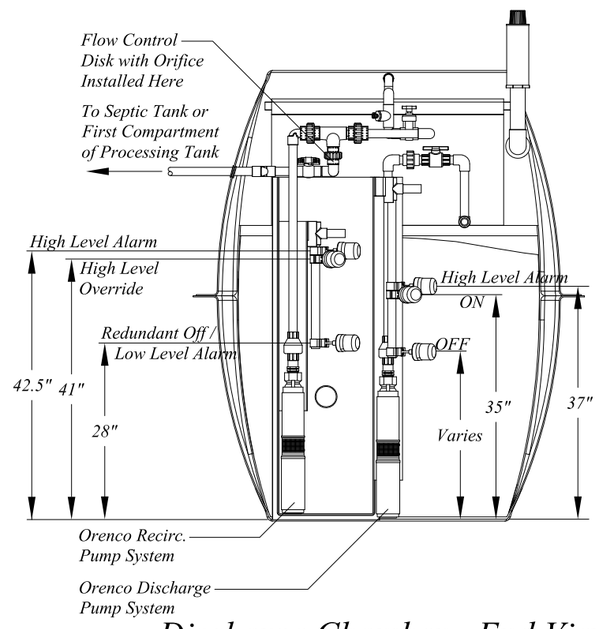


Control Panel Detail
Not To Scale



** Primary Tank - Side View*

AX25 800 gal. Recirc. Tank - Side View



Discharge Chamber - End View

** 1,250 Gallons minimum capacity for 5 bedrooms*
1,500 Gallons minimum capacity for 6 bedrooms.

Copyright © 2013
Orenco Systems®, Inc.

UNAUTHORIZED CHANGES & USES
Orenco has prepared these drawings for use by the design engineer. Orenco will not be responsible or liable for unauthorized changes to or uses of these drawings. All changes to these drawings must be made in writing and must be approved by the design engineer.

PRODUCT CONFIGURATION DRAWINGS

Orenco Systems® Incorporated
Changing the Way the World Does Wastewater®

Drawn By: BEN SMITH
Drawn For:

Project: AX25RT Mode 3B
Title: NDW-ATX-RT-STD-25

Scale: 1" = 2'-0"
Sheet: 1 OF 1
Rev: A-02
Date: 4/22/2013

NORTH CAROLINA DEPARTMENT
OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL HEALTH
ON-SITE WATER PROTECTION SECTION

INNOVATIVE WASTEWATER SYSTEM APPROVAL

INNOVATIVE WASTEWATER SYSTEM NO: IWWS-2000-2R

ISSUED TO: Geoflow, Inc.
506 Tamal Plaza
Corte Madera, CA 94925
(800)828-3388; Fax: (415)927-1800
Website: www.geoflow.com

FOR: Geoflow's Subsurface Drip System

APPROVAL DATE: August 29, 2000
May 17, 2007

In accordance with 15A NCAC 18A .1969, an application by Karen Ferguson, Geoflow, Inc., of Corte Madera, California, for modification to the approval of their subsurface wastewater drip system has been reviewed, and the system has been found to meet the standards of an innovative system when the following conditions for use, monitoring and operation are met:

I. System description:

a. Collection system: conventional gravity, pressure sewer fed by grinder pumps or individual septic tank effluent pumping units.

b. Pretreatment: Aerobic System: DEH-approved Pressure Dosed Sand Filter, Peat Biofilter, Aerobic Treatment Unit, or approved equal.

c. Filtration: Automatic, appropriately sized self-cleaning screen filter(s) or disc filters capable of screening particles larger than or equal to 130 microns.

d. Manifold: Common line (Schedule 40 PVC) to connect all the dripline in a single field at the start of the field and the distal ends of the dripline (flush end).

e. Air vent: Air Vacuum Breaker(s) installed at the high point(s) of each dripfield to keep soil from being sucked into the drip emitters due to back siphoning or backpressure.

f. Dripline: Geoflow's Wasteflow PC dripline with pressure-compensating emitters spaced uniformly in the tubing (24-inch, 18-inch, 12-inch, or 6-inch centers). The tubing consists of three layers; the inside layer is an anti-bacterial protector, the middle layer is black and the outside layer is purple-striped for easy identification. The emitters are impregnated with Treflan® to inhibit root intrusion.

g. Field flushing valve: An automatic valve used to enable accumulated debris and sediment to be flushed from the dripline back to the pretreatment unit.

h. System Controls: Control/software package controlling all functions, including filter flushing, system dosing and flushing, audible/visible alarms, and for larger systems, telemetry (> 600 gpd), and flow monitoring and self diagnostics (>3000 gpd) capabilities.

