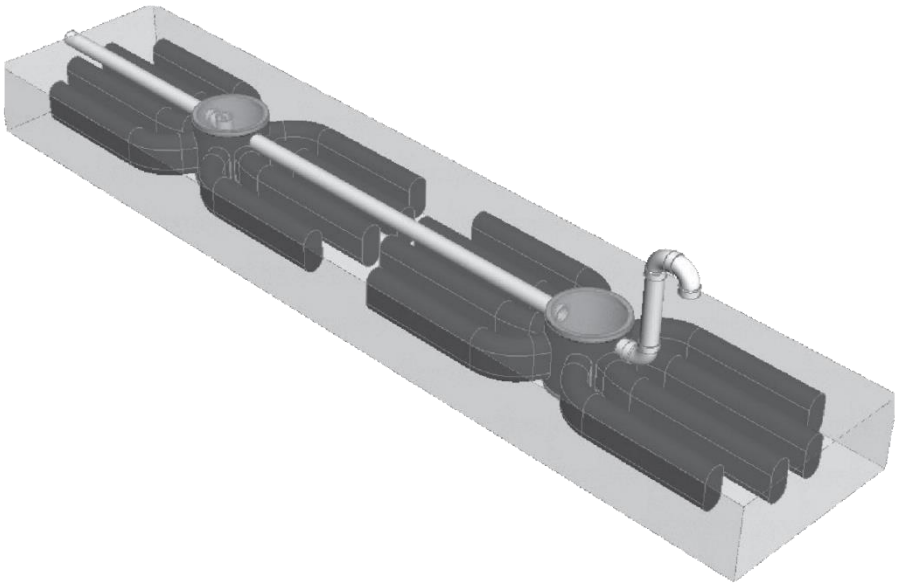
MAINE

ENVIROFIN™

WASTEWATER TREATMENT SYSTEMS

DESIGN AND INSTALLATION MANUAL



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Presby Environmental, Inc.
An Infiltrator Water Technologies Company

July 2020

The information in this Manual is subject to change without notice. We recommend that you check your state's page on our website on a regular basis for updated information. Your suggestions and comments are welcome. Please contact us at:

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IMPORTANT NOTICE: This Manual is intended ONLY for use in designing and installing Presby Environmental' s **EnviroFin®** Wastewater Treatment System. The processes and design criteria contained herein are based solely on our experience with and testing of **EnviroFin®**. Substitution of any product is prohibited.

NEW FOR 2020

IMPORTANT CHANGES TO THE USE OF ENVIROFIN IN MAINE

Presby Environmental Inc. (PEI) has made several critical changes to the way in which the EnviroFin System is to be designed and installed in Maine. The changes are effective upon approval and will remain in effect until further notice.

ALL OF THESE CHANGES ARE INCORPORATED INTO THIS MANUAL PLEASE READ, UNDERSTAND, AND INCORPORATE THESE CHANGES BEFORE DESIGNING AND/OR INSTALLING AN ENVIROFIN SYSTEM

I. Number of Units Required:

The minimum Enviro-Fin (EF) unit requirement has increased from 1 unit per 1.5 bedrooms (br) to 2 units per br for residential systems; and 1 unit per 225 gallons per day (gpd) to 1 unit per 75 gpd for commercial systems.

If an Aquaworx Remediator (Remediator) is installed in the treatment train prior to release of effluent into the EF system, the minimum EF unit requirement is 1 unit per bedroom for residential systems and 1 unit per 150 gpd for commercial systems. *Minimum system sand basal area requirements are not impacted by this change in specifications.*

One-bedroom systems are now allowed for use with the EF system.

II. Strap and Buckle Replaces Zip Ties

Based on installer feedback, the zip ties used to attach the Fins to the Fin Distribution Unit have been replaced with a nylon strap and buckle systemin order to ease unit assembly.

III. Serial Section Loading limits

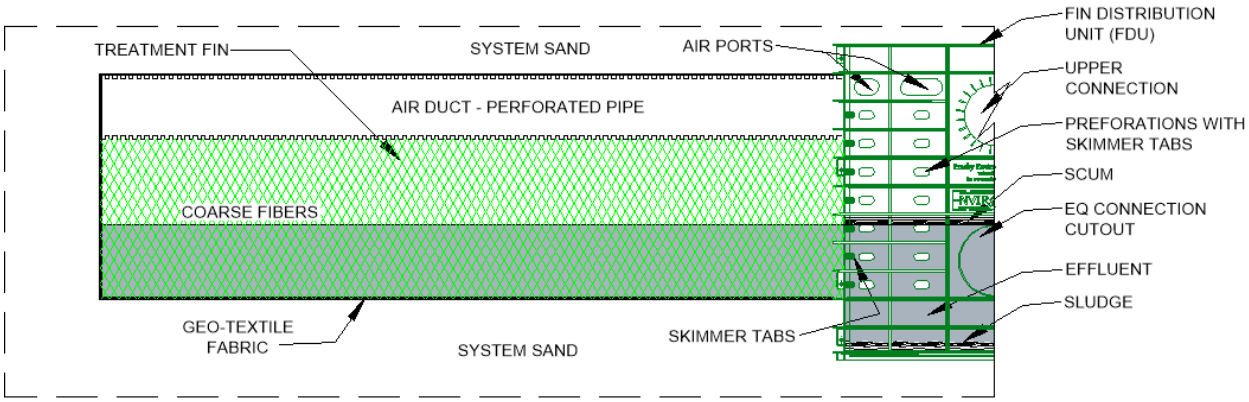
Serial section loading limits have been modified to reflect the revised loading rates on the EnviroFin Units. Systems may now contain *up to* 10 units in series or 750 gpd.

1.0 INTRODUCTION

1.1 Background

The EnviroFin® (EF) system creates an eco-system designed to simultaneously and passively purify and disperse effluent after primary treatment by a septic tank. At the heart of the EF system is the centrally located Fin Distribution Unit (FDU), a plastic basin & sump, which is perforated around the circumference including patented, interior skimmer tabs. The FDU equalizes flow to other EF units in series and distributes effluent to 8 treatment fins radiating outward from the central unit. The treatment fins provide superior wastewater treatment utilizing high performance components. The perforated plastic air ducts supply oxygen to the bacterial surfaces and remove waste gases. The green, randomized, plastic fibers packed beneath the air duct and the geotextile fabric surrounding the treatment fin and FDU provide abundant and varied surface areas for bacterial attachment. The treatment fins distribute the treated effluent to a bed of specified system sand for additional polishing and even dispersal to the native soil interface. Treatment provided by the EF system protects the native soils from organic clogging and the formation of less permeable biomats in these critical areas essential for consistent, long term dispersal and infiltration of the treated wastewater flows. The EF system is also completely passive, requiring no electricity, motors, alarms, computers, etc.

The system has been successfully tested and certified to NSF/ANSI 40, Class I (a certification typically given to mechanical aeration devices) standards.



Additional system benefits include:

- adapts well to difficult sites
- installs easily and quickly
- requires a smaller area
- increases system performance and longevity
- recharges groundwater more safely than traditional systems

Environmental Standards and Technical Support

All EF systems shall be designed and installed in compliance with the procedures and specifications detailed in this Manual and in the product's Maine approval. In the event of contradictions between this Manual and state rules, Presby Environmental, Inc. (PEI) should be contacted for technical assistance at (800) 473-5298.

Certification Requirements

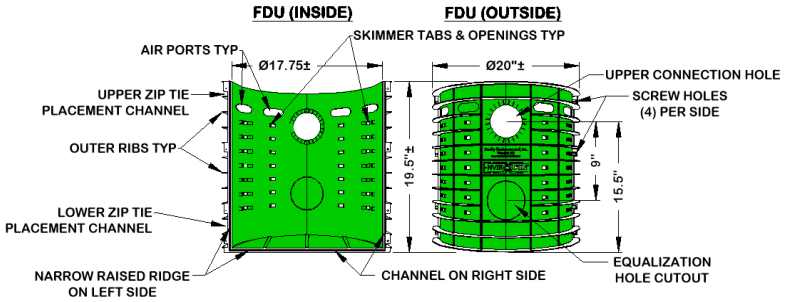
Designers and installers who have not previously attended a PEI certification course are required to obtain certification. Certification is obtained by attending a certification course presented by PEI or its sanctioned representative or by viewing tutorial videos on our website and then successfully passing a short assessment test. PEI recommends professionals involved in the inspection or review of EF systems also become PEI certified. This is a separate, additional certification from the PEI pipe-based product lines.

1.2 System Components

Fin Distribution Unit (FDU)

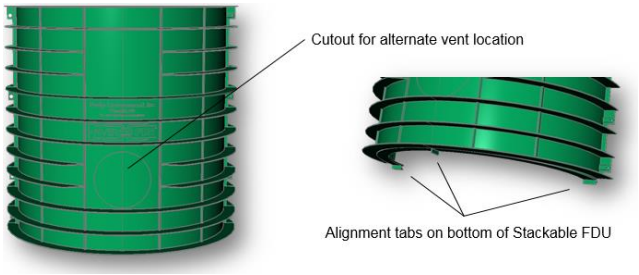
- Perforated with skimmer tabs on interior.
- Upper inlet and outlet holes.
- Lower inlet and outlet cutouts are available for the connection of equalization pipes.
- Assembled using supplied stainless-steel screws and silicone caulk for watertight bottom seal.
- Effluent is supplied to the FDU by means of a 4 in sanitary tee positioned horizontally (see page 27 for details).

Illustration of inner and outer FDU component:



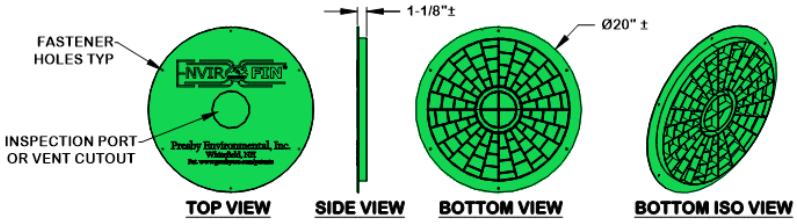
Stackable FDU (optional riser)

A stackable FDU is designed to be attached on top of a standard FDU in order to bring the cover closer to the final grade for access. It has no holes for pipe attachment but is provided with a cutout as an alternate vent location. The stackable FDU is mated to the standard FDU with supplied stainless-steel screws. Alignment tabs have been molded into the bottom of the FDU to facilitate easy assembly with the mating part.



Top Cover

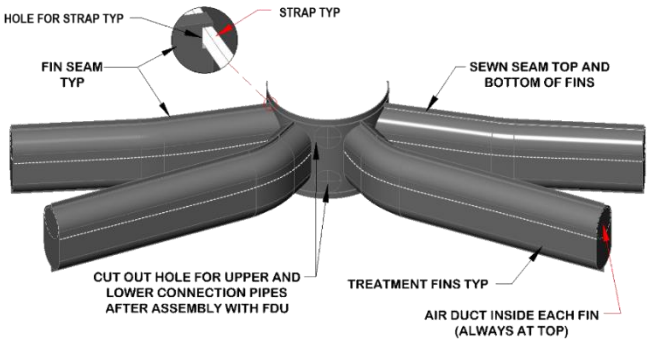
The FDU's top cover is an injection molded plastic component. In the center of the cover is a cutout for the attachment of an optional inspection port. The cover is attached to the top of the FDU with the supplied stainless-steel screws.



Treatment Fin

There are eight treatment fins per EF unit. Each set of fins is comprised of:

- two halves with four treatment fins each;
- a perforated plastic air duct which runs along the top;
- randomly oriented, green fibers packed beneath the air duct and surrounded by geo-textile fabric.



1.0 INTRODUCTION

Strap and Buckle, Stainless Steel Fasteners and Plastic Pipe

Strap and buckle, stainless steel screws and silicone caulk are supplied to assemble the FDU halves with the cover and to attach the treatment fins to the FDU body. Hand tools (razorblade knife, screwdriver) used to assemble the units are not provided. All 4-in plastic piping and fittings must also be purchased by the installer from third parties.

System Sand

The system sand that surrounds the EF unit is an essential component of the system. It is critical that the correct type and amount of system sand is used during construction. System sand shall be coarse to very coarse, clean, granular sand, free of organic matter. System sand is placed a minimum of 3 in above and 6 in below, beside and between the EF treatment fins and 3 in below the FDU. A minimum of 6 in of system sand must extend horizontally around the perimeter of each unit, measured from the outermost edge of the treatment fin. System sand shall adhere to all of the following percentage and quality restrictions:

Table A: System Sand Specification

Sieve Size	Percent Retained on Sieve (by weight)
3/4 in (19 mm)	0
#10 (2 mm)	0 - 35
#35 (0.50 mm)	40 - 90
Note: not more than 3% allowed to pass the #200 sieve (verified by washing sample per requirements of ASTM C-117)	

System Sand Acceptable Alternative: ASTM C-33 (concrete sand), natural or manufactured sand, with not more than 3% passing the #200 sieve (verified by washing the sample per the requirements of ASTM C-117 as noted in the ASTM C-33 specification) may be used as an acceptable alternate material for use as system sand.

