RILEY COUNTY ENVIRONMENTAL HEALTH ADMINISTRATIVE STANDARDS FOR ALTERNATIVE SYSTEM INSPECTION AND MAINTENANCE

Introduction and Purpose

These Administrative Standards for Alternative System Inspection and Maintenance (Administrative Standards) are supplemental to the Riley County Sanitary Code (Code). They provide the standards necessary to comply with the provisions of the Code relating to alternative system inspection and maintenance. These Adminstrative Standards are organized by those types of alternative systems currently approved for use in Riley County.

Authorization and Amendments

These Administrative Standards have been approved by the Board of County Commissioners (Board). Any amendments to these Administrative Standards shall be submitted by staff to the Board for consideration and approval.

Approved Alternative Private Wastewater Disposal Systems in Riley County

The following types of alternative private wastewater disposal systems are currently approved for use in Riley County. Additional types of alternative private wastewater disposal systems may be approved by the Board of County Commissioners using the standards listed below. Once approved, that type of alternative system will be included in these administrative standards.

Standards for Alternative Private Wastewater Disposal Systems:

1. The system must contain the National Science Foundation (NSF) and/or the Underwriter's Laboratory (UL) certification for a residential wastewater treatment system and must meet minimum design standards acceptable for use in the State of Kansas as authorized by the Kansas Department of Health and Environment, Kansas Administrative Requlations (28-5-2 through 28-5-9); Bulletin 4-2, March 1997; Enviromental Health Handbook, Second Edition, 2002; Residential Onsite Wastewater Treatment Systems, 2008, Second Edition, Consortium of Institutes for Decentralized Wastewater Treatment; Riley County Sanitary Code, Chapter I, Article 4, Section 1-4.3, Chapter II, Article 2,

Section 2-2.1, Chapter II, Article 5, Section 2-5.1 through Section 2-5.7, Chapter II, Article 6, Section 2-6.2, Section 2-6.3; and

2. Recommendations for approval or denial of the NSF and/or UL approved system from the Riley County Environmental Specialist will be presented to the Board of County Commissioners based on the following:

    a. The alternative system must have adequate access for inspection, routine maintenance and repair work *(Residential Onsite Wastewater Treatment Systems, 2008, Second Edition, page 111-112, Consortium of Institutes for Decentralized Wastewater Treatment).*
    b. Tank access risers must be at grade *(Residential Onsite Wastewater Treatment Systems, 2008, Second Edition, page 111-112, Consortium of Institutes for Decentralized Wastewater Treatment).*
    c. Tank riser lids must be securely fastened with safety screws and not be so heavy as to make them inaccessible *(Residential Onsite Wastewater Treatment Systems, 2008, Second Edition, page 111-112, Consortium of Institutes for Decentralized Wastewater Treatment).*
    d. Any documented failures of that type of proposed alternative system will be introduced to the Board of County Commissioners for review and determination of that type of alternative system's reliability and durability.

Bio Microbics "FAST" and the Pentair "DELTA" Environmental Alternative Private Wastewater Disposal Systems

Inspection and maintentance of aerated systems are outlined in those systems' service manuals. A copy of the "Fast" system manual is attached as Appendix I. A copy of the "Delta" system manual is attached as Appendix II. Based on those respective service manuals, and other approved references within the Riley County Sanitary Code, the following is a step-by-step procedure for inspection and maintenance of both systems:

STEP 1: Make quick overview of system looking for system damaged due to excessive weight loading on the system. Listen for excessive noise from the system. A constant humming noise much like a household refigerator should be heard. *(Appendix I, Bio Microbics "FAST" Service Manual, page 5 and 6); (Appendix II, " Delta" Environmental, Installation, Operation, and Maintenance Manual, page 26.)*

STEP 2: Check for proper function of the blower and clean the inlet air filter element. Measure and record the dissolved oxygen level in the aeration chamber. *(Appendix I, Bio Microbics "FAST" Service Manual, page 5 and 6); (Appendix II, "Delta" Environmental, Installation, Operation, and Maintenance Manual, page 5,13 and 16); (Residential Onsite Wastewater Treatment Systems, 2008, Second Edition, page 112, Consortium of Institutes for Decentralized Wastewater Treatment)*

STEP 3: Verifiy the alarm panel by turning the blower off. The audible alarm will sound approximately 10 seconds later. To silence the alarm, press the "silence" button. *(Appendix I,*

Bio Microbics "FAST" Service Manual, Page 5 and 6); (Appendix II, "Delta" Environmental, Installation, Operation, and Maintenance Manual, page 5,13 and 16.)

STEP 4: Clean the vent(s) and blower housing intakes of any obstructions. A musty, earthy-type odor is normal from the aeration unit; however, a rotten egg smell indicates a system failure. *(Appendix I, Bio Microbics "FAST" Service Manual, page 5 and 6); (Appendix II, " Delta" Environmental, Installation, Operation, and Maintenance Manual, page 13 and 16.)*

STEP 5: Check the effluent discharge from the aeration tank. It should be clear and odorless. (*Appendix I; Bio Microbics "FAST" Service Manual, page 5 and 6); (Appendix II, "Delta" Environmental, Installation, Operation, and Maintenance Manual, page 13.)*

STEP 6: Remove a test sample from the aeration basin and check for pH and conduct a 30 minute settleability test. Note: pH outside the 6.0 to 9.0 reading will not allow the activated biomass to form correctly. Settleability readings less than the 200 ml level indicate an operational problem which can be corrected by a measured wasting of the activated sludge mixed liquor. Levels above 600 ml can indicate a young activated sludge mixed liquor or growth of a filamentous organism. *(Standard Methods for Examination of Water and Wastewater, 22nd edition, page 2-89 through 2-91, American Public Health Association, American Water Works Association, and Water Environment Federation); (Residential Onsite Wastewater Treatment Systems, 2008, Second Edition, page 112, Consortium of Institutes for Decentralized Wastewater Treatment); (NSF International Standard / American National Standard, NSF / ANSI 40-2012, Residential Wastewater Treatment Systems, prepared by the NSF Joint Committee on Wastewater Technology, page 13, 8.5.2.1.3 pH);* (*Appendix I; Bio Microbics "FAST" Service Manual, page 9); (Appendix II, "Delta Environmental, Installation, Operation and Maintenance Manual, page 6 and 7)*

STEP 7: Pump solids from the tank when it reaches 18" deep in the primary settling tank and 4" in the aeration tank or a settleability of 600 ml or 60%. (*Appendix I, Bio Microbics "FAST" Service Manual, page 5 and 6); (Appendix II; "Delta" Environmental, Installation, Operation, and Maintenance Manual, page 6, 13,and 14)*; (*Residential Onsite Wastewater Treatment Systems, 2008, Second Edition, page 112, Consortium of Institutes for Decentralized Wastewater Treatment)* **NOTE*: This is not a septic tank and does not require pumping on a (5) year schedule.***

STEP 8: If the alternative system utilizes drip irrigation, obtain and record lateral field operational pressures. An increase in pressure from the previous reading indicates the emitters are not delivering the flow efficiently to the bed. Make sure the air release valves are operating correctly. Look for short circuit leaks in the lateral field. Flush laterals and install a new pump filter. (*Appendix I, Bio Microbics "FAST" Service Manual, page 7); (Residential Onsite Wastewater Treatment Systems, 2008, Second Edition, page 167-172, Consortium of Institutes for Decentralized Wastewater Treatment)*

STEP 9: Record and report above findings on the "Riley County Alternative Private Wastewater Disposal System Inspection Report" attached as Appendix III.

ORENCO Sand/Shale Alternative Private Wastewater Disposal System

Inspection and maintentance of ORENCO systems are outlined in the ORENCO systems service manual, a copy of which is attached as Appendix IV. Based on that service manual, and other approved references in the Riley County Sanitary Code, the following is a step-by-step procedure for inspection and maintenance:

STEP 1: Make quick overview of system looking for system damaged due to excessive weight loading on the system. *(Minimum Standards for Design and Construction of Onsite Wastewater Systems, Bulletin 4-2, March 1997, page 13, State of Kansas Department of Health and Environment in Cooperation with K-State Research and Extension)*

STEP 2: Pump the septic tank at a minimum once every five (5) years. **NOTE:** ***This system contains a septic tank and requires pumping on a five (5) year schedule.*** *(Riley County Sanitary Code, Chapter II, Article 5, Section 2-5.6.1; EPA Onsite Wastewater Treatment Systems Manual, United States Environmental Protection Agency, 2002, page 4-45; EPA Design Manual, Onsite Wastewater Treatment and Disposal Systems, United States Environmental Protection Agency, 1980, Chapter 6, Section 6.2.7, page 110; Minimum Standards for Design and Construction of Onsite Wastewater Systems, Bulletin 4-2, March 1997, State of Kansas Department of Health and Environment, Bureau of Water – Nonpoint Source Section, in cooperation with K-State Research and Extension, page 13; A Minnesota Regulator's Guide to the Venhuizen Standard Denitrifying Sand Filter Wastewater Reclamation System, Copyright 1997 by David Venhuizen, P.E., page 20; Septic Tank Maintenance, Karen M. Mancl and Brian Slater, The Ohio State University Extension – College of Food, Agricultural, and Environmental Sciences, Publication #AEX-740, Last Updated: 2016, page 2 and 3.)*

STEP 3: Inspect the tank pump system and verify no obvious holes or leaks are in the system. All float cords should be neatly wrapped in the riser so as not to interfere with the operation of the floats. *(Appendix IV, Orenco Operation and Maintenance Manual, page 13 and 17)*

STEP 4: Verify operation of the high water alarm by lifting the top float up. Check that the maximum normal height within the tank has not been exceeded by looking for a high water mark indicator. *(Appendix IV, Orenco Operation and Maintenance Manual, page 13, 16 and 17)*

STEP 5: With the liquid level above the middle "timer off" float, turn the pump on by flipping the "manual or automatic" switch in the control panel to "manual". Watch the liquid level inside the screened vault as the pump is runnng for about 30 seconds. Return the switch to "automatic". Observe the level inside the screened vault. If it drops very quickly and activates the low level alarm, the pump's trash screen (Biotube® cartridge) may need to be cleaned. *(Appendix IV, Orenco Operation and Maintenance Manual, page 13)*

STEP 6: Record the values from the time meter and/or cycle counter, located in the control panel, on the "Riley County Sand/Shale Filter Alternative Private Wastewater Disposal System Inspection Report" for later troubleshooting reference. *(Appendix IV, Orenco Operation and Maintenance Manual, page 13)*

STEP 7: Determine the programmable timer setting is correct and has not changed from the last inspection. If the settings have changed, correct as necessary to obtain optimal setting for

wastewater loading on the filter. *(Appendix IV, Orenco Operation and Maintenance Manual, page 13)*

STEP 8: Next, flush the manifold lateral lines of accumulated solids. Failure to perform lateral flushing will eventually lead to clogging of the sand filter media. At the end of each lateral remove the lid on the flushing valve enclosure. Thread the flushing elbow onto the valve and open the valve. In the control panel, set the (manual/off /auto) switch to "manual" and flush the line until clear. Shut the valve and move the elbow to the next line. Repeat this process until the effluent is clear on all lateral lines. When complete, turn the control panel switch back to "auto". *(Appendix IV, Orenco Operation and Maintenance Manual, page 14)*

STEP 9: Check residual pressure to determine if the orifices are clear of solids. A ten (10) foot long, ¾ inch diameter, clear PVC pipe with a male adapter glued to one end is necessary to perform these steps accurately. (Note: If this test is being done by only one person, turn the pump on before screwing the pipe into the flushing valve.) Open the flushing valve. Have someone turn the pump on. Set the control panel switch to "manual" and screw the clear PVC pipe onto the elbow at the end of the lateral line in a vertical position. Maintain the clear pipe in a vertical position. Letting the pipe fall unsupported to the ground may damage the flushing assembly. Have someone turn the pump on. Open the valve and, using a tape measure, measure the distance from the bottom of the flushing elbow to the top of the liquid surface in the clear PVC pipe. This is referred to as the "squirt height" or system residual head and shall be recorded on the system inspection report form. Continue the process for all lateral lines and then return the control panel switch to the "auto" position. (Note: If this test is being done by one person, first shut off the flushing valve, then slowly unscrew the clear pipe and allow the effluent in the clear pipe to flow into the flushing valve box before turning off the pump.) Turn off the pump. Close the flushing valve. Compare the measured "squirt height" with the value documented during the system's initial installation. That initial value should be written on the front page of the owner's system manual. It might also be found in the control panel or on the underside of the fiberglass lid covering the septic tank pump system. The "squirt height" measured at the time of inspection should be at least equal to the initial value from the start-up of the system, but no more than 20% higher. *(Appendix IV, Orenco Operation and Maintenance Manual, page 15)*

STEP 10: If the "squirt height" is within acceptable limits, be sure all flushing valves are turned off , remove the clear PVC pipe, close all flushing valve box lids and proceed to STEP 12. Excessive "squirt height" indicates that too many of the orifices in the distribution manifold are plugged and require clearing. Proceed to STEP 11.

STEP 11: **NOTE:** ***This step will not be performed by the Environmental Health Specialist. This step involves maintenance of these systems and is recommended to be performed by a business that specializes in installation and maintenance of these systems*** *(Appendix IV, Orenco Operation and Maintenance Manual, page 13).* Clearing of the orifices can be accomplished by one of the following methods: 1. Turn the control panel switch to "off" and push a stiff bottle brush connected to a cleaning snake down each lateral line through the flushing valve assembly. 2. Using a high pressure washer, feed a small diameter "bullet nozzle" through each lateral. The high pressure water coming out of the nozzle will help pull it through the lateral. Upon completion of the lateral line flushing, in the presence of the Environmental Health Specialist retest the lateral lines as in Step 9 above once more to ensure the cleaning was successful. *(Appendix IV, Orenco Operation and Maintenance Manual, page 15)*

STEP 12: Record and report above findings on the "Riley County Sand/Shale Filter Alternative Private Wastewater Disposal System Inspection Report" attached as Appendix V and double-check to ensure the control switch in the control panel has been returned to the "auto" position.

Eljen Geotexile Sand Filter (GSF)
Alternative Private Wastewater Disposal System

Inspection and maintentance of the GSF system is outlined in the system's Kansas Design & Installation Manual. A copy of the GSF system manual is attached as Appendix VI. Based on the GSF manual, and other approved references within the Riley County Sanitary Code, the following is a step-by-step procedure for inspection and maintenance of the GSF system:

STEP 1: Make quick overview of system looking for system damaged due to excessive weight loading on the system and/or surfacing of wastewater. *(Minimum Standards for Design and Construction of Onsite Wastewater Systems, Bulletin 4-2, March 1997, page 13, State of Kansas Department of Health and Environment in Cooperation with K-State Research and Extension)*

STEP 2: Pump the septic tank at a minimum once every five (5) years. **NOTE:** ***This system contains a septic tank and requires pumping on a five (5) year schedule.*** *(Riley County Sanitary Code, Chapter II, Article 5, Section 2-5.6.1; EPA Onsite Wastewater Treatment Systems Manual, United States Environmental Protection Agency, 2002, page 4-45; EPA Design Manual, Onsite Wastewater Treatment and Disposal Systems, United States Environmental Protection Agency, 1980, Chapter 6, Section 6.2.7, page 110; Minimum Standards for Design and Construction of Onsite Wastewater Systems, Bulletin 4-2, March 1997, State of Kansas Department of Health and Environment, Bureau of Water – Nonpoint Source Section, in cooperation with K-State Research and Extension, page 13; A Minnesota Regulator's Guide to the Venhuizen Standard Denitrifying Sand Filter Wastewater Reclamation System, Copyright 1997 by David Venhuizen, P.E., page 20; Septic Tank Maintenance, Karen M. Mancl and Brian Slater, The Ohio State University Extension – College of Food, Agricultural, and Environmental Sciences, Publication #AEX-740, Last Updated: 2016, page 2 and 3.)*

STEP 3: Inspect the septic tank and verify an effluent filter is installed. Examine area around tank to determine if there are any signs of leakage. *(Appendix VI, Eljen GSF Kansas Design & Installation Manual, page 6, Section 1.12)*

STEP 4: If system includes a pressure dosing component, inspect the tank pump system and verify no obvious holes or leaks are in the system. All float cords should be neatly wrapped in the riser so as not to interfere with the operation of the floats. Observe pump activation and determine pump is working properly. If alarm is present, verify it is working properly. *(Appendix VI, Eljen GSF Kansas Design & Installation Manual, page 20, Section 5.0)*

STEP 5: If system includes ventilation, inspect the air vent verify they are not obstructed or broken. *(Appendix VI, Eljen GSF Kansas Design & Installation Manual, page 22, Section 7.0)*

Appendix I

Bio Microbics “FAST” Environmental Alternative Private Wastewater Disposal System Service Manual

BIO MICROBICS
BETTER WATER. BETTER WORLD.

FAST® Service Manual

FOR USE WITH

(NSF Std 40 & 245)	**MicroFAST® 0.5, 0.625, 0.75, 0.9, 1.5**
(non-NSF certified)	**MicroFAST® 3.0, 4.5, 9.0**
(ETV/EPA tested)	**RetroFAST® 0.150, 0.250, 0.375**
	NitriFAST® 0.5, 0.625, 0.75, 0.9, 1.5, 3.0, 4.5, 9.0
	HighStrengthFAST® 1.0, 1.5, 3.0, 4.5, 9.0

SERVICE MANUAL

FOR USE WITH FAST® SYSTEMS:

(NSF® Std 40/245 cert.)	MicroFAST® 0.5, 0.625, 0.75, 0.9, 1.5
(Non-NSF cert.)	MicroFAST® 3.0, 4.5, 9.0
(ETV/EPA tested)	RetroFAST® 0.150, 0.250, 0.375
	NitriFAST® 0.5, 0.625, 0.75, 0.9, 1.5, 3.0, 4.5, 9.0
	HighStrengthFAST® 1.0, 1.5, 3.0, 4.5, 9.0

GENERAL INFORMATION

All FAST® products are ETL certified for safety (electrical, environmental, etc.). One or more of the following patents protects this process: 3,966,599; 3,966,608; 3,972,965; 5,156,742. Certified by NSF International, the MicroFAST® 0.5, 0.625, 0.75, 0.9 and 1.5 systems meets NSF Standard 40, Class 1 and Standard 245 certifications for wastewater treatment devices. If you have questions regarding any Bio-Microbics products, please contact us:

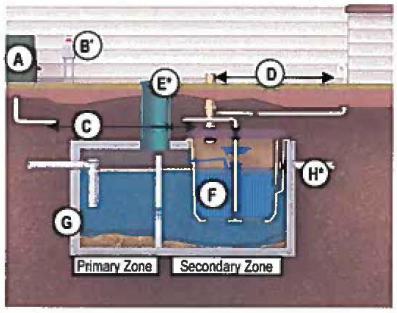
800-753-FAST (3278) or (913) 422-0707

e-mail: onsite@biomicrobics.com

About FAST®: The FAST® (Fixed Activated Sludge Treatment) system uses naturally occurring bacteria (biomass) to treat sewage for dispersal into the environment. This continuous process provides the biomass with waste (food) and air in a suitable environment. Dead bacteria and non-biodegradable waste settle and accumulate in the bottom of the tank for periodic removal.

The FAST® process consists of the treatment module and blower. The blower provides air to the system via the air supply pipe. The air supply pipe and draft tube create an air lift. The air lift mixes oxygen and waste throughout the media inside the tank. Bacteria grows on the media and digests the waste. A vent pipe expels harmless vapors created by the process.

- A. Blower and Housing
- B. Control Panel
- C. Air Line Piping
- D. Vent(s) and Observation Port
- E. Access
- F. FAST® Unit
- G. Tank
- H. Outlet to Drain field

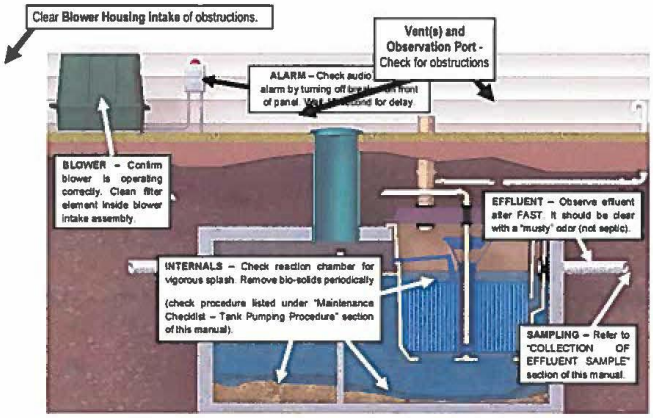


GENERAL LAYOUT

**PLEASE NOTE: Adequate pump out must be provided for primary and secondary zones. There may be ancillary equipment associated with your system: pump(s) (before and/or after the FAST® unit), a distribution box, a disinfection system, an irrigation system, a remote alarm, or auto dialer, etc.*

REGULAR SERVICE MAINTENANCE

⚠ WARNING *Always secure all access covers to prevent unauthorized people from entering the tank. Only qualified service personnel should open access ports and/or covers. Infectious organisms exist in a septic tank. If any contact with wastewater occurs, immediately wash and disinfect all exposed areas and contact personal physician. Failure to do so could result in severe sickness or death. DO NOT use an open flame or cause a spark near a septic tank's access points. Gases emanating from septic tanks can explode if ignited or deadly if inhaled.*

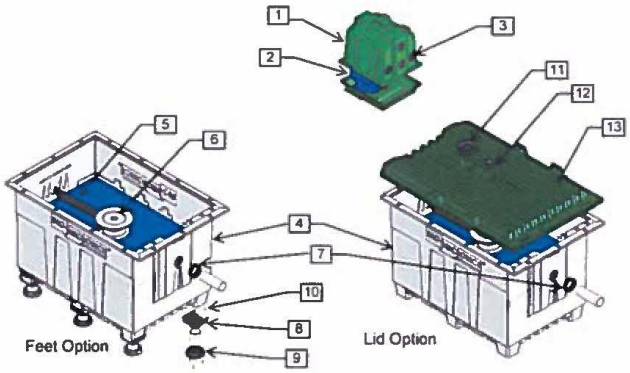


SYSTEM COMPONENTS

SUPPLIED EQUIPMENT

Please refer to the Installation Manual for a list of your system's original supplied parts. Picture shown is the MicroFAST® standard parts diagram.

If replacement parts are needed please have the serial number ready and call the local distributor listed on the control panel or Bio-Microbics.



COMMON NAME

1. Blower Housing
2. Blower (with blower I/O piping, Inlet Filter Assembly, blower and housing screws not shown)
3. Louver
4. Liner
5. Recirculation Trough
6. Air Lift
7. 4" Outlet Gasket
8. Foot Top (foot option)
9. Foot Bottom (foot option)
10. Foot Screws (foot option)
11. 6" Observation Port Gasket (lid option)
12. 2" Air Line Gasket (lid option)
13. Lid ***(Optional)*** (Not with MCF 4.5 or 9.0)

DO'S & DON'TS.....*What can I put down the drain?*

Please refer to the list below for important info on how to keep your treatment system performing as it should.

⚠CAUTION *Introducing harmful or damaging substances into the FAST system may void the warranty.*

DO NOT PUT THESE ITEMS DOWN THE DRAIN:

FOOD WASTES	ANIMAL BONES / COFFEE GROUNDS / CORN COBS / EGG SHELLS / SKIN / FRUIT PEELS / MELON RINDS / HOME BREWERY WASTE
PERSONAL PRODUCTS	BANDAGES / CONDOMS / SANITARY NAPKINS / WET WIPES / DISPOSABLE DIAPERS
CHEMICALS/ TOXINS	AUTOMOTIVE FLUIDS / CAUSTIC CLEANERS / DRUGS / FLOOR STRIPPER HARSH DETERGENTS / HERBICIDES / MEDICATIONS / PAINTS (OIL-BASE / PESTICIDES / AMMONIUM CHLORIDE CLEANERS / SOLVENTS / THINNE
OTHER PRODUCTS	CAT LITTER / CIGARETTE BUTTS / CLOTH TOWELS / FILM DEVELOPING WASTE / METAL OBJECTS / MODELING CLAY / PAPER TOWELS / SCRAPS / PLASTIC BAGS / PLASTIC OBJECTS / RAGS / RV WASTE

RECORD KEEPING

Keep copies of all system drawings/plans of the site/installed equipment/service records with all other home appliance documents. Record all applicable information.

LAUNDRY

Spread wash loads throughout the week. Instead of liquid fabric softener, dryer sheets should be used. Use low-suds, biodegradable and low phosphate detergents, like Mighty Mike® from Scienco/FAST (www.sciencofast.com).

LEAKY FIXTURES

Large quantities of water are added to your wastewater system when you have leaking fixtures. Timely detection and repair can help to maximize the life of your system, especially the drain field.

WATER SOFTENERS

The FAST® process may tolerate discharge from properly operating softeners that backwash as needed based on water usage (DIR) vs. timer operated systems, if allowed by your local regulatory authority. However, these discharges can possibly damage other parts of the septic system.

FOOD WASTES

Garbage disposal waste is acceptable - if allowed by your local regulatory authority. However, it may lead to more frequent removal of solids from your septic tank. Please dispose of large quantities of food in the garbage.

FATS, OILS & GREASE

Too much grease (i.e. animal fats, vegetable oils, lard, etc) put down the drain may overload the system and prevent the bacteria from fully breaking down the waste.

DISINFECTANTS/CLEANERS

Use citric acid, chlorine, or biodegradable cleaners according to the manufacturer's recommendations. Products containing ammonium chloride compounds or pine oil-based cleaners should not be used. Use drain cleaners as a last resort to unclog pipes.

GARAGE & WORKROOM

Drains from work areas should be diverted away from your system; petroleum-based products and saw dust should not enter the septic system.

MEDICATIONS

DO NOT FLUSH UNUSED MEDICATIONS DOWN THE DRAIN. Please dispose properly by returning unused medication to the pharmacy/doctor.

NOTE: The human body absorbs ≤20% of typical medications, please notify service provider of medications taken frequently or used intermittently in the house; this could ease disruption of service for your system.

SEPTIC ADDITIVES/ENZYMES

The wastewater in the system typically contains all the required bacteria for proper operation. Commercial additives are most often unnecessary; and may do more harm than good.