II. Siting criteria:

a. The Geoflow Subsurface Drip System may be utilized on sites that meet the following criteria:

i. Sites classified suitable or provisionally suitable in accordance with Rules .1939-.1948;

ii. Sites reclassified to be provisionally suitable in accordance with Rules .1956(1), (2), (4), (5) or (6a);

iii. Sites meeting the criteria for low pressure pipe systems in accordance with Rule .1957(a)(2); or

iv. Sites meeting the criteria for new or existing fill, in accordance with Rule .1957(b). The system is considered a fill system when all or part of the drip tubing shall be installed in fill material. For existing fill systems, the minimum vertical separation distance between the drip tubing or installed trench bottom and any soil wetness condition or any soil horizon unsuitable as to soil structure, clay mineralogy, organic soil, rock or saprolite shall be 18 inches.

b. Required vertical separation requirements shall be measured from the bottom of the drip tubing, or the installed trench bottom, whichever is deeper. All reductions in vertical separation allowed in the Rules and for other Approved Systems, including for Advanced Pretreatment systems approved in accordance with Rule .1970, based on the use of low pressure pipe or drip distribution systems shall apply (per recommendation of an NC Licensed Soil Scientist, as applicable).

c. The minimum horizontal setback requirements of Rule .1950(a) shall be met, except as allowed for in conjunction with an Advanced Pretreatment System as allowed pursuant with Rule .1970.

III. System sizing:

a. The following table shall be used in determining the long-term acceptance rate (LTAR) for the Geoflow Subsurface Drip System. The LTAR shall be based on the most hydraulically limiting soil horizon within 18 inches of the naturally occurring ground surface or to a depth of one foot below drip tubing, whichever is deeper.

Soil Group	Soil Textural classes (USDA classification)	Soil Textural Classes (USDA Classification)	LTAR (area basis) (gpd/ft^2)*
I.	Sands (with S or PS structure and clay mineralogy)	Sand Loamy Sand	1.0 - 0.6
II.	Coarse Loams (with S or PS structure and clay mineralogy)	Sandy loam Loam	0.6 - 0.4
III.	Fine Loams (with S or PS structure and clay mineralogy)	Sandy Clay Loam Loam Silt Loam Clay loam Silty Clay Loam Silt	0.4-0.15
IV.	Clays (with S or PS structure and clay mineralogy)	Sandy Clay Silty Clay Clay	0.15-0.05

***In conjunction with an approved Innovative, Controlled Demonstration, or Experimental Pretreatment System meeting TS-I or TS-II performance standards or better, the same LTAR may be used as would apply to an LPP system as long as all the conditions of the Innovative, Controlled Demonstration, or Experimental Approval for the pretreatment system are met, including the requirements for a site-specific hydraulic assessment, which may allow use of higher LTARs than those delineated in this table. These reductions shall apply to area only, and not to the required total linear feet of tubing. The linear feet of tubing shall be maximized utilizing reduced tube spacing as the site and this Innovative Approval permit. The minimum zone size and linear feet of tubing in each zone shall also adhere to the manufacturer's recommendations.**

When any reductions are taken in vertical separations or horizontal setbacks pursuant to the use of a TS-I or TS-II system approved in accordance with Rule .1970, the long-term acceptance rate shall not exceed 0.6, 0.4, 0.15 and 0.10 gallons per day per square foot for Soil Groups I, II, III, or IV, respectively.

b. The following table shall be used in determining the LTAR for Geoflow Subsurface Drip Systems installed in saprolite pursuant to Rule .1956(6). The LTAR shall be based on the most hydraulically limiting, naturally occurring saprolite to a depth of two feet below the drip tubing.

Saprolite group	Saprolite Textural Classes	Saprolite Textural Classes	LTAR *(areal basis)* (gpd/ft^2)
I.	Sands	Sand Loamy sand	0.6 - 0.4 0.5 - 0.3
II.	Loams	Sandy Loam Loam Silt Loam	0.4 - 0.25 0.3 - 0.2 0.20 - 0.07
III*	Fine Loam	Sandy Clay Loam	0.10 – 0.05

*Use of Group III Saprolite requires TS-I or TS-II pretreatment

c. In calculating the minimum number of square feet for the drainfield, the design daily sewage flow rate shall be

divided by the long-term acceptance rate determined from the appropriate table, above

d.. In calculating the minimum length of drip tubing to be used, the total square footage of drainfield as derived in Section III(c) shall be divided by two feet.

