The Presby Wastewater Treatment System

Vermont

Design and Installation Manual

for

Advanced Enviro-Septic® & Enviro-Septic®

Wastewater Treatment Systems

Made in USA

VERMONT
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Drinking Water & Groundwater Protection Division
THIS IS SUBJECT TO PROVISIONS OR CONDITIONS LISTED IN PERMIT
Permit #: 2004-02-R10
Date: May 1, 2023

✔ **Minimizes the Expense** ✔ **Protects the Environment** ✔ **Preserves the Site**

Presby Environmental, Inc.

An Infiltrator Water Technologies Company

The Next Generation of Wastewater Treatment Technology

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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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Enviro-Septic® is a registered trademark of Presby Environmental, Inc.
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IMPORTANT NOTICE: This Manual is intended ONLY for use in designing and installing Presby Environmental's Advanced Enviro-Septic® and Enviro-Septic® Wastewater Treatment Systems. The use of this Manual with any other product is prohibited. The processes and design criteria contained herein are based solely on our experience with and testing of Advanced Enviro-Septic® and Enviro-Septic®. Substitution of any other large diameter gravelless pipe will result in compromised treatment of wastewater and other adverse effects.

This Manual refers to the Innovative/Alternative System Approval (Approval Number 2004-02-R7) issued by the State of Vermont Department of Environmental Conservation.

All designers must provide the above Approval to each landowner who is a prospective purchaser of a System prior to the sale of the system and prior to the filing of any application for a site-specific approval.

To access the Approval, please go to the Vermont Department of Environmental Conservation web page for: Wastewater Disposal Innovative/Alternative (I/A) System/Product Approvals

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1.0 Background

Liquid that exits from a septic tank ("effluent") contains suspended solids that can cause traditional systems to fail prematurely. Solids can overload bacteria, cut off air required for aerobic bacterial activity, and/or seal the underlying soil, interfering with its ability to absorb liquid.

1.1 What Our System Does

By utilizing simple yet effective natural processes, the Presby Treatment System treats septic tank effluent in a manner that prevents suspended solids from sealing the underlying soil, increases system aeration, and provides a greater bacterial treatment area ("biomat") than traditional systems.

1.2 Why Our System Excels

The Presby Treatment System retains solids in its pipe and provides multiple bacterial surfaces to treat effluent prior to its contact with the soil. The continual cycling of effluent (the rising and falling of liquid inside the pipe) enhances bacterial growth. This all combines to create a unique eco-system that no other passive wastewater treatment system is designed to offer. The result is a system that excels by being more efficient, lasting longer, and has a minimal environmental impact.

1.3 System Advantages

a) costs less than traditional systems
b) eliminates the need for washed stone
c) often requires a smaller area
d) installs more easily and quickly than traditional systems
e) adapts easily to residential and non-residential sites of virtually any size
f) adapts well to difficult sites
g) develops a protected receiving surface preventing sealing of the underlying soil
h) blends "septic mounds" into sloping terrain
i) increases system performance and longevity
j) tests environmentally safer than traditional systems
k) recharges groundwater more safely than traditional systems
l) made from recycled plastic

1.4 Patented Technology

At the heart of Advanced Enviro-Septic® (AES) and Enviro-Septic® (ES) treatment systems is a patented corrugated, perforated plastic pipe with interior skimmer tabs and cooling ridges. All AES and ES pipe is surrounded by two or more filtering, treatment and dispersal layers (see further product descriptions below). AES and ES pipes are assembled and installed in a bed of specified System Sand which can either be below the ground or above. Our systems are completely passive, requiring no electricity, motors, alarms, computers, etc.

1.5 Advanced Enviro-Septic® (AES)

The Advanced Enviro-Septic pipe is assembled into an onsite wastewater treatment system that has been successfully tested and certified to NSF/ANSI 40, Class I (a certification typically given to mechanical aeration devices), BNQ of Quebec, Class I, II, III and Cebedeau, Belgium standards. AES is comprised of corrugated, perforated plastic pipe, Bio-Accelerator® fabric along its bottom which is surrounded by a layer of randomized plastic fibers and a sewn geo-textile fabric. AES creates an eco-system designed to simultaneously purify and disperse effluent after primary treatment by a septic tank. AES is the "next generation" of our Enviro-Septic technology. The AES product incorporates Bio-Accelerator, a proprietary enhancement that screens additional solids from effluent, accelerates treatment processes, assures even distribution and provides additional surface area. Each foot of AES provides over 40 sq ft of total surface area for bacterial activity.