Sand Fill

Sand fill meeting the requirements of 10-144 CMR 241 Table 11A may be used to raise the elevation of the system in order to meet the required separation distance from the seasonal high water table (SHWT) or restrictive feature or in fill extensions. No organic material or stones larger than 3 in are allowed in the sand fill. System sand may be used in place of sand fill.

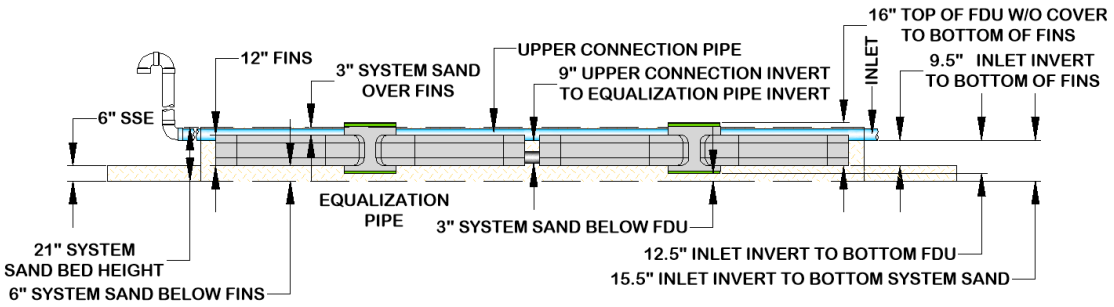
System Sand Bed Height Dimension

The height of the EF system sand bed measures 21 in minimum (does not include cover material or FDU):

- 6 in minimum of system sand below the treatment fins (3” below FDU);
- 12 in height of treatment fins;
- 3 in minimum of system sand above the top of the treatment fin; and
- system sand extensions (SSE) are a minimum 6 in deep.

Key EnviroFin Dimensions

The following is an illustration showing key dimensions (side view – not to scale):



2.0 SYSTEM DESIGN

2.1 Sizing

EnviroFin Unit Requirements

- Residential systems: 2 EF units per bedroom
- Non-residential/ommercial system comprised of residential strength effluent: 1 unit per 75 gpd. Consult PEI for high strength effluent requirements.
- Systems that incorporate a Remediator in the septic tank are sized at 1 unit per bedroom for residential appications or 1 unit per 150 gpd for non-residential/commercial applications.

Note: Mixed use systems shall be calculated separately as residential plus non-residential based on requirements outlined above.

Table B: System Sand Bed Area Required

Soil Profile	Number of Bedrooms							Commercial Sizing per 100 gpd
	1	2	3	4	5	6	Additional Bedroom	
1	111.1	222	333	444	556	667	111.1	74.07
2	44.5	89	134	178	223	267	44.5	29.67
3	66.7	133	200	267	333	400	66.7	44.44
4, 5 & 6	22.3	45	67	89	111	134	22.3	14.84
7	66.7	133	200	267	333	400	66.7	44.44
8	111.1	222	333	444	556	667	111.1	74.07
9	178.6	357	536	714	893	1071	178.6	119.05
	Minimum System Sand Bed Area (FT^2)							

Consult PEI for high strength effluent requirements.

Minimum SSBA requirements are not impacted by use of the Remediator.

2.2 Design Layout

The EF units can be arranged in many different configurations and shapes to accommodate an array of site challenges, provided the minimum full depth system sand bed treatment area and minimum system sand dispersal area for the site soils (soil profiles) are utilized. For simplicity, this manual divides the EF design layout into two basic shapes, rectangular and circular. Multi-Level™ beds are a variation of rectangular layouts. Beds may incorporate system sand extensions (SSE), which may have irregular shapes and are allowed to slope with the existing terrain up to 33%. The bottom of the treatment fins must always remain level.

Rectangular Design Layout

Utilizes minimum spacing to create efficient designs and minimize the amount of system sand required. Allows for systems to be divided into multiple, single unit, EF beds using a D-box to split flows. Individual beds may be sized for different soils (soil profiles) within the same system and site.

Design Procedure

Task 1: Determine Number of EnviroFin Units Needed

a) Residential: Multiply the number of bedrooms times 2 units per bedroom.
b) Commercial: Systems with normal strength effluent are calculated by dividing the daily design flow (DDF) 75 gpd per unit. (Contact Technical Support for high strength wastewater.)

Note: If system is being designed with a Remediator in the septic tank, systems may be sized at 1 unit per bedroom for residential applications or 150 gpd per unit for Non-residential/commercial applications.

2.0 SYSTEM DESIGN

Task 2: Determine Minimum System Sand Bed Area (SSBA) Required
Using Table B, find where the system's Soil Profile and number of bedrooms intersect to determine the minimum System Sand Bed Area (SSBA) needed for the DDF. For commercial systems, find where the system's Soil Profile and the commercial column intersect to determine the SSBA per 100 GPD. Multiply this number by the DDF, divided by 100 to determine the minimum SSBA.

Task 3: Determine Multiple Bed System Layout
If using multiple beds, calculate the SSBA for each bed by dividing the SSBA by the total number of EF units required for all beds, then multiply by the number of EF units in each bed. Note: If individual beds are located in different soils (perc rates) the minimum SSBA may be calculated separately to accommodate different SLRs, resulting in different sized dispersal areas within the system. Follow the remaining tasks for each bed individually.

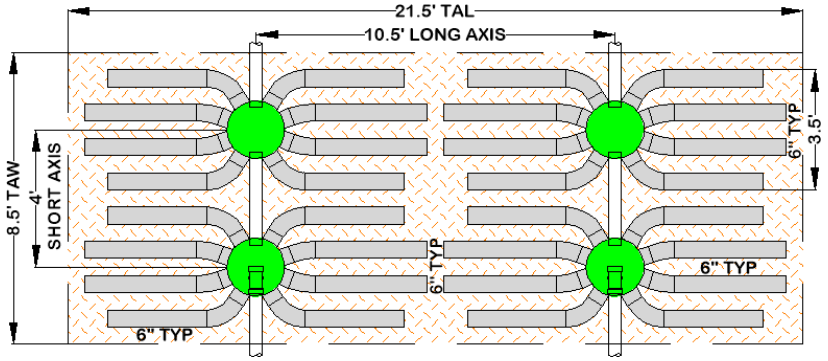
Note: Treatment fins can interlace with the fins from adjacent EF unit(s) as long as there is a minimum of 6 in of system sand between them. This will result in odd dimensions for the unit's length and width. Although allowed, the standard layout is recommended for ease of design and installation.

Task 4: Calculate the Full Depth System Sand Bed Area
Calculating the full depth SSBA is done in three steps as follows:

a) To find the length of the full depth SSBA, use the following formula: **full depth SSBA (along the long axis) of EF = (# of EF units -1) x C/L ft + 11 ft.)**
b) To find the width of the full depth SSBA use the following formula **full depth SSBA (along the short axis) of EF units = (# of EF Units – 1) x C/L + 4.5 ft.**
c) Calculate full depth SSBA: multiply result from 1 and 2 above.

Example:

a) The field is two EF units long on the long axis, the SSBA length needed to extend beyond the units along this axis is: (2 units -1) x 10.5 ft + 11 ft = 21.5 ft.
b) The field is two units long on the short axis, the full depth SSBA width needed to extend beyond the units along this axis is: (2 units -1) x 4 ft + 4.5 ft) = 8.5 ft.
c) Full depth SSBA = 21.5 x 8.5 = 182.75 ft^2.



Please note, the term "axis" only refers to the orientation of the EF units themselves. The EF units may be oriented with its long axis horizontally or vertically depending on site constraints.

Task 5: Determine if System Sand Extensions (SSEs) are needed

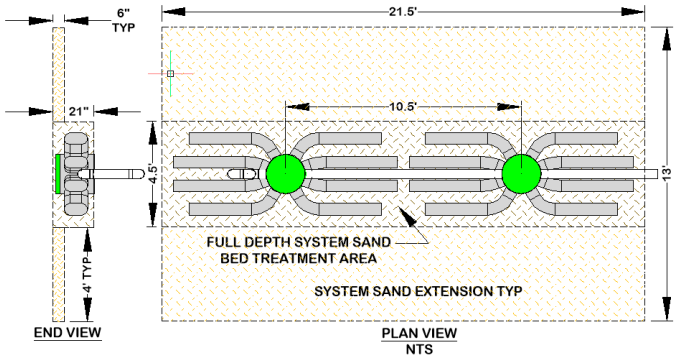
a) *Level beds:* Choose sand bed dimensions to accommodate site constraints. Long and narrow beds are preferred. Sand bed dimensions must be at least those calculated in Task 4 and have the minimum SSBA required from Task 2. The sand bed that extends beyond the dimensions calculated in Task 4 is called the SSE and only needs to be 6 in thick. The dimensions from Task 4 must be within 20 ft of the final sand bed dimensions.

i. If the full depth SSBA from Task 4c is equal or larger than the minimum SSBA from Task 2 then there will not be any SSEs needed.
ii. If the SSBA from Task 4c is smaller than the minimum SSBA from Task 2 then a SSE will be needed.

2.0 SYSTEM DESIGN

To calculate the SSE, divide the minimum SSBA from Task 2 by the full depth SSBA length (Task 4a) subtract the full depth SSBA width (Task 4b) and divide the result by 2. This results in the width of the SSEs, which are a minimum of 6 in thick and are applied to each side of full depth SSBA.

Example Using Remediator:
268 ft^2 (Min. SSBA Task 2) / 21.5 ft (Task 4a) = 12.47 ft. 12.47ft – 4.5 ft (Task 4b) = 7.97 / 2 = 3.99 ft SSE on each side. Round this value up to 4 ft for ease of construction.



b) *Sloping beds:* For beds on sloping terrain, the SSE is placed entirely on the down slope side of the full depth SSBA. No SSEs are allowed on the up-slope side or ends of the full depth SSBA.

i. For site slopes less than 5%: Follow the design procedure outlined in Task 5a except SSE shall be placed on the downslope side of the full depth SSBA.

ii. For site slopes equal to or greater than 5%: The minimum SSE for beds on slopes of 5% or more is 2.5 ft. The SSE may fan outward as much as 45 degrees on each side (see illustration in Section 2.3 on page 14) if there is a down slope constraint but can never provide less than a 2.5 ft SSE.

If the full depth SSBA from Task 4 is equal to or larger than the minimum SSBA from Task 2, add a 2.5 ft SSE to the length of the full depth SSBA on the downslope side. If the full depth SSBA from Task 4 is smaller than the minimum SSBA from Task 2, divide the minimum SSBA from Task 2 by the full depth SSBA length on the downslope side of the bed from Task 4 then subtract the full depth SSBA width length from the side of the bed perpendicular to the downslope edge of the bed. This results in the width of the SSE, which is a minimum of 6 in thick and is applied to the downslope side of the full depth SSBA. If result is less than 2.5 ft, increase extension to 2.5 ft minimum.

Design Example #1: Single family residence, two bedrooms, Soil Profile #3, single rectangular bed with long axis parallel with the contour; level bed design.

Task 1: Determine number of EnviroFin Units Needed

a) Residential: Multiply number of bedrooms x 2 units per bedroom = 4 EF units.
b) Commercial: N/A

Task 2: Determine Minimum System Sand Bed Area SSBA Required

Table B shows a minimum system sand bed area of 133 ft^2 required for a 2-bedroom residence in soil profile #3.

Task 3: Determine Multiple Bed System Layout

N/A using a single bed configuration.

Task 4: Calculate the Full Depth System Sand Bed Area

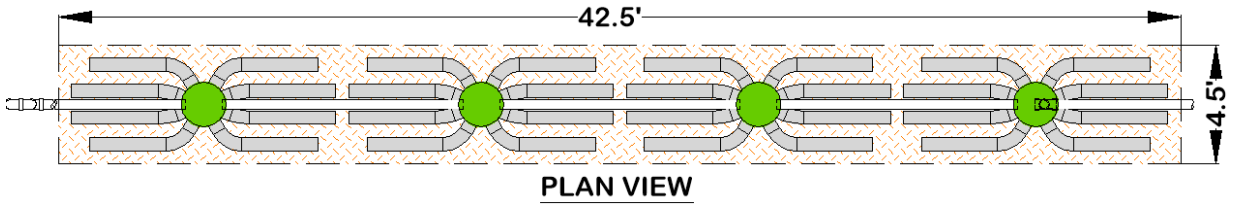
a) Full depth SSBA along long axis of EF = (# of EF units -1) x C/L ft + 11 ft).
(4 – 1) x 10.5 + 11 = 42.5 ft. The minimum bed length will be 42.5 ft.
b) Full depth SSBA along short axis of EF units = (# of EF Units – 1) x C/L + 4.5 ft. (1-1) x 0 + 4.5 = 4.5 ft.
c) Calculate minimum full depth SSBA 42.5 x 4.5 = 191.25 ft^2.