IV. Design criteria:

a. Pretreatment:

The drip emitter system shall be preceded by a pretreatment process designed to reduce the wastewater biochemical oxygen demand (BOD) and total suspended solids (TSS) concentrations to a maximum of 30 milligrams per liter (mg/1), each. This level of pretreatment may be achieved by properly designed Aerobic Treatment Units (ATUs) approved in accordance with Rule .1957(c), Approved Innovative Pretreatment Systems, or approved equal.

b. Dosing tank:

i. The dosing tank and dosing system shall meet the design and construction criteria of Rules .1952-.1954, except that the minimum liquid capacity shall not be less than the total liquid capacity of the septic tank that would be required for this system.

ii. Level control floats in the dosing tank shall be adjustable and replaceable from the ground surface without requiring entrance into the tank.

iii. The requirement for a separate high water alarm that is audible and visible by system users shall be met, in conjunction with any required self monitoring features of the Geoflow system.

c. Pumps:

Unit shall include effluent rated high head submersible pump(s), or effluent rated suction lift self-priming centrifugal pump(s), in accordance with Rule .1952(c)(2). For a suction lift pump, the intake pipe shall contain a screen and foot valve as specified by Geoflow, Inc. Pump, controls, intake pipe and screen, as applicable, shall be easily accessible by the system operator for routine operation, maintenance, monitoring and servicing.

d. Filters:

Self-cleaning filter(s) capable of screening particles larger than or equal to 130 microns shall be used. Self-cleaning process shall be automatic. Geoflow Filters, or approved equal, shall be used. Filter flushing residuals shall be pumped into the upstream end of the pretreatment system, with provisions made to minimize disturbance of any solids in the septic tank or settling chamber (where applicable). Filter number and size shall be at least as necessary to have flow rate during both irrigation and flushing conditions to be within filter manufacturer-specified acceptable operating range.

e. Geoflow processing and control unit:

i. Controls shall provide for delivery of designer-specified preprogrammed volumes of effluent to each field zone (adjustable and variable between zones) at designer-specified time intervals (flow equalization); automatic flushing of integral unit filters (filter flushing), initiated by a timer (adjustable duration); automatic flushing (at least weekly) of the drip laterals (field flushing) with filtered effluent for designer-specified duration; and monitor pump cycles and run times (for each pump and field zone) and flow (with totalizing flow meter, or equal). For systems designed for over 3000 gallons per day, controls shall also monitor alarm conditions (high water, power outage), flow volume to each zone and flow variance indication when flow is + or - 20% of design.

ii. Controls and float levels shall be synchronized to assure the minimum dose is available prior to initiating a dosing cycle to a zone or subfield. Minimum dose volume per zone shall be set as needed so that at least 80-percent of each does is delivered when the minimum pressure in the field network is at least 10 pounds per square inch (pipe-full conditions). This shall be approximated by using five times the liquid capacity of the drip laterals plus the liquid capacity of the supply and return lines (only the portions which drain between doses), unless a smaller volume is field determined to meet this performance criteria. For example, the minimum dose-time can be field-determined as follows:

-When zone is "dry", measure the time from pump-start until the Top of Return pressure is >10 psi. This time shall be designated "Ti". Also measure the total gallons it took to reach 10 psi. This "fill" volume is designated "Gi"
-Determine minimum additional dose time, as: (4xGI)/(irrigation flow rate) = "Tf"
-Total adjusted minimum dose time can be reduced to "Ti" plus "Tf", and adjusted dose volume is 5x "Gi"

Minimum automatic field flushing volume per zone shall be <u>two</u> times the liquid capacity of the drip laterals plus the liquid capacity of supply and return and manifold lines that drain between doses.

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.

iii. Duplex pump dosing system shall be provided whenever the design flow rate exceeds 3000 gallons per day or when the total length of drip lines exceeds 10,000 feet.

iv. A telemetry system shall be provided for systems with a design flow greater than 600 gallons per day, whereby the operator shall be notified immediately of alarm conditions (high water and power outage). In addition for design flows greater than 3000 gpd the operator shall be notified immediately of flow variance (+/-20%). Telemetry system and alarm shall include automatically rechargeable battery backup power supply

v. 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.