PAPER PRODUCTS

Use single- or double-ply, non-quilted, white toilet paper products. Some color dyes in the paper cannot be eaten by natural bacteria. Non-bleached paper (brown in color) takes longer to break down and can therefore increase the pump out frequency of your tank. Avoid flushing paper towels, napkins, wipes, or other thick paper material.

MAINTENANCE CHECKLIST

⚠ WARNING *Always secure all access covers to prevent unauthorized people from entering the tank. Only qualified service personnel should open access ports and/or covers. Infectious organisms exist in a septic tank. If any contact with wastewater occurs, immediately wash and disinfect all exposed areas and contact personal physician. Failure to do so could result in severe sickness or death.*

⚠ WARNING *DO NOT use an open flame or cause a spark near a septic tank access points. Gases emanating from septic tanks can explode if ignited or deadly if inhaled*

NORMAL OPERATING CONDITIONS	
SOUND	The FAST® system's blower makes a constant humming noise, much like a household refrigerator. Under normal conditions, the blower should last 5+ years without need for replacement. If an unusual noise is heard, refer to the **Trouble-Shooting Guide.**
ODOR	A musty, earthy-type of odor is normal. However, if a sewage odor (rotten egg smell) is detected, refer to the **Trouble-Shooting Guide.**
SIGHT	A properly loaded and operated FAST® system will produce effluent that looks like tap water. If the effluent is turbid, opaque, or suddenly changes, refer to the **Trouble-Shooting Guide.**

☐ **TRAFFIC** Ensure that the FAST® system has not been damaged due to excessive weight loading (>1,750 lb. point load.) Only normal yard traffic (lawn mowers, etc.) is acceptable. Traffic bearing (H-20) tanks can be made for use with FAST® (w/ feet). Consult local distributor or the factory for guidance.

☐ **BLOWER OPERATION** DO NOT turn off the blower (unless testing alarm). Treatment quality and drain field life could be reduced. Check the blower for proper function. Clean the blower's inlet air filter element. The blower can be operated by a timer in certain situations. Contact your local Bio-Microbics distributor for more information. If the blower is malfunctioning please refer to the "Troubleshooting Guide" or Blower Replacement Section located in this manual.

☐ **ALARM PANEL AND ALARM SOUNDS** The alarm has a ~10 second built-in delay. Test the audible alarm by turning the blower OFF. To silence the alarm, use the "Silence" button on the panel's front. If the alarm is activated for an unknown reason, please refer to the "Troubleshooting Guide" located in this manual.

☐ **VENTS, ODORS, AND INTAKES** Clear the vent(s) and blower housing intakes of any obstructions. Please refer to the "Troubleshooting Guide" located in this manual if you detect septic odors coming from the FAST® vent as this may indicate a problem with the system.

☐ **WATER QUALITY** effluent should be clear and odorless. All FAST® systems are capable of exceeding the USEPA standard for secondary wastewater treatment (40CFR, part 133.102) depending on how they are applied, sized, installed and operated. If samples are required please refer to the "Collection of Effluent Sample" section below.

☐ **BIO-SOLIDS (SLUDGE) LEVELS** Scheduling sludge removal depends on the size and design of the septic tank. Check the sludge levels in both tanks/compartments by inserting a sludge-measuring instrument and taking measurements in multiple locations in each compartment of the tank(s). Pump both compartments/tanks if the sludge is:

1. 18" deep in the primary settling tank or is within 6" of the connection point between the settling tank and the secondary/treatment zone; and/or
2. Within 3"-4" of the bottom of the FAST® unit in the treatment tank.

To determine the proper measurement for #2 above, measure the total liquid depth of the treatment tank (containing the FAST® unit) using a sludge-measuring instrument. Take that value and subtract the height of the FAST® product (in the table below). The result is the total sludge storage height available in the tank.

FAST® Models	Module Height
ALL RetroFAST®	27" [68.5 cm]
FAST® Models 0.5, 0.625, 0.75, 0.9, 1.5, & 4.5	31" [79 cm]
FAST® models 3.0 & 9.0	55" [140cm]

All stricter, applicable regulations supersede these operational directions.
Always pump out both zones, even if only one zone may require it.

TROUBLESHOOTING GUIDE

Contact factory or local distributor for all other issues: (913) 422-0707

PROBLEM	SITUATION	POSSIBLE CAUSE / SOLUTION
Alarm is activated (sounding)	Blower is NOT running *Please check the following. If problem persists, call service provider*	➢ **Breaker has tripped** – turn blower switch ON. If the switch will not stay ON, *see next steps...*
		➢ **Breaker trips after 2-3 seconds** – blower is over amping – electrician needs to check blower wiring.
		➢ **Breaker trips immediately** – electrical system has a short – electrician must investigate
		➢ **Blower is seized** – cooling fan will not spin freely with power OFF – replace blower – call service provider
	Blower is running *Please check the following. If problem persists, call service provider*	➢ **Water Level is high** – check the water level in the unit. Water level should be 2-3 inches above the media. Water level high? **YES:** consult distributor **NO:** Go to next step.
		➢ **Liquid Level Switch Present – NO:** Go to next step. **YES:** Check if wired in the same conduit as 90 VAC or higher wires (a violation of electric code NEC/IEC). **If YES:** Wires will need to be separated.) – **If NO:** Switch may need adjusting. Turn switch's Allen screw clockwise, wait ~10 seconds for alarm to "catch up".
		➢ **Current Sensor Present – YES:** Open panel and find "Diagnostic LED's" in the upper right hand corner. Note which light is lit and consult the distributor. **NO:** Consult distributor
		➢ **Vent is undersized or Vent(s) or airline is blocked or broken** – Check specifications for vent sizing requirements. Remove blockage or repair vent(s) or airline.
Waste is backing up from tank	Blockage in pipe network.	➢ **Check all piping for blockage,** including all interior tank piping and effluent piping.
	Mechanical failure of ancillary equipment	➢ **Pump is not running** – have qualified person check pumping system for mechanical and/or electrical failures.
		➢ **Pump's Level Controls** are improperly set, have failed, or pump too much volume per dose. Have service provider check/adjust pumping system.
System emits odor (rotten egg smell)	Mechanical failure/ Air line break	➢ **Blower operating** – **NO:** check "blower is not running" above, **YES:** *see next step*
		➢ **Proper splash** in reaction chamber – **NO:** air line is broken, **YES:** *see next steps*
	Multiple issues can contribute; the cause is usually due to oversized settling tank. Multiple solutions possible.	➢ **Decrease settling tank volume** – easiest done with a pumping system which can then pump the tank
		➢ **Move vent** – re-locate the vent to a location where the prevailing winds will catch odor.
		➢ **Place a carbon filter** on the end of the vent pipe – only use a filter that will create less than 0.1 psi of back pressure.
		➢ **Create bio-filter vent** - create a remote vent by placing a well perforated vent line in a trench with shredded bark mulch - contact local installer
Blower runs backwards	3-Phase installed incorrectly power out of phase or	➢ **Switch any two** "hot legs" at the panel or blower AFTER turning OFF the power. Only a QUALIFIED electrician can do this work. After rewiring, it may be necessary to dry the blower's internal parts.
	Single-Phase (which can run counter-clockwise) installed incorrectly	➢ **Some blowers** have wires numbered "5" and "8". After turning OFF the power, switch these two wires. Only a QUALIFIED electrician can do this work. After re-wiring, it may be necessary to dry the blower's internal parts.
Blower is noisy	Blower noise is an annoyance at site	➢ **Blower housing** can be supplemented with additional sound reducing measures, contact your service provider.
		➢ **Blower may be re-located** from its current location and can be placed up to 100 ft away from unit.
	Blower is shaking or makes a loud, whiny noise	➢ **Vibration between** the blower & housing–tighten or place rubber washers in mounting screws between blower & housing
		➢ **Blower bearings** are going bad - replace blower now or wait for it to seize up
Effluent is dirty	Many solids detected in effluent	➢ **Toxic substance** in system, check for even growth in reaction chamber
		➢ **Pump out required** – refer to "Bio-Solids Levels" under "Maintenance Checklist" section
		➢ **Other** – call service provider
Water in blower/ housing	Water entry from outside	➢ **Move blower** above flood level
	Blower is siphoning	➢ **Check blower rotation** – see "Blower runs backwards" section above
		➢ **Move blower** to location higher than the FAST system

TANK PUMPING PROCEDURE:

⚠ WARNING *Only qualified service personnel should open access ports/covers. If any contact is made with wastewater, immediately wash and disinfect all exposed areas and contact personal physician. Failure to do so could result in severe sickness or death.*

⚠ CAUTION *Avoid pumping down after periods of heavy rain or when the ground water is likely to be above the bottom of the concrete tank. Emptying the tank under these conditions could cause the tank to float up and become dislodged.*

1. Open the access ports/cover(s) and insert the hose. Always pump out both settling and treatment chambers of the system, even if only one side requires it.
2. Once the unit has been pumped out, immediately refill the tank with clean water to reduce the risk of the tank floating and to minimize the impact on treatment. Close the access ports/cover(s) making sure it is watertight.
3. Properly dispose of the solids removed in compliance with local and state regulations.

COLLECTION OF EFFLUENT SAMPLE

Please contact your local distributor or Bio-Microbics for a copy of the **"Testing Protocol"** document. ***Important:*** All samples must be collected, stored, transported and tested according to the "Testing Protocol" document by Bio-Microbics and the most current version of **Standard Methods**.

OTHER SYSTEM COMPONENTS (if applicable)

☐ Check **LIXOR® PRE-AERATION DEVICE** blower, inlet filter, blower housing, and air delivery system for proper function.

☐ Check **INFLUENT BIOSTEP® PUMP(S)** for proper function. Clean the screening device by using built in swab or other method.

☐ Check **SANITEE® EFFLUENT SCREEN (FILTER)** or other screening device. Clean by using the built in swab or other method.

☐ **DISPERSAL SYSTEM** (not by Bio-Microbics) Follow manufacturer's recommendation.

SEASONAL/INTERMITTENT USE PROPERTIES

The FAST® System will function normally even if there is no wastewater flowing during short periods of vacancy. Examples of seasonal/intermittent use and suggested operational procedures:

- **Summer use property** (shut down all winter) - blower should be turned off at end of summer and restarted at least a week before returning. Please contact your local service provider to restart the system and check with local regulations.
- **Weekend property** (used at least once every three weekends) - maintain normal operation or utilize FAST's SFR® blower timer feature on control panel.

Important: Consult your service provider and local regulations prior to any system changes.

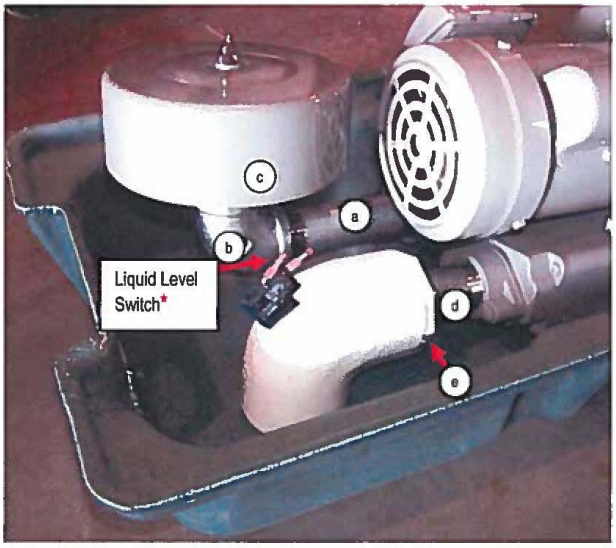
BLOWER REPLACEMENT

⚠ WARNING *All electrical work shall be properly performed by a qualified electrician per all applicable codes. Failure to do so may result in severe bodily injury or death.*

⚠ WARNING *Hazards exist in confined spaces such as a septic tank. All confined space precautions must be followed if entering a tank. Always keep tank openings covered during storage and installation*

When replacing a blower follow the steps below. If relocating the blower run the electrical supply conduit from the control panel to the desired blower location. Air line piping from the blower to the FAST® unit may NOT exceed 100 ft [30.5m] in total length and must have ≤ 4 elbows. The total electrical supply should NOT exceed 150 ft [45 m]. The blower and blower housing must be mounted on a solid base such as concrete to avoid settling.

CONNECT SUPPLIED PIECES (refer to picture below)



a. Longest steel pipe
b. Steel elbow
c. Air filter assembly
d. Shortest steel pipe
e. PVC reducer bushing

SECURE BLOWER ASSEMBLY to housing base using four supplied #14 x 1½" self-tapping screws. Drill screws directly into blower base.

RECONNECT AIR LINE from FAST® unit to blower outlet using required piping. **A "quick disconnect" is highly recommended to be installed in this location if it is not currently in place.**

NOTE: ALL CONNECTIONS MUST BE AIR AND WATER TIGHT

CONNECT INCOMING POWER to the blower at junction box. Follow the **FAST® Installation Manual** for further instruction. Common wiring diagrams are located at the end of this manual.

***(OPTIONAL) LIQUID LEVEL SWITCH** – NOT required for most new systems. AMI control panel with current sensor replaces this switch. To replace this switch:

a) Drill a $^{3}/_{8}$" hole in the blower outlet pipe.
b) ***IMPORTANT***: Connect low voltage wires to switch before mounting in pipe.
c) Insert the switch into the $^{3}/_{8}$" hole (nipple first), then glue into place with PVC glue.
d) Install low voltage pressure switch wiring back to the control panel according to applicable codes (must not be inside high voltage blower wiring).

CONTROL PANEL REPLACEMENT

CAUTION *Always have all utility lines and equipment marked by a locating service prior to performing any work.*

WARNING *All electrical work shall be properly performed by a qualified electrician per all applicable codes. Failure to do so may result in severe bodily injury or death.*

The FAST® systems, including all electrical parts, are ETL (UL equivalent) certified for electrical safety. The control panel meets NEMA4X standards for all weather use (not explosive or submerged environments). The total electrical supply should NOT exceed 150 ft [45m].

Bio-Microbics also manufactures control panels that can control other systems, such as UV and sewage pumps. Call your distributor or Bio-Microbics for more information.

When replacing a panel follow the steps below. If relocating the panel run the electrical supply conduit from the control panel to the blower location. Keep in mind the electrical supply line should NOT exceed 150 ft [45 m] total.

1. Turn all Power OFF.
2. Examine wiring directions inside the supplied FAST® control panel (also found at the end of this Manual).
3. A dedicated breaker is required in the building's master electrical panel. Make connections between the master panel and FAST® control panel.
4. Make connections between the blower and FAST® control panel per the electrical diagram.
5. For systems requiring the Liquid Level Switch- connect the switch to the control panel terminals labeled "FLOAT" or "HI Press Input". The newest AMI control panel with current sensor can be used to replace this switch.

CERTIFICATIONS

WARNING *Only authorized service personnel should service a septic system and its components. Deadly hazards such as lethal gases and high voltage electricity are associated with the system.*

MicroFAST® 0.5, 0.625, 0.75, 0.9, and 1.5 systems are tested and certified to NSF®/ANSI® Standards 40 (Class I) and 245

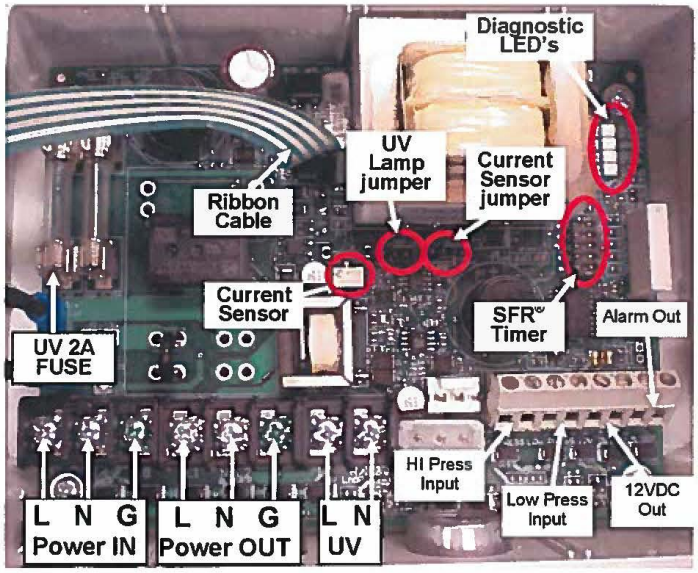
NSF
Certified to NSF/ANSI Standard 40

PARAMETER		LIMIT
CBOD5	30 day avg.	25 mg/L
	7 day avg.	40 mg/L
TSS	30 day avg.	30 mg/L
	7 day avg.	45 mg/L
pH		6-9 s.u.
Total Nitrogen		50% reduction of influent

ELECTRICAL WIRING DIAGRAMS

Only the MicroFAST® 0.5, 0.625, 0.75, and 0.9 system diagrams are displayed here. Information for larger FAST® systems accompanies those units and can be obtained from Bio-Microbics.

AMI 110/220 PANEL



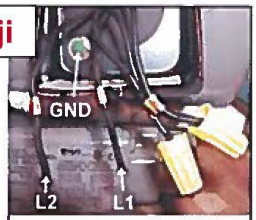
TIMING MODES DIP SWP OS. (S1)					BLOWER MINUTES	
5	4	3	2	1	ON	OFF
Off	Off	Off	Off	Off	30	15
Off	Off	Off	Off	On	15	15
Off	Off	Off	On	On	30	30
Off	Off	On	Off	Off	60	15
Off	Off	On	Off	On	60	30
Off	Off	On	On	Off	120	30
On	On	On	On	Off	TEST	
On	On	On	On	On	∞	
TEST = 15 SEC ON, 20 SEC OFF						
∞ = ALWAYS ON						

BLOWER DIAGRAMS

ATTENTION: Please refer to side of shipping box for correct Blower.

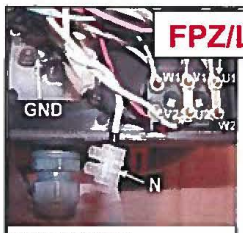
Fuji

Model: FUJI VFC 209, 100P, 300P
Power: 110VAC
- L1 to P1
- N to T2, T4
- T1 & T3, cap together



Model: FUJI VFC 209, 100P, 300P
Power: 220V 1ø
- L1 to P1
- L2 to T4
- T2 & T3, cap together
- T1, cap off

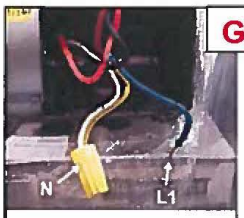
FPZ/Lafert



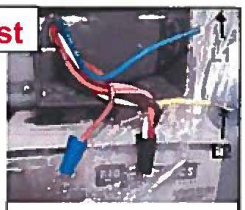
Model: FPZ SCL06
Power: 110VAC
- Jumper U2 to V1
- Jumper W2 to U1
- L1 to "terminal block"
- N to white connector

Model: FPZ SCL06
Power: 220VAC, 1ø
- L1 to "terminal block"
- L2 to V1
- Jumper W2 to U2

Gast



Model: GAST R2103, R4P115, R1102
Power: 110VAC
- L1 to P1
- N to 2,4
- P2,5,3 cap together



Model: GAST R2103, R4P115, R1102
Power: 220VAC 1ø
- L1 to P1
- L2 to 4
- 5, 3 and 2, cap together
- P2 cap off

LIMITED WARRANTY

Bio-Microbics, Inc. warrants every new residential FAST® system against defects in materials and workmanship for a period of two years after installation or three years from date of shipment, subject to the following terms and conditions, (Commercial FAST system for a period of one year after installation or eighteen months from date of shipment, whichever occurs first, subject to the following terms and conditions):

During the warranty period, if any part is defective or fails to perform as specified when operating at design conditions, and if the equipment has been installed and is being operated and maintained in accordance with the written instructions provided by Bio-Microbics, Inc., Bio-Microbics, Inc. will repair or replace at its discretion such defective parts free of charge. Defective parts must be returned by owner to Bio-Microbics, Inc.'s factory postage paid, if so requested. The cost of labor and all other expenses resulting from replacement of the defective parts and from installation of parts furnished under this warranty and regular maintenance items such as filters or bulbs shall be borne by the owner. This warranty does not cover general system misuse, aerator components which have been damaged by flooding or any components that have been disassembled by unauthorized persons, improperly installed or damaged due to altered or improper wiring or overload protection. This warranty applies only to the treatment plant and does not include any of the structure wiring, plumbing, drainage, septic tank or disposal system. Bio-Microbics, Inc. reserves the right to revise, change or modify the construction and/or design of the FAST system, or any component part or parts thereof, without incurring any obligation to make such changes or modifications in present equipment. Bio-Microbics, Inc. is not responsible for consequential or incidental damages of any nature resulting from such things as, but not limited to, defect in design, material, or workmanship, or delays in delivery, replacements or repairs.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED. BIO-MICROBICS SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NO REPRESENTATIVE OR PERSON IS AUTHORIZED TO GIVE ANY OTHER WARRANTY OR TO ASSUME FOR BIO-MICROBICS, INC., ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF ITS PRODUCTS.

Contact your local distributor for parts and service.

FAST® System Serial Number: _____

System Designer Name: _____

Designer Phone: _____

Health Official Name: _____

Health Official Phone: _____

Manufacturer Name: Bio-Microbics, Inc.

Manufacturer Phone: 1-800-753-FAST (3278)

Installed By: _____

Installer Phone: _____

Maintenance Provider Name: _____

Maintenance Provider Phone: _____

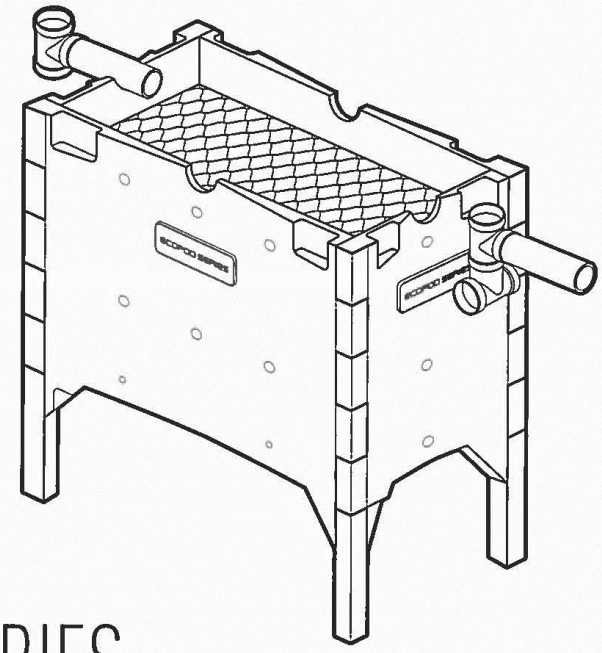
BIO MICROBICS
BETTER WATER. BETTER WORLD.
8450 Cole Parkway • Shawnee, KS 66227 • USA
Ph: 913-422-0707 • Fax: 913-422-0808
800-753-FAST (3278) • www.biomicrobics.com

Appendix II

Pentair “DELTA” Environmental Alternative Private Wastewater Disposal System Service Manual

PENTAIR

DELTA ENVIRONMENTAL®



ECOPOD-N® SERIES
FIXED FILM WASTEWATER TREATMENT SYSTEM
INSTALLATION, OPERATION AND MAINTENANCE MANUAL

NOTE! To the installer: Please make sure you provide this manual to the owner of the equipment or to the responsible party who maintains the system.

Part # K4509 | © 2013 Pentair Ltd. | 05/06/13

TABLE OF CONTENTS

DISTRIBUTOR AND HOMEOWNER NOTES

1. The Delta Environmental Model E50N has been tested by NSF International and conforms to NSF/ANSI Standard #40 & #245, class 1 effluent requirements. All other E series models are certified based on provisions in the standard for certification of a series of plants of the same model varying only in rated treatment capacity and materials of construction.
2. State and/or local regulations govern the installation and use of individual Aerobic Wastewater Treatment Systems and must be complied with.

Consult your local Sanitarian/Environmentalist prior to installation.

HOMEOWNER RECORDS

S/N: _____ DATE: _____

INSTALLED BY: _____

DISTRIBUTOR: _____

_____

_____

This booklet provides operations, installation and warranty information on the **TREATMENT PLANT ONLY**. Other components that you may have, such as dosing equipment, drip irrigation or other components, require additional operations booklets and carry separate warranties.

Be sure that you have all of the correct booklets for each of the component pieces in your system.

Contact your installer or call 1-800-219-9183.

Post in a Service/Utility Area

ECOPOD-N® TREATMENT SYSTEMS NOTICE

This home is served by an Individual Wastewater Treatment System. This system will serve you well only if it is properly maintained. Your system comprises

_____

Your system is located

_____

You should not build or fill over this area, or allow heavy traffic. Do not allow water to stand over this area, avoid using strong chemicals, cleaning fluids, etc., which will kill helpful bacteria in the system. You should also avoid flushing grease, food scraps, cigarette butts, sanitary napkins, and other inorganic waste down the drain.

You should have your system serviced (pumped out) every 3 to 5 years. Your service technician can advise you if you need more frequent or additional service.

To have your system serviced, or for additional information, contact _____ at _____ .

All of the details regarding system operation can be found in your homeowner's manual, which you should have received at installation. If you did not receive a copy, call 1-800-219-9183 and we will send you one at no charge.

Keep a Record of Service Below:

DATE	SERVICE PERFORMED	SERVICE TECHNICIAN

INTRODUCTION

A WORD ABOUT YOUR DELTA AEROBIC WASTEWATER TREATMENT SYSTEM AND HOW IT WORKS

The ECOPOD-N Fixed Film Wastewater Treatment System that you have purchased produces high quality water suitable for various disposal methods. It is used to enhance your on-site wastewater disposal system. You can be proud that in purchasing your ECOPOD-N System, with a minimum amount of maintenance you can directly contribute to a cleaner, safer environment.

All wastewater treatment systems of this type work by using bacteria that nature has provided. By pumping air into the system, the bacteria grow and thrive in much larger amounts than would occur naturally. The overpopulation of bacteria speeds up the process of breaking down domestic wastewater, making it safe for release into the environment. This entire process takes place within the walls of your specially designed, self-contained ECOPOD-N Treatment System.

The result of this process is a clear, odorless discharge, which meets or exceeds state water quality standards.

By following the few simple steps that you will find in this manual, your ECOPOD-N Fixed Film Wastewater Treatment System will provide you with years of service and the knowledge that you are doing your part to protect public health, our groundwater, lakes, rivers, and streams.