Task 5: Calculate System Sand Extensions

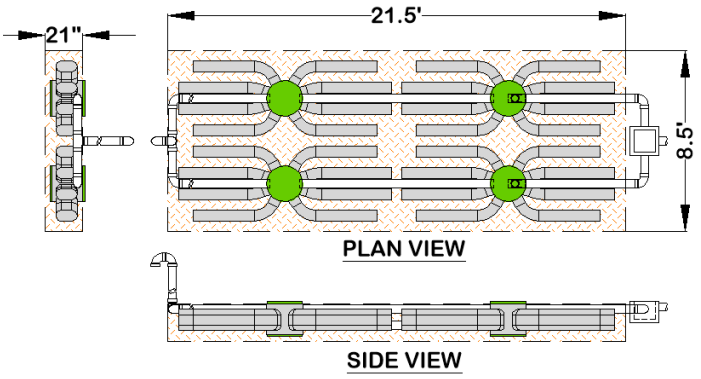
a) Level site: The site will accommodate a sand bed length of 42.5 ft. A bed design of 42.5 ft x 4.5 ft provides 191.25 ft^2 of SSBA, which is larger than the 133 ft^2 required by Task 2. In this case, there will not be any SSEs.
b) This is not a sloping site this step not necessary.

2.0 SYSTEM DESIGN

Illustration of Example #1:



Alternate acceptable sand bed configuration, 182.75 ft^2, no SSE required:



Design Example #2: Mixed use system designed for two one-bedroom apartments and an office building with daily design flow or 300 gpd. System designer will use a Remediator in the septic tank; Soil Profile #2 soils and 6% sloping site with no constraints for length.

Task 1: Determine Number of EnviroFin Units Needed

a) Residential: 2 bedrooms with Remediator in tank times 1 units per bedroom = 2 units.
b) Commercial: DDF 300 ÷ 150 gpd per unit = 2 units.

System is being designed with a Remediator in the septic tank, the system will be designed using 4 units.

Task 2: Determine Minimum System Sand Bed Area (SSBA) Required

Minimum SSBA required residential portion: 89 ft^2; commercial portion: 29.67 x 3 = 89.01 ft^2. Total SSBA required = 89 + 89.01 = 178.01 ft^2.

Task 3: Determine Multiple Bed System Layout

N/A using a single bed.

Task 4: Calculate the Full Depth System Sand Bed Area

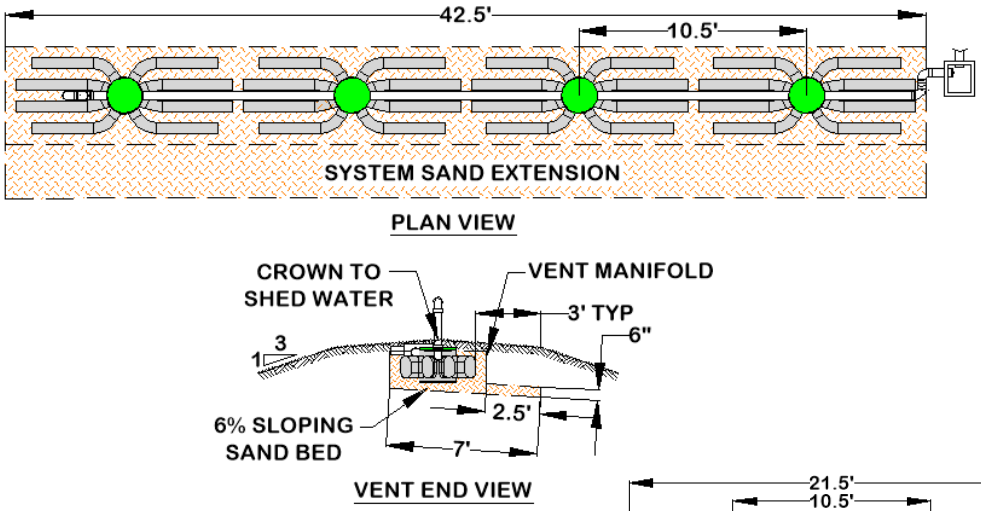
a) Full depth SSBA along long axis of EF = (# of EF units -1) x C/L ft + 11 ft).
SSBA length → use 10.5 ft long axis C/L: → (4 – 1) x 10.5 ft + 11 ft = 42.5 ft.
b) Full depth SSBA along short axis of EF = (# of EF Units – 1) x C/L + 4.5 ft. SSBA width → use 4 ft short axis C/L: → (1 – 1) x 4 + 4.5 = 4.5 ft.
c) Calculate full depth SSBA. 42.5 x 4.5 = 191.25 ft^2.

Task 5: Calculate System Sand Extensions

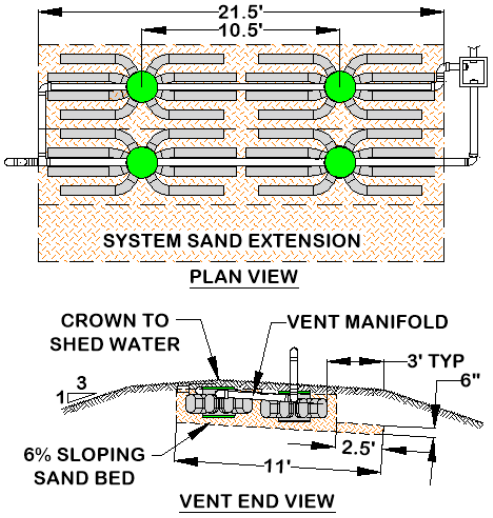
a) Bed slopes greater than 5%, skip to b.
b) The full depth SSBA from Task 4 is larger than the minimum SSBA from Task 2. Since the site slope is greater than 5%, a 2.5 ft SSE will be added to the length of the full depth SSBA on the downslope side of the bed. Final SSBA is 297.5 ft^2.

2.0 SYSTEM DESIGN

Illustrations of Example #2:



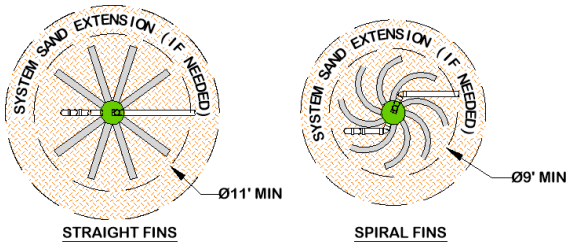
Alternate acceptable sand bed configuration, 236.5 ft^2, with a 2.5 ft. SSE required:



Circular Design Layout

Utilizes a round design which may accommodate constraints of certain sites better than a rectangular bed. Allows for wide dispersal within the system sand bed. Allows for system to be divided into multiple, single unit, EF beds using a D-box to split flows. Individual beds may be sized for different soils (soil profiles) within the same system and site.

Circular bed configurations are allowed when required by site constraints, however it is important to note that circular beds allow sloping and irregular SSEs, however using a rectangular layout in these circumstances will usually be easier to design and construct. Two acceptable circular fin configurations are shown.



Design Procedure

Task 1: Determine Number of EnviroFin Units Needed

a) Residential: Multiply the number of bedrooms times 2 units per bedroom (1 unit per bedroom when preceded by a Remediator).

b) Commercial: Systems with normal strength effluent are calculated by dividing the daily design flow (DDF) 75 gpd per unit (150 gpd per unit when preceded by a Remediator). (Contact Technical Support for high strength wastewater.)

2.0 SYSTEM DESIGN

Task 2: Determine Minimum System Sand Bed Area (SSBA) Required
Using Table B, find where the system's Soil Profile and number of bedrooms intersect to determine the minimum System Sand Bed Area (SSBA) needed for the DDF. For commercial systems, find where the system's Soil Profile and the commercial column intersect to determine the SSBA per 100 GPD. Multiply this number by the DDF, divided by 100 to determine the minimum SSBA.

Task 3: Determine Multiple Bed System Layout
If using multiple beds, calculate the SSBA for each bed by dividing the SSBA by the total number of EF units required for all beds, then multiply by the number of EF units in each bed. Note: If individual beds are located in different soils (perc rates) the minimum SSBA may be calculated separately to accommodate different SLRs, resulting in different sized dispersal areas within the system. Follow the remaining Tasks for each bed individually.

Note: Treatment fins can interlace with the fins from adjacent EF unit(s) as long as there is a minimum of 6 in of system sand between them. This will result in odd dimensions for the unit's length and width. Although allowed, the standard layout is recommended for ease of design and installation.

Task 4: Determine Full Depth System Sand Bed Area (SSBA)
Arrange circular EF unit(s) to best fit site constraints. Find the diameter of the EF unit(s) without sand, from outer edge of fin on one side to outer edge of fin on the other. Add one foot for the 6 in of system sand around the outside of the fins. This is the full depth SSBA diameter. Using curving fins provides the smallest diameter of 9 ft and using straight fins will result in a diameter of 11 ft. Calculate area using $A = \pi(d/2)^2$

Task 5: Calculate Minimum System Sand Bed Diameter
Using the following formula: $2 \, x \, \sqrt{SSBA \div \pi}$ and the SSBA from Task 2 for single bed applications or Task 3 for multiple bed applications, find the minimum system sand bed diameter.

Task 6: Calculate System Sand Extensions (SSE)

a) If the diameter of the minimum SSBA (Task 5) is larger than the diameter of the full SSBA (Task 4), then there will be a 6 in deep, SSE around the full depth SSBA. Subtract the full depth SSBA diameter (Task 4), from the minimum SSBA diameter (Task 5), then divide by 2. This is the distance of the SSE beyond the edge of the full depth SSBA.
b) If the diameter of the minimum SSBA (Task 5) is equal or smaller than the diameter of the full SSBA (Task 4), then there will not be an SSE.

Note: The system sand bed can utilize many different shapes and configurations as long as there is a minimum of 6 in of system sand around the perimeter of the treatment fins and the appropriate minimum SSBA associated with the design flow & soils (perc rate) and the number of EF units within each bed of the system.

Design Example #3 (Circular Beds): Single family residence, two bedrooms, Soil Profile #1, level site, due to a site obstacle the EF units will need to be divided to two locations.

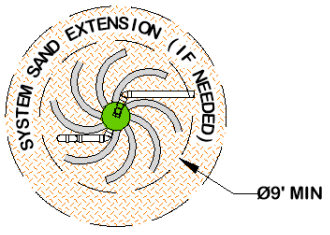
Task 1: Determine number of EnviroFin Units Needed

a) Residential: 2 bedrooms x 2 units per bedroom = 4 units
b) Not applicable.

Task 2: Determine Minimum System Sand Bed Area SSBA Required
Table B shows a minimum SSBA of 222 ft^2 required for a 2-bedroom residence in soil profile #1.

Task 3: Determine Multiple Bed System Layout
SSBA per unit = 222 $ft^2 \div 4$ units = 55.5 ft^2 per unit minimum.

For this example, assume 1 fin will be in a separate location using a round layout configured with fins positioned in spiral layout radiating outward from FDU and the remaining 3 EF units will be placed in one location using a horizontal rectangular layout. Bed sizing will be calculated for the circular bed using the following steps and bed sizing for the rectangular bed will continue with step 4 from the rectangular bed design procedure.



SPIRAL FINS

Task 4: Determine Full Depth System Sand Bed Area

SSBA diameter at full depth using spiral fins is 9 ft. Calculate area A = π(9/2)^2 = 63.62 (round up to 64 ft^2).

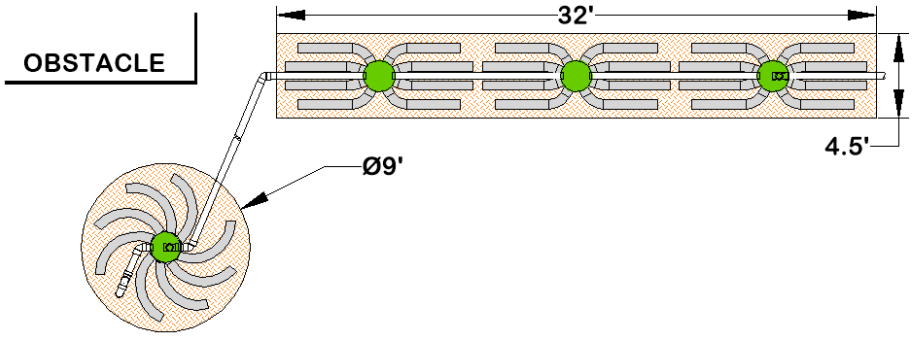
Task 5: Calculate Minimum System Sand Bed Diameter

Using the following formula: $2\ x\ \sqrt{SSBA \div \pi}$ = $2\ x\ \sqrt{55.5 \div \pi}$ = 8.40, ft diameter min. 9 ft diameter fin layout exceeds the required minimum SSBA of 55.5 ft^2 from Task 3.