1.6 Enviro-Septic® (ES)

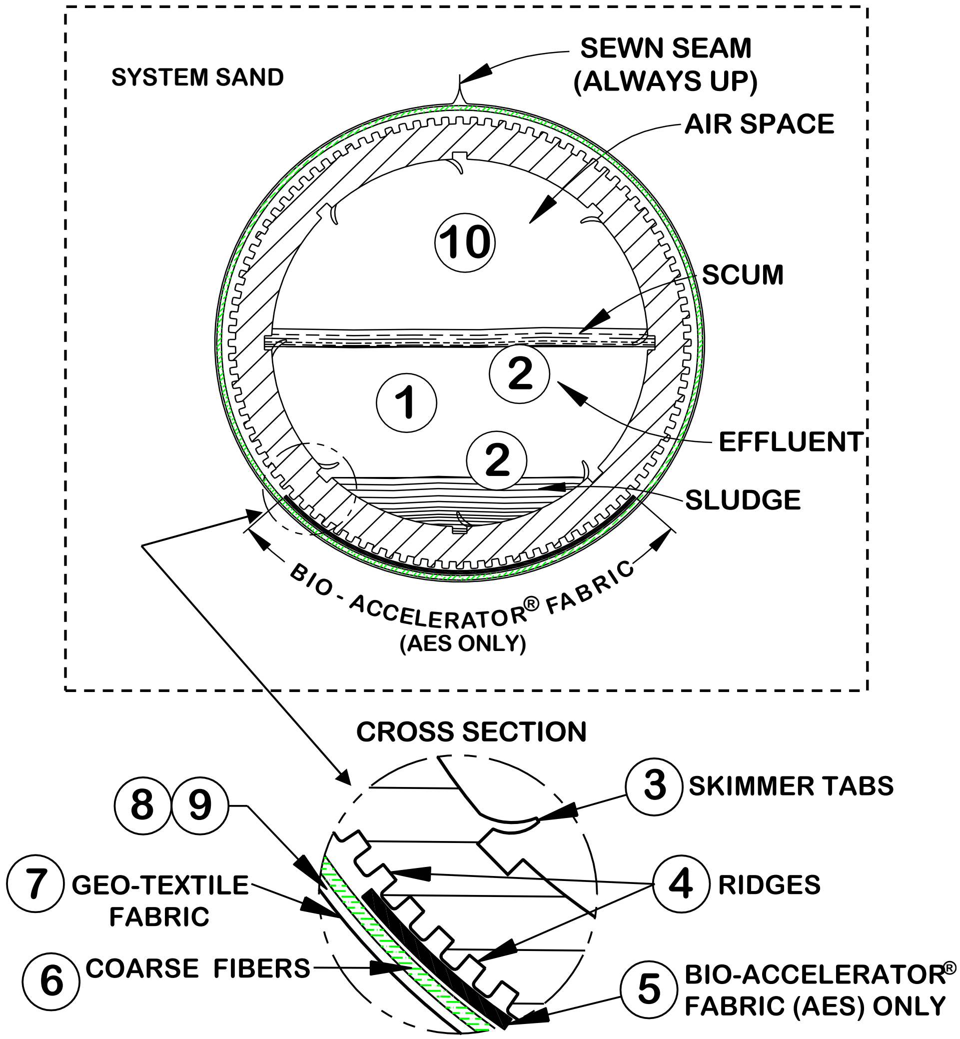
The Enviro-Septic pipe is assembled into an onsite wastewater treatment system. ES is comprised of corrugated, perforated plastic pipe which is surrounded by a layer of randomized plastic fibers and a sewn geo-textile fabric. The system is designed to simultaneously purify and disperse effluent after primary treatment by a septic tank. Each foot of ES provides over 25 sq ft of total surface area for bacterial activity.

2.0 Ten Stages of Wastewater Treatment

The Presby Wastewater Treatment System's

10 STAGES OF TREATMENT

Advanced Enviro-Septic (AES) and Enviro-Septic (ES)



Stage 1: Warm effluent enters the pipe and is cooled to ground temperature.

Stage 2: Suspended solids separate from the cooled liquid effluent.

Stage 3: Skimmers further capture grease and suspended solids from the existing effluent.

Stage 4: Pipe ridges allow the effluent to flow uninterrupted around the circumference of the pipe and aid in cooling.

Stage 5: Bio-Accelerator fabric screens additional solids from the effluent, enhances and accelerates treatment, facilitates quick start-up after periods of non-use, provides additional surface area for bacterial growth, promotes even distribution, and further protects outer layers and the receiving surfaces so they remain permeable (AES only).