The ECOPOD-N Fixed Film Wastewater Treatment System may be only one of several components required by your health department to provide a complete on-site system.

CALIFORNIA PROPOSITION 65 WARNING:

⚠WARNING This product and related accessories contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

PROCESS DESCRIPTION

Water enters a pretreatment/settling tank similar to conventional septic tanks. In this tank, debris and settleable solids settle to the bottom and are decomposed by anaerobic bacteria.

The effluent enters the ECOPOD-N Fixed Film Wastewater Treatment System from the primary tank where it is introduced into an oxygen rich environment. In this oxygen rich environment, a colony of bacteria, called the biomass, develops and is capable of digesting (breaking down) biodegradable waste into carbon dioxide and water. This is a continuous process as long as the biomass is supplied with incoming wastewater and oxygen. The ECOPOD-N is a specially designed containment device that houses an engineered plastic media specifically designed to treat domestic wastewater. The ECOPOD-N is submerged in a tank of liquid, which operates as a dilution zone. An external air compressor is connected to the tanks to provide the necessary air to the system. There are no moving mechanical parts or filters in the ECOPOD-N.

In this system, conditions are favorable only to attached growth bacteria. This means that the most common disadvantages of other types of systems are eliminated. No rising sludge, floating sludge or washouts can occur.

In addition to CBOD and TSS reduction, ammonia nitrogen is one of the contaminants. Wastewater nitrification of the ammonia and denitrification of nitrates occur within the bacteria masses. A 50%+ removal rate of total nitrogen is common without any type of recirculation or cycling of the blower.

HOMEOWNER CARE AND OPERATION INSTRUCTIONS

The ECOPOD-N Fixed Film Wastewater Treatment System has been designed and built to provide long term, reliable and efficient service.

Once the unit has been installed (see installation instructions), the unit will operate with a minimum amount of attention.

Please reference the system's Data Plates that are located on the tank, air pump, and the alarm panel in the event that a problem arises or service is required.

The following should be accomplished as checks for system failure:

Daily

- Observe the warning device, which comes on when the power to the air pump has been interrupted, when the air supply system has malfunctioned, or there is a high water level in the treatment plant. If the alarm is activated, check for a blown fuse or thrown circuit breaker. Check the air pump to be sure it is operating. Once accustomed to the soft humming sound of a properly operating unit, any unusual noise is an indication of malfunction. If an unusual noise is detected or total failure is observed, call an authorized Delta dealer/distributor.

Weekly

- Check the treatment plant for offensive odor. If such a condition should develop, call an authorized Delta dealer/distributor.

Every 3 Months

- **The air filter on the air pump should be cleaned.** Rinse with warm water if necessary. (See installation instructions.) Do not use oil or other solvents.

Every 6 Months

- Inspect and make any necessary adjustments to mechanical and electrical components.
- Inspect effluent quality's color, turbidity and check for any odor.
- Take a sample from the reactor tank to check the sludge level described in the "Solids Removal" section.
- **The homeowner must be notified in writing if any improper operation is observed and cannot be corrected at the time of service.**

Note: To keep maintenance to a minimum and ensure high effluent quality, see the next section.

The following should not be used or disposed of into the system:

- Greases, fats, oils, pesticides, herbicides, or any other toxins.
- Garbage disposal should be used sparingly. Dispose of food waste, grease, etc., in the solid waste bin. Food waste represents additional loading the Fixed Film Wastewater Treatment System would have to digest, increasing pump-out intervals.
- Paints, household chemicals, automobile fluids, etc. – do not discard mop water into the system.
- Nonbiodegradable items such as cigarette butts, disposable diapers, feminine hygiene products, condoms, hair, coffee grounds, rags, paper towels, bandages, latex, plastic or metallic objects, etc.

- Wash loads must be spread out over the week. Once a week multiple loads or half loads are not recommended.
- Citrus products, oranges, lemons, grapefruit, etc.
- Additives for septic systems – they do more harm than good.
- Hydraulic overload due to excessive water from other sources.
- Home brewery waste, strong medicines, antibiotics and antibacterial soaps should be avoided.
- Strong disinfectants or bleaches. Laundry products such as Lysol, Pine-Sol, Tidy Bowl, or discharge from water softeners.
- Recommended detergents are powdered, low-sudsing, low phosphates and biodegradable washing soda ingredients such as Gain, Arm & Hammer, Fresh Start, and Dash Bright. Fabric softener dryer sheets are recommended.
- Recommended cleaning products are non-chlorine, biodegradable and nontoxic such as Ivory & Sunlight dish washing liquids, Cascade & Sunlight powdered dishwasher detergents, Comet & Biz powdered cleaners, baking soda.

SYSTEMS REQUIRING PUMPOUTS DUE TO THE ABOVE VIOLATIONS ARE NOT COVERED BY THE WARRANTY.

The ECOPOD-N Fixed Film Wastewater Treatment System is designed to handle domestic wastewater; nothing else should go into it. For anything other than domestic wastewater, contact Delta Environmental.

Safety Warnings

THE PROPER OPERATION OF THIS OR ANY OTHER HOME SEWAGE SYSTEM DEPENDS UPON PROPER ORGANIC LOADING AND THE LIFE OF THE MICROORGANISMS INSIDE THE SYSTEM. DELTA IS NOT RESPONSIBLE FOR THE IN-FIELD OPERATION OF A SYSTEM, OTHER THAN THE MECHANICAL AND STRUCTURAL WORKINGS OF THE PLANT ITSELF. DELTA CANNOT CONTROL THE AMOUNT OF HARSH CHEMICALS OR OTHER HARMFUL SUBSTANCES THAT MAY BE DISCHARGED INTO THE SYSTEM BY THE OCCUPANTS OF A HOUSEHOLD; WE CAN ONLY PROVIDE A COMPREHENSIVE OWNER'S MANUAL THAT OUTLINES SUBSTANCES THAT SHOULD BE KEPT OUT OF THE SYSTEM.

HYDRAULIC OVERLOADING (FLOWS IN EXCESS OF DESIGN FLOW) MAY CAUSE THE SEWAGE TREATMENT SYSTEM NOT TO PERFORM TO THE FULLEST CAPABILITIES.

ANTS HAVE BEEN SHOWN TO BE DESTRUCTIVE TO THE AIR PUMP. REGULAR CARE SHOULD BE TAKEN TO PREVENT INFESTATION OF ANTS NEAR THE SYSTEM. DAMAGE OR DESTRUCTION BY ANTS IS NOT COVERED UNDER MANUFACTURER'S WARRANTY.

YOUR STATE OR LOCAL HEALTH DEPARTMENT MAY REQUIRE OTHER PIECES OF EQUIPMENT TO FUNCTION SEPARATELY OR IN CONJUNCTION WITH EQUIPMENT MANUFACTURED BY DELTA ENVIRONMENTAL. DELTA IS NOT RESPONSIBLE FOR THE MECHANICAL OR ELECTRICAL SAFETY OF EQUIPMENT IT DOES NOT MANUFACTURE OR SUPPLY WITH ITS FIXED FILM WASTEWATER TREATMENT SYSTEM. PARTICULAR CARE SHOULD BE USED IN EVALUATING THE ELECTRICAL OR MECHANICAL SAFETY OF EQUIPMENT MANUFACTURED BY OTHERS. THIS MAY INCLUDE BUT IS NOT LIMITED TO ELECTRICAL CONTROL PANELS OR AIR PUMPS.

IF ELECTRICAL SERVICE HAS NOT BEEN INSTALLED FOR CHECKING AIR DISTRIBUTION SYSTEM DURING INSTALLATION, AND IF AN EXTENSION CORD IS USED TO TEST THE AIR PUMP, NEVER LEAVE THE EXTENSION CORD PLUGGED IN. REMOVE IT AFTER TESTING IS COMPLETED.

DUE TO A POSSIBLE FIRE HAZARD, DO NOT PLUG INTO SERVICE EQUIPMENT ON POWER POLE AND DO NOT USE EXTENSION CORDS. ALL ELECTRICAL WORK PERFORMED BY THE INSTALLER OR OTHERS MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND LOCAL CODES.

SOLIDS REMOVAL

The ECOPOD-N Fixed Film Wastewater Treatment System is designed to provide years of trouble-free operation.

Determination of the need for solids removal can be done through a simple test. A one quart sample should be pulled from the reactor tank and can be done so through the 4" sample port. Allow the sample to settle in a clear one quart jar for one hour. If the solids content exceeds 25 percent of the total volume after settling or more than 13 inches of sludge, the treatment plant should be pumped out. Call your local authorized sewage disposal service to have the tank contents pumped out and disposed of properly.

The method of pumping out should be as follows:

- Remove all of the solids from both the reactor tank and primary tank.
- The air pump should be in the off position.

After the pumpout process is complete, fill the tank with fresh water to normal operating level.

Refer to the "Installation Procedure" to get the treatment plant back into operation.

Should indication of improper operation be observed at any time, contact your local authorized Delta dealer/distributor.

NOTE: THE COST ASSOCIATED WITH PUMPING THE TREATMENT SYSTEM IS NOT COVERED UNDER WARRANTY AND IS NOT INCLUDED IN THE SERVICE POLICY.

SEASONAL USE GUIDELINES OF ECOPOD-N FIXED FILM WASTEWATER TREATMENT SYSTEM

These guidelines are for conditions as outlined below and apply for systems that are not in use for periods of time indicated. Site conditions not covered by the following must be forwarded to Delta for recommended guidelines to meet the particular site conditions.

1. System not in use for more than one month and less than three months. Electrical power is left on and there are no frost conditions.
   - Leave air pump on and system running.
2. System not in use more than three months. Electrical power is turned off and there are not frost conditions.
   - Remove all materials and liquid from tank.
   - Refill with clean water.
   - Turn off air pump.
3. System not in use more than three months. Electrical power is on and there are not frost conditions.
   - Leave air pump on and system running; OR
   - Remove all material and liquid from tank.
   - Refill with clean water.
   - Turn off air pump.

TANK PUMPING PROCEDURE:

⚠ WARNING *Only qualified service personnel should open access ports/covers. If any contact is made with wastewater, immediately wash and disinfect all exposed areas and contact personal physician. Failure to do so could result in severe sickness or death.*

⚠ CAUTION *Avoid pumping down after periods of heavy rain or when the ground water is likely to be above the bottom of the concrete tank. Emptying the tank under these conditions could cause the tank to float up and become dislodged.*

1. Open the access ports/cover(s) and insert the hose. Always pump out both settling and treatment chambers of the system, even if only one side requires it.
2. Once the unit has been pumped out, immediately refill the tank with clean water to reduce the risk of the tank floating and to minimize the impact on treatment. Close the access ports/cover(s) making sure it is watertight.
3. Properly dispose of the solids removed in compliance with local and state regulations.

COLLECTION OF EFFLUENT SAMPLE

Please contact your local distributor or Bio-Microbics for a copy of the **"Testing Protocol"** document. ***Important:*** All samples must be collected, stored, transported and tested according to the "Testing Protocol" document by Bio-Microbics and the most current version of **Standard Methods**.

OTHER SYSTEM COMPONENTS (if applicable)

☐ Check **LIXOR® PRE-AERATION DEVICE** blower, inlet filter, blower housing, and air delivery system for proper function.

☐ Check **INFLUENT BIOSTEP® PUMP(S)** for proper function. Clean the screening device by using built in swab or other method.

☐ Check **SANITEE® EFFLUENT SCREEN (FILTER)** or other screening device. Clean by using the built in swab or other method.

☐ **DISPERSAL SYSTEM** (not by Bio-Microbics) Follow manufacturer's recommendation.

SEASONAL/INTERMITTENT USE PROPERTIES

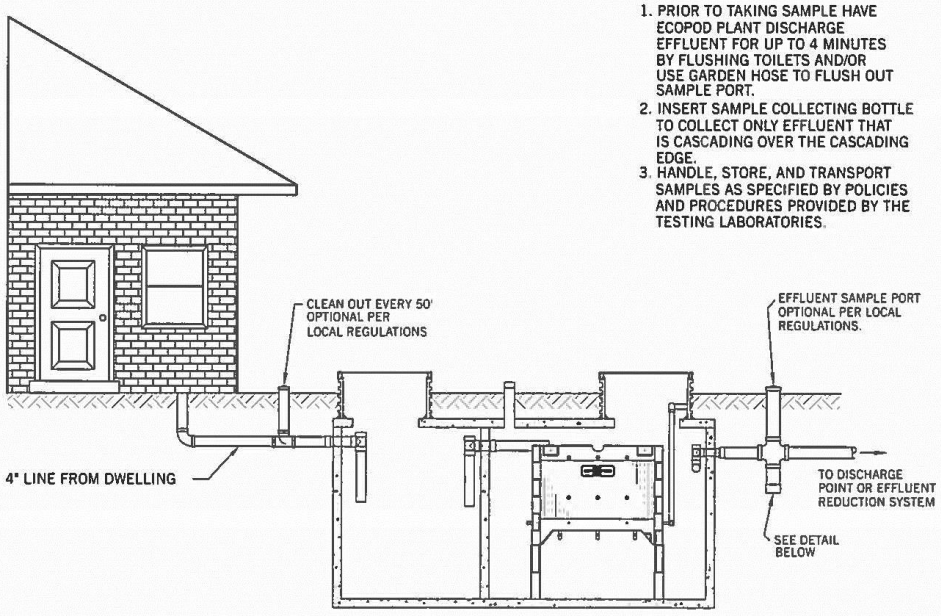
The FAST® System will function normally even if there is no wastewater flowing during short periods of vacancy. Examples of seasonal/intermittent use and suggested operational procedures:

- **Summer use property** (shut down all winter) - blower should be turned off at end of summer and restarted at least a week before returning. Please contact your local service provider to restart the system and check with local regulations.
- **Weekend property** (used at least once every three weekends) - maintain normal operation or utilize FAST's SFR® blower timer feature on control panel.

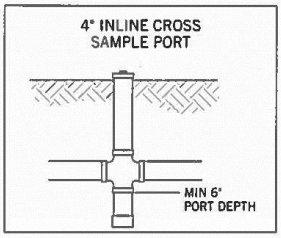
Important: Consult your service provider and local regulations prior to any system changes.

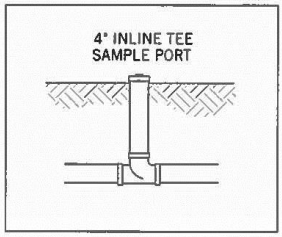
SAMPLE PROCEDURES:

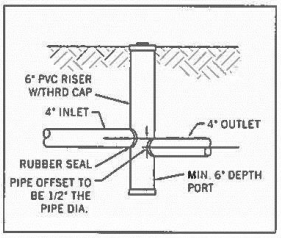
1. PRIOR TO TAKING SAMPLE HAVE ECOPOD PLANT DISCHARGE EFFLUENT FOR UP TO 4 MINUTES BY FLUSHING TOILETS AND/OR USE GARDEN HOSE TO FLUSH OUT SAMPLE PORT.
2. INSERT SAMPLE COLLECTING BOTTLE TO COLLECT ONLY EFFLUENT THAT IS CASCADING OVER THE CASCADING EDGE.
3. HANDLE, STORE, AND TRANSPORT SAMPLES AS SPECIFIED BY POLICIES AND PROCEDURES PROVIDED BY THE TESTING LABORATORIES.



EXAMPLES OF SAMPLE PORTS







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SAMPLE PORTS

PLOT SCALE	DRAWING NUMBER	DRAWN BY	DATE	SHEET	REV
NTS	EP SAMP PORTS	D.WRIGHT	10/31/07	1 OF 1	A

INSTALLATION INSTRUCTIONS ONLY FOR USE BY CERTIFIED, LICENSED INSTALLERS

1. Prepare an excavation, having a diameter approximately one foot larger than the tank and a depth that will allow approximately 3 inches of the inspection port to extend above normal ground level. Backfill with a 6 inch layer of sand or gravel if otherwise unable to provide a smooth, level, compact base. We recommend that the hole be roped off in some fashion to prevent injury to passersby.
2. Using lifting lugs provided, place the plant in the excavation so that the inlet and outlet line up with the sewer piping. The inlet line should slope down toward the plant and the outlet line should slope down away from the plant. The plant should be level within 1/2 inch, edge to edge.
3. Position inlet and outlet lines and make connections as necessary, depending upon construction materials. The inlet line should be inserted and glued into the inlet elbow and the discharge line should be inserted and glued into the outlet coupling.

   Note: Open inspection port and make sure discharge tee assembly is level and centered in clarifier prior to attaching discharge piping. Fill the tank with water until water flows from the discharge before backfilling. Backfill around plant, up to the bottom of the discharge connections.
4. Do not install the air pump(s) in a low lying area where water may accumulate. The air pump should be installed near the control panel and within 100 ft. of the tank. The air pump can be installed outdoors or in a clean, well ventilated area, such as a tool room, garage, etc.
5. Mount the control panel in an area such that the alarm can be heard and be readily observed. A 3-wire grounded GFI circuit is required for safety. Install a disconnect switch near the panel to visually disconnect the control panel from the power source. All electrical work shall be done according to NEC and local code requirements. The control panel must be grounded. Connect the source ground wire to the ground location in the panel.
6. The control panel is rated for indoor and outdoor use and contains a fuse or circuit breaker for the air pump. An electrical malfunction in the air pump or wiring to the air pump will cause the fuse or circuit breaker to blow. The control panel also contains a pressure switch and visual and audible alarm. Loss of air pressure caused by air pump system malfunction or a high water level in the treatment plant will cause the alarm to sound and light to illuminate.
7. Attach control panel to suitable mounting surface using all four mounting holes on back of box. Use proper screws of sufficient length to ensure a secure and permanent mounting.
8. Control panel is rated for outdoor service; however, do not place it where it can be immersed in rising water or where runoff water such as from a roof will fall on it. Do not mount it where it is subject to wetting from sprinklers, hoses, etc.
9. The control panel must never be connected to a circuit that is not properly grounded. Never connect the unit to a nongrounded circuit. If there is doubt, have a qualified electrician check for proper grounding. The control panel must be connected to a 20 amp maximum electric source equipped with a ground fault interrupter (GFI) circuit breaker. A standard circuit breaker can be replaced with a GFI circuit breaker which can be obtained from almost any store that sells electrical supplies.
10. After the control panel is properly mounted, connect conduit and install wiring as shown on drawings bound herein.

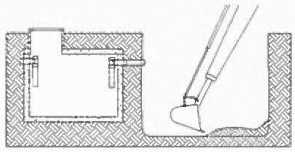
11a. Install float switch wire from the control panel to the treatment plant. Wire can be direct burial type UF 600 volt or can be installed in schedule 40 PVC conduit. Use type THWN, 600 volt if installed in conduit. Wire must be buried in accordance with NEC table 300-5. If in doubt, bury 24" deep. Keep sufficient distance or depth from air line to avoid confusion of pipes or damage to wiring during installation or repair of air piping. Connect to the float switch normally open contacts using underground rated compound filled wire nuts.

11b. If using the dual pressure switch panel, ignore 11a. To set the high level pressure switch that detects high water level in the unit, follow these instructions: Bring plant to operating water level with compressor turned on. Using properly sized screwdriver, turn high level alarm adjustment screw clockwise until alarm occurs. Then turn the screw counterclockwise until alarm stops.

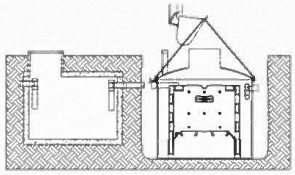
12. Connect the pressure air tubing to the 1/8" barb-fitting in the air piping system. The air tubing should be protected by conduit as shown on drawing.
13. Install a minimum 2" schedule 40 PVC piping between air pump and treatment unit. A minimum of 12" ground cover is recommended.
14. Turn power on to control panel. Air pump should start.
15. Check air piping joints for leakage using a soapy water solution. Repair if necessary and then carefully backfill air line and inlet and discharge piping and cover plant to grade level.
16. Recheck water level in the tank.
17. Plant is ready to receive incoming sewage. No special start-up procedures are required. The process is naturally occurring and does not require any special additives.
18. Test alarm circuit by momentarily squeezing air tubing and allowing air pressure to decrease. This should take a few minutes. Alarm should occur. Release air tubing and alarm should stop. Lift float in tank to horizontal position. Alarm should occur. Release float. Alarm should stop. The audible alarm can be turned off by flipping the toggle switch on the panel front door to the left.
19. Close cover on control panel and lock if necessary.
20. In the event that a fuse blows, replace with time delay or slow blow, 125 volt minimum voltage rating and the same amp rating as the existing fuse.
21. The distribution of air to all droplines must be uniform. If the air flow is not evenly distributed, check the air pump or the main air line.
22. Spend time with your customer whenever possible. Review operation instructions. Be sure that the customer has a manual to keep. This saves valuable time avoiding return visits.
23. Retain these instructions for future reference.
24. **⚠ WARNING: CONTROL PANEL CONTAINS HIGH VOLTAGE AND MUST BE INSTALLED AND SERVICED ONLY BY QUALIFIED PERSONNEL.**

DELTA ENVIRONMENTAL
RECOMMENDED INSTALLATION PROCEDURE

1. EXCAVATION:
Dig hole from the side for accurate sizing. This reduces the bridging distance between the tank and undisturbed soil and provides good support for inlet and outlet pipes. The bottom of the hole should be undisturbed and level. If leveling is necessary due to overexcavation, use sand for fill.

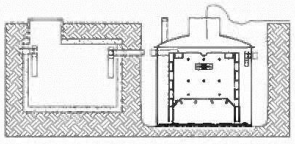


NOTE: Never place tank directly on rock. Place at least six inches of sand bedding between the tank and rock surface.



2. TANK PLACEMENT:
Use the backhoe to set the tank. Lifting lugs are furnished to lift the tank.

CAUTION: A small amount of soil or sand should be used around the bottom of the tank to hold it in place. Sand is best. If excavated soil is used, tamp it underneath the tank to provide a good base.



3. FILL TANK WITH WATER:
Place hose in 24" manway or 6" inch riser. Begin filling tank with water.

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DELTA ENVIRONMENTAL

INSTALLATION PROCEDURE

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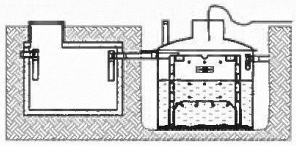
NTS	DEP034	D.WRIGHT	10/30/07	1 OF 3	A

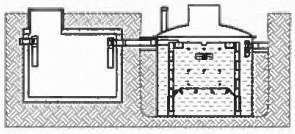
4. GFI CONTROLS AND AIR PUMP
Install duplex or quadruple GFI or GFI protected receptacles at the selected location of the air pump. Mount control panel and install fittings, tubing and piping to tank location.

CAUTION: Do not plug anything but the air pump into the control panel.



5. INLET/OUTLET AND AIR CONNECTIONS
Properly make solvent cemented inlet, outlet and air connections.

6. FILLING THE TANK
Finish filling tank with water until it drains out of outlet. Begin backfilling with natural soil or a good backfill material.

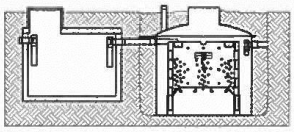


7. AIR DISTRIBUTION
Turn the air pump on and check all air connections and piping for air tightness.

NOTE: If electrical GFI receptacle has not been installed for checking air distribution system during installation, use an extension cord to run the air pump. Never leave the extension cord plugged in. Remove it after inspection is completed.

WARNING: Possible Fire Hazard

Do Not plug into main service equipment on power pole.



Do Not use extension cords.

8. FINAL BACKFILLING
Backfill should be mounded above grade slightly to allow for settling. Tamp the backfill beneath the inlet, outlet and air piping to provide good support.

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INSTALLATION PROCEDURE

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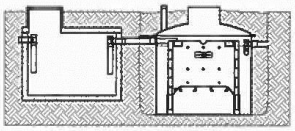
9. TRIM INSPECTION RISERS

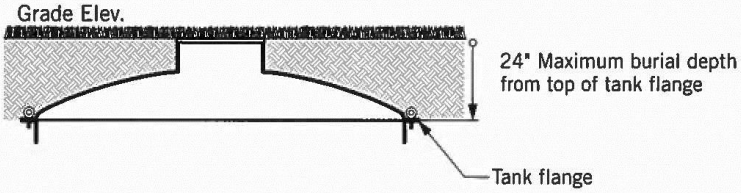
Trim inspection risers to proper length. The 4" aeration inspection riser also serves as a vent for the tank.

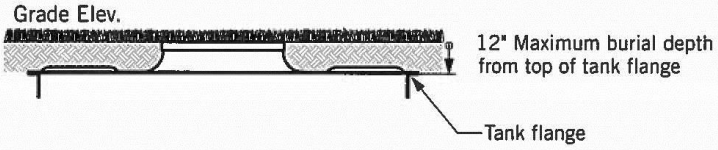


CAUTION: The bottom of the 4" aeration riser must be above the water level for both visual inspection and ventilation. Both of the optional 6" and 4" top caps must be above ground level to prevent groundwater from entering the risers.

CAUTION: Care must be taken not to push the optional 6" Clarifier Inspection Riser down too far. This may cause damage to the effluent discharge tee assembly and the clarifier.

CAUTION: Maximum burial depth for Delta fiberglass tanks – 2 feet from top of tank flange with dome or 24" manways and 1 foot from top of tank flange with flat lids. For burial depths beyond 2 feet, contact the factory. For further details refer to the installation manual.





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INSTALLATION PROCEDURE

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TROUBLESHOOTING GUIDE

Air Supply Malfunction

1. Check to be sure air distribution is working properly. This will be evident in the reactor as the liquid will be forcefully agitated. A septic (rotten egg) odor could mean that the system is not getting enough air. If the air system is not working, partially working or working very little (slight bubbles), check the following:
   a. Check to be sure the air pump is working.
      - Check timer if one is used.
      - Bypass timer temporarily and connect directly to source.
      - Check the electrical source.
      - If electrical source is okay, check service guide on pump unit for troubleshooting information.
      - Wash air filter on pump.
      - Consult manufacturer for servicing information.
   b. Check to be sure tank is not severely out of level. Air follows a path of least resistance. The pressure differences can be enough to restrict air flow.
   c. Check for broken or cracked air lines both outside and inside the tank.
   d. Ants will destroy an air pump. Check to see if there is an ant nest around the air pump.
   e. Air pump should be protected from rising water.
   f. Always check to see if inlet and outlet lines are correctly installed.