Task 6: Calculate System Sand Extensions

No SSE is required because the area from Task 5 is greater than the area needed from Task 3.

Illustration of Design Example #3 (units separated to avoid site obstacle):



Note: Many alternative layouts could have been used.

2.3 Design Specifications

The system shall be designed in accordance with this Manual and Maine rules and can be installed utilizing any of the design configurations outlined in this Manual.

Daily Design Flow (DDF)

Residential DDF for EF systems is calculated in accordance with Maine rules. Systems servicing more than two residences shall use the commercial specifications detailed in the sizing tables. The minimum DDF shall be one bedroom for any single-family residential system and 300 gpd for any commercial system.

Septic Tank

The system is designed to treat effluent that has received "primary treatment" in a standard septic tank. Septic tanks shall be sized according to state/local rules. All septic tanks must be equipped with baffles to prevent excess solids from entering the EF system.

Water Purification Systems

- Water purification systems and water softeners should not discharge into any EF system.
- If water purification systems or water softeners must be discharged into the EF system, then the EF system will need to be "oversized." Calculate the total amount of backwash in gpd, multiply by 2, and add this amount to the DDF when determining the septic tank and EF drainfield area sizing.
- Water purification systems and water softeners require regular routine maintenance; consult and follow the manufacturer's maintenance recommendations.

Pressure Distribution

The use of pressure distribution lines in the EF systems is prohibited. Pumps may be utilized when necessary only to gain elevation and to feed a D-box which then distributes effluent by gravity to the EF units. Siphon dosing is permitted; adequate venting is required in a siphon-dosed system or pumped system, which may require an additional high vent (referred to as "differential venting").

2.0 SYSTEM DESIGN

Effluent (Wastewater) Strength

Design specifications for use of the EF system are based on residential strength effluent, which has received primary treatment in a septic tank. Designing a system that will treat higher strength wastes requires additional EF units. In these situations, our Technical Advisors shall be consulted for recommendations at (800) 473-5298.

Effluent Filters

- Effluent filters are not required in Maine and not recommended for use with EF systems.
- If used, effluent filters shall be maintained on at least an annual basis. Follow manufacturer's instructions regarding required inspections, cleaning and maintenance of the effluent filter.
- Effluent filters must allow the free passage of air to ensure the proper functioning of the system.
- Charcoal filters in vent stacks (for odor control) are not recommended by PEI. They can block air flow and potentially shorten system life. Contact PEI for recommendations to correct odor problems.

Flow Equalizers Required

All distribution boxes (D-boxes) used to divide effluent flow require flow equalizers in outlets to the field (not vents). A flow equalizer is an adjustable plastic insert installed in the outlet holes of a D-box to equalize effluent distribution to each outlet whenever flow is divided. Flow equalizers are limited to a maximum of 15 gallons per minute (gpm) per equalizer. Equalized flow distribution in a single series, utilizing one D-box outlet, will not require a flow equalizer.

EnviroFin Requirement

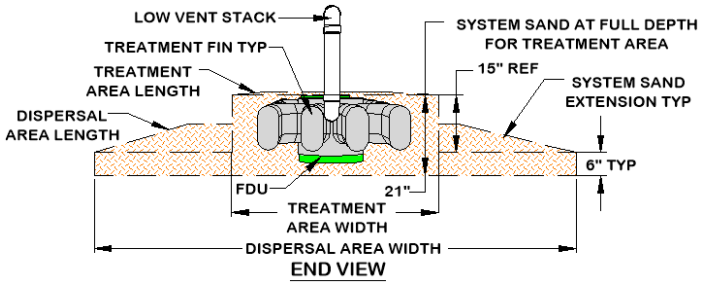
EF systems use the bed sizing tables and installation requirements noted in this Manual.

- Residential systems: 2 units per bedroom. If installed with a Remediator, 1 unit per bedroom.
- Non-Residential/Commercial systems comprised of residential strength effluent: 1 unit per 75 gpd. If installed with a Remediator, 1 unit per 150 gpd.

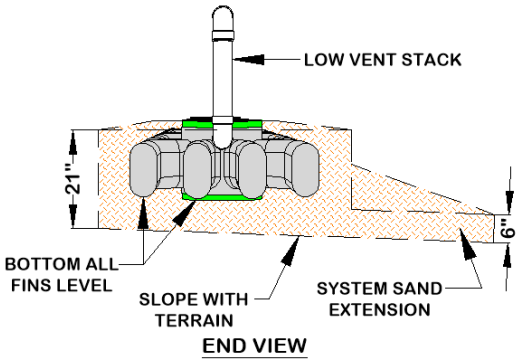
System Sand Extensions (SSE)

The EF units are designed to treat the wastewater in a full depth SSBA. The required number of units are sized based on the design flow to the system. The SSBA is determined by the soils the system is placed in or upon. For the purpose of dispersal and depending on the parent material profile of the soils (soil profile), it may be necessary to increase the SSBA of the EF system beyond what is needed to accommodate the EF units and treatment area within the bed. However, this extra SSBA, only needs to be 6 in in depth and is called a system sand extension (SSE). Calculating and determining if a SSE is necessary, is shown for rectangular bed designs in Section 2.2, page 8, Task 5 and for circular bed designs Section 2.2, page 11, Task 6.

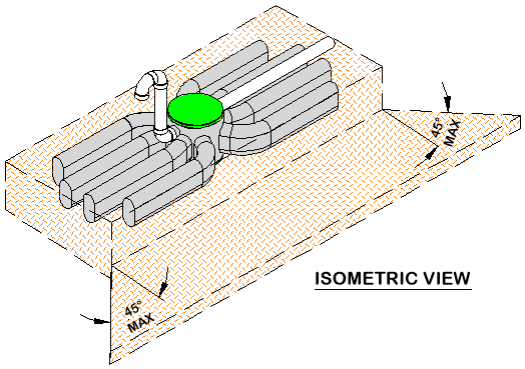
a) For level rectangular sand beds, SSEs are divided to either side, end or both, as the design may require of the EF units as shown.



b) For sloping sites using rectangular sand beds, the SSE is placed entirely on the downslope side of the system sand bed as shown below. Please note that the EF treatment fins portion of the system sand bed will always be constructed level; only the system sand can slope at the same angle as the existing terrain.



c) Sloping SSEs may also expand outward at a 45-degree angle as it travels down the slope, which accommodates the flow path of the effluent. This also helps to minimize the total SSE's width. The equation for calculating the area of the SSE with 45 degree extensions is: (length of full depth SSBA x width of SSE) + (width of SSE)^2. Example: (21.5 ft x 5 ft) + (5 ft)^2 = 132.5 ft^2 area of SSE.



Sloping Sites and Sloping Mound Systems

- The percentage of slope in all system drawings refers to the slope of the system, not the existing terrain ("site slope") and refers to the slope of the bed itself ("system slope"). However, the EF treatment units themselves must be designed and installed level.
- The system slope and the site slope do not have to be the same.
- Maximum site slope is 33% and maximum system slope is 25%.

Table D: System Slopes

Soil Profile	% System Slope Max.	% Site Slope Max.	Configurations Allowed
4, 5 & 6	25	33	All Single and Multi-Level™ Layouts
2			
3, 7			
1, 8	20	25	All Single-Level Layouts
9	10	15	

System slope refers only to the system sand extension and not the treatment area, which must always remain level.

2.0 SYSTEM DESIGN

Separation Distances (Horizontal and Vertical)

The vertical separation to the SHWT or impermeable layer is measured from the bottom of the treatment fins (not the bottom of the FDU). For Multi-Level™ Systems, vertical separation is measured from the treatment fins of the lower units. Horizontal setbacks are measured from the outermost edge of the treatment fins.

Barrier Materials over System Sand

No barrier materials (hay, straw, tarps, etc.) are to be placed between the system sand and cover material. Fine materials from the soils above, will not migrate significantly into the system sand, so no protection is needed.

H-20 Loading

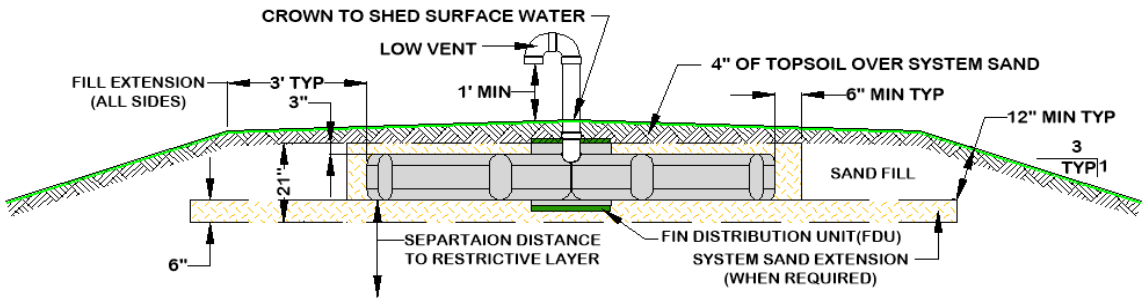
At the present time and until further testing is conducted, the EF wastewater treatment system cannot be specified for H-10 or H-20 loading, or beneath pavement applications.

2.4 System Configurations

Elevated Bed Systems (Mounds)

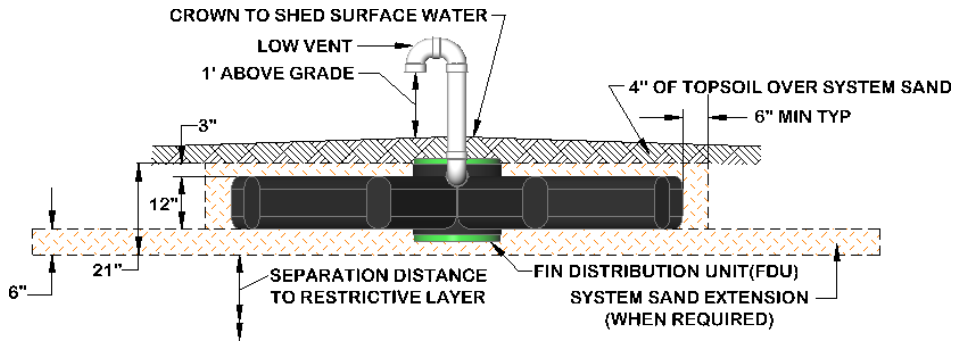
Elevated beds are designed for sites with soil, depth to groundwater or restrictive feature constraints that do not allow for in-ground bed systems. An elevated bed system is a soil absorption field with any part of the system above original grade. Side-slope tapering is used to blend the raised portion of the system with the existing grade. Elevated bed systems require 3 ft fill extensions on each side (measured from the outermost portion of the treatment fin), after which side-slope tapering is to be a maximum of 3 horizontal ft for each 1 ft of vertical drop until it meets existing grade.

Illustration of an elevated level bed:



In-Ground Bed Systems

Systems are installed below existing grade for sites with no soil restrictive features to limit placement. In-ground systems that slope over 5% require a 2.5 ft system sand extension on the downhill side of the field. The EF system in an in-ground application on a level site:



2.0 SYSTEM DESIGN

Equalized Flow Distribution (EQ Distribution)

The septic tank is connected to the first EF unit at the top connection fitted with a modified “Tee” baffle (see section 3.1 Installation Requirements, page 27). Subsequent EF units are connected in a single series using upper and lower connections. EQ distribution systems distribute evenly to each EF unit in the series simultaneously through the bottom connection. EQ distribution system units must all be sited at the same elevation.

Additional criteria:

- May be used for up to 5 bedrooms residential or commercial design flows of 750 gpd or less. For larger flows see Equalized Flow, Combination Distribution (EQ Combination) on page 17.
- Maximum number of EF units in single EQ distribution is 10 units (5 units if using the Remediator).
- For gravity systems, D-boxes are not required.
- The flow is not divided for EQ distribution configurations, so flow equalizers are not required.
- A low vent shall be connected to the upper connection of the last EF unit in the series.