Stage 6: A mat of coarse, randomly-oriented fibers separates more suspended solids from the effluent.

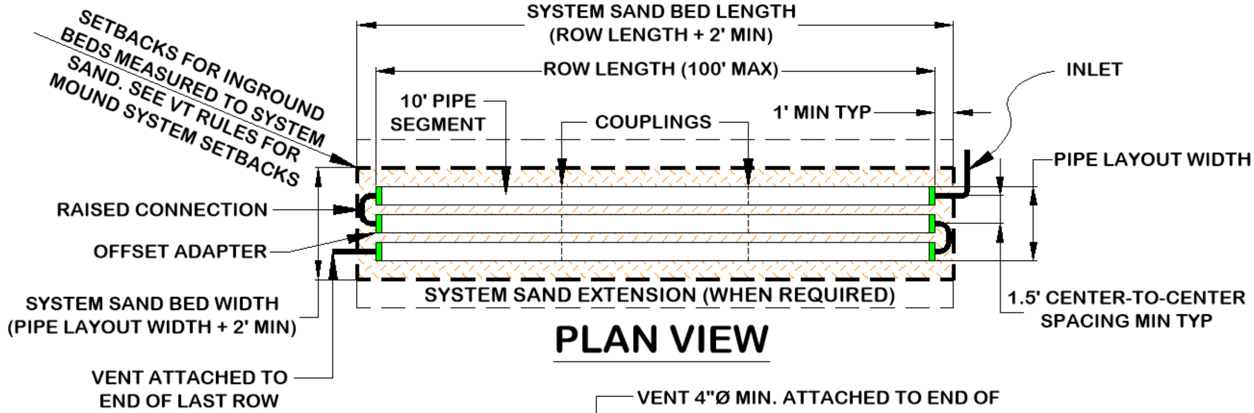
Stage 7: Effluent passes into the geo-textile fabrics and grows a protected bacterial surface.

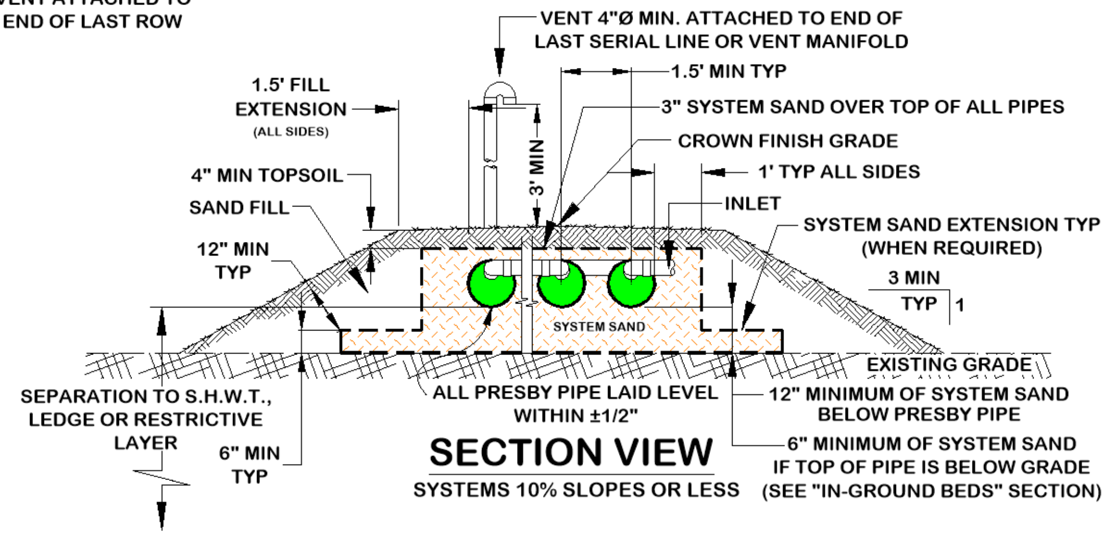
Stage 8: Sand wicks liquid from the geo-textile fabrics and enables air to transfer to the bacterial surface.