Internal Assembly Malfunction

1. Primary treated wastewater from the primary tank should not enter directly into the dilution zone because of improperly installed or loose seals or gaskets where pipe goes through the tank wall. Check the size of holes to be sure that there is no clearance for matter to pass through the wall around the piping.
2. Check to be sure all internal piping and connections are tight.

Design Overload

1. The system could be hydraulically overloaded (there is too much water going through the system for the size of the system).
2. The system could be biologically overloaded (there is too much waste for the size of the system).

Improper Installation or Settling

1. You should follow the manufacturer's installation procedures very carefully.
2. Where settling is common, approximately 2" of sand should be placed and tamped in the bottom of the hole.
3. Proper installation is the first step in preventing callbacks for service problems.
4. Whenever possible, it is important to spend time with the homeowner. Be sure they have an operations book. A few minutes invested in the beginning will avoid service calls later.

No Harsh Chemicals Should Be Put into the System

1. Water in the reactor tank should be relatively clear in both the reactor and dilution zones. Blue or gray/blue water indicates heavy use of detergents or other chemicals. If water appears sudsy there is too much detergent being used.
2. Water in the dilution zone should be clear. Water is discharged into the discharge tee at a minimum of 6–8 inches below water surface. You MAY NOT be able to see clear water by looking into the tank. Samples must be taken at the sample port.
3. Oils and grease should be kept to a minimum. Grease tends to form in white balls.

Troubleshooting Electrical System

1. Air pump does not run:
   a. Check main service for power.
   b. Check and/or replace fuse with same rating as in control panel.
2. Alarm does not occur when air pump is off:
   a. Malfunctioning pressure switch – replace.
   b. Malfunctioning light or buzzer – replace.
3. Alarm occurs continuously even when air pump is running:
   a. Air leak in main air system or air tubing to pressure switch – repair leak or replace air line.
   b. Malfunctioning pressure switch – replace.
   c. High water level in tank – inspect for cause.
   d. Short in float switch wire or float switches – repair or replace.

NOTE: ALL REPLACEMENT PARTS ARE AVAILABLE FROM YOUR LOCAL DISTRIBUTOR.

⚠ CAUTION: ELECTRICAL SHOCK OR HAZARD MAY OCCUR IF UNIT IS NOT SERVICED PROPERLY. THE MANUFACTURER RECOMMENDS THAT A LICENSED ELECTRICIAN BE CALLED WHEN ELECTRICAL PROBLEMS OCCUR.

COMPONENT REPLACEMENT PROCEDURE

1. **Air Pump** – Follow the same procedure as outlined in the "Installation Instructions."
2. **Float Switch** – Remove Treatment Plant's Riser or 24" cover. Locate float switch cable. Untie knot. Cut float switch cable. Slip float switch cable through rubber grommet into the plant. Replace with exact replacement float switch. Reinstall by reversing the procedure. Reconnect float switch wires using underground rated compound filled wire nuts. **See Float Switch Mounting Details. (Applicable only with float switch option.)**
3. **Pressure Switch** – Turn all power off to the control panel. Remove screws securing pressure switch as well as connectors and tubing. Reverse procedure to install new pressure switch.
4. **Buzzer** – Turn all power off to the control panel. Remove screw attaching buzzer to back plate as well as connectors. Reverse procedure to install new buzzer.
5. **Lamp Holder** – Turn all power off to control panel. Remove lock nut securing lamp holder to door as well as connectors. Remove lamp holder. Install new lamp holder with gaskets furnished. Continue with reverse procedure.

6. **Lamp** – Turn all power off to control panel. Remove red lamp cover from front of control panel. Remove and replace lamp, which is a push-in type. Replace lamp cover and cover gasket.
7. **Fuse** – Turn all power off to control panel. Pull top of fuse holder outward. Remove and replace fuse. Push fuse back into place.
8. **Buzzer Switch** – Turn all power off to control panel. Remove rubber boot on switch. Remove hex nut from switch on panel front as well as connectors on switch. Reverse procedure to install new switch.

GENERAL COMMENTS

1. Only factory approved equipment can be used for replacement on individual treatment systems.
2. If the decision is made to pump out a system, be sure to contact a licensed waste hauler.
3. If a chronic problem develops and all items have been checked, consult with the factory.
4. Taking pictures of systems when troubleshooting will help document activity in the field.
5. Keep good records.

NOTE: IF THE ENTIRE COVER NEEDS TO BE REMOVED ON ANY ONE OF THE VARIOUS MODEL TREATMENT PLANTS, THE EXISTING SILICONE OR STRIP SEAL MUST BE REMOVED AND REPLACED WITH A NEW ONE. THIS WILL PROVIDE A POSITIVE SEAL WHICH WILL NOT ALLOW ANY INFILTRATION INTO OR OUT OF THE TREATMENT PLANT.

ECOPOD-N Unit Specifications

Treatment Plant	Treatment Capacity (GPD)	Minimum Primary Tank Total Volume (Gal)	Reactor Tank Volume (Gal)	Reactor Tank Dilution Volume (Gal)	Media Size	Air Requirements
E50N	500	500	710	590	2'x2'x4'	12 CFM
E60N	600	600	916	736	3'x2'x4'	14.4 CFM
E75N	750	750	1090	910	3'x2'x4'	18 CFM
E100N	1000	1000	1405	1165	4'x2'x4'	24 CFM
E150N	1500	1500	2100	1740	6'x2'x4'	36 CFM

MATERIALS OF CONSTRUCTION

Suffix FF	Reactor Tank	Fiberglass
	Cover	Fiberglass
	Media Container	Fiberglass / Polyethylene
Suffix CA	Reactor Tank	Concrete
	Cover	Concrete
	Media Container	Fiberglass / Polyethylene

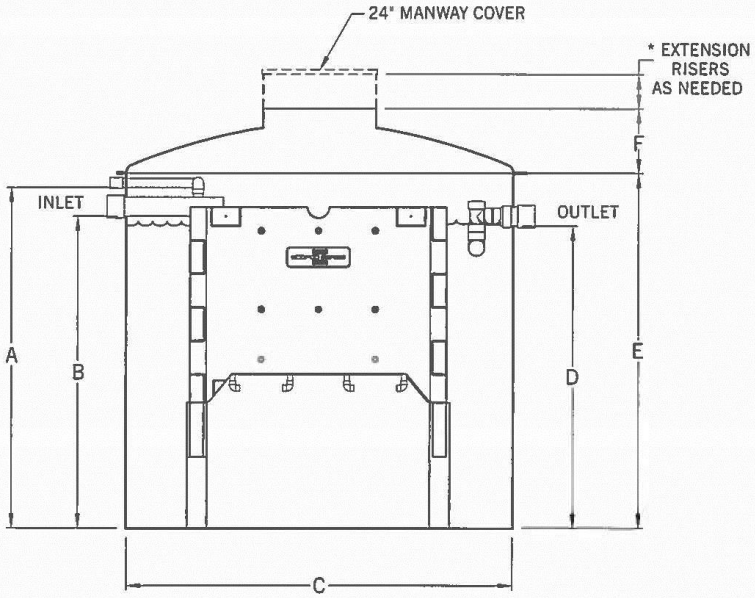
These are standard production units. Other configurations are available upon request.

ECOPOD-N Electrical Requirements

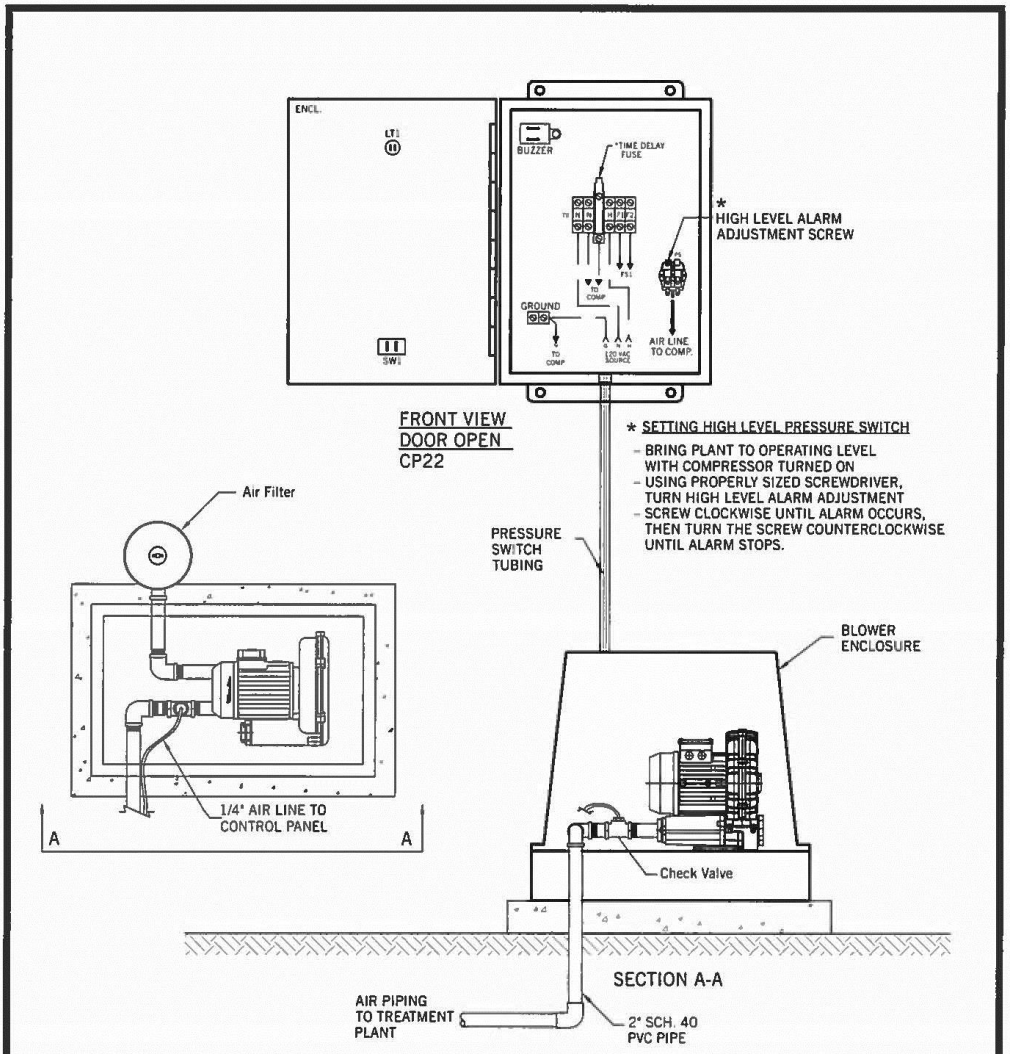
Model	Compressor	Motor Full Load Amps	Measured Operating Watts	Electrical Requirements
E50N	Delta Model 06	3.5	185	115 volt – single phase
E60N	Delta Model 06	4.7	280	115 volt – single phase
E75N	Delta Model 06	4.7	280	115 volt – single phase
E100N	Delta Model K03	7.1	475	115 volt – single phase
E150N	Delta Model K03	7.1	475	115 volt – single phase

ECOPOD-N Dimensions

Treatment Plant	A	B	C	D	E	F
E50N	4' 10"	4' 2"	5' 6"	4' 0"	5' 0"	1' 5"
E60N	4' 10"	4' 6"	6' 0"	4' 4"	5' 0"	1' 5"
E75N	5' 7"	4' 11"	6' 3"	4' 9"	5' 9"	1' 6"
E100N	6' 0"	5' 5"	6' 9"	5' 3"	6' 2"	1' 6"
E150N	6' 2"	5' 9"	8' 0"	5' 7"	6' 4"	1' 9"



* REFERENCE SHEET 3 OF INSTALLATION PROCEDURE FOR MAX BURIAL DEPTH



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CONTROL PANEL CONNECTION

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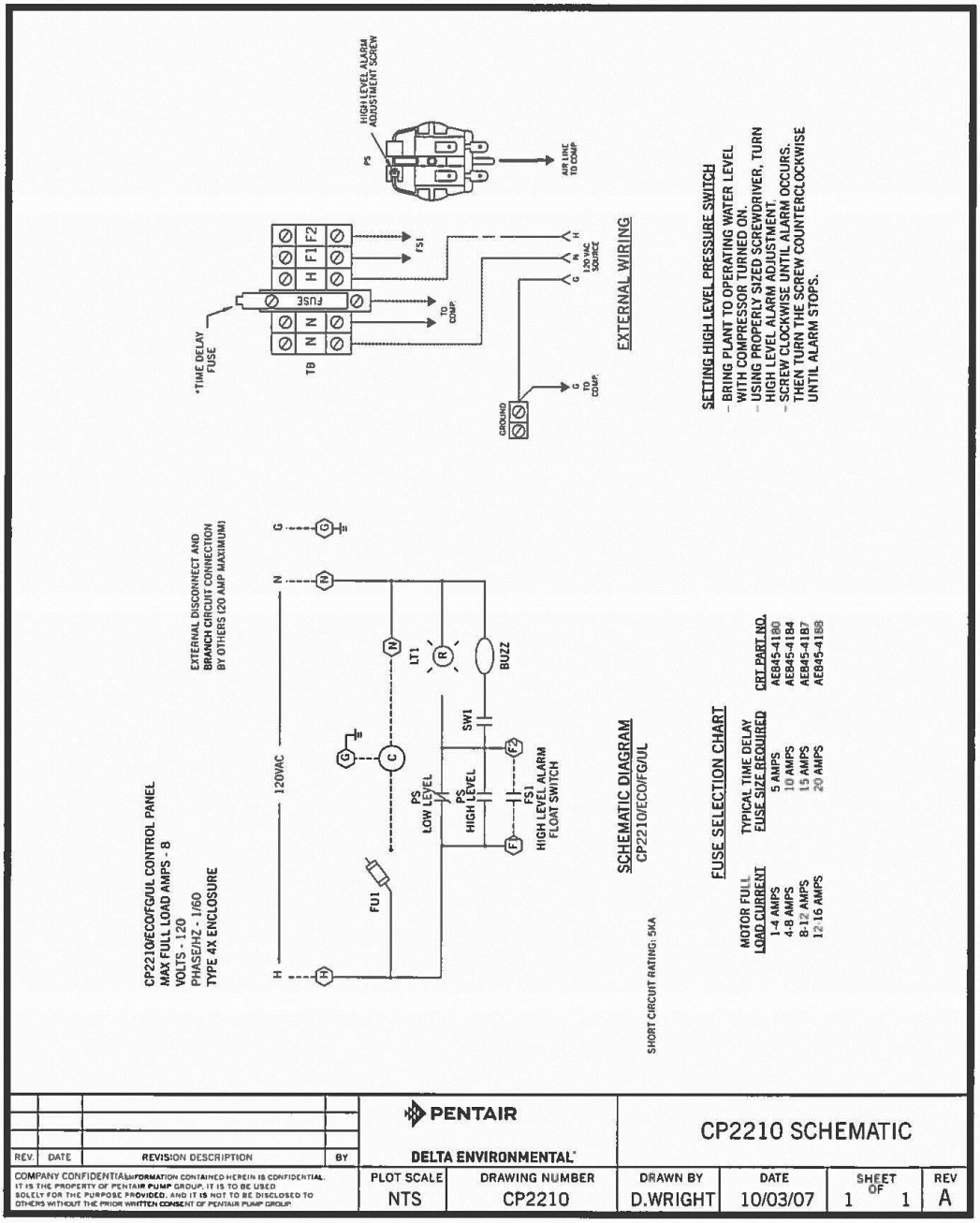

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CP2210 SCHEMATIC

PLOT SCALE	DRAWING NUMBER	DRAWN BY	DATE	SHEET	REV
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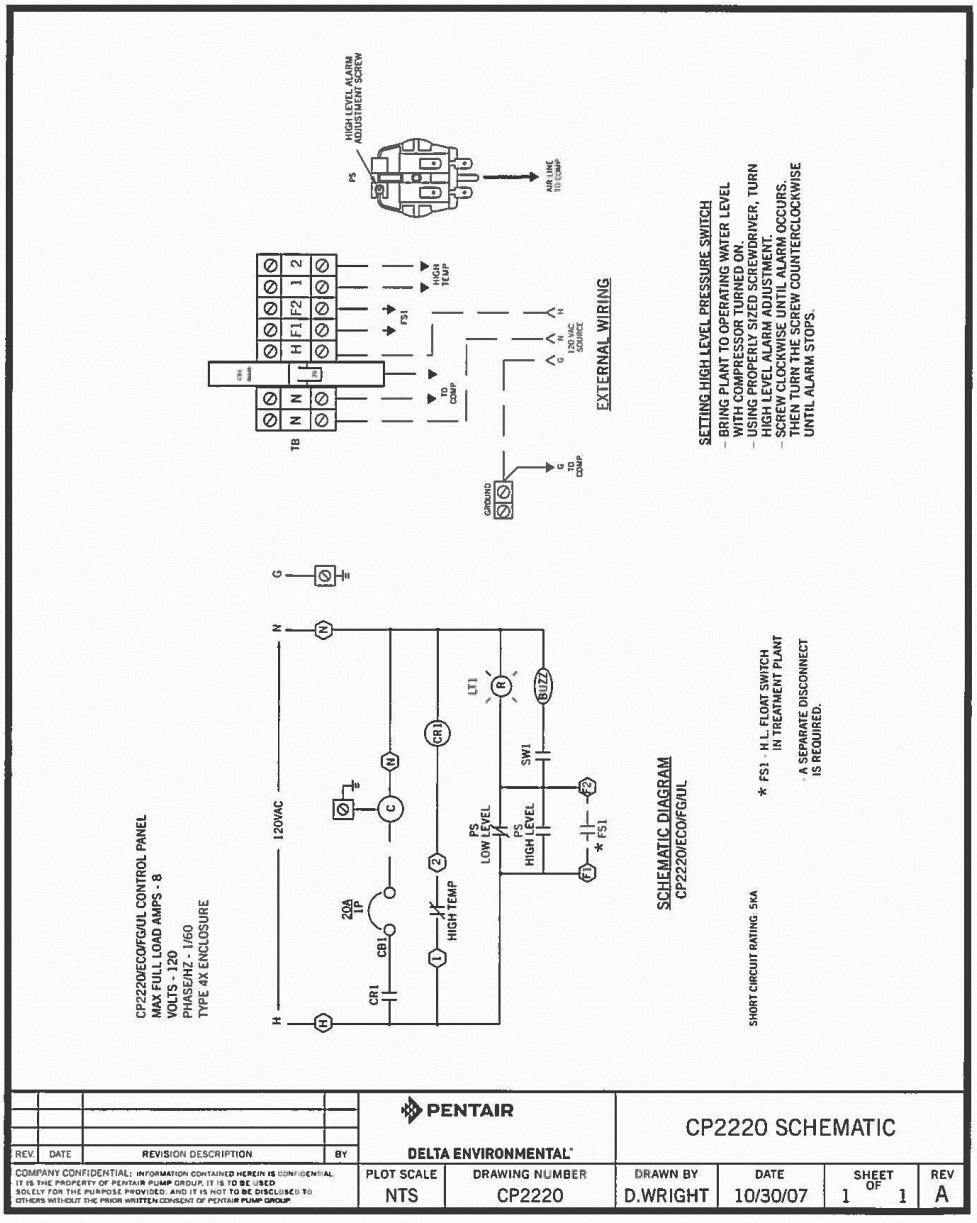
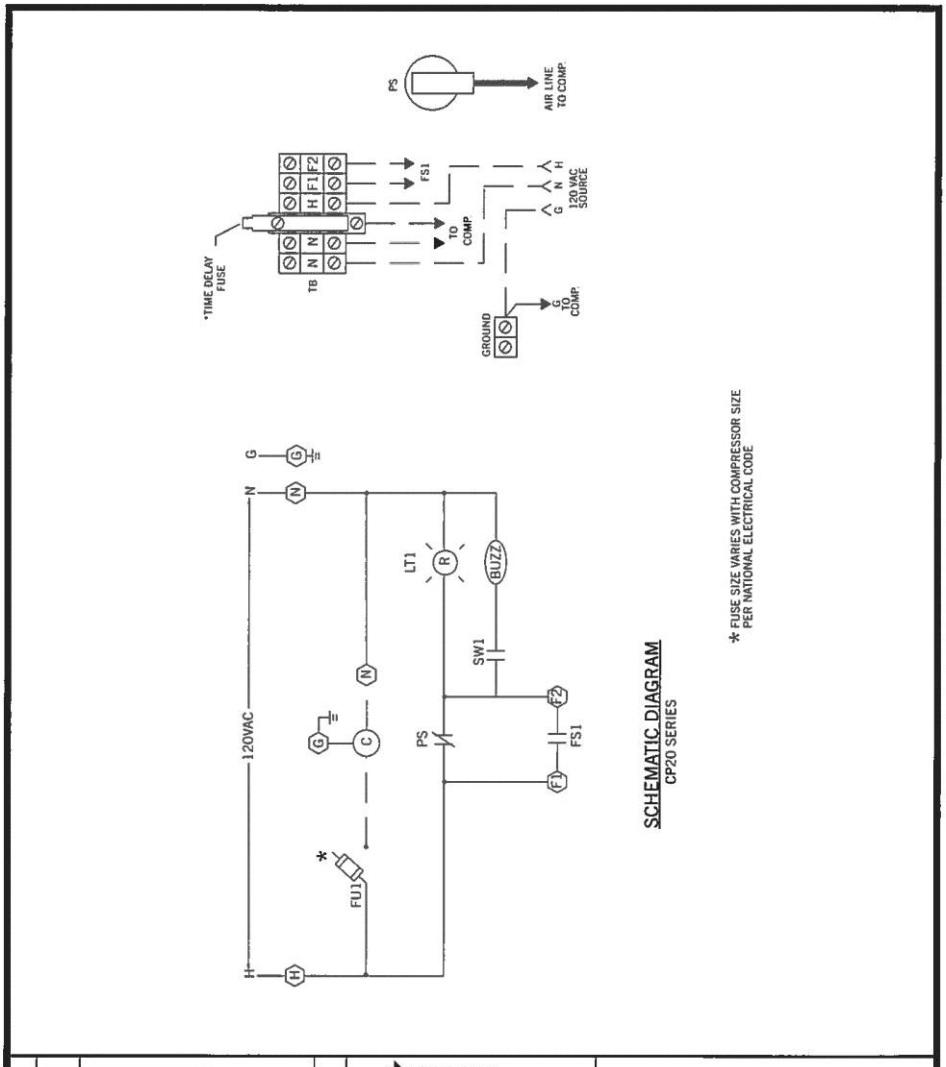

CP2220/ECO/FG/UL CONTROL PANEL
MAX FULL LOAD AMPS - 8
VOLTS - 120
PHASE/HZ - 1/60
TYPE 4X ENCLOSURE
120VAC
SCHEMATIC DIAGRAM
CP2220/ECO/FG/UL
EXTERNAL WIRING
SETTING HIGH LEVEL PRESSURE SWITCH
- BRING PLANT TO OPERATING WATER LEVEL WITH COMPRESSOR TURNED ON.
- USING PROPERLY SIZED SCREWDRIVER, TURN HIGH LEVEL ALARM ADJUSTMENT SCREW CLOCKWISE UNTIL ALARM OCCURS. THEN TURN THE SCREW COUNTERCLOCKWISE UNTIL ALARM STOPS.
* FS1 H.L. FLOAT SWITCH IN TREATMENT PLANT
- A SEPARATE DISCONNECT IS REQUIRED.
SHORT CIRCUIT RATING: 5KA
PENTAIR
DELTA ENVIRONMENTAL
CP2220 SCHEMATIC
REV. DATE REVISION DESCRIPTION BY
COMPANY CONFIDENTIAL: INFORMATION CONTAINED HEREIN IS CONFIDENTIAL. IT IS THE PROPERTY OF PENTAIR PUMP GROUP. IT IS TO BE USED SOLELY FOR THE PURPOSE PROVIDED AND IT IS NOT TO BE DISCLOSED TO OTHERS WITHOUT THE PRIOR WRITTEN CONSENT OF PENTAIR PUMP GROUP
PLOT SCALE NTS
DRAWING NUMBER CP2220
DRAWN BY D.WRIGHT
DATE 10/30/07
SHEET 1 OF 1
REV A

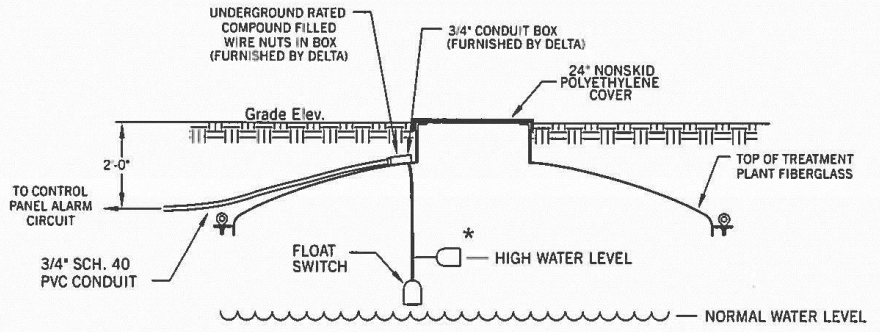


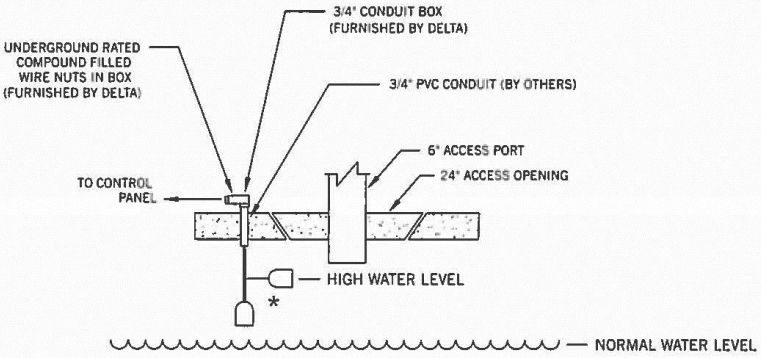
REV.	DATE	REVISION DESCRIPTION	BY

PENTAIR
DELTA ENVIRONMENTAL

CP20 SCHEMATIC

PLOT SCALE	DRAWING NUMBER	DRAWN BY	DATE	SHEET	REV
NTS	CP20	D.WRIGHT	04/09/03	1 OF 1	A





ENTRANCE INTO CONCRETE TANK

NOTES:

1. GROMMET TO BE SELECTED FOR TIGHT FIT AROUND CABLE AND IN LID.
2. WIRE TO CONTROL PANEL TO BE 18 GAUGE AND RATED FOR DIRECT BURIAL SERVICE. WOODS WIRE-886 OR EQUAL.
3. WIRE NUTS TO BE RATED FOR UNDERGROUND SERVICE IDEAL-DB PLUS MODEL 60 OR EQUAL.
4. FLOAT SWITCH TO BE NORMALLY OPEN MDI-2900-B8S13B OR EQUAL.
5. SMALL ACCESS PORT SHOWN ON DRAWING; LARGE ACCESS PORTS MAY BE SUPPLIED.
6. MINIMUM AMOUNT OF CONDUIT SHOWN ABOVE IS REQUIRED EVEN WITH TYPE UF CABLE.