Illustrations of EQ Distribution Configuration:

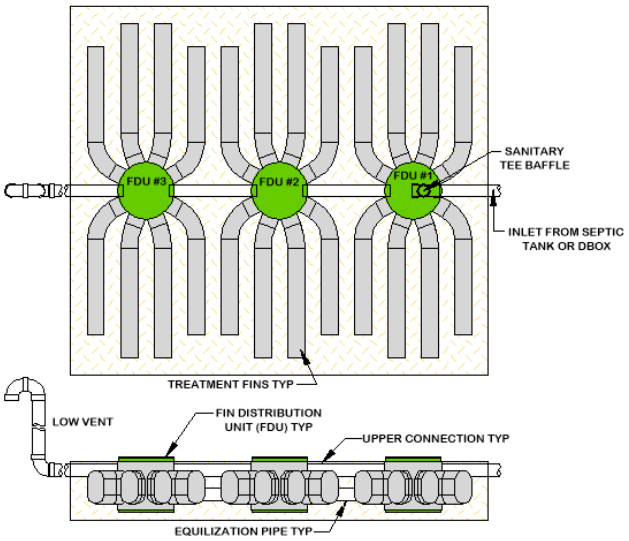
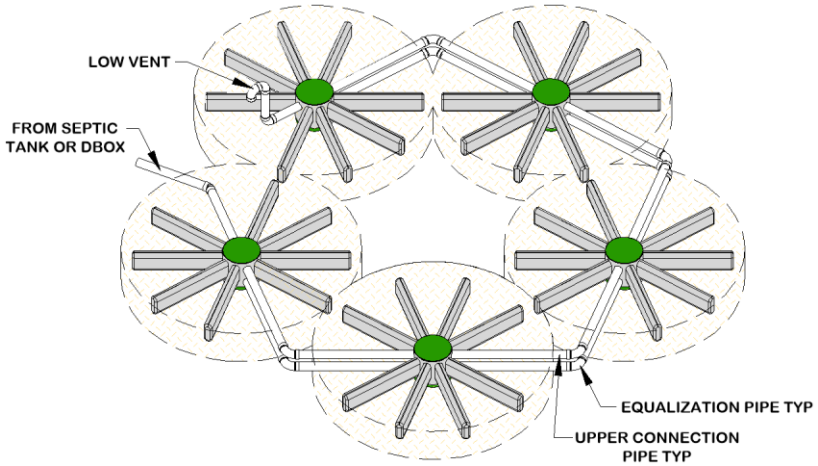


Illustration of EQ Distribution, Circular Configuration:



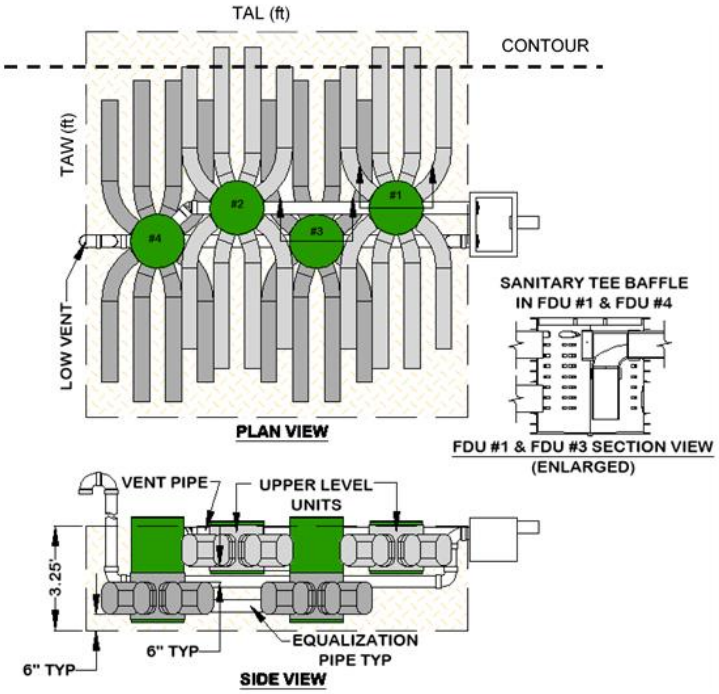
2.0 SYSTEM DESIGN

Equalized Flow Distribution Multi-Level™ (Multi-Level™ EQ Distribution)

Multi-Level™ EQ distribution systems position EF units at multiple levels to allow a smaller footprint for accommodating tight sites in good soils. Multi-Level™ EQ distribution systems must separate flows to each level using a D-box. Multi-Level™ EQ distribution systems follow the requirements for EQ distribution systems except:

- Multi-Level™ EQ distribution systems are limited to soil profiles 2, 3, 4, 5, 6 and 7.
- Full depth SSBA; no system sand extensions are allowed.
- Mound fill extensions are measured from the upper level EF units.
- A minimum of 6 in of system sand separates the bottom of the fin in the upper level EF unit from the top of the fin in the lower level EF unit.
- A vent manifold may connect both levels to a low vent.
- Contact PEI technical assistance for design assistance.

Illustrations of Equalized Flow Distribution Multi-Level™ System Configuration:



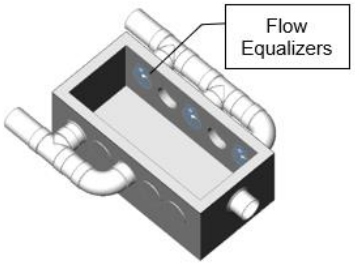
Equalized Flow, Combination Distribution (EQ Combination)

EQ combination distribution within one bed, or multiple beds, is required for systems with more than 5 bedrooms or commercial DDF's greater than 750 gpd with each individual section not exceeding these limits. EQ combination distribution systems distribute effluent evenly to each EF unit in each section simultaneously through the bottom connection. EQ combination systems may be designed and installed on a slope by dividing flows with a d-box to each elevation (and section). EQ combination distribution consists of two or more sections installed within a single or multiple bed.

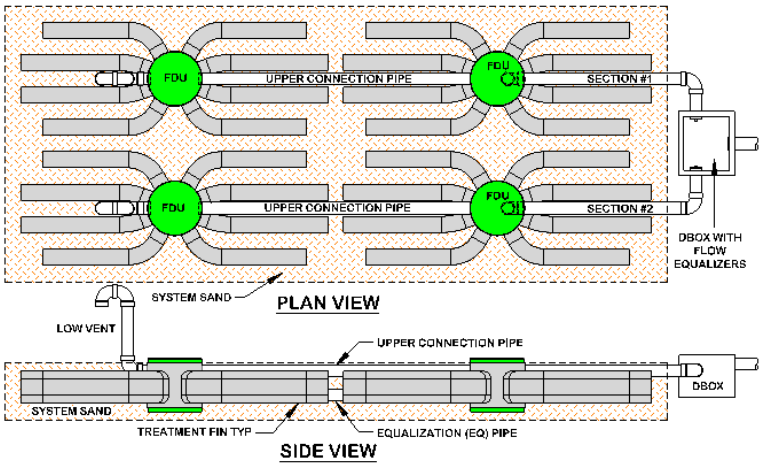
- Each EQ distribution section in an EQ combination system consists of a series of EF units.
- Maximum number of EF units in an EQ series is 10 units (5 units if using a Remediator) with all EF units at the same elevation.
- EQ combination sections may contain different amounts of EF units if flow is divided properly.

2.0 SYSTEM DESIGN

- Divide flows to uneven sections by manifolding D-box outlets such that each outlet feeds a single EF unit. Example: Two sections, one with 2 EF units and the other with 3 EF units. Manifold 2 D-box outlets to one section and 3 outlets to the other section.
- Section loading limit is 750 gpd.
- There is no limit on the number of EQ combination distribution sections within a bed.



Illustrations of Single Level EQ Combination Distribution Systems:

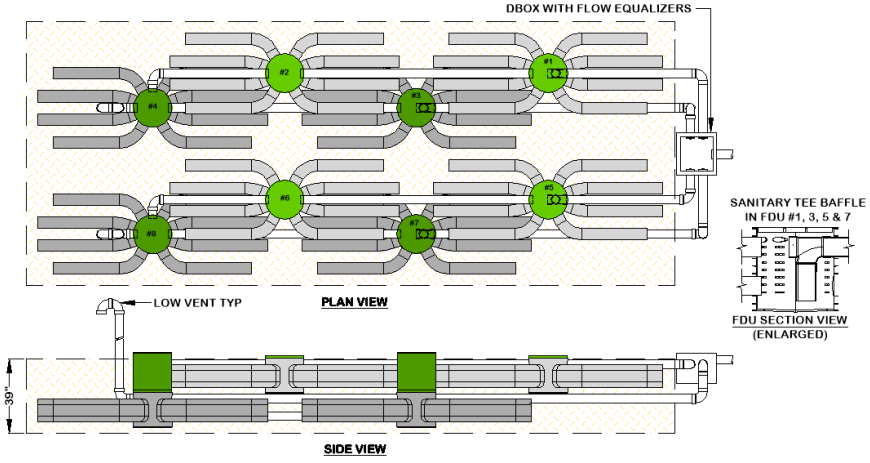


Equalized Flow, Combination Distribution Multi-Level™ (Multi-Level™ EQ Combination)

Equalized flow, combination distribution Multi-Level™ systems position EF units at multiple levels to allow a smaller footprint for accommodating tight sites in good soils. Multi-Level™ EQ combination systems follow the requirements for single level EQ combination systems except:

- Multi-Level™ EQ combination systems are limited to soil profiles 2, 3, 4, 5, 6 and 7.
- Full depth SSBA; no system sand extensions are allowed.
- Mound fill extensions are measured from the upper level EF units.
- A minimum of 6 in of system sand separates the bottom of the upper level EF unit fins from the top of the lower level EF unit fins.
- Effluent is delivered to each level separately using a d-box.
- A vent manifold may connect both levels to a low vent.

Illustrations of Multi-Level™ EQ Combination Distribution Systems:



Individual D-box Distribution

Individual D-box distribution is a configuration where every EF unit is fed individually from a D-box outlet.

- Flow equalizers must be used in the D-box outlets feeding the EF units.
- Each EF unit requires a modified inlet "Tee" baffle.
- EF units may be contained in a single bed or multiple beds.
- EF units may be arranged at a single elevation, different elevations, or on a slope.
- The D-box outlet invert will be at or above the elevation of the highest EF unit's inlet invert.

Multiple Bed Distribution

Multiple bed distribution incorporates two or more beds (single level or Multi-Level™), each bed with EQ flow, EQ combination, or individual D-box distribution. Multiple beds may consist of different size beds, as long as the D-box outlet ratio matches the ratio of EF units within the beds. For instance: 3 beds with 3 EF units in the first bed, 2 EF units in the second bed and one unit in the third bed would be fed from a D-box by 3 manifolded outlets, 2 manifolded outlets and a single D-box outlet, respectively. Multiple beds may be oriented along the contour of the site, along the slope of the site or at different elevations.

- In multiple bed distribution, a single bed may consist of as little as a single EF unit.
- Multi-Level™ systems may be used in multiple bed configurations.
- The D-box outlet invert will be at or above the elevation of the highest EF unit's inlet invert.
- Test pit/perc tests should indicate the soils in each bed location, allowing the ability to size each location according to soil type.

Illustration of End-to-End Multiple Beds:

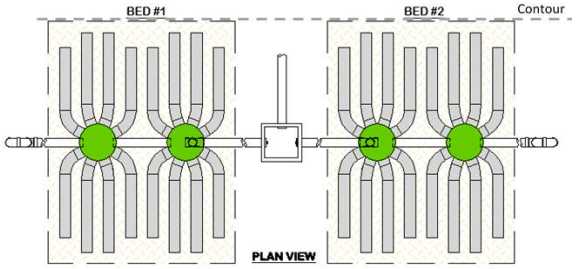
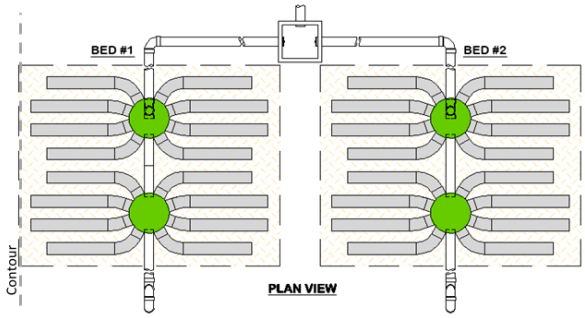


Illustration of Side-to-Side Multiple Beds:



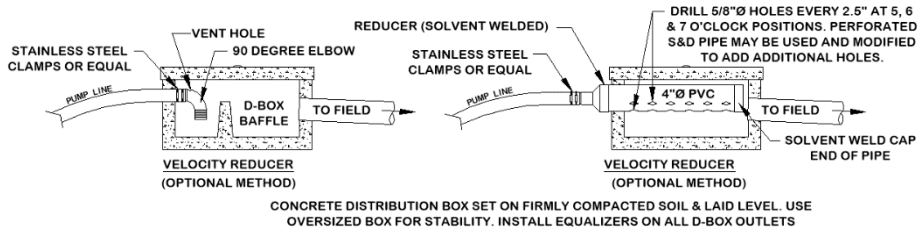
2.5 Pump Systems

Pumped systems supply effluent to the system using a pump and D-box when site conditions do not allow for a gravity system. Dosing siphons are also an acceptable means of delivering effluent to the system.