f. Geoflow Subsurface Drip System Field Design (See Section VII for designer responsibilities):

i. The field network shall utilize 16mm, 18mm, or 20mm nominal size WASTEFLOW PC polyethylene dripline containing bactericide incorporated into the inner lining and Treflan® root intrusion inhibitor bound into the pressure-compensating emitters. Manufacturer guarantees roots shall be effectively inhibited by this product for a minimum period of ten years. Pressure compensating emitters shall be spaced uniformly along the dripline on a maximum of two foot centers and designed to deliver 0.53 or 1.02 gallons per hour per emitter (+ or - 5%) at internal tubing pressures of 7 to 60 pounds per square inch.

ii. Individual drip lines shall be designed and installed level, following the naturally occurring ground contour (allow maximum variance of + or - two inches within any linear segment), on two-foot centers. In order to keep all laterals on-contour, lines or portions of lines may be installed on greater than two-foot centers, requiring additional total application area. Minimum spacing between laterals may also be reduced to 1-1/2 feet for short segments as needed to avoid field obstructions. Furthermore, laterals may be spaced uniformly on less than 2-foot centers to handle site-specific situations, as long as the total area requirement remains unreduced. Solvent welded heavy duty nonperforated flexible PVC pipe shall be used to connect the supply and return manifolds with the driplines, or to connect common driplines

installed at varying depths or locations (e.g.: in stepdowns or to connect looped drip line segments). The connection lines shall be made to the driplines by solvent welded Geoflow compression adapters or Geoflow Lockslip fittings, or approved equal. Connection lines shall be conveyed over earthen dams constructed at least 2-inches higher than the driplines served, to retain effluent in the lines at the end of each dose cycle.

iii. The field shall consist of a minimum of two separately and automatically dosed and valved zones whenever the total length of dripline exceeds 5000 linear feet, or as otherwise needed to meet irrigation and/or flushing requirements.

iv. The hydraulic design shall be based on achieving the following conditions:

- No more than a 10 percent variation in flow between any individual emitters anywhere within a separately dosed zone, including any drain back.

- When the slope exceeds 10 percent, check valves shall be used in the supply and return manifolds, or other acceptable means identified to minimize disproportionate amount of drainage into the lowest area of the zone.

- Maintenance of scour velocity of at least 1.2 feet per second in the supply line from the dosing tank to the beginning of the drip field during normal dosing cycles.

- Maintenance of flushing velocities of at least 1.2 feet per second in each supply manifold segment during field flushing, and maximum flushing velocities less than 10 feet per second in each supply and return manifold segment.

- Minimum pressure in the dripline of 10 pounds per square inch during flushing flows and a maximum of 60 pounds per square inch during normal dosing flows.

- Maintenance of flushing velocities of at least one foot per second at the distal end of each dripline during field flushing, with valving provided to enable flushing velocities of at least two feet per second at the distal end of each dripline to be achieved with manual flushing.

v. Field appurtenances include an air vent at the high point(s)/outlet of each zone; check valve at the high point/outlet of each zone (when there are more than one zone); solenoid valve with separate isolation valves on each side at the low point/inlet to each zone (or by an appropriate alternative method which enables all valves to be serviced without effluent discharge from supply/return lines); cleanout at each end of the supply and return manifolds; a separate cleanout at the distal end of the supply line to each zone; and pressure monitoring fittings at the field inlet and outlet points and at both ends of the supply and return manifolds. The operator must be able to service all solenoid valves and air vents and check pressures without effluent discharging from the network in preparation for these maintenance/testing procedures. Valves and cleanouts shall be provided with protective vaults or boxes.

V. Installation and Testing Procedures:

a. A preconstruction conference shall be required to be attended by the systems designer (Geoflow-authorized), installer (Geoflow-authorized), local health department, and licensed soil scientist and registered professional engineer, as applicable, prior to beginning construction of the Geoflow Subsurface Drip System and any associated pretreatment system components.

b. Dosing tank and septic tank shall be demonstrated to be watertight by a 24-hour leakage test (maximum of 1/2-inch rise or fall in 24 hours) or vacuum test. Test shall be run with risers/and inlet/outlet pipes in place.

c. Drainfield area shall be prepared in a manner that minimizes site disturbance. No equipment shall cross the field areas during rainfall events, or when the fields are above field capacity (□too wet to plow□). Lightweight equipment only shall be used to remove trees, roots, and rocks, with hand incorporation of select fill material used to eliminate weak spots where roots or boulders must be removed. Field shall be prepared as needed to enable a grass cover to be established and maintained prior to line installation.