* HIGH LEVEL FLOAT NOT REQUIRED WHEN USING CP22 SERIES CONTROL PANELS

REV.	DATE	REVISION DESCRIPTION	BY

PENTAIR
DELTA ENVIRONMENTAL®

FLOAT SWITCH MOUNTING (TO USE W/ CP20 PANEL)

PLOT SCALE	DRAWING NUMBER	DRAWN BY	DATE	SHEET OF	REV
NTS	DWG NO	D.WRIGHT	05/18/09	1 OF 1	A

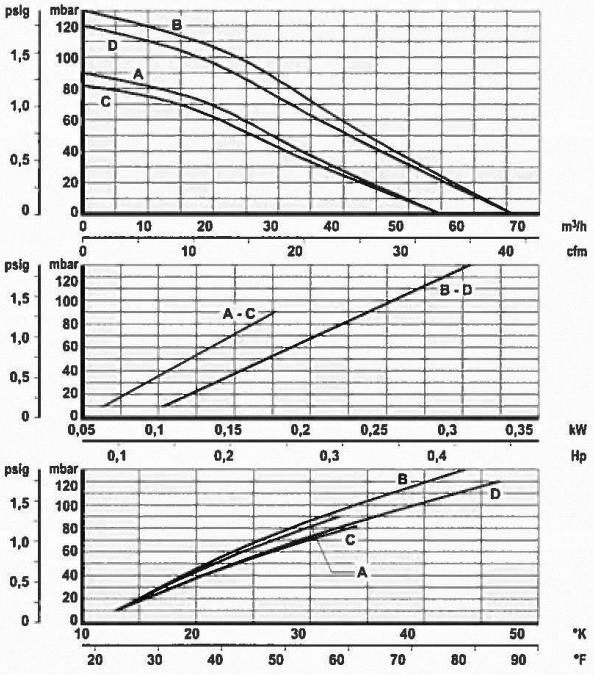
F.P.Z. GmbH
Killanstraße 142
90425 NÜRNBERG
Tel. 0911.36.76.68.00
Fax 0911.36.76.68.01
E-mail deutschland@fpz.com

effepizeta

LATERAL CHANNEL BLOWERS - EXHAUSTERS

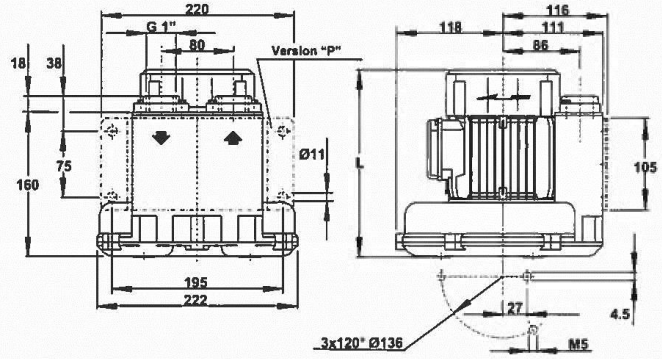
SCL 06 MOR

SN 1750-0



	P (1) kW	Δp (2) mbar	psig	Q (3) m³/h	cfm
COMPRESSOR					
A	50 Hz - 2900 rpm				
	0.2	90	1.30	0	0
B	60 Hz - 3500 rpm				
	0.23	80	1.16	32	19
	0.4	130	1.88	0	0
EXHAUSTER					
C	50 Hz - 2900 rpm				
	0.2	82	1.18	0	0
D	60 Hz - 3500 rpm				
	0.23	80	1.16	28	16
	0.4	120	1.74	0	0

kW 50 Hz - 60 Hz	H	m Kg
0.2 - 0.23	235	6.5
0.4	235	7.1



MAXIMUM NOISE LEVEL	Lp dB(A)
50 Hz - 2900 rpm	58
60 Hz - 3500 rpm	59

To allow the perfect performing of the machine, it has to be equipped with the INLET FILTER and the SECURITY VALVE AT LEAST; other accessories available on request.

(1) Installed power.
(2) Maximum differential pressure referred to installed motor.
(3) Inlet flow at max differential pressure per installed motor.

The characteristics data given, refer to the handling of gas with inlet temperature of 15°C, normal density of 1,23 kg/m³ and absolute pressure of 1013 mbar in suction in case of performing as compressor, in discharge in case of performing as exhauster. Dimensions in mm. Noise level measured at 1 m distance with in/outlets piped. Tolerance on given values ±10% - unbinding and can be changed without prior notice.

® **FPZ, Inc**
150 N. Progress Drive
Saukville, WI 53080 - U.S.A.
Tel. (262) 268-0180
Fax (262) 268-0415
E-mail usa@fpz.com

REGENERATIVE BLOWERS - **PRESSURE**

SCL K03 / K04 / K05 / K06

MS SERIES - MOR RANGE

SN 1874-8 1/2

TECHNICAL CHARACTERISTICS

- Aluminum alloy construction
- Smooth operation
- High efficiency impeller
- Maintenance free
- Mountable in any position
- Recognized TEFC - cURus motor

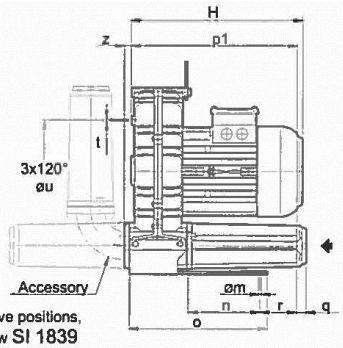
OPTIONS

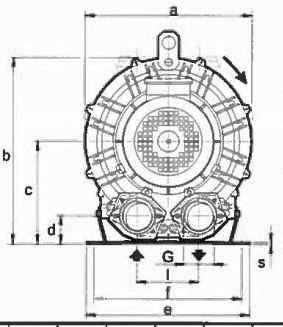
- Special voltages (IEC 38)
- Surface treatments

ACCESSORIES

- Inlet and/or inline filters
- Additional inlet/outlet silencers
- Safety valves
- Flow converting device
- Optional connectors

Dimensions in inches.
Dimension for reference only.





Possible alternative positions, please refer to drw SI 1839

Model	a	b	c	d	e	f	G	l	m	n	o	p1	q	r	s	t	u	z
K03-MS	9.49	10.55	5.79	1.69	9.06	8.07	1"1/4 NPT	3.39	0.39	3.27	5.59	8.07	0.71	2.95	0.16	M6	5.51	0.47
K04-MS	11.22	12.40	6.77	1.93	10.04	8.86	1"1/2 NPT	4.02	0.47	3.74	6.73	8.74	0.71	2.76	0.16	M6	6.89	0.71
K05-MS	12.87	14.37	7.87	2.13	12.60	10.24	2" NPT	4.72	0.59	4.53	10.43	12.60	0.71	3.86	0.16	M8	7.87	0.75
K06-MS	14.80	15.47	8.07	2.13	12.80	11.42	2" NPT	4.92	0.59	5.51	10.71	13.15	0.71	3.35	0.16	M8	9.45	0.75

Model	Maximum flow Scfm		Installed power Hp		Maximum differential pressure △p (In WG)		Noise level Lp dB (A) (1)		Overall dimensions H	Weight
	60 Hz 3500 rpm	*50 Hz 2900 rpm*	60 Hz 3500 rpm	*50 Hz 2900 rpm*	60 Hz 3500 rpm	*50 Hz 2900 rpm*	60 Hz 3500 rpm	*50 Hz 2900 rpm*	Inches	Lbs
K03-MS	52	*43*	3/4	*3/4*	64	*60*	62.0	*60.0*	10.43	24.30
			1	*1*	95	*77*	62.3	*60.3*	11.97	26.50
K04-MS	98	*81*	1 ½	*1 ½*	58	*80*	64.8	*62.8*	11.65	36.40
			2	*2*	85	*100*	65.0	*63.0*	13.78	43.00
			3	-	120	-	65.2	-	13.78	49.60
K05-MS	156	*129*	2	*2*	52	*70*	70.5	*68.5*	13.20	51.80
			3	*3*	90	*110*	70.8	*68.8*	13.20	58.40
			4	*4*	128	*120*	71.1	*69.1*	14.40	67.20
K06-MS	216	*179*	3	*3*	50	*65*	73.0	*71.0*	13.54	68.70
			4	*4*	75	*95*	73.3	*71.3*	14.17	71.65
			5 ½	*5 ½*	110	*140*	73.6	*71.6*	14.17	77.60
			6 1/5 (2)	-	132	-	73.9	-	14.45	77.60

(1) Noise measured at 1 m distance with inlet and outlet ports piped, in accordance to ISO 3744.
(2) No cURus motor

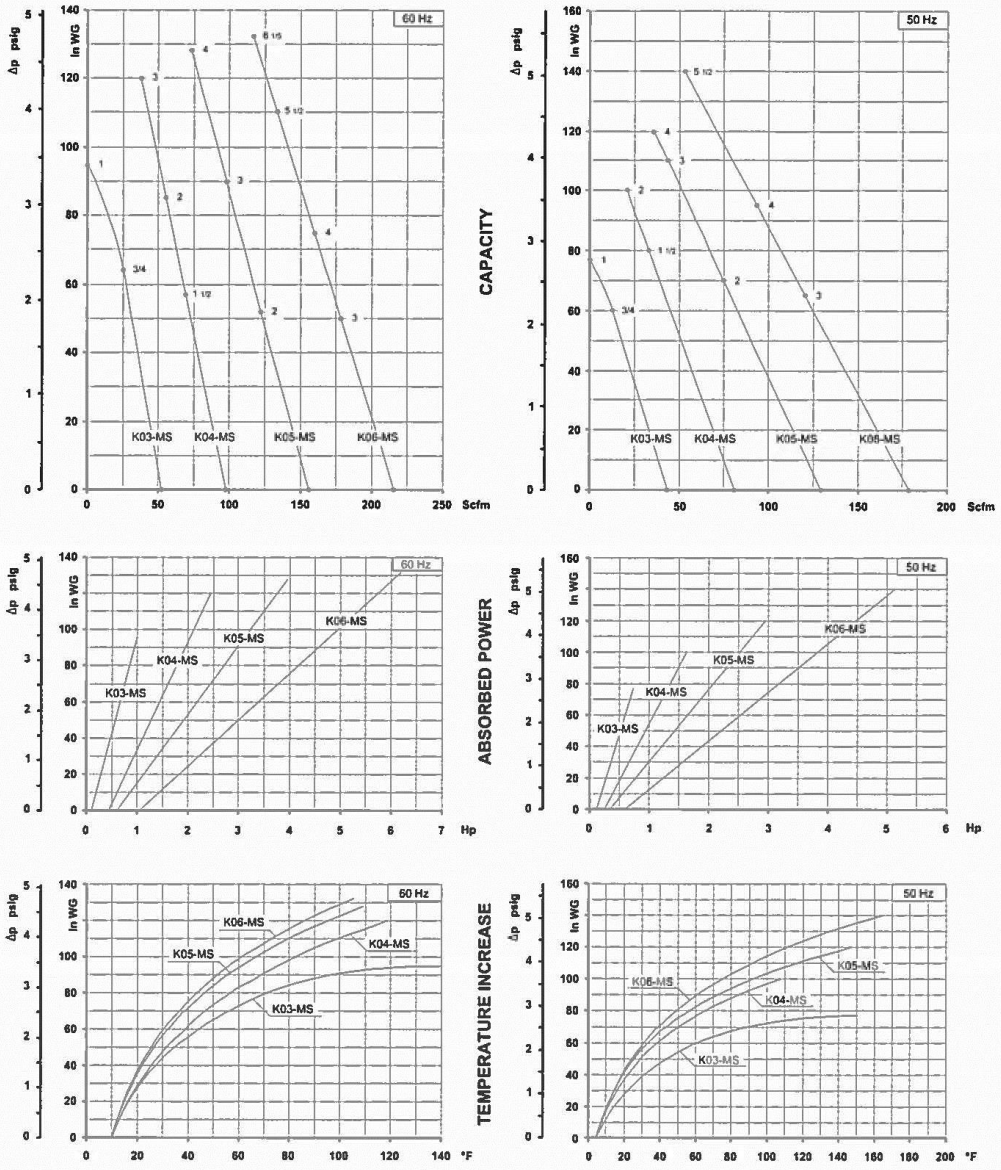
- For proper use, the blower should be equipped with inlet filter and safety valve; other accessories available on request.
- Ambient temperature from +5° to +104°F.
- Specifications subject to change without notice.

REGENERATIVE BLOWERS - **PRESSURE**

SCL K03 / K04 / K05 / K06

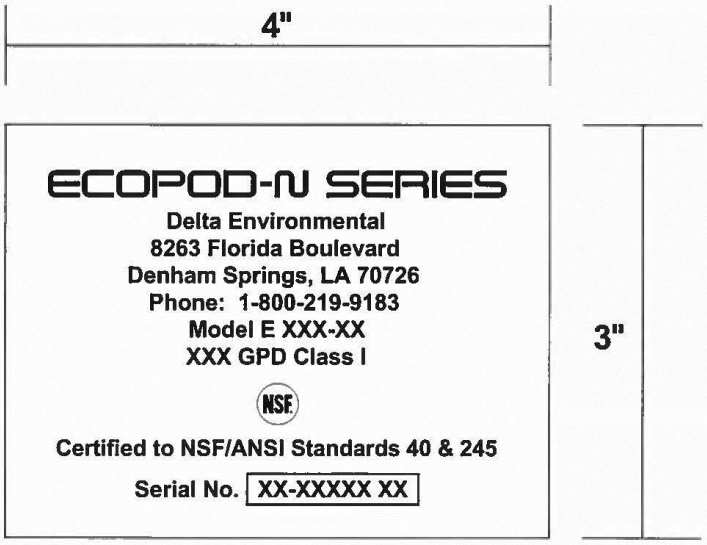
MS SERIES - MOR RANGE

SN 1874-8 2/2



Curves refer to air at 68°F temperature and 29.92 In Hg atmospheric pressure (abs) measured at inlet port.
Values for flow, power consumption and temperature rise: +/-10% tolerance.
Data subject to change without notice.

ECOPOD-N SERIES DATA PLATES



DELTA ENVIRONMENTAL
INDIVIDUAL MECHANICAL WASTEWATER TREATMENT SYSTEM
SERVICE POLICY

INITIAL POLICY:

A two year initial service policy shall be furnished to the user by the manufacturer or the distributor through the dealer. This policy is to be included in the purchase price from the seller of the system and shall provide the following:

1. **An inspection/service call every six months,** which includes inspection, adjustment, and servicing of the mechanical and electrical component parts as necessary to ensure proper function.
2. An effluent quality inspection every six months consisting of a visual check for color, turbidity, scum overflow, and an examination for odors.
3. If any improper operation is observed that cannot be corrected at that time, the user shall be notified immediately in writing of the conditions and the estimated date of correction. **THIS POLICY DOES NOT INCLUDE PUMPING SLUDGE FROM UNIT IF DEEMED NECESSARY.**

CONTINUING SERVICE POLICY:

An annually renewable service policy affording the same coverage as the Initial Service Policy is available. Consult your dealer for pricing information.

PARTS:

Replacement parts or components may be obtained from your local distributor or contact Delta Environmental for information.

COMPLAINTS:

In order for Delta Environmental to properly address complaints, we require that you put in writing the date and nature of the complaint as detailed as possible. This MUST include the serial number of your system.

Send to: Delta Environmental
8263 Florida Blvd.,
Denham Springs, LA 70726

Pentair Water
Flow Technologies
8263 Florida Blvd.
Denham Springs, LA 70726
225.665.6162
225.664.9467 Fax
800.219.9183 Toll Free

Delta Environmental™
Pentair Water

ECOPOD LABOR TIME ESTIMATES FOR OPERATION & MAINTENANCE

Items to be checked for proper mechanical and electrical operation every 6 months

Item	Every Six Months
Visually Inspect Control Panel Operation	**30 Minutes**
Visually Inspect Air Blowers Operation	
Visually Inspect Optional Influent/Effluent Pump Operation	
Check Sludge Levels in Primary Tanks and Dilution Tank	

Estimated Pump-Out Schedule:

Waste total volume, once every three to five years

Power Consumption:

E50N, E60N, E75N – 1/3 HP 24 hours of run time per day
E100N, E150N – 3/4 HP 24 hours of run time per day

Appendix III

Riley County Alternative Private Wastewater Disposal System Inspection Report

Riley County Alternative Private Wastewater Disposal System Inspection Report

Inspection Date #1: _____ Serviced by: _____
Name: _____ _____
Address: _____ Permit # _____

Equipment	***Yes***	***No***	***Results***
Alarm(s) (tested) (*energized and silenced*)			
Blower Filter & Vents (cleaned)			
Blower excessive noise			
Blower Amperage (amp)			
Blower Voltage (120 volts)			
Lift station filter (replaced)			
Elapsed time meter or cycle counter (hours)			
Lateral field pressure (psi)			
Air release valve (operational)			
Biological / Chemical			***Results***
30- Minute Settleability (range 200 to 600 ml)			
Aeration tank color (tan color)			
Odor (normal is musty)			
pH (range 6.0 – 9.0)			
Dissolved Oxygen (above 2.0 mg/l)			
Effluent Discharge from the Aeration Tank (clear and odorless)			
Tank Requires Pumping (Sludge Judge Reading)	***Yes***	***No***	***If Yes, Then Date Pumped***
Primary (18" maximum)			
Secondary (4" maximum)			
Lift station (4" maximum)			
Septic System Overview	***Yes***	***No***	
Inspection Ports Checked			
Lateral Field Surfacing			
Tank Water Tight			
Damage due to excessive weight loading to the system			
Repair Permit Required			

Appendix IV

ORENCO Sand/Shale Alternative Private Wastewater Disposal System Service Manual

Operation & Maintenance

For Standard Intermittent Sand Filter Kits (w/o distributing valves)

Orenco Systems®
Incorporated
1-800-348-9843

Important names and phone numbers

Service Person:_____ Phone: _____

_____

Installer:_____ Phone: _____

_____

Electrician:_____ Phone: _____

_____

Regulating agency:_____ Phone: _____

_____

Designer:_____ Phone: _____

_____

Orenco sand filter kit model #: _____

Residual head (squirt height) at startup: _____

Programmable timer settings: "ON"_____ "OFF"_____

Float settings from top of dosing tank: alarm/timer override _____ inches
timer off _____ inches
red. off/low level alarm_____ inches

Distance from top of sand filter pump basin (SFPB) to "ON" level:_____ inches

Distance from top of SFPB to bottom of treatment sand:_____ inches

NIM-OM-ISF-1
Rev 1.1 © 5/03

O&M Manual: *Standard Intermittent Sand Filter Kits*

Table of Contents

Important: *Attach as-built drawings and pumping equipment component information to back of this manual.*

O&M Manual: *Standard Intermittent Sand Filter Kits*

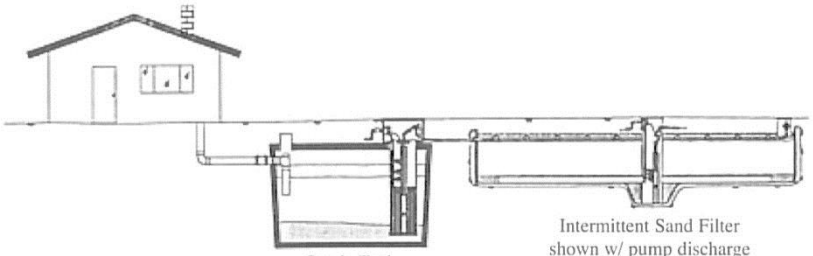
Introduction

Intermittent Sand Filter Systems for Treatment of Residential Sewage

The intermittent sand filter (ISF) system concept

Figure 1 below illustrates the general layout of an intermittent sand filter (ISF) system serving a home. Normally, the entire system is buried except for the fiberglass lids at ground level for maintenance access.

Figure 1: Typical Residential ISF System



The following describes the path the sewage takes through the system.

- Raw sewage from the home flows by gravity into the septic tank where the heavy solids settle to the bottom of the tank and the light solids float to the top of the tank. A relatively clear zone forms between the floating solids (scum) and the settled solids (sludge).
- A pump system suspended in the outlet end of the septic tank pumps liquid effluent from the clear zone of the tank to the sand filter. PVC plastic piping evenly distributes the effluent over the surface of the specially-graded sand. Small particles and other contaminants in the effluent are mechanically, biologically, and chemically reduced as the effluent passes down through the sand.
- The treated effluent is collected at the bottom of the sand filter in an underdrain from which it passes by gravity or is pumped for final treatment and disposal, usually in some type of soil absorption system.

The installer of the system should provide to the user exact drawings of the layout and construction of system. These drawings should be attached at the end of this manual.

Benefits of using an ISF system

An ISF system produces very high quality effluent, much superior to that which is discharged by a septic tank alone. In many localities, this higher degree of treatment is required to protect ground water, surface waters, and public health. Sites that have poor soil conditions, poor drainage, high ground water, or sensitive surface waters are potential candidates for sand filter installations. Because ISF effluent is highly treated, many cities and counties allow substantial reduction in the area they require for disposal. Additionally, some localities allow ISF treated water to be reused for subsurface landscape irrigation.

Operation

Components and automatic operation of the ISF system

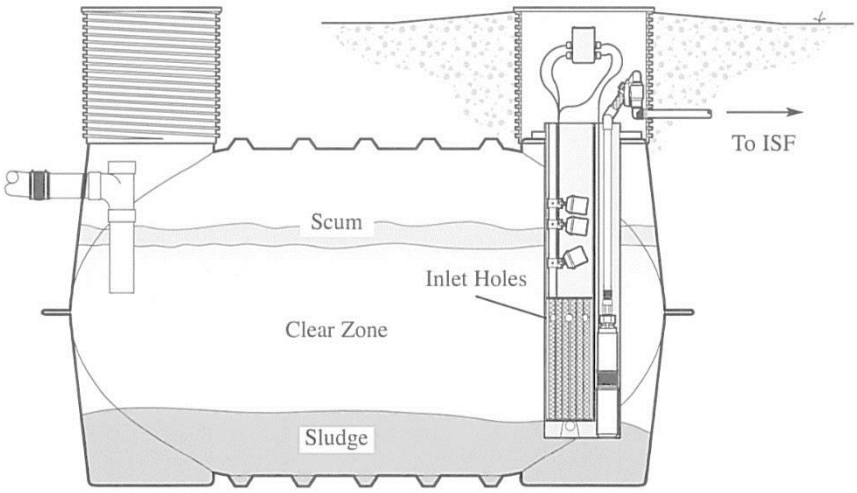
The septic tank

Figure 2 below illustrates a septic tank with a pump system installed. The septic tank is a structurally sound, watertight vessel that accepts raw sewage from a home. In the tank, the heavy solids in the sewage fall to the bottom of the tank to form the sludge layer and the light solids in the sewage float to the top of the tank to form the scum layer. The septic tank is very efficient in digesting the sewage. In fact, more than 40% of the overall sewage treatment takes place in the tank. Solids accumulate slowly in the tank over many years and have to be pumped out periodically. Please refer to the monitoring and maintenance section for further discussion.

The septic tank pump system

Figure 3 on the following page illustrates the pump system. It is installed at the outlet end of the septic tank so that the pump system's inlet holes can draw from the clearest zone in the tank. As effluent enters the PVC vault through the inlet holes, the Biotube® filter cartridge prevents solids larger than 1/8th inch from getting to the pump, thus allowing the discharged effluent to be substantially free of solids.

Figure 2: Single Compartment Dosing Septic Tank



Operation

The pump system consists of 7 main components:

1. **PVC riser with fiberglass lid** — provides ground-level access for servicing equipment and septage pumping.
2. **Electrical splice box** — provides an approved, safe method for wiring the pump and float assembly.
3. **Float assembly** — controls the minimum and maximum liquid levels in the tank and sends alarm signals to the control panel under certain conditions.
4. **Biotube® screened pump vault** — provides the method for filtering the effluent and contains the pump and float assembly.
5. **Discharge assembly** — connects the pump to the piping outside the tank and usually includes a ball valve and union for removal and maintenance.
6. **High-head effluent pump** — pumps the filtered effluent to the sand filter.
7. **Control panel** — provides electrical control of the pump system. Figures 4 and 5 show examples of "single-pump" and "double-pump" sand filter control panels.

The septic tank pump system's operation is automatic, being controlled by the float assembly and by the programmable timer (PT) in the control panel. Under normal operating conditions, the liquid level in the tank is maintained between the top two floats (Figure 3). The PT turns the pump on for short periods of time throughout the day as long as the liquid level is between the top two floats. This allows small volumes of effluent to be dosed to the sand filter, evenly spread out over a 24-hour period.