- Pump volume per dose shall be no greater than 40 gallons times the total number of EF units.
- Pump dosing should be designed for a minimum of 6 cycles per day; 6-8 cycles per day are recommended.
- If possible, the dosing cycle should provide one hour of drying time between doses.
- Pump systems must have a high-water alarm float or sensor installed inside the pump chamber. Follow state, local and national code requirements.
- Pumped systems with equalized flow distribution are limited to a maximum dose rate of 40 gpm and do not require the use of a flow equalizer on the D-box outlet. Never pump directly into the EF FDU.
- All pump systems require differential venting.
- All pumped systems require a D-box with baffles, a velocity reducing tee or other means to be used for velocity reduction.
- All systems with combination distribution or multiple bed distribution shall use flow equalizers in each D-box outlet with each bed or EQ distribution section or EQ combination system limited to a maximum of 15 gpm, due to the flow constraints of the equalizers.
    - *Example: pumping to a combination system with 3 sections (using 3 D-box outlets). The maximum delivery rate is (3 x 15) = 45 gpm.*

- The rate at which effluent enters the EF FDU shall be controlled. Excessive effluent velocity can disrupt solids that settle in the FDU.
    - Effluent shall never be pumped directly into the EF unit.
    - A D-box or tank shall be installed between the pumping chamber and the unit to reduce effluent velocity.
    - Force mains shall discharge into a D-box (or equivalent) with velocity reducer such as a baffle, 90° bend, tee or equivalent.
- Velocity reducers are also needed for gravity systems when there is excessive slope between the septic tank and the system.

Two methods of velocity reduction:



2.6 Venting

An adequate air supply is essential to the proper functioning of EF systems. Venting is always required. All systems shall utilize differential venting. Venting is established through suction (chimney effect) created by the draw of air from the high vent, which pulls air from the low vent.

General Rules

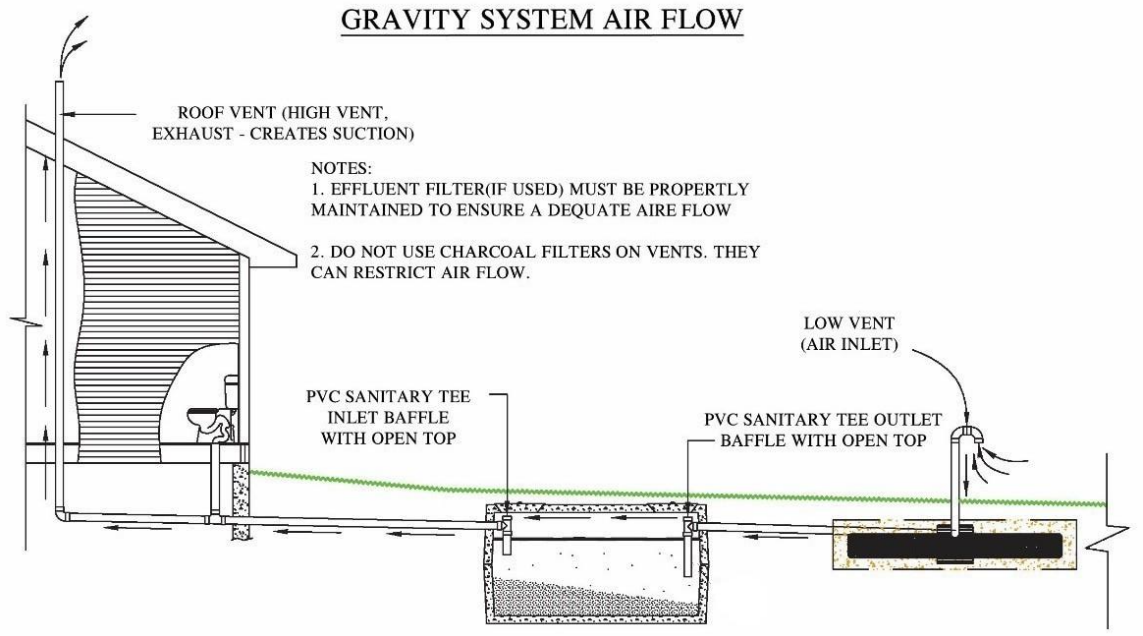
- Differential venting is the use of high and low vents in a system.
- In a gravity system, the roof stack acts as the high vent.
- High and low vent openings shall be separated by a minimum of 10 vertical ft.
- If possible, the high and low vents should be of the same capacity.
- Roof vent diameter must be a minimum of 3 in, 4 in diameter is recommended. If the roof vent is less than 3 in, an additional high vent is recommended.
- Vent openings shall be located to ensure the unobstructed flow of air through the entire system.
- The low vent inlet shall be a minimum of 3 ft above final grade or anticipated snow level. Vents extending more than 3 ft above grade must be anchored to a post or other stable object.
- Sch. 40 or SDR 35 PVC (or equivalent) should be used for all vent stacks.
- One 4 in vent is required for up to and including 20 EF units.
- Multiple 4” vents or a 6” vent is required for more than 20 EF units.
- Multiple units requiring more than one low vent may be manifolded together as is practicable in order to reduce the number of low vents.
- A single 6 in vent may be installed in place of up to three 4 in vents.
- If a vent manifold is used, it shall be at least the same diameter as the vent(s).
- Vent piping should slope downward toward the system to prevent moisture from collecting in the pipe and blocking the passage of air.
- Remote venting or By-Pass venting may be utilized to minimize the visibility of vent stacks.
    - *For options to relocate the high vent, see Remote Venting, page 21.*
    - *For options to eliminate the high vent, see Bypass Venting, page 22.*
- When venting multiple beds, it is preferred that each bed be vented separately (have their own high and low vents) rather than manifolding bed vents together. Multiple vents can be remotely located to the same location if desired.
- Vents for Multi-Level™ beds must connect to the lower level rows.

2.0 SYSTEM DESIGN

Gravity Systems Vent Location

- A low vent is installed at the end of the last unit of each series (EQ section) utilizing the upper connection of the end unit.
- The house (roof) vent functions as the high vent as long as there are no restrictions or other vents between the low vent and the house (roof) vent.
- When the house (roof) vent functions as the high vent, there shall be a minimum of a 10 ft vertical differential between the low and high (roof) vent openings.

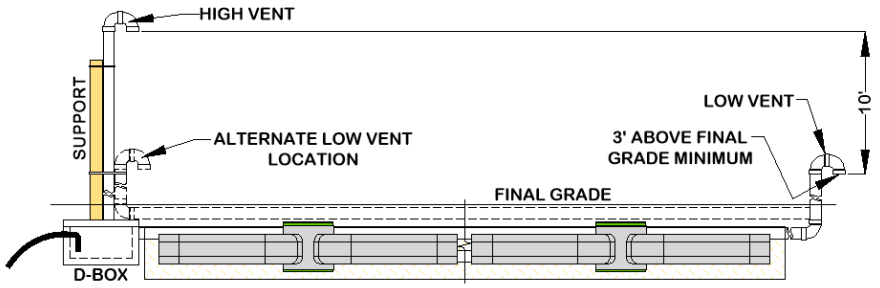
Illustration of gravity system air flow:



Pump System Vent Locations

Pump system venting must meet the following requirements:

- A low vent is installed at the end of the last unit of each EQ section either through the top cover or end unit.
- A high vent is installed through an unused D-box outlet.
- The low vent may be attached to the D-box and the high vent attached to the end of the last EF unit (or manifold) only when the D-box is insulated against freezing.

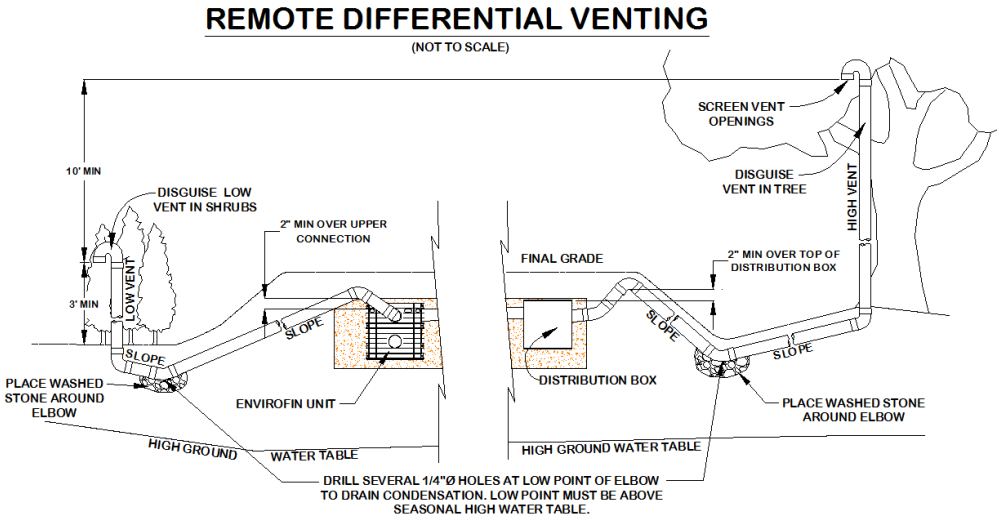


Remote Venting

If site conditions do not allow the vent pipe to slope toward the system, or the owner chooses to utilize remote venting for aesthetic reasons (causing the vent pipe not to slope toward the system), the low point of the vent line must be drilled creating several ¼ in holes to allow drainage of condensation. This procedure may only be used if the vent pipe connecting to the system has:

- A **high point** that is above the highest point of all EF units or the D-box; and,
- A **low point** opened for drainage which is above the SHWT.

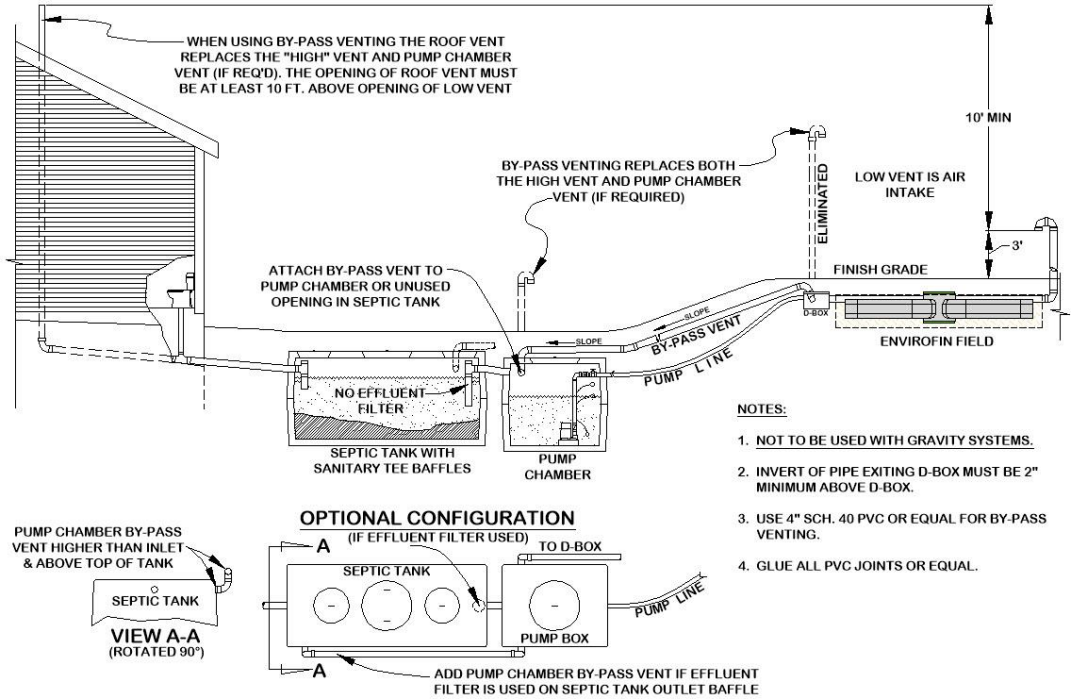
Illustration of Remote Venting:



By-Pass Venting

When a field is fed using pumping or dosing, it is necessary to provide air flow through the system by using either an independent high vent at the field or "by-pass venting". For by-pass venting, the system is plumbed by attaching Sch. 40 or SDR 35 PVC from the D-box back to the septic tank or pump chamber if no effluent filter is present. This process "by-passes" the pump line and allows air to flow from the low vent to the roof vent which functions as the high vent. The bypass vent line invert must rise 2 in above the D-box before dropping to the pump chamber or septic tank.