d. Field laterals shall be staked out by use of an engineer's or laser level and tape to assure conformation with natural contours and design requirements for sizing, location and separations. Maximum drip line depth shall be in accordance with permit conditions.

e. When a trencher is used, trench bottoms shall be hand cleaned and drip tubing shall be secured to the center of the trench bottom prior to backfilling.

f. Fields shall be installed in accordance with manufacturer's recommendations for each site. A vibratory plow, static plow or trencher is most typically used and soil moisture must be dry enough so that soil compaction will not occur.

g. Minimum soil cover over drip tubing shall be six inches, to finished grade. Cover material shall be free of rocks or debris. Minimum depth of valves in protective vaults or boxes shall be at least 18 inches below grade.

h. Extreme care must be taken during system installation to assure no extraneous debris enters the tankage, supply lines, and drip line network. Supply lines and manifolds shall be flushed out prior to system startup.

i. Manufacturer's recommendations shall be followed for system startup. All leaks in pipe network or from emitters exhibiting excessive emission rates as evidenced by wet spots during dosing cycles comparable to normal operating conditions shall be repaired. Normal dosing and flushing flow rates and flushing pressure at the ends of each zone supply and return manifold shall be measured and determined to be in accordance with design criteria.

j. Fields shall be finished graded to shed surface water and in a matter which facilitates easy maintenance with standard mowing equipment. Provisions shall be made to establish and maintain a vegetative cover so as to prevent erosion and to allow for effective system inspection.

k. All mechanical components, pumps, pump cycling, filters, flushing, high water alarm and telemetry systems, as applicable, must be demonstrated to be fully operable in accordance with their design.

VI. Operation, Maintenance and Monitoring Requirements:

a. System management entity, inspection/maintenance and reporting frequency requirements shall be comparable to at least Type V(a) systems in Rule .1961(b), Table V(b), except that the maximum inspection interval for systems shall be quarterly for the first year of operation. During the first operational inspection after system start-up, a Geoflow appointed representative will meet with the Operator in Responsible Charge (ORC) and the property owner. In the event any system is found to be out of compliance, Geoflow will assist in development of an action plan to bring the system back in compliance. The maximum inspection/maintenance/inspection frequency shall revert to quarterly for a period of one year after a system found to be out of compliance is repaired.

b. The ORC shall provide monitoring reports to the health department which include a log of all malfunction incidences/notifications and maintenance activities. Minimum maintenance during each required inspection shall include visual observation of the dripfield(s), checking/cleaning filter(s), measured dosing flow rate to each zone and recording of flow meter reading, pump run times and cycle counts. Flushing flow rates and pressure head measurements during flushing at the inlet and outlet of each field zone shall be taken at least once per year.

c. For systems with a design flow rate of over 600 gallons per day, the operator in responsible charge (ORC) shall be telemetrically notified of high water and power outage. For systems with a design flow rate of over 3000 gallons per day, the ORC shall also be telemetrically notified of flow variance (+ or – 20%) and catastrophic failure (+or– 50%) conditions.

d. The ORC shall also conduct other additional observations, measurements, monitoring, and maintenance activities as specified in the Operation Permit and as recommended by the manufacturer of the Geoflow system and as required for any applicable advanced pretreatment system that may also be present.

VII. Responsibilities and Permitting Procedures:

a. All systems shall be designed by a professional engineer or by individuals authorized in writing by Geoflow, Inc.. The system shall be designed by a professional engineer when pretreatment components have not received prior state approval, when the approved treatment system requires a professional engineer, when the system design flow exceeds 600 gpd, or when duplex pumps are required in accordance with section IV(e)(iii) above. Plans and specifications shall be prepared, reviewed and approved in accordance with Rules .1938(e) and (f).

b. The system shall be installed by a contractor authorized in writing by Geoflow's appointed representative, who shall coordinate the installation with the designer and the manufacturers appointed field representative. Geoflow's appointed field representative and designer shall provide written confirmation of their acceptance of the system installation prior to operation permit issuance.

c. Prior to issuance of an operation permit a contract for operation and maintenance shall be executed between the system owner and an ORC as required in accordance with Rule .1961(b), who is authorized in writing by the manufacturer to operate and maintain the system. A condition of the operation permit shall be that a contract for operation and maintenance with an ORC shall remain in effect for as long as the system is to remain in use.

VIII.Repair of System:

The provisions of 15A NCAC 18A .1961(c) shall govern the use of the Geoflow Subsurface Wastewater Drip System for repairs to existing malfunctioning wastewater systems.

Approved by:_____Date:_____