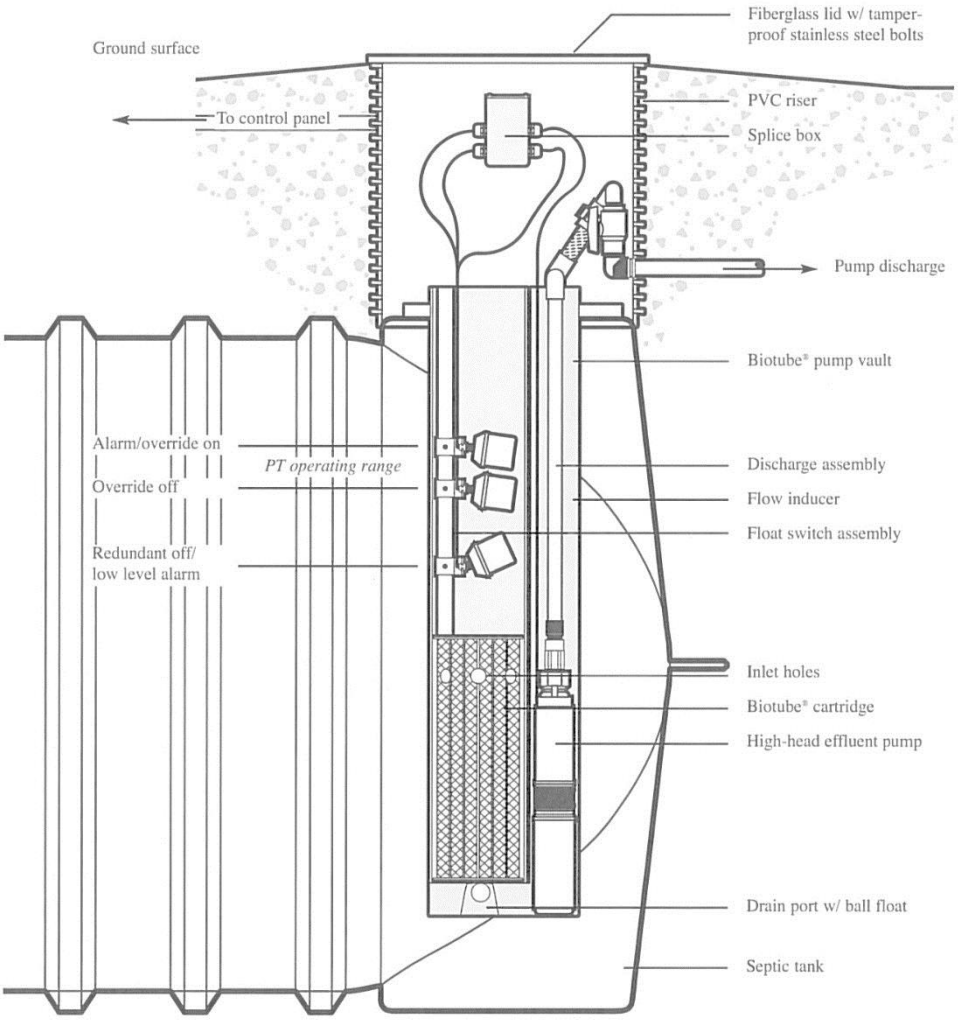
When the liquid level in the tank drops to the second or "timer off" float, the programmable timer is temporarily deactivated, preventing any effluent from being pumped out of the tank until flow into the tank raises the liquid level again. This usually happens once or more each 24-hour period, normally during the middle of the day and at night when little water is being used.

In the event that the liquid level rises to the top or "high level alarm/timer override" float, the pump will come on (overriding the PT) and an alarm on the control panel will sound. The pump runs only for a few minutes, just long enough to drop the liquid level 2.5 to 3 inches. The system then returns to PT operation and the alarm resets itself once the override condition is over. Please refer to page 17 of this manual for troubleshooting alarms.

The bottom float is called the "redundant off/low level alarm" float and is only activated during a problem situation. If the liquid level drops to this bottom float, an alarm will sound on the control panel and the pump will shut off (if it's running). Please refer to page 17 of this manual for troubleshooting alarms.

Operation

Figure 3. Biotube® Septic Tank Pump System



Operation

Figure 4: Single-pump Control Panel (gravity discharge sand filter)

1. Programmable Logic Unit
2. Motor-Start Contactor
3. Toggle Switch
4. Controls Circuit Breaker
5. Pump Circuit Breaker
6. Audio Alarm
7. Visual Alarm
8. Panel Enclosure

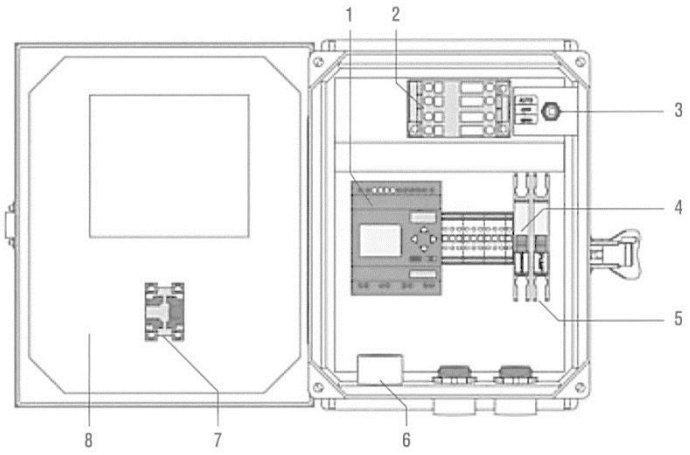
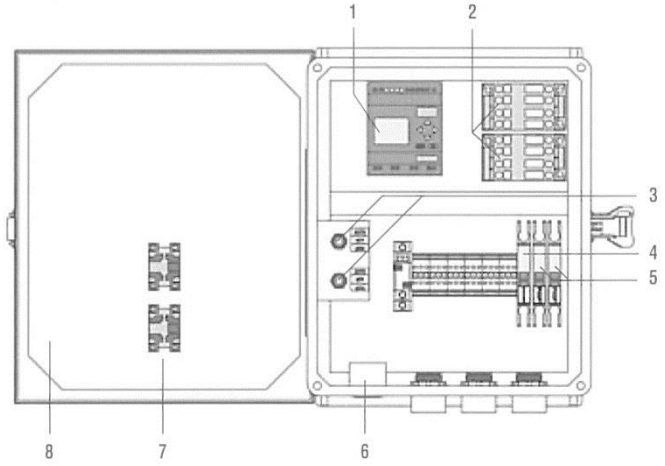


Figure 5: Double-pump Control Panel (pump discharge from sand filter)

1. Programmable Logic Unit
2. Motor-Start Contactor
3. Toggle Switches
4. Controls Circuit Breaker
5. Pump Circuit Breaker
6. Audio Alarm
7. Visual Alarm
8. Panel Enclosure

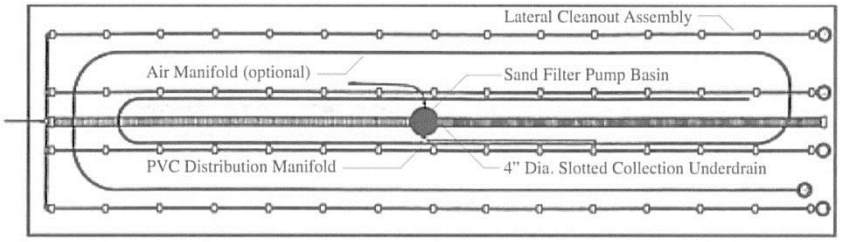


Operation

The ISF

Figures 6 and 7 are top and side views of the intermittent sand filter.

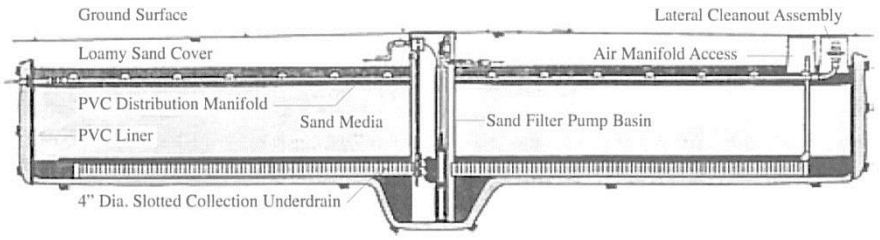
Figure 6: Top View of Standard ISF



The ISF is contained in a 30 mil PVC liner that prevents groundwater from damaging the ISF and permits collection of the treated effluent in the bottom of the ISF. When the pump in the septic tank is running, effluent pressurizes the PVC distribution manifold located on top of the treatment sand and flows out of each lateral through evenly spaced 1/8th inch holes. This spreads the effluent evenly over the sand. Small particles and other contaminants in the effluent are mechanically, biologically, and chemically reduced as the effluent passes down through the approximately 24 inch depth of specially-graded sand.

The sand filter functions optimally when it receives small volumes of effluent, evenly distributed throughout the day. A slotted 4 inch diameter pipe collects the effluent in the bottom of the ISF and conveys the treated effluent to a gravity disposal system or to a sand filter pump basin if final disposal requires the use of a pump. The as-built drawings of the actual installation should be attached at the end of this manual.

Figure 7: Side View of Standard ISF

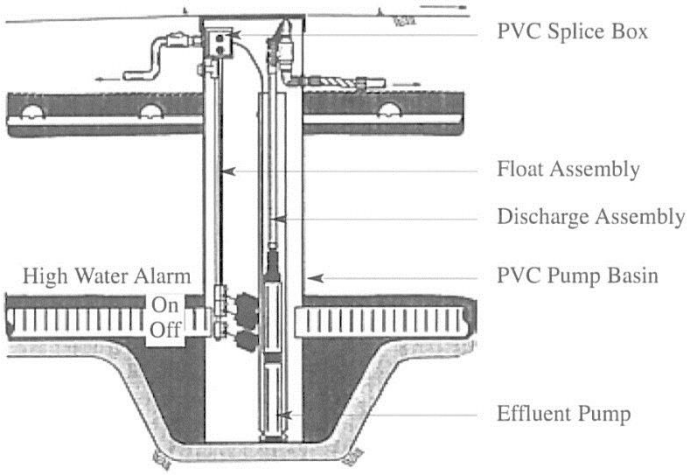


Operation

The sand filter pump basin (when required)

When final disposal cannot be achieved by gravity, e.g. the drainfield is on higher ground than the sand filter, a sand filter pump basin is installed in the ISF as shown in Figure 8.

Figure 8: Side View of Standard ISF Pump Basin



The pump basin package consists of components similar to the septic tank pump system:

1. **PVC pump basin** — contains the pump and related equipment in the ISF.
2. **Electrical splice box** — provides an approved, safe method for wiring the pump and float assembly.
3. **Float assembly** — controls the liquid level in the bottom of the ISF and sends an alarm signal to the control panel when a high water condition exists.
4. **Discharge assembly** — connects the pump to the piping outside the basin and usually includes a ball valve and union for maintenance and removal.
5. **Effluent pump** — pumps the treated effluent to the disposal points.
6. **Control panel** — provides electrical control of the pump system. Figure 5 illustrates the "double pump" control panel required when a sand filter pump basin is used.

Operation

One control panel operates both pumps (one in the septic tank; one in the sand filter pump basin). The pump in the sand filter pump basin is controlled by floats only and does not involve use of a programmable timer. This method of control is often described as "demand" operation since the pump starts "on demand" as soon as the liquid reaches the "on" float. The pump shuts off when the liquid level drops down to the "off" float. A protective interlock in the control panel prevents the septic tank pump from operating if there is a high water condition in the sand filter pump basin. This prevents flooding of the ISF.

User operation of an ISF system

While the physical and biological processes of handling and treating the wastewater in an ISF system occurs automatically, it is important that users exercise discretion in their disposal of waste to the ISF system. As a rule of thumb, it is recommended that nothing be disposed to the septic tank–with the exception of toilet paper and mild detergents–that hasn't first been ingested. Avoid dumping toxic chemicals, grease, water softener backwash, and septic tank additives into the system. The use of a garbage grinder is also not recommended.

Daily use of water should be kept within a reasonable range. Most households use an average of 50 gallon per person per day. Excessive water usage can be detrimental to the septic tank, ISF, and final disposal area. Excessive water usage will usually result in periodic short alarm occurrences (approximately 2 to 3 minutes long). These short-term alarms may be the result of doing too many wash loads in one day, leaking septic tank or plumbing fixtures, improper float or programmable timer settings, or large social gatherings. Please see the troubleshooting section starting on page 17 for more complete information on identifying alarm conditions.

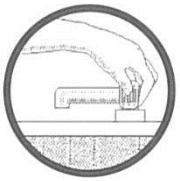
The do's and don'ts lists that follows suggest practices that will help to ensure long life and minimal maintenance for ISF systems.

Operation

Do's

Do feel free to place a bird bath, potted plant, or other yard decoration on the tank riser lid, as long as it can be readily removed for maintenance. Landscaping or permanent structures should be planned prior to installation in order to ensure that the integrity of the system is not jeopardized.

Do keep accurate records of maintenance & service calls. The results will be valuable if system problems occur. Make sure whoever services the system keeps a complete record with this manual.



Do practice water conservation. By reducing the amount of water use, the life of the system may be increased and power consumption reduced. When possible, avoid doing several loads of laundry in one day. Take short showers and don't let water run unnecessarily while washing hands, food, teeth, dishes, etc.

Do be aware that a simple toilet float can hang up and result in over 2000 gallons per day of wasted water. Normal household usage ranges from 100 to 200 gallons per day. Use water-saving devices in the toilet tank and don't flush unnecessarily.

Operation

Don'ts

Don't accidentally dig up an underground utility line. Before digging, telephone the local One Call number to have underground utilities marked.

Don't connect rain gutters or storm drains to the septic tank or allow surface water to drain into it.

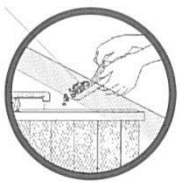
Don't use excessive quantities of water. Repair leaky toilets, faucets or plumbing fixtures. Leaky toilets can waste up to 2000 gallons of water in one day. Take shorter showers and use water saving devices such as low-flow fixtures and low-flush toilets.

Don't dump recreational vehicle (RV) waste into the septic tank because it will increase the the frequency of septage pumping and possibly damage the sand filter. RV waste dumped directly into the screened vault will clog the pump and plug the screen. Some RV waste contains chemicals that are toxic to the biological activity in the septic tank.

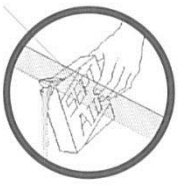
Don't flush undesirable substances into the septic tank. Flushing flammable and toxic products is dangerous. Other materials such as paper towels, rags, newspaper, cigarettes, coffee grounds, egg shells, sanitary napkins, large amounts of hair and cooking grease are a maintenance nuisance. These materials will also increase the frequency of septage pumping and may damage the sand filter.

Operation

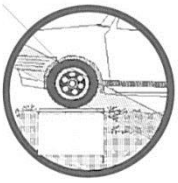
Don'ts



Don't use garbage disposal systems because they also increase the frequency of septage pumping. Compost food scraps or dispose of them in the trash. Collect grease in a container rather than disposing down the drain. Some items (egg shells, coffee grounds, tea bags, etc.) are not biodegradable and should be dispose of in the trash.



Don't use septic tank additives. Additives do not improve the performance of the septic tank and can cause major damage to the sand filter or drainfield. The natural microorganisms that grow in the system are sufficient. These organisms generate their own enzymes for breaking down and digesting nutrients.



Don't drive over the septic system. If the septic tank is in an area subject to possible traffic, consider putting up an attractive barricade or row of shrubs to discourage traffic unless the tank has been equipped with a special traffic lid.

Don't enter the septic tank. Any work to the tank should be done from the outside. Gases that can be generated in the tank or the lack of oxygen can be fatal.

Don't dispose water softener backwash in the septic tank. The backwash brine contains high levels of chlorides that can destroy the microorganisms and inhibit the biological digestion that occurs in the tank. The brine solution also interferes with the solid's sedimentation that occurs in the tank, and may increase the flow through the tank from 25 to 50 percent.

Operation

Substitutes for household hazardous wastes

Although their use is not required, the following substitutes for common house hold chemicals will reduce the stress on a septic system and the environment.

- **Ammonia-based cleaners:** Sprinkle baking soda on a damp sponge. For windows, use a solution of 2 Tbs. white vinegar to 1 qt. water. Place the mixture into the spray bottle.
- **Disinfectants:** Use Borax: 1/2 cup in a gallon of water; deodorizes also.
- **Drain decloggers:** Use a plunger or metal snake, or remove and clean trap.
- **Scouring cleaners and powders:** Sprinkle baking soda on a damp sponge or add 4 Tbs. baking soda to 1 qt. warm water or use Bon Ami. It's cheaper and won't scratch.
- **Carpet/upholstery cleaners:** Sprinkle on dry cornstarch or baking soda, 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 to 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: 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 cleaners:** Choose one with a zero phosphate content or use soap flakes with 1/3 cup of washing soda. (Before switching, wash clothes in pure washing soda to remove detergent residues.)

Maintenance

ISF system monitoring and maintenance

Even though it is not difficult or time consuming, maintenance of intermittent sand filter systems is frequently neglected. It is recommended, therefore, that users of these systems contract to have routine inspections and maintenance performed. A business that specializes in installation and maintenance of such sewage disposal systems can perform the following maintenance for a nominal fee and ensure proper operation of the system for many years.

CAUTION: *Use proper personal protection equipment such as rubber gloves and clothing that cover parts of the body that will be exposed to sewage or effluent.*

Septic tank

Measurement of the septic tank sludge and scum depths should be done after the first year of installation and approximately every three years thereafter to determine when the septic tank needs pumping.

Septic tank pump system

The pump system should be inspected annually to ensure it's operating properly. Unscrew the two stainless steel bolts that fasten the fiberglass lid over the pumping equipment. Remove the fiberglass lid for an inspection that includes these steps.

1. Verify that there are no obvious holes or leaks in the riser.

2. Verify that the float cords are neatly wrapped in the riser so that they cannot interfere with the operation of the floats.

3. Verify that the high water alarm works by lifting the top float up.

4. Be sure the liquid level is above the middle "timer off" float for the following test. Turn the septic tank pump on by flipping the MOA switch in the control panel (Figure 4 or 5) to manual. Watch the liquid level inside the screened vault as the pump is running for about 30 seconds. Return the MOA switch to auto. If the liquid level inside the screened vault drops very quickly and activates the low level alarm, the Biotube® cartridge may need to be cleaned. Refer to the installation instructions for Screened Pump Vaults in Section 5 if cleaning is necessary.

5. If the control panel has an elapsed time meter (ETM) and/or a cycle counter (CT), read and record these values on the inspection form in Section 3. ETM's and CT's are valuable troubleshooting tools if problems occur with the system.

6. Verify the programmable timer setting is correct. The correct timer setting should be written on the front of this manual.

Maintenance

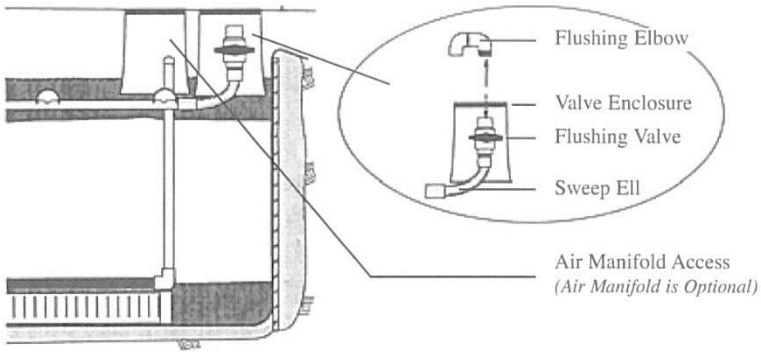
ISF

The key maintenance objective for the ISF is flushing of the manifold laterals. It is important to flush accumulated solids out of the laterals and keep the distribution orifices (holes) in the manifold clear so that the effluent is spread as evenly as possible over the sand media. Failure to perform lateral flushing will eventually lead to clogging at the top of the sand media.

The end of each lateral (Figure 9) has a cleanout assembly for flushing that should be done annually following these steps.

1. Remove the lid on the flushing valve enclosure at the end of each lateral. Locate the flushing elbow that is in the bottom of one of the enclosures.
2. Thread the flushing elbow onto the outlet of the first flushing valve. Open this valve.
3. In the control panel, flip the MOA (manual/off/auto) switch for the septic tank to manual. The pump should now be running.
4. As soon as the effluent flowing out of the flushing elbow appears clear (this should take only a few seconds), turn off the flushing valve.
5. Quickly move the flushing elbow to the next lateral. Open this valve and flush until the effluent is clear.
6. Repeat step 5 for the remaining laterals. If the redundant off/low level alarm (bottom float) is activated during the flushing, it will be necessary to add water to the tank to finish the flushing.
7. Immediately turn the MOA switch back to auto.

Figure 9: Lateral Cleanout Assembly



Maintenance

Next, the residual pressure ("squirt") test that follows should be used to ascertain whether the distribution orifices are clear. A 10 foot long, 3/4 inch diameter, clear PVC pipe with a male adapter glued to one end is necessary to perform these steps accurately.

1. Screw the clear PVC pipe to the end of one of the flushing valves. Maintain the clear pipe in a vertical position. Letting the pipe fall unsupported to the ground may damage the flushing assembly.
2. Open the flushing valve. Have someone turn the pump on. Note: If this test is being done by only one person, turn the pump on before Step 1.
3. Using a tape measure, measure the distance from the bottom of the flushing elbow to the top of the liquid surface in the clear pipe. This measured distance is called the "squirt" height or system residual head.
4. Turn off the pump. Close the flushing valve. Unscrew the clear pipe. Note: If this test is being done by one person, first shut off the flushing valve, then slowly unscrew the clear pipe and allow the effluent in the clear pipe to flow into the flushing valve box before turning off the pump.
5. Compare the measured "squirt" height in Step 3 with the value documented during initial installation of the system. The initial value should be written on the front page of this manual. It might also be found in the control panel or on the underside of the fiberglass lid covering the septic tank pump system.
6. The "squirt" height found in Step 3 should be at least equal to the initial value, but no more than 20% higher.
7. If the "squirt" height is acceptable, be sure all flushing valves are turned off and replace the flushing valve box lids.

If the "squirt" height is found to be excessive, this indicates that too many of the orifices in the distribution manifold are plugged. Clearing of the orifices can be accomplished by one of the following methods:

1. Push a stiff bottle brush (connected to a cleaning snake) down each lateral through its flushing valve assembly.
2. Using a high pressure washer, feed a small diameter "bullet" nozzle through each lateral. The high pressure water coming out of the nozzle will help pull it through the lateral.

The "squirt" test should be performed once more to ensure the cleaning was successful.

Maintenance

Sand filter pump basin

The pump system should be inspected annually to ensure it's operating properly. Unscrew the two stainless steel bolts that fasten the fiberglass lid over the pumping equipment. Remove the fiberglass lid for an inspection that includes these steps.

1. Verify that the float cords are neatly wrapped in the top of the basin so that they cannot interfere with the operation of the floats.
2. Verify that the high water alarm works by lifting the top float up.
3. Check that the maximum normal high water level (noted on the front page of this document) is not exceeded in the basin. This can usually be seen as a water mark on the inside of the basin.

Air manifold kit (optional)

Referring to Figures 7, 8 & 9, an air manifold may have been installed during initial installation for use in renovating a failing ISF or helping the ISF perform during one or more of the following possible problem situations:

1. Clogging due to abuse of the system, resulting in hydraulic or biological overload.
2. Clogging due to poor quality sand. Note: An air manifold should NEVER be used as justification for allowance of poor quality sand.
3. Poor effluent quality due to extremely cold weather.
4. Insufficient oxygen resulting from burying the sand filter too deep, covering the sand filter with dense or otherwise impermeable material, or compaction of the cover material.

A small compressor is attached to the air line under the air manifold access lid. In some cases, it may be necessary to only run the compressor for a few days or few weeks for a successful renovation. If it is necessary to leave a compressor running continuously, a small linear compressor that draws only 2 amps is most cost-effective. Contact Orenco Systems, Inc. or its representative for more information on operating air manifolds. After the sand is renovated, be sure to fix the cause. If poor quality sand was the culprit, removal and replacement of the upper 12" of sand will be required.

Maintenance

Troubleshooting chart

The following troubleshooting chart describes most of the common problems found in ISF systems.

Problem	Cause	Solution
Infrequent short duration alarms	Excessive water usage from too many loads of laundry done at once, large parties, leaving a water fixture running	Spread laundry loads out over the day or several days. Occasional parties will not harm the system–the alarm simply alerts the user that the system is getting more water than it is designed to handle on a regular basis.
Frequent short duration alarms (every day or almost every day)	Water usage beyond what the system is designed to handle	Reduce water usage. Check for leaking plumbing such as faucets and toilets. Check for possible infiltration into septic tank.
	PT not set properly to handle acceptable daily flow.	Reset PT to acceptable range.
	Top two floats set too close to one another.	Reposition floats to correct settings.
	Screened Vault filter clogged	Clean Screened Vault
Short duration alarms only during storms or very wet periods	Infiltration from leaky septic tank, plumbing, or stormwater connections.	Find and fix leaks. Unhook undesirable connections.
Continuous high water alarm		
Continuous low level alarm		

Appendix V

Riley County Sand/Shale Filter Alternative Private Wastewater Disposal System Inspection Report

Riley County Sand / Shale Filter
Alternative Private Wastewater Disposal System
Inspection Report

Inspection Date #1: _____ Serviced by: _____
Name: _____ _____
Address: _____ Permit # _____

Equipment	***Yes***	***No***	***Results (Failure requires a repair permit)***
All float cords are neatly wrapped to prevent float interference			
No holes or leaks in the system			
Alarm and Floats (*Tested*)			
Biotube® (checked)			
Elapsed Time Meter (reading)			
Cycle Timer Functioning (reading)			
Operates on "Auto" & Manual"			
Manifold lines flushed			
Pressure Checks on Filter (not more than 20% increase over start up value)	***Initial (inches)***	***Present (inches)***	***Results (Failure requires a repair permit)***
Inspection Port #1 (inches)			
Inspection Port #2 (inches)			
Inspection Port #3 (inches)			
Inspection Port #4 (inches)			
Inspection Port #5 (inches)			
Inspection Port #6 (inches)			
Tank Requires Pumping (Minimum requirement is once every 5 years)	***Yes***	***No***	***If Yes, Then Date Pumped***
Inspection Ports Checked			
Lateral Field Surfacing			
Damage due to excessive weight loading to the system			
Tank Water Tight			
Repair Permit Required			

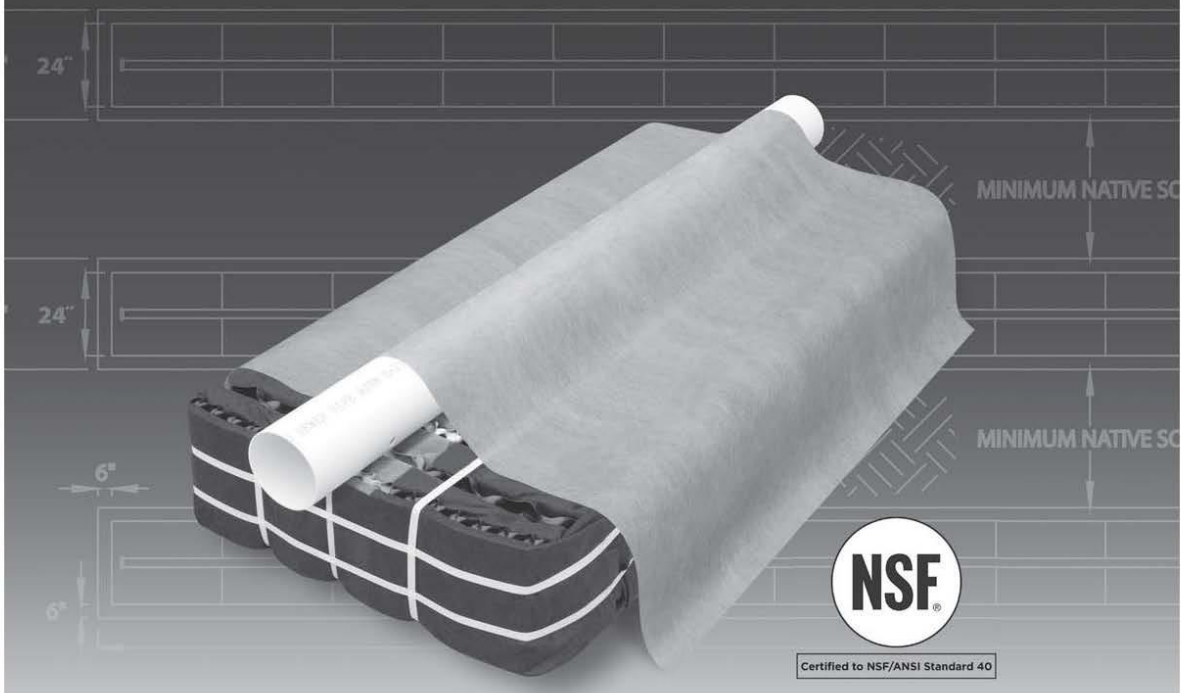
Appendix VI

Eljen Geotextile Sand Filter (GSF) Alternative Private Wastewater Disposal System Kansas Design and Installation Manual

GSF®

Geotextile Sand Filter

Kansas
Design & Installation Manual



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December 2017

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SUBJECT PAGE

GSF DRAWINGS AND TABLES

DRAWINGS

TABLES

Glossary of Terms

A42 Module 48" x 24" x 7" (L x W x H)

Cover Fabric The geotextile cover fabric (provided by manufacturer) that is placed over the GSF modules.