Illustration of by-pass venting:

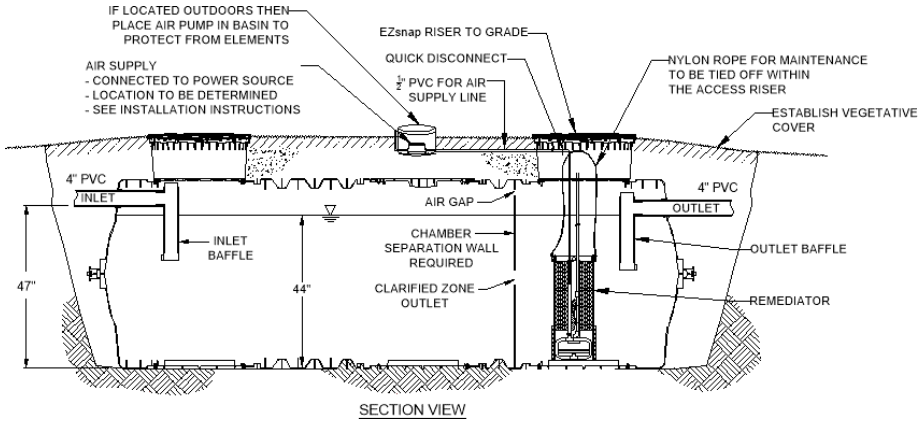


Vent Manifolds

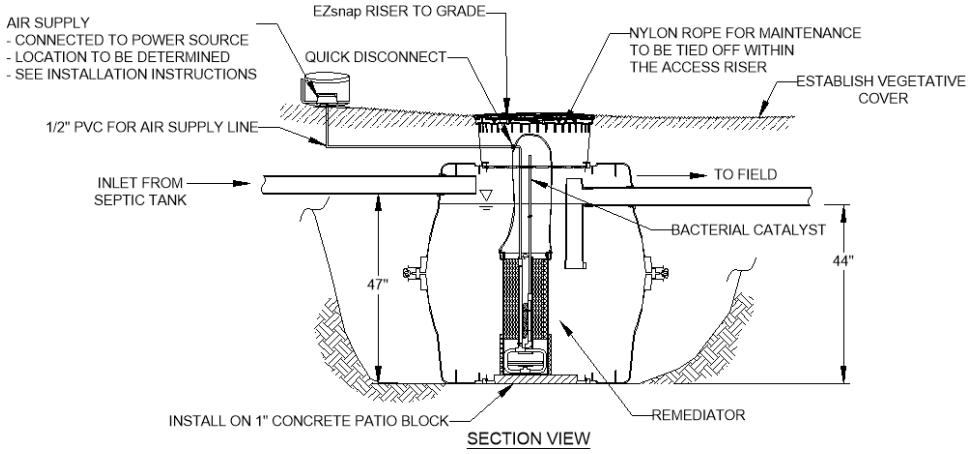
A vent manifold may be incorporated to connect the ends of a number of sections or rows of EF units to a single vent opening. Slope the lines connecting the manifold to the FDU to drain condensation.

2.7 Aquaworx Remediator

The Aquaworx Remediator (Remediator) system provides aerobic conditions to significantly reduce wastewater strength and increase the dissolved oxygen concentration in the effluent. The bacteria within the oxygen-rich wastewater works to minimize the waste materials suspended in the effluent. The Remediator may be installed in the last chamber of a state approved multi-compartment septic tank per manufacturer requirements, or in a separate vessel. Illustrated below is the option of installing a Remediator in the outlet chamber of a 1,500-gallon Infiltrator IM-1530 plastic tank configured for multi-compartment use:



The Remediator may also be placed in a separate vessel downstream of the septic tank with a minimum volume of 500 gallons. Illustrated below is the Remediator placed in a 500-gallon Infiltrator IM-540 plastic tank downstream of the septic tank.



Calculating EnviroFin Units with a Remediator

When using a Remediator upstream of an EF field, the number of EF units required is calculated at 1 unit per bedroom for residential systems or 1 unit per 150 gpd for commercial systems treating residential effluent. For example: a three-bedroom home = 450 gpd ÷ 150 gpd/unit = 3 units. If the answer is fractional, always round up to the nearest whole number of units. This assumes residential strength wastewater.

2.8 Site Selection

Determining Site Suitability

Refer to state or local rules regarding site suitability requirements.

Topographic Position Requirement

EF systems shall not be located where surface or ground waters will converge, causing surface water flow to become concentrated or restricted within the soil absorption field. The system shall be located in an area that does not concentrate water, both surface and subsurface. If allowed by state and local authorities, altering the terrain upslope of a system may alleviate this requirement if the waters are sufficiently altered to redirect flows away from the field.

- Locate systems on convex, hill, slope or level locations. Avoid swales, low areas, or toe-of-slope areas that may not provide sufficient drainage away from the system.
- No onsite system may be located on concave slopes that concentrate surface or ground water flows unless up-slope terrain is sufficiently altered, or interceptor drains are used to redirect water away from the system.
- Systems should not be located where lawn irrigation, roof drains, or natural flows increase water loading to the soils around the system.
- Divert surface water away from the system. Interceptor drains, if used, must be upslope and a minimum of 10 ft away from the EF system and designed to avoid ponding.
- Systems should not be located where structures such as curbs, walls or foundations might adversely restrict the soil's ability to transport water away from the system.
- Systems should be located to allow access for septic tank maintenance and to all FDU's for effluent removal.
- Avoid locating systems in rocky or wooded areas that require additional site work, since this may alter the soil's ability to accept water.
- No trees or shrubs should be located within 10 ft of the system to prevent root infiltration.

3.0 INSTALLATION

3.1 Installation Requirements

Component Handling

- Keep mud, grease, oil, etc. away from all components. Avoid dragging treatment fins through wet or muddy areas. Store units on high and dry areas to prevent surface water and soil from entering the fins or contaminating the fabric prior to installation.
- The outer fabric of the fins is ultra-violet stabilized; however, this protection breaks down after a period of time in direct sunlight. To prevent damage to the fabric, allow system to remain in cardboard packaging until ready to install or cover the EF units with an opaque tarp if stored outdoors.

Site Preparation Prior to Excavation

1. Locate and stake out the full depth SSBA, extension areas and soil material cover extensions on the site according to the approved plan.
2. Install sediment/erosion control barriers prior to beginning excavation to protect the system from surface water flows during construction.
3. Do not stockpile materials or equipment within the portion of the site receiving system sand.

Critical Reminder to Prevent Soil Compaction

It is critical to keep excavators, backhoes, and other equipment off the excavated or tilled surface of a bed. Before installing the system sand, excavation equipment should be operated around the bed perimeter; not on the bed itself. Avoid using construction equipment down slope of the system to prevent soil compaction.

When to Excavate

- Do not work wet or frozen soils. If a fragment of soil from about 9 in below the surface can easily be rolled into a wire, the soil moisture content is too high for construction.
- Do not excavate the system area immediately after, during or before precipitation.

Tree Stumps

Before tilling, remove all grass, leaves, sticks, brush and other organic matter or debris including all topsoil from any area to receive system sand or sand fill. Remove all tree stumps and the central root system below grade by using a backhoe or excavator with a mechanical “thumb” or similar extrication equipment, lifting or leveraging stump in a manner that minimizes soil disturbance. It is not necessary for the soil of the system site to be smooth when the site is prepared.

- Avoid soil disturbance, relocation, compaction, mechanical leveling, or tamping of dislodged soil.
- Fill all voids created by stump or root removal with system sand or sand fill.

Raking and Tilling Procedures

All areas receiving system sand, sand fill, and fill extensions shall be raked or tilled to remove the organic layer. If a backhoe/excavator is used to till the site, fit it with chisel teeth and till the site. The backhoe/excavator shall remain outside of the proposed system sand area and all areas that will be impacted by side-slope tapering. Remove all stones larger than 6 in, stumps roots, grass, brush and other organic matter or debris from the excavated system site.

- For in-ground bed systems, excavate the system bed as necessary below original grade. Using an excavator or backhoe, tilt the bucket teeth perpendicular to the bed and use the teeth to rake furrows 2 in – 6 in deep into the bottom of the entire area receiving system sand or sand fill (“receiving area”).
- For elevated bed systems, remove all organics and topsoil in the footprint of the dispersal area prior to installing system sand. Next, use an excavator or backhoe to rake furrows 2 in – 6 in deep into the receiving area.

Note: It is not necessary for the soil of the system site to be smooth when the site is prepared.

3.0 INSTALLATION

Install System Sand and/or Sand Fill Immediately After Excavation

- To protect the tilled area from damage by precipitation, install system sand immediately after tilling.
- Work off either end or the uphill side of the system to avoid compacting soil.
- Keep at least 6 in of sand between the vehicle tracks and the tilled soil of the site if equipment must work on receiving soil. Heavy equipment with tires shall never enter the receiving area due to likely wheel compaction of underlying soil structures.
- Track construction equipment should not travel over the installed EF units and treatment fins. Mark location(s) of individual units and work around them.
- Using the properly specified system sand, place at least 6 in of material on the scarified surface(s).
- Level the top of the system sand to the required elevation within ±1/2 in.
- Locate the center of the FDUs with a grade stake or other means and remove 3 in of system sand large enough to accommodate the FDU. This will leave 3 in of system sand below the FDU.

Assembling the EnviroFin Unit

Assemble the EF unit according to the instructions provided in the package. Assembly videos are also available on our website at www.presbyeco.com.

EnviroFin Unit Installation

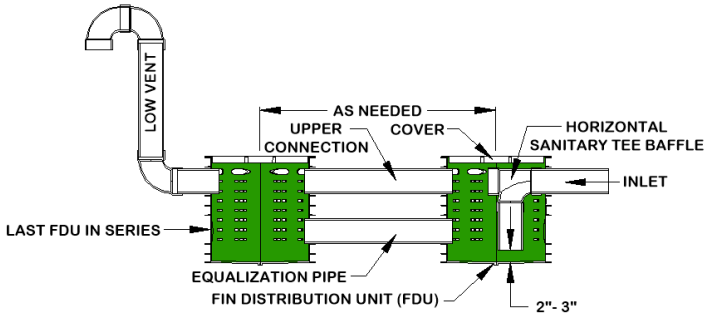
Once the dispersal field has been properly prepared, place the required number of assembled EF units required by the approved plan and DDF. To install the EF units:

1. Place the assembled EF units on the full depth SSBA by centering the FDU in the prepared holes excavated earlier. Notice the orientation of the inlet and outlet holes of the FDU and orient them to allow easy connection with the inlet sewer line. This should be clearly shown on the approved design.
2. Using grade stakes and/or system sand, position the EF treatment fins to allow at least 6 in of system sand between all the fins.

Connecting EnviroFin Units

1. Verify the distance between centers of the FDU's is a minimum of 4 ft center to center or as noted on the approved design.
2. Mark and cut all 4-in plastic pipe to required lengths. Sch. 40 pipe should be used. Remember to add 4 in to allow the pipe to extend into the inside of FDU(s). Remove all burred edges of pipes.
3. The first EF unit of a series or group is required to have a sanitary tee baffle on the inlet side of the FDU.
4. The bottom of the inlet baffle must extend downward to within 2 - 3 in of the FDU's bottom.
5. Connect the upper feed and equalization pipes to the next FDU if connected in series to multiple units. If the EF unit is the last module in a series or one of multiple satellite units, the upper exit pipe is used as the vent and there will be no outlet equalization pipe needed (inlet only). The upper feed pipe may be installed after backfilling with system sand to that level.
6. All plastic pipe joints must be glued or joined with stainless steel fasteners.
7. Repeat as necessary for additional EF units.

Section view of EF unit with baffle and connections (fins not shown):

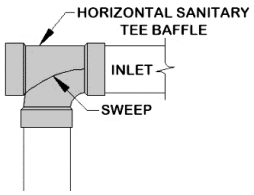


3.0 INSTALLATION

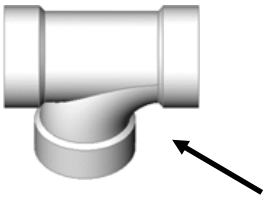
Horizontal Sanitary Tee (not supplied)

Attached to the 4-in sewer line from the septic tank or D-box is a horizontal 4-in sanitary tee, which is used to create an inlet baffle inside the FDU. The sanitary tee is not supplied by PEI. The downspout portion of this baffle must be sized to locate the bottom of the baffle 2.5 in (+/- ½") from the bottom of the FDU. This baffle system is only required in the first EF unit. When connected in series, subsequent units utilize equalized flow distribution (EQ distribution) through the bottom connection, so a tee is not required.

Illustration of Horizontal Sanitary Tee:



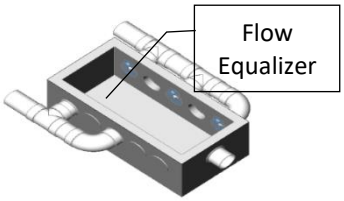
Sanitary Tee Enlarged:



Distribution Box Installation

It is essential that the D-box remain level after installation in order to ensure even distribution to all rows within the system. To prevent movement, the D-box shall be set on a layer of level compacted soil, sand, pea gravel base or a concrete footing. Take care when backfilling that the D-box remains level.