Design Flow Consult the local regulations to determine the design flow for your project.

GSF The Eljen Geotextile Sand Filter Modules and the 6-inch sand layer at the base and 6 inches along the sides of the modules.

GSF Module The individual module of a GSF system. The module is comprised of a cuspated plastic core and corrugated geotextile fabric.

Specified Sand To ensure proper system operation, the system MUST be installed using ASTM C33 Sand.

ASTM C33 sand will have less than 10% passing the #100 Sieve and less than 5% passing the # 200 sieve. Ask your material supplier for a sieve analysis to verify that your material meets the required specifications.

TABLE 1: SPECIFIED SAND SIEVE REQUIREMENTS

ASTM C33 SAND SPECIFICATION		
Sieve Size	Sieve Square Opening Size	Specification Percent Passing (Wet Sieve)
3/8 inch	9.52 mm	100
No. 4	4.76 mm	95 - 100
No. 8	2.38 mm	80 - 100
No. 16	1.19 mm	50 - 85
No. 30	590 µm	25 - 60
No. 50	297 µm	5 - 30
No. 100	149 µm	0 - 10
No. 200	75 µm	0 - 5

Primary Treatment Zone

- Perforated pipe is centered above the GSF module to distribute septic effluent over and into corrugations created by the cuspated core of the geotextile module.
- Septic effluent is filtered through the Bio-Matt fabric. The module's unique design provides increased surface area for biological treatment that greatly exceeds the module's footprint.
- Open air channels within the module support aerobic bacterial growth on the modules geotextile fabric interface, surpassing the surface area required for traditional absorption systems.
- An anti-siltation geotextile fabric covers the top and sides of the GSF module and protects the Specified Sand and soil from clogging, while maintaining effluent storage within the module.

Secondary Treatment Zone

- Effluent drips into the Specified Sand layer and supports unsaturated flow into the native soil. This Specified Sand/soil interface maintains soil structure, thereby maximizing the available absorption interface in the native soil. The Specified Sand supports nitrification of the effluent, which reduces oxygen demand in the soil, thus minimizing soil clogging from anaerobic bacteria.
- The Specified Sand layer also protects the soil from compaction and helps maintain cracks and crevices in the soil. This preserves the soil's natural infiltration capacity, which is especially important in finer textured soils, where these large channels are critical for long-term performance.
- Native soil provides final filtration and allows for groundwater recharge.

FIGURE 1: GSF SYSTEM OPERATION

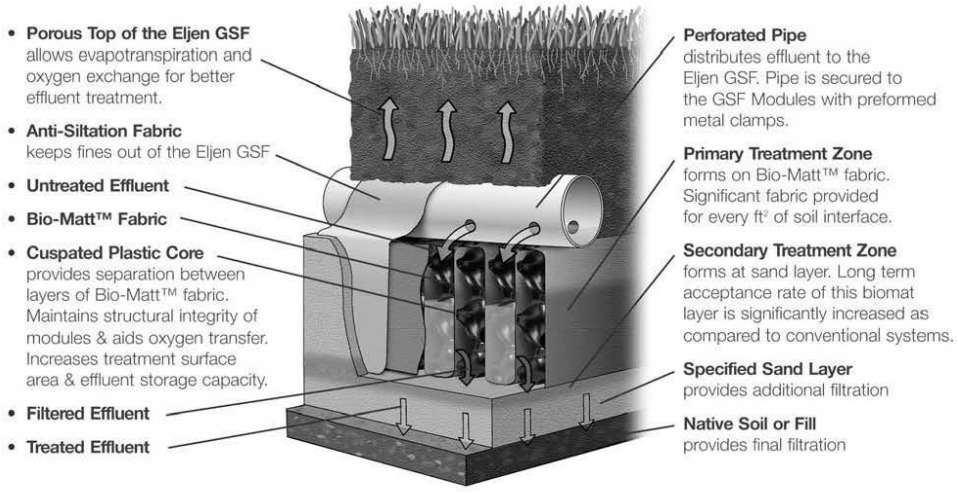
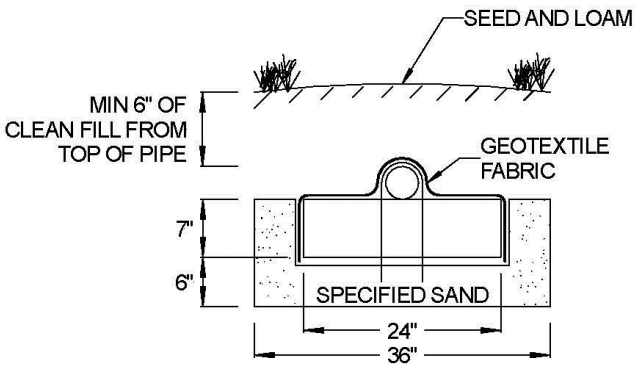


FIGURE 2: TYPICAL A42 GSF CROSS SECTION



A42 MODULE (L x W x H) 48" x 24" x 7"

All systems are required to have a minimum of:

- 6 inches of Specified Sand is at the edges of the GSF module.
- 6 inches of Specified Sand is at the beginning and end of each GSF Row.
- 6 inches of Specified Sand is directly below the GSF module.
- Minimum 6 inches of cover measured from the top of pipe.

1.0 Design and Installation

1.1 REQUIREMENTS: GSF systems must meet the local rules and regulations except as outlined in this manual. The Kanas State regulations, State of Kansas Department of Health and Environment, Bulletin 4-2, March 1997 Minimum Standards for Design and Construction of Onsite Wastewater Systems will be referred to as the *guidelines*.

The sizing charts apply to residential systems only and are found in section 1.16. Please contact Eljen's Technical Resource Department at 1-800-444-1359 for design information on commercial systems.

1.2 SPECIFIED SAND SPECIFICATION FOR GSF SYSTEMS: The sand immediately under, between rows and around the perimeter of the GSF system must meet ***ASTM C33 SPECIFICATIONS, WITH LESS THAN 10% PASSING A #100 SIEVE AND LESS THAN 3% PASSING A #200 SIEVE.*** Please place a prominent note to this effect on each design drawing. See Table 1 for more information on the sand and sieve specifications.

1.3 CONNECTIONS AND FITTINGS: Connections of lines to tanks and distribution boxes must be made using watertight mechanical seals. Use of any grouting material is not permitted.

1.4 PLACING GSF MODULES: The "Painted Stripe" on the GSF modules indicates the top of the module and is not intended to indicate the location of the distribution pipe. With the painted stripe facing up, all rows of GSF modules are set level, end to end on the Specified Sand layer. No mechanical connection is required between modules.

1.5 DISTRIBUTION: Gravity, pump to gravity or pressure distribution are acceptable when using the GSF System. All piping must meet the guidelines. A pressure manifold is placed inside the distribution pipe when using pressure distribution. Refer to section 5.0 and 6.0 of this manual for details of how to construct the distribution network and when pressure distribution is recommended. All piping must meet state and local regulations.

1.6 DISTRIBUTION BOX: The 4 main options for installing a distribution box are 1) Install on top of 16" patio blocks, 2) Install on concrete slab, 3) Install encased in concrete, 4) Install a leveling D-box. The soil below the D-box should always be packed and leveled to stabilize the D-box installation.

1.7 COVER FABRIC: Geotextile cover fabric is provided by Eljen Corporation for all GSF systems. It is placed over the top and sides of the module rows to prevent long term siltation and failure. **Cover fabric substitution is not allowed.** Fabric should drape vertically over the pipe and must *not* block holes in the distribution pipe or be stretched from the top of the pipe to the outside edge of the modules. "Tenting" will cause undue stress on fabric and pipe.

1.8 BACKFILL & FINISH GRADING: Complete backfill with a minimum of 6 inches of cover material measured from the top of the distribution pipe. Use well graded native soil fill that is clean, porous and devoid of large rocks. Do not use wheeled equipment over the system. A light track machine may be used with caution, avoiding crushing or shifting of pipe assembly. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

1.9 ADDITIONAL FACTORS EFFECTING RESIDENTIAL SYSTEM SIZE: It is recommended that homes with expected higher than normal water usage increase the septic tank volume as well as incorporate a multiple compartment septic tank. Consideration for disposal area may be up-sized for expected higher than normal water use.

For example:

- Luxury homes, homes with a Jacuzzi style tubs, and other high use fixtures.
- Homes with known higher than normal occupancy.

1.10 GARBAGE DISPOSALS: The use of a garbage disposal is not recommended as they can cause septic system problems by generating an increased amount of suspended solids, grease and nutrients.

However, if such units are proposed, other measures should be taken to mitigate the increased nutrients to the field. Consult your local and state code for garbage disposal requirements. Eljen recommends a dual compartment tank or tanks in series. Consider upsizing the field for the additional biological load.

NOTE: Eljen requires the use of septic tank outlet effluent filters on all systems. Filters with higher filtration are recommended for systems with garbage disposals.

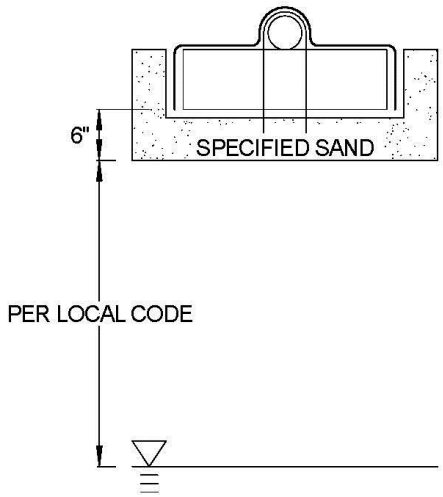
1.11 SEPTIC TANKS: Dual compartment tanks are recommended for all systems. Eljen supports this practice as it helps to promote long system life by reducing TSS and BOD to the effluent disposal area.

1.12 SEPTIC TANK FILTERS: Septic tank effluent filters are ***REQUIRED*** on the outlet end of septic tank. Filter manufactures require that filters be cleaned from time to time. Ask your installer or designer for specific cleaning requirements based on the type or make of the filter installed. Eljen requires the septic tank to be pumped every three years or as needed which would be a good time to check and conduct filter maintenance.

1.13 SYSTEM VENTING: It is required to vent all systems that are over 18 inches below finished grade and systems beneath any surface condition that would not allow for surface air exchange with the system such as patios. See Section 7.0 for a more detailed explanation of venting GSF products.

1.14 VERTICAL SEPARATION TO GROUND WATER OR LIMITING LAYER AND DISTRIBUTION METHOD: Please refer to local health department regulations for vertical separation distances.

FIGURE 3: VERTICAL SEPARATION TO RESTRICTIVE LAYER



1.15 NUMBER OF GSF MODULES REQUIRED: Residential systems use a minimum of six (6) modules per bedroom. See Section 1.16 for more information on systems sizing.

1.16 SIZING GSF SYSTEM FOR TRENCHES, BEDS & SAND MOUNDS:

TABLE 2: SOIL ABSORPTION LOADING RATE BASED ON PERC

Perc Rate (minutes/inch)	Recommended Absorption Area (ft2/bedroom)	Loading Rate (gpd/ft2)	Bed Application Minimum Units per Bedroom
Less than 5	94	1.6	6
5 - 10	116	1.3	7
11 - 15	137	1.1	8
16 - 30	188	0.8	9
31 - 45	215	0.7	10
46 - 60	250	0.6	12
Greater than 60	Not recommended		

TABLE 3: SOIL ABSORPTION LOADING RATE BASED ON SOIL TEXTURE AND STRUCTURE

Group	Soil Characteristics	Wastewater Loading gpd/ft^2	Bed Application Minimum Units per Bedroom
I	Gravelly coarse sand and coarser	2.0	6
II	Coarse sands (not cemented)	1.6	7
III	Medium sand with single grain structure and loose to	1.3	8
IV	Other sands and loamy sands with single grain or weak structure (not extremely firm or cemented consistence) Sandy loams, loams and silt loams with moderate or strong structure (except platy and loose to friable consistence)	0.8	9
V	Sandy loam, silt loams and loams with weak structure (not of extremely firm or cemented consistence) Sandy clay loams, clay loams and silty clay loams with moderate to strong structure (not to platy, of frim, or of cemented consistence)	0.5	10
VI	Sandy clay loams, clay loams and silty clay loams with weak structure (not massive, not of firm, or of cemented consistence) Some sandy clays, clays and silty clays with moderate and strong structure (not platy, not of firm, or of cemented consistence)	0.3	12
VII	Other soils of high clay content with weak or massive structure, extremely firm or cemented consistence or platy, clay pan, fragipan, and caliche soils.	Not Recommended for conventional soil absorption system.	

TABLE 4: RECOMMENDED SOIL ABSORPTION REDUCTIONS

Region	Western Kansas	Central Kansas	Eastern Kansas
Region Multiplier	65%	80%	100%
Recommended reduction	35%	20%	0%

2.0 Trench Installation Sizing and Guidelines

Trench Example:

House size:	3 Bedrooms
Design Flow:	450 gpd
Soil Description:	Sandy Loam, Moderate Structure
Absorption Field Type:	Trench
Region:	Eastern Kansas

Calculate Minimum Absorption Area

Lookup loading rate from Table 3 and determine the loading rate:

Group	Soil Characteristics	Wastewater Loading gpd/ft^2	Bed Application Minimum Units per Bedroom
IV	Other sands and loamy sands with single grain or weak structure (not extremely firm or cemented consistence) Sandy loams, loams and silt loams with moderate or strong structure (except platy and loose to friable consistence)	0.8	9

Lookup loading rate from Table 4 and determine the region multiplier:

Region	Western Kansas	Central Kansas	Eastern Kansas
Region Multiplier	65%	80%	100%

Absorption Area: Design Flow ÷ Loading Rate x Region Multiplier

450 gpd ÷ 0.8 gpd / ft^2 x 100% = 562.5 ft^2

Calculate Number of Modules Required

Number of units required = Absorption Area ÷ 12 Square Foot Per Module

Units required

562.5 ft^2 ÷ 12 ft^2 / module =	46.9 Modules
Round to:	47 Modules

Calculate Minimum Trench Length

47 Units x 4 ft/unit = 188 linear ft

Trench Width

3 ft

Final Dimension Layout

(Note: System layout and number of rows will vary based on site constraints)

Min. Product Length	188 ft
(note: 6 inches of sand required at each end of trench which makes the minimum trench length 189 ft)	
Trench Width	3 ft
Minimum Number of Units	47 Modules
Min. System Area	567 ft^2

FIGURE 4: PLAN VIEW – TRENCH SYSTEM

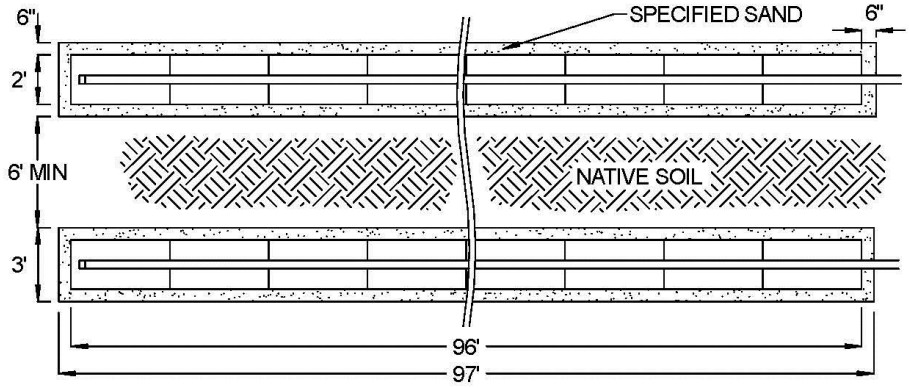


FIGURE 5: SECTION VIEW – TRENCH SYSTEM – LEVEL SITE

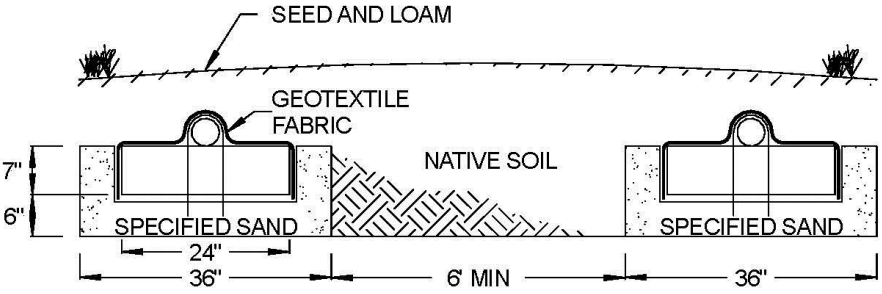
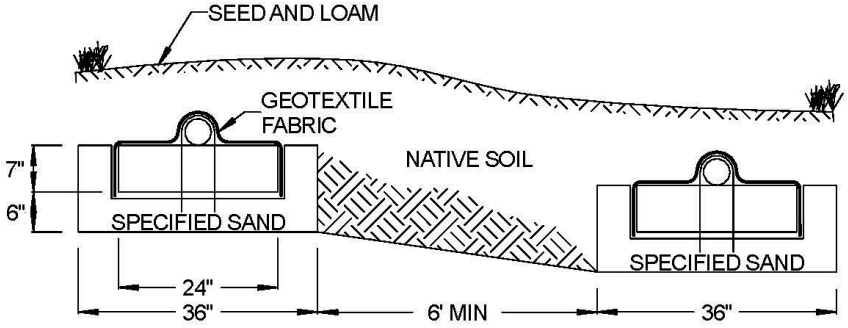


FIGURE 6: SECTION VIEW – TRENCH SYSTEM – SLOPING SITE



2.0 Trench Installation Sizing and Guidelines

1. Ensure all components leading to the GSF system are installed properly. Septic tank effluent filters are required with the GSF system.

2. Determine the number of GSF Modules required using the trench sizing example.

3. Prepare the site. Do not install a system in saturated ground or wet soils that are smeared during excavation. Keep machinery off infiltrative areas.

4. Plan all drainage requirements above (up-slope) of the system. Set soil grades to ensure that storm water drainage and ground water is diverted away from the absorption area once the system is complete.

5. Excavate the trench; scarify the receiving layer to maximize the interface between the native soil and specified sand.

6. Minimize walking in the trench prior to placement of the specified sand to avoid soil compaction.

7. Place specified sand in a 6" lift, stabilize by foot, a hand held tamping tool or a portable vibrating compactor. The stabilized height below the GSF module must be level at 6".

8. Place GSF modules with **PAINTED STRIPE FACING UP**, end to end on top of the specified sand along their 4-foot length.

9. A standard 4-inch perforated pipe, SDR 35 or equivalent, is centered along the modules 4-foot length. Orifices are set at the 4 & 8 o'clock position.

10. All 4-inch pipes are secured with manufacturers supplied wire clamps, one per module.

11. (Pressure Distribution Systems) Insert a pressure pipe (size per design and code) into the standard 4-inch perforated pipe. The pressure pipe orifices are set at the 12 o'clock position as shown in Figure 14. Each pressure lateral will have a drain hole at the 6 o'clock position. Each pressure lateral shall have a clean out at the end of the trench. Refer to Section 6 for guidelines on when to use pressure distribution.

12. ***Cover fabric substitution is not allowed.*** The installer should lay the Eljen provided geotextile cover fabric lengthwise down the trench, with the fabric fitted to the perforated pipe on top of the GSF modules. Fabric should be neither too loose, nor too tight. The correct tension of the cover fabric is set by:
    a. Spreading the cover fabric over the top of the module and down both sides of the module with the cover fabric tented over the top of the perforated distribution pipe.
    b. Place shovelfuls of Specified Sand directly over the pipe area allowing the cover fabric to form a mostly vertical orientation along the sides of the pipe. Repeat this step moving down the pipe.

13. Place 6 inches of Specified Sand along both sides of the modules edge. A minimum of 6 inches of Specified Sand is placed at the beginning and end of each trench.

14. Complete backfill with a minimum of 6 inches of cover material measured from the top of the distribution pipe. Backfill exceeding 18 inches over the top of the unit requires venting at the far end of the trench. Use well graded native soil fill that is clean, porous and devoid of large rocks. Do not use wheeled equipment over the system. A light track machine may be used with caution, avoiding crushing or shifting of pipe assembly. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

15. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

Bed Example:

House size:	3 Bedrooms
Design Flow:	450 gpd
Percolation Rate:	35 Min
Absorption Field Type:	Bed
Region:	Western Kansas

Calculate Minimum Absorption Area

Lookup loading rate from Table 2 and determine the loading rate:

Perc Rate (minutes/inch)	Recommended Absorption Area (ft2/bedroom)	Loading Rate (gpd/ft2)	Bed Application Minimum Units per Bedroom
31 - 45	215	0.7	10

Lookup loading rate from Table 4 and determine the region multiplier:

Region	Western Kansas	Central Kansas	Eastern Kansas
Region Multiplier	65%	80%	100%

Absorption Area: Design Flow ÷ Loading Rate x Region Multiplier

450 gpd ÷ 0.7 gpd / ft^2 x 65% = 417.8 ft^2

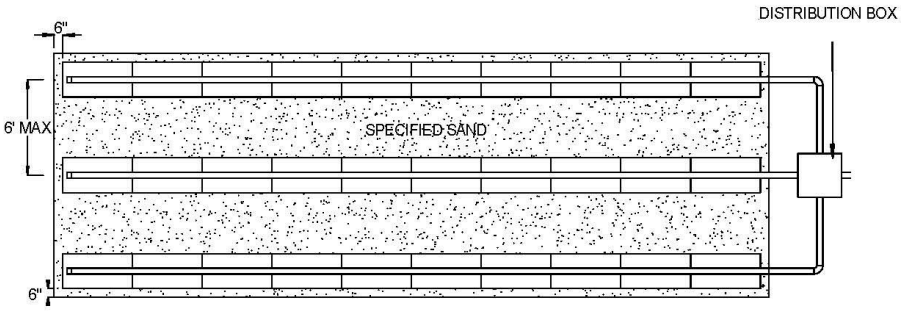
Calculate Number of Modules Required

Lookup units required per bedroom from Table 2:

Perc Rate (minutes/inch)	Recommended Absorption Area (ft2/bedroom)	Loading Rate (gpd/ft2)	Bed Application Minimum Units per Bedroom
31 - 45	215	0.7	10

Units Required: Number of Bedrooms x Units Required per Bedroom

FIGURE 7: PLAN VIEW – BED SYSTEM



SYSTEM CONSTRUCTION WILL VARY PER DESIGN

FIGURE 8: SECTION VIEW – 2 LATTERAL BED SYSTEM

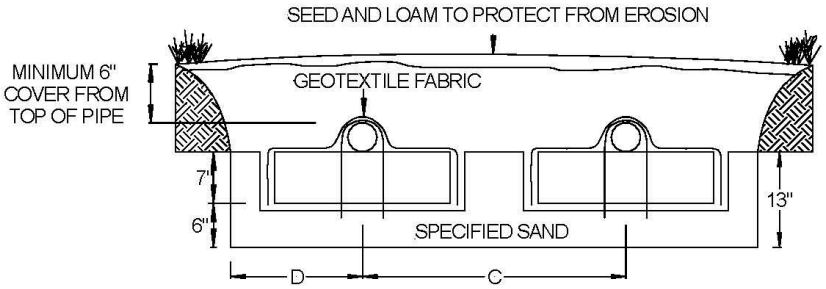


FIGURE 9: SECTION VIEW – 3 LATTERAL BED SYSTEM

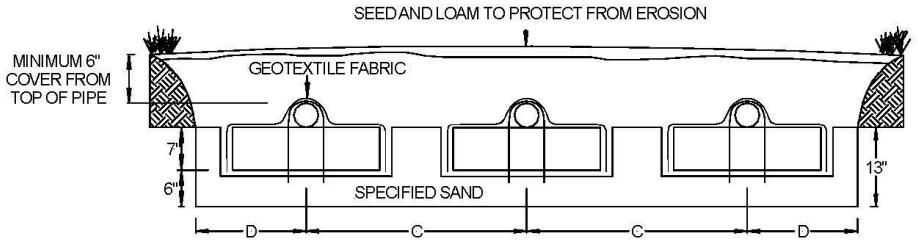


FIGURE 10: SECTION VIEW – 4 LATTERAL BED SYSTEM

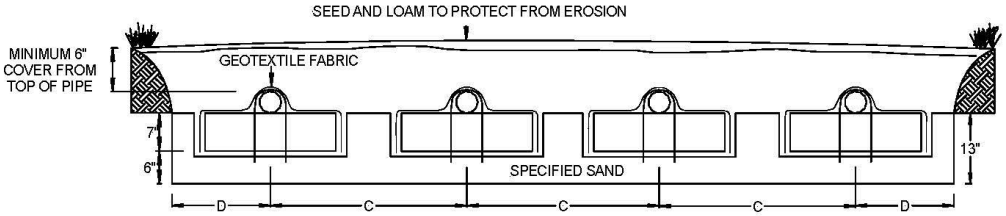


TABLE 5: BED LAYOUT CHART

		Group I		Group II		Group III		Group IV		Group V		Group VI	
		C	D	C	D	C	D	C	D	C	D	C	D
2 Bedroom	2 Laterals	3	1.5	3.25	1.625	3.5	1.75	5.25	2.625	7.5	3.75	10.25	5.125
	3 Laterals	3	1.5	3	1.5	3	1.5	5	2.5	7	3.5	10.16	5.08
	4 Laterals	3	1.5	3	1.5	3.5	1.75	4.5	2.25	7.25	3.625	10	5
3 Bedroom	2 Laterals	3	1.5	3.25	1.625	3.75	1.875	5	2.5	7.5	3.75	10.5	5.25
	3 Laterals	3	1.5	3.3	1.66	3.6	1.8	5.16	2.58	7.3	3.6	10.3	5.16
	4 Laterals	3	1.5	3	1.5	3.5	1.75	4.875	2.437	6.875	3.437	10.25	5.125
4 Bedroom	2 Laterals	3.25	1.625	3.5	1.75	3.75	1.875	5.25	2.65	7.5	3.75	10.5	5.25
	3 Laterals	3.16	1.58	3.16	1.58	3.5	1.75	5.16	2.58	7.1	3.5	10.33	5.16
	4 Laterals	3	1.5	3.25	1.625	3.5	1.75	5.125	2.562	7.375	3.687	10.25	5.125

3.0 Bed Installation Sizing and Guidelines

1. Ensure all components leading to the GSF system are installed properly. Septic tank effluent filters are required with the GSF system.

2. Determine the number of GSF Modules required using the bed sizing example.

3. Prepare the site. Do not install a system in saturated ground or wet soils that are smeared during excavation. Keep machinery off infiltrative areas.

4. Plan all drainage requirements above (up-slope) of the system. Set soil grades to ensure that storm water drainage and ground water is diverted away from the absorption area once the system is complete.

5. Excavate the bed absorption area; scarify the receiving layer to maximize the interface between the native soil and specified sand.

6. Minimize walking in the absorption area prior to placement of the specified sand to avoid soil compaction.

7. Place specified sand in a 6" lift, stabilize by foot, a hand held tamping tool or a portable vibrating compactor. The stabilized height below the GSF module must be level at 6".

8. Place GSF modules with **PAINTED STRIPE FACING UP**, end to end on top of the specified sand along their 4-foot length.

9. A standard 4-inch perforated pipe, SDR 35 or equivalent, is centered along the modules 4-foot length. Orifices are set at the 4 & 8 o'clock position.

10. All 4-inch pipes are secured with manufacturers supplied wire clamps, one per module.

11. (Pressure Distribution Systems) Insert a pressure pipe (size per design and code) into the standard 4-inch perforated pipe. The pressure pipe orifices are set at the 12 o'clock position as shown in Figure 14. Each pressure lateral will have a drain hole at the 6 o'clock position. Each pressure lateral shall have a clean out at the end of each module row. Refer to Section 6 for guidelines on when to use pressure distribution.

12. ***Cover fabric substitution is not allowed.*** The installer should lay the Eljen provided geotextile cover fabric lengthwise down the row, with the fabric fitted to the perforated pipe on top of the GSF modules. Fabric should be neither too loose, nor too tight. The correct tension of the cover fabric is set by:
    a. Spreading the cover fabric over the top of the module and down both sides of the module with the cover fabric tented over the top of the perforated distribution pipe.
    b. Place shovelfuls of Specified Sand directly over the pipe area allowing the cover fabric to form a mostly vertical orientation along the sides of the pipe. Repeat this step moving down the pipe.

13. Place 6 inches of Specified Sand along both sides of the modules edge. A minimum of 6 inches of Specified Sand is placed at the beginning and end of each module row. A minimum of 12 inches of Specified Sand is placed in between module rows.

14. Complete backfill with a minimum of 6 inches of cover material measured from the top of the distribution pipe. Backfill exceeding 18 inches over the top of the unit requires venting at the far end of the trench. Use well graded native soil fill that is clean, porous and devoid of large rocks. Do not use wheeled equipment over the system. A light track machine may be used with caution, avoiding crushing or shifting of pipe assembly. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

15. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

4.0 Mound Installation Guidelines

4.1 MOUND REFERENCE: The following sizing and guidelines provide the dimensions of the dispersal bed for your mound. Consult the local regulations for more information on the construction of the mound system.

4.2 MOUND EXAMPLE:

House size:	4 bedrooms
Slope of site:	4%
Daily Design Flow: 150 gpd x 4 bedrooms =	600 gpd
Nature of Limiting Condition:	High water table at 18 inches
Soil Application Rate (SAR):	0.5 gpd/ft^2

FIGURE 11: CROSS SECTION – MOUND SYSTEM

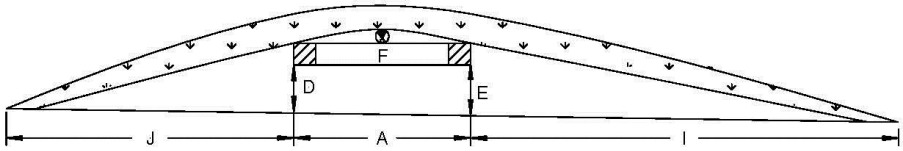
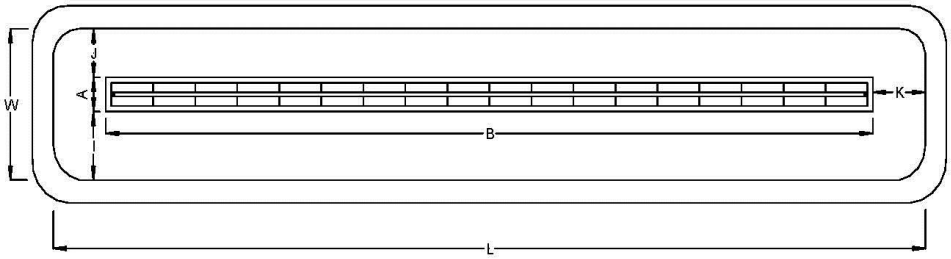


FIGURE 12: PLAN VIEW – MOUND SYSTEM



A – Dispersal bed width (accounts for sand) –**Minimum 3 ft for A42**
B – Dispersal bed length
D – Up slope fill depth under dispersal bed – **Minimum 1 ft**
E – Down slope fill depth under dispersal bed – **Minimum 1 ft**
F – Dispersal bed depth – **Constant 7 in**
I – Distance from edge of dispersal bed to down slope edge of fill
J – Distance from edge of dispersal bed to up slope edge of fill
K– Distance from end of dispersal bed to edge of fill
L – Overall mound fill length
W – Overall mound fill width

4.4 CALCULATE VARIABLES: The following equations are from the Regulation.

A – Maximum Dispersal Bed Width = 0.83 ft/gpd $\sqrt{\frac{\text{DDF (gpd)} \times \text{SAR (gpd/ft}^2\text{)}}{3}}$

Maximum Dispersal Bed Width = 0.83 ft/gpd $\sqrt{\frac{600 \text{ gpd} \times 0.5 \text{ gpd/ft}^2}{3}}$

Maximum Dispersal Bed Width = 8.3 ft

For this example, we will use a 3-foot-wide dispersal width, using A42s.

B – Dispersal Bed Length = Daily Design Flow ÷ Sand Fill Loading Rate 1.6 gpd/ft^2 ÷ Dispersal Bed Width
Dispersal Bed Length = 600 gpd ÷ 1.6 gpd/ft^2 ÷ 3 ft = 125.0 ft. Round to, **125 ft**

D – Upslope fill depth under dispersal bed = **Minimum 1 ft**
(***NOTE:*** For this example, assume the depth of fill at the up-slope edge of the dispersal bed is **1 ft**.)

E – Downslope fill depth under dispersal bed = **Minimum 1 ft**
C + (Slope of site stated as a decimal x Dispersal bed width)
1 ft + (0.04 x 3 ft) = **1.12 ft**

F – Dispersal Bed Depth – Constant 7 in., convert to feet – **0.583 ft**

I – Downslope Width = (Downslope Fill Depth + Dispersal Bed Depth) x 3 x Downslope Correction Factor

Slope %	Downslope (I) Correction Factor	Upslope (J) Correction Factor
0	1	1
2	1.06	0.94
4	1.14	0.89
6	1.22	0.86
8	1.32	0.8
10	1.44	0.77
12	1.57	0.73
14	1.72	0.71
16	1.92	0.68
18	2.17	0.65
20	2.5	0.62

Downslope Width = (1.12 ft + 0.583 ft) x 3 x 1.14 =5.82, round to **6 ft**.

J – Upslope Width = (Upslope Fill Depth + Dispersal Bed Depth) x 3 x Upslope Correction Factor

Slope %	Downslope (I) Correction Factor	Upslope (J) Correction Factor
0	1	1
2	1.06	0.94
4	1.14	0.89
6	1.22	0.86
8	1.32	0.8
10	1.44	0.77
12	1.57	0.73
14	1.72	0.71
16	1.92	0.68
18	2.17	0.65
20	2.5	0.62

Upslope Width = (1 ft + 0.583 ft) x 3 x 0.89 =4.22, round to **4.25 ft**.

K – End Slope Length = (((Downslope Fill Depth + Upslope Fill Depth)/2) + Dispersal Bed Depth) x 3
End Slope Length = (((1.12 ft + 1)/2 + 0.583 ft) x 3 = 4.93 ft, round to **5 ft**.

L – Overall Mound Length = Dispersal Bed Length + 2 x End Slope Length
125 ft + 2 x 5 ft = **135 ft**

W – Overall Mound Width = Dispersal Bed Width + Downslope Width + Upslope Width
3 ft + 6 ft + 4.25 ft = **13.25 ft**

Basal Area Calculation
Level Sites = Overall Mound Length x Overall Mound Width

Sloping Sites = Dispersal Bed Length x (Dispersal Bed Width + Downslope Width)
125 ft x (3 + 6) = 1,125 ft^2

The above calculation must exceed the Basal Area Required = Daily Design Flow ÷ Soil Infiltration Rate
600 gpd ÷ 0.5 gpd/ft^2 = 1,200 ft^2

System does not meet the requirements. Extend downslope width to meet basal area required.
Adjusted Downslope Width = (Basal Area Required ÷ Dispersal Bed Length) – Dispersal Bed Width
(1,200 ft^2 ÷ 125 ft) – 3 ft = 6.6 ft

The downslope extension (I) was 6 ft. To meet the basal requirements, we extended the downslope extension to 6.6 ft.

4.5 DISPERSAL BED CONSTRUCTION –
Width – 3 ft
Length – 100 ft

A42 Modules needed for this system: Length ÷ 4

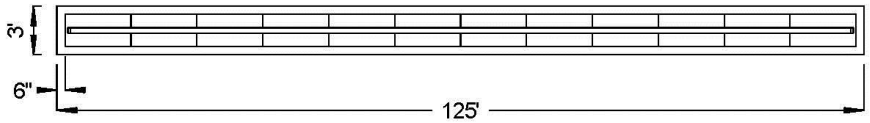
(125 ft – 1) ÷ 4 ft/module = 31, round down to 31 A42 Modules

Determine End Spacing of A42s inside the dispersal bed:

(Dispersal Bed Length – Modules x 4) ÷ 2

(125 ft – 31 Modules x 4) ÷ 2 = 0.5 ft

FIGURE 13: PLAN VIEW – 600 GPD – DISPERSAL BED MOUND SYSTEM



4.0 Mound Installation Guidelines

1. Ensure all components leading to the GSF system are installed properly. Septic tank effluent filters are required with the GSF system.

2. Determine the number of GSF Modules required using the sizing formula.

3. Prepare the site. Do not install a system on saturated ground or wet soils that are smeared during preparation. Keep machinery off infiltrative areas.

4. Plan all drainage requirements above (up-slope) of the system. Set soil grades to ensure that storm water drainage and ground water is diverted away from the absorption area once the system is complete.

5. Remove the organic soil layer. Scarify the receiving layer to maximize the interface between the native soil and Specified Sand. Minimize walking in the absorption area prior to placement of the Specified Sand to avoid soil compaction.

6. Place fill material meeting local requirements (or Specified Sand requirements) onto the soil interface as you move down the excavated area. Place specified sand in a 6" lift, stabilize by foot, a hand held tamping tool or a portable vibrating compactor. The stabilized height below the GSF module must shall meet the mound design requirements.

7. Place GSF modules with **PAINTED STRIPE FACING UP**, end to end on top of the specified sand along their 4-foot length.

8. A standard perforated 4-inch distribution pipe is centered along the modules 4-inch length. Orifices are set at the 4 & 8 o'clock position.

9. All distribution pipes are secured with manufacturers supplied wire clamps, one per module.

10. (Pressure Distribution Systems) Insert a pressure pipe (size per design and code) into the standard perforated distribution pipe. The pressure pipe orifices are set at the 12 o'clock position as shown in Figure 14. Each pressure lateral will have a drain hole at the 6 o'clock position. Each pressure lateral shall have a clean out at the end of each module row. Refer to Section 6 for guidelines on when to use pressure distribution.

11. ***Cover fabric substitution is not allowed.*** The installer should lay the Eljen provided geotextile cover fabric lengthwise down the row, with the fabric fitted to the perforated pipe on top of the GSF modules. Fabric should be neither too loose, nor too tight. The correct tension of the cover fabric is set by:
    a. Spreading the cover fabric over the top of the module and down both sides of the module with the cover fabric tented over the top of the perforated distribution pipe.
    b. Place shovelfuls of Specified Sand directly over the pipe area allowing the cover fabric to form a mostly vertical orientation along the sides of the pipe. Repeat this step moving down the pipe.

12. Ensure there is 6 inches of specified sand surrounding the GSF modules in the mound. Slope the sand away from the mound as described on the plan.

13. Complete backfill with a minimum of 6 inches of cover material measured from the top of the distribution pipe. Use well graded native soil fill that is clean, porous and devoid of large rocks. Do not use wheeled equipment over the system. A light track machine may be used with caution, avoiding crushing or shifting of pipe assembly. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

14. Divert surface runoff from the system. Finish grade to prevent surface ponding. Topsoil and seed system area to protect from erosion.

5.0 Dosing Distribution Guidance

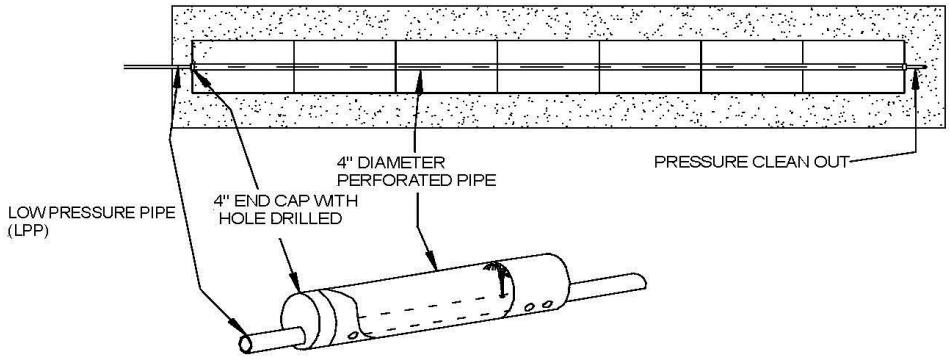
DOSING DESIGN CRITERIA: Dosing volume must be set to deliver a maximum of **3 gallons per Module** per dosing cycle. Head loss and drain back volume must be considered in choosing the pump size and force main diameter.

6.0 Pressure Distribution Guidance

6.1 PRESSURE DISTRIBUTION USE: Pressure distribution systems are typically employed for large scale systems to ensure equalized flows throughout the dispersal area. Pressure distribution systems are also used for laterals that are longer than the maximum allowed gravity run according to the guidelines. Most commercial systems are pressure dosed unless it is servicing a low flow and/or expected low waste strength application like a gas station rest area without food services. Please consult your local regulators for guidelines for additional sites that will require pressure distribution.

6.2 PRESSURE DISTRIBUTION CONSTRUCTION: Standard procedures for design of pressure distribution networks apply to the GSF filter. A minimum orifice size according to the regulations shall be maintained. A drain hole is required at the 6 o'clock position of each pressure lateral for drainage purposes. The lateral pipe network *(size per design and code)* is placed within a standard 4-inch perforated pipe. The perforation in the 4-inch outer pipe are set at the 4 and 8 o'clock position, the drilled orifices on the pressure pipe are set to spray at the 12 o'clock position directly to the top of the 4-inch perforated pipe as shown below.

FIGURE 14: PRESSURE PIPE PLACEMENT



PRESSURE PIPE CROSS SECTION FOR ALL APPLICATIONS

FIGURE 15: PRESSURE CLEAN OUT

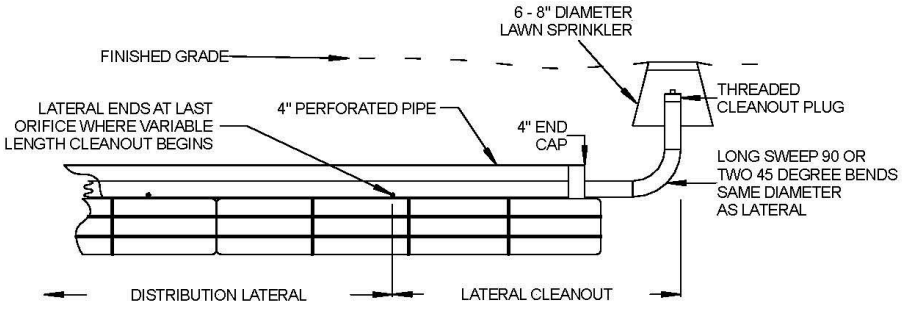
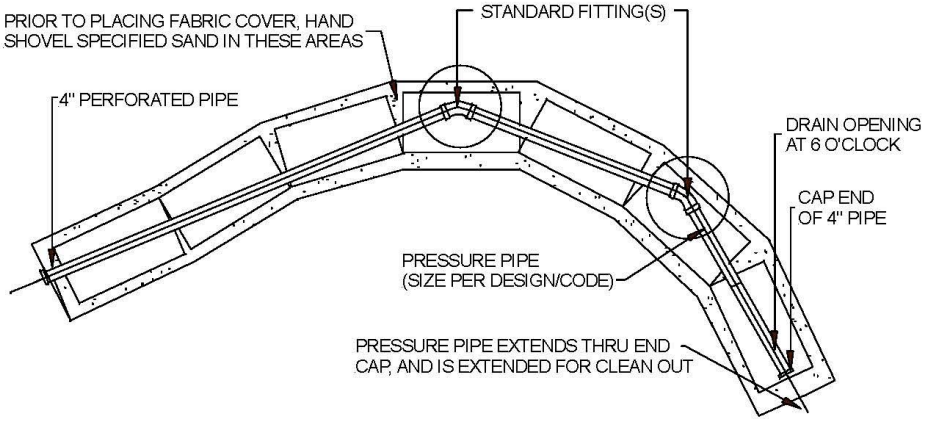


FIGURE 16: CONTOURED TRENCH PRESSURE DISTRIBUTION

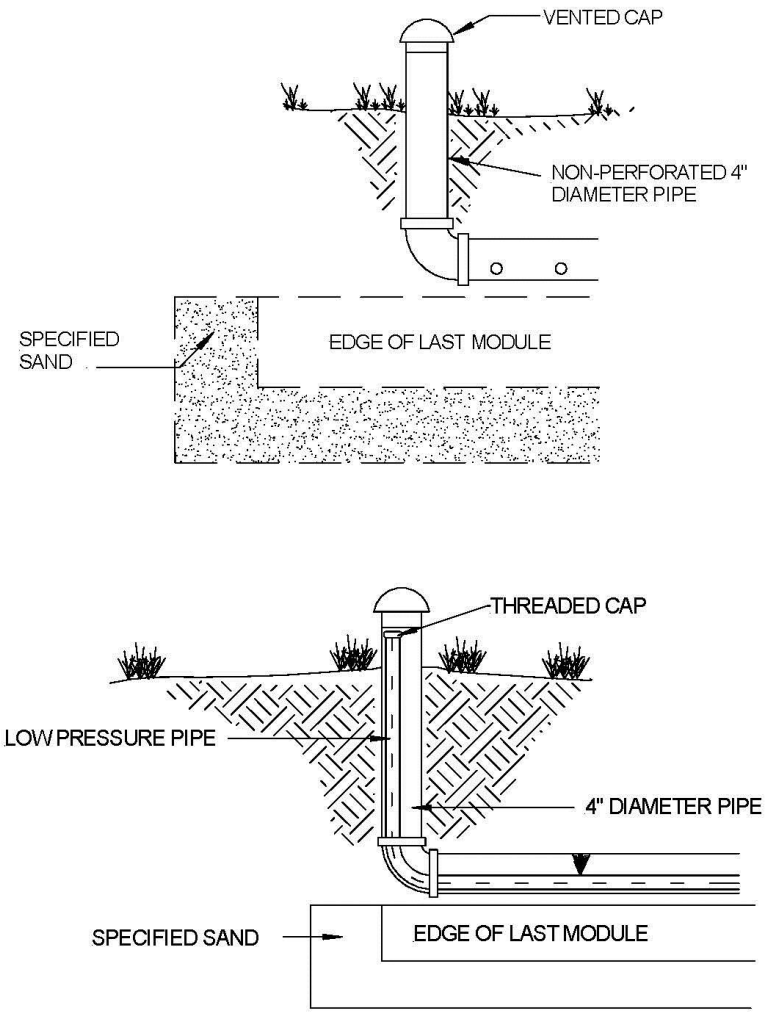


GSF Pressure Distribution trench placed on a contour or winding trenches to maintain horizontal separation distances may also be used in Dosed or Gravity system by removing the pressure pipe and using the 4-inch diameter perforated distribution pipe.

7.0 System Ventilation

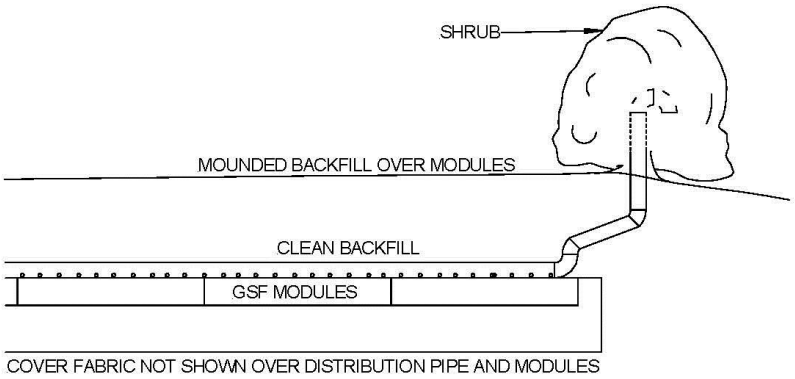
SYSTEM VENTILATION: Air vents may be incorporated with your design. This will ensure proper aeration of the system. The GSF has aeration channels between the rows of GSF modules connecting to cuspations within the GSF modules. Under normal operating conditions, only a fraction of the filter is in use. The unused channels remain open for intermittent peak flows and the transfer of air. All systems with 18" or more of cover material require ventilation. System vents can be at or above grade, check with state and local codes for specific design criteria.

FIGURE 17: VENT LAYOUTS FOR GRAVITY AND LOW-PRESSURE SYSTEMS



7.3 VENTILATION PLACEMENT: In a GSF system, the vent is usually a 4-inch diameter pipe extended to a convenient location behind shrubs, as shown below. Corrugated pipe may be used. If using corrugated pipe, ensure that the pipe does not have any bends that will allow condensation to pond in the pipe. This may close off the vent line. The pipe must have an invert higher than the system so that it does not drain effluent.

FIGURE 18: GSF WITH 4" VENT EXTENDED TO CONVENIENT LOCATION



COMPANY HISTORY

Established in 1970, Eljen Corporation created the world's first prefabricated drainage system for foundation drainage and erosion control applications. In the mid-1980s, we introduced our Geotextile Sand Filter products for the passive advanced treatment of onsite wastewater in both residential and commercial applications. Today, Eljen is a global leader in providing innovative products and solutions for protecting our environment and public health.

COMPANY PHILOSOPHY

Eljen Corporation is committed to advancing the onsite industry through continuous development of innovative new products, delivering high quality products and services to our customers at the best price, and building lasting partnerships with our employees, suppliers, and customers.

eljen CORPORATION

Innovative Environmental Products & Solutions Since 1970

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Riley County Eljen Geotextile Sand Filter (GSF) Alternative Private Wastewater Disposal System Inspection Report

Inspection Date #1: _____ Serviced by: _____
Name: _____ _____
Address: _____ Permit # _____

Equipment	***Yes***	***No***	***Results (Failure requires a repair permit)***
All float cords are neatly wrapped to prevent float interference			
No holes or leaks in the system			
Alarm and Floats (*Tested*)			
Distribution box (D-Box) level			
D-Box lid securely attached			
Equal flow to each line			
Tank Requires Pumping (Minimum requirement is once every 5 years)	***Yes***	***No***	***If Yes, Then Date Pumped***
Effluent Filter Present			
Air Vents Checked			
Lateral Field Surfacing			
Damage due to excessive weight loading to the system			
Tank Water Tight			
Repair Permit Required			