Distribution Box (D-box) Manifold for Splitting Uneven Flows



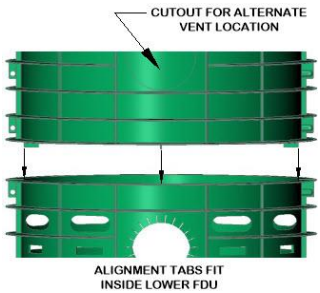
Divide flows to uneven sections or multiple beds by manifolding D-box outlets such that each outlet feeds a single EF unit. Example: Two sections, one with 2 EF units and the other with 3 EF units. Manifold 2 D-box outlets to one section and 3 outlets to the other section. This configuration will divide flows appropriately. Flow equalizers are required in all D-box outlets which split effluent flows.

Level Tolerances

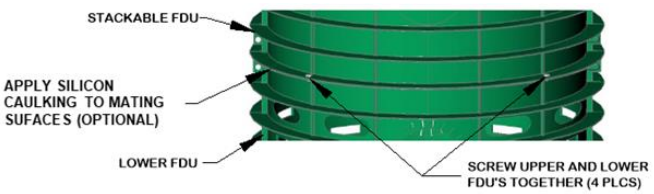
Use a laser level or transit to install the EF unit level. Variations beyond 1/2 in (± ¼ in) for the FDU and variations beyond 1 in (± ½ in) for the treatment fins may affect system performance and are not acceptable.

Installing Stackable FDU (Riser) as needed

Some installations will have more material cover than traditional systems which may place access to the top of the FDU cover more than 12 in below grade. PEI offers an optional extension kit called a stackable FDU that is placed on top of the lower FDU. The cover is then attached to the top of the stackable FDU. Use the following procedure when an FDU extension is required once the bottom FDU, treatment fins, and system sand are installed:



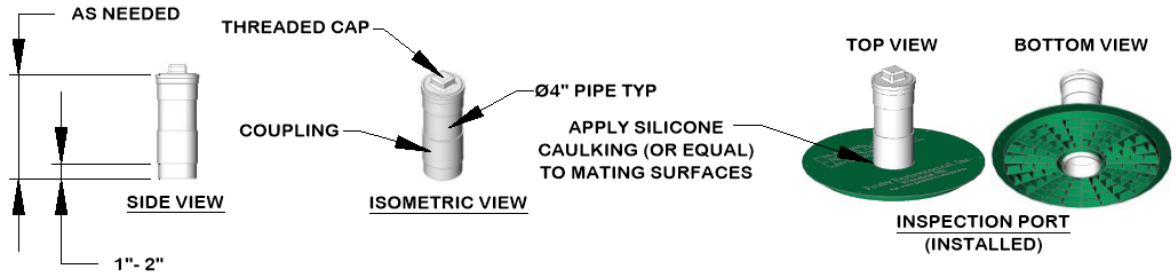
1. Join two stackable FDU halves with the supplied stainless-steel screws.
2. Remove cover from bottom FDU.
3. Place and secure stackable FDU on top of the lower FDU (in place of the cover) making sure the alignment tabs on the stackable FDU are inside the lower FDU. Screw the upper FDU to the lower FDU with the supplied stainless-steel screws.
4. Place and secure cover on stackable FDU.
5. The 4-in diameter cutout in the stackable FDU can be used as an alternate location for the vent.
6. Install design-required fill sand and topsoil around the stackable FDU.



3.0 INSTALLATION

Inspection Port (optional)

When an inspection port is desired or mandated by regulators, the cutout in the center of the cover is used. The cutout will accommodate 4-in Sch. 20 to 40 pipe. The inspection port is constructed from third party plastic pipes and fittings. The inspection port is to be constructed with watertight fittings and joints. The top of the port should be within a few inches of the final grade. The inspection port may also extend above the final grade. Apply silicon caulking (or equal) to the inspection port and cover's mating surfaces.
Illustration of typical inspection port:



Backfilling EnviroFin Unit(s)

1. Place and secure cover on FDU with stainless steel screws provided.
2. Attach inspection port if required. Apply silicon caulking to mating surfaces.
3. Carefully place system sand around treatment fins, FDU's, upper connection and EQ Connection pipe. Lightly tamp to fill voids.
4. Ready for state and/or local inspection if required.
5. Optional - Place magnetic tape or ferrous metal (rebar, etc.) over top of FDU(s) so they can be located easily using a metal detector.
6. Continue placing system sand to a minimum of 3 in over the treatment fins and a minimum of 6 in beyond the perimeter of the outermost treatment fins.
7. Once required amount of system sand is achieved, place topsoil (material free of organics, stones over 4 in and building debris, having a texture similar to the soil at the site), without causing compaction.
8. Grade field to shed water.

Backfilling and Final Grading

1. Spread a minimum of 4 in of suitable earth cover (topsoil or loam) free of organics, stones over 4 in and building debris, having a texture similar to the soil at the site, without causing compaction.
2. To prevent erosion, soil cover above the system shall be planted with native, shallow-rooted vegetation such as grass, wildflowers and certain perennials or ground covers. No trees or shrubs should be located within 10 ft of the system perimeter to prevent roots from growing into and damaging the system.

Fill Extensions Requirements

All systems with any portion of the system sand bed above original grade require 3 ft fill extensions on each side beyond the outside edge of all EF treatment fins and then tapering to meet existing grade at a maximum slope of 3:1. There must be a minimum of 12 in of cover material over the ends of all system sand extensions (if present).

4.0 REJUVENATION AND EXPANSION

4.1 Bacteria Rejuvenation and Expansion

Why Would System Bacteria Rejuvenation Be Needed?

Bacteria rejuvenation is the return of bacteria to an aerobic state. Flooding, improper venting, alteration or improper depth of soil material cover, use of incorrect sand, sudden use changes, introduction of chemicals or medicines, and a variety of other conditions can contribute to converting bacteria in any system from an aerobic to an anaerobic state. This conversion severely limits the bacteria's ability to effectively treat effluent, as well as limits liquids from passing through. A unique feature of the EF system is its ability to be rejuvenated in place.

How to Rejuvenate System Bacteria

System bacteria are "rejuvenated" when they return to an aerobic state. By using the following procedure, this can be accomplished in most EF systems without costly removal and replacement.

1. Contact PEI before attempting rejuvenation for technical assistance.
2. Determine and rectify the problem(s) causing the bacteria conversion.
3. Drain the septic tank and EF units at each FDU of wastewater using a state approved septage hauler. No effluent is allowed to reach ground or surface waters. Note: All EF units connected with an equalized connection can be drained from a single EF unit in the series.
4. Expose and open the D-box (if present).
5. Safeguard all system openings and excavations.
6. Guarantee a passage of air through the system.
7. Allow all units to dry for 72 hours minimum. The system sand should return to its natural color.
8. Re-assemble the system to its original design configuration. As long as there is no physical damage to the system components, the original components may be reused.

Reusable Components

EF components are not biodegradable and may be reused. In cases of improper installation, it may be possible to excavate, clean, and reinstall all system components.

System Expansion

Enviro-Fin systems are easily expanded by adding units to the original design or by adding additional sections. All system expansions must comply with State and local regulations. Permits may be required prior to system expansion.

System Replacement

In the unlikely event that an EF system needs to be replaced (out-of-spec system sand, sited at wrong elevation, etc.):

- It can be reinstalled in the same location, eliminating the need for a replacement field reserve area.
- All unsuitable material must be removed prior to replacement system construction.
- Disposal of hazardous materials to be in accordance with state and local requirements.
- If the soils under and around the system have not been compromised, replace in the same excavated location with new system sand.
- If components are not damaged, they may be cleaned and reused.

Note: Permits may be required for system replacement.

5.0 OPERATION AND MAINTENANCE

5.1 Operation and Maintenance

Proper Use

EF systems do not require a maintenance and monitoring agreement, however they do require minimal maintenance as is standard for conventional onsite systems, provided the system is not subjected to abuse. An awareness of proper use and routine maintenance will guarantee system longevity. We encourage all system owners and service providers to obtain and review a copy of our Owner's Manual, available from our website www.presbyeco.com or via mail upon request to (800) 473-5298 or info@presbyeco.com.

System Abuse Conditions

The following conditions constitute system abuse:

- Liquid in high volume (excessive number of occupants and use of water in a short period of time, leaking fixtures, whirlpool tubs, hot tubs, water softening equipment or additional water discharging fixtures if not specified in system design).
- Solids in high volume (excessive number of occupants, paper products, personal hygiene products, garbage disposals or water softening equipment if not specified in system design).
- Antibiotics and medicines in high concentrations.
- Cleaning products in high concentrations.
- Fertilizers or other caustic chemicals in any amount.
- Petroleum products in any amount.
- Latex and oil paints.
- System suffocation (compacted soils, barrier materials, etc.) without proper venting.

System Maintenance/Pumping of the Septic Tank

- Inspect the septic tank at least once every two years under normal usage.
- Pump the tank when surface scum and bottom sludge occupy one-fourth or more of the liquid depth of the tank.
- If a garbage disposal is used, the septic tank will likely require more frequent pumping.
- After pumping, inspect the septic tank for integrity to ensure that no groundwater is entering it. Also check the integrity of the tank inlet and outlet baffles and repair if needed.
- Inspect the system to ensure that vents are in place and free of obstructions.
- Effluent filters require ongoing maintenance due to their tendency to clog and cut off oxygen to the system. Follow filter manufacturer's maintenance instructions and inspect filters frequently.

Note: PEI does not recommend the use of septic system additives.

Site Maintenance

It is important that the system site remain free of shrubs, trees, and other woody vegetation to within a minimum of 10 ft of the system, including the entire SSBA, and areas impacted by side slope tapering and perimeter drains (if used). Roots can infiltrate and cause damage or clogging of system components. If a perimeter drain is used, it is important to make sure that the outfall pipes are screened to prevent animal activity. Also check outfall pipes regularly to ensure that they are not obstructed in any way.

6.0 WARRANTY

6.1 PRESBY ENVIRONMENTAL, INC. STANDARD LIMITED WARRANTY

(a) The structural integrity of each unit or accessory manufactured by Presby Environmental, Inc. (collectively referred to as "Units"), when installed and operated in an onsite wastewater system in accordance with Presby Environmental's installation instructions, is warranted to the original purchaser ("Holder") against defective materials and workmanship for one year from the date upon which a septic permit is issued for the septic system containing the Units; provided, however, that if a septic permit is not required for the septic system by applicable law, the one (1) year warranty period will begin upon the date that installation of the septic system commences. In order to exercise its warranty rights, Holder must notify Presby Environmental in writing at its corporate headquarters in Whitefield, New Hampshire within fifteen (15) days of the alleged defect. Presby Environmental will supply replacement Units for those Units determined by Presby Environmental to be defective and covered by this Limited Warranty. Presby Environmental's liability specifically excludes the cost of removal and/or installation of the Units.

(b) THE LIMITED WARRANTY AND REMEDIES IN SUBPARAGRAPH (a) ARE EXCLUSIVE. THERE ARE NO OTHER WARRANTIES WITH RESPECT TO THE UNITS, INCLUDING NO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

(c) This Limited Warranty shall be void if any part of the Presby Environmental system (unit or other accessory) is manufactured by anyone other than Presby Environmental. The Limited Warranty does not extend to incidental, consequential, special or indirect damages. Presby Environmental shall not be liable for penalties or liquidated damages, including loss of production and profits, labor and materials, overhead costs, or other losses or expenses incurred by the Holder or any third party. Specifically excluded from Limited Warranty coverage are damage to the Units due to ordinary wear and tear, alteration, accident, misuse, abuse or neglect of the Units; the Units being subjected to vehicle traffic or other conditions which are not permitted by the installation instructions; failure to maintain the minimum ground covers set forth in the installation instructions; the placement of improper materials into the system containing the Units; failure of the Units or the septic system due to improper siting or improper sizing, excessive water usage, improper grease disposal, or improper operation; or any other event not caused by Presby Environmental. This Limited Warranty shall be void if the Holder fails to comply with all of the terms set forth in this Limited Warranty.

Further, in no event shall Presby Environmental be responsible for any loss or damage to the Holder, the Units, or any third party resulting from installation or shipment, or from any product liability claims of Holder or any third party. For this Limited Warranty to apply, the Units must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and Presby Environmental's installation instructions.

(d) No representative of Presby Environmental has the authority to change this Limited Warranty in any manner whatsoever, or to extend this Limited Warranty. No warranty applies to any party other than the original Holder.

The above represents the standard Limited Warranty offered by Presby Environmental. A limited number of states and counties have different warranty requirements. Any purchaser of Units should contact Presby Environmental's corporate headquarters in Whitefield, New Hampshire, prior to such purchase, to obtain a copy of the applicable warranty, and should carefully read that warranty prior to the purchase of Units.