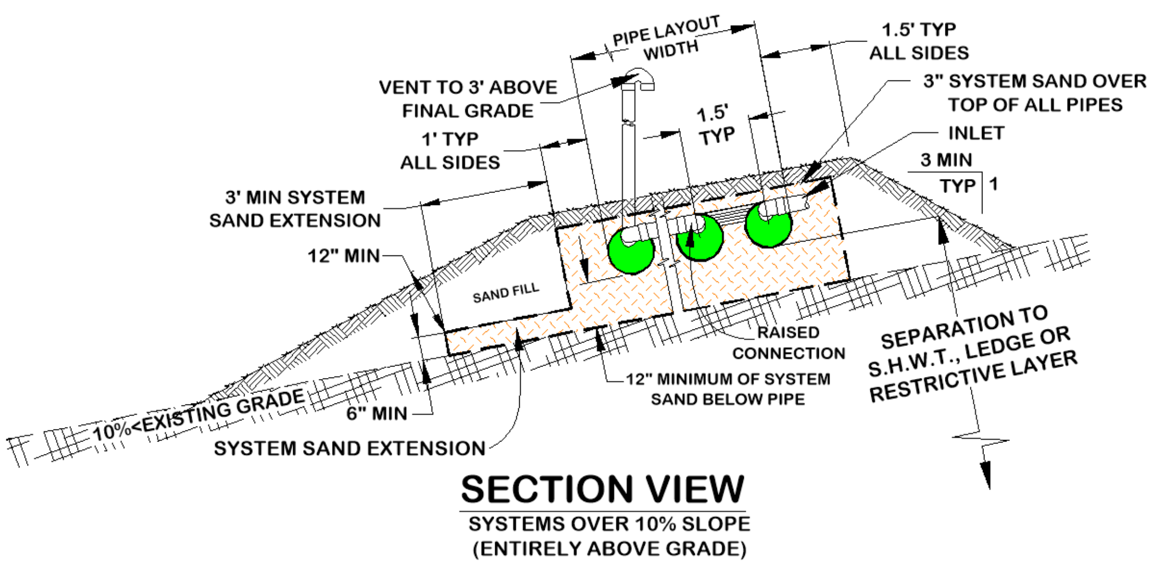
Stage 9: The fabrics and fibers provide a large bacterial surface to break down solids.

Stage 10: An ample air supply and fluctuating liquid levels increase bacterial efficiency.

3.0 System Diagrams







Notes: Advanced Enviro-Septic® may be noted as "AES" and Enviro-Septic® as "ES". All in-ground systems must be level (see illustration in para. 9.0, pg. 5).

4.0 AES and ES System Components

4.1 AES and ES Pipe

a) Plastic pipe made with a significant percentage of recycled material
b) 10 ft sections (can be cut to any length)
c) Ridged and perforated, with skimmer tabs on interior
d) AES only: Bio-Accelerator® along bottom of pipe (sewn seam is always placed up).
e) Surrounded by a mat of randomly oriented plastic fibers
f) Wrapped in a non-woven geo-textile fabric stitched in place
g) Exterior diameter of 12 in.
h) Each 10 ft section has a liquid holding capacity of approx. 58 gallons
i) A 10 ft length of pipe is flexible enough to bend up to 90°

4.2 Offset Adapter

An offset adapter is a plastic fitting 12 in in diameter with an inlet hole designed to accept a 4-inch sewer line, raised connection or vent pipe. The hole is to be installed in the 12 o'clock position. The distance from the bottom of the offset adapter to the bottom of its inlet hole is 7 in When assembling pipes into rows, note that the geo-textile fabrics are placed over the edges of the offset adapter and couplings.

4.3 Double Offset Adapter

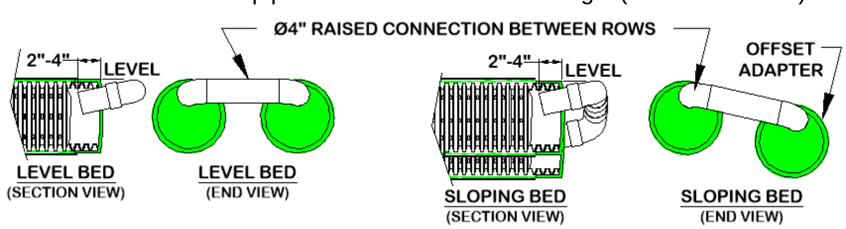
A double offset adapter is a plastic fitting 12 in in diameter with two 4 in holes designed to accept a 4 in inlet pipe, raised connection, vent or vent manifold, and/or bottom drain, depending upon the particular requirements of the design configuration. The 4 in holes are to be aligned in the 12 o'clock and 6 o'clock positions. The holes are positioned 1 in from the outside edge of the double offset adaptor and 2 in from each other.

4.4 Coupling

A coupling is a plastic fitting used to create a connection between two pieces of pipe. Note that the couplings are wide enough to cover 1 or 2 pipe corrugations on each of the two pipe ends being joined. The couplings feature a snap-lock feature that requires no tools. When assembling pipes into rows, note that the geo-textile fabric does not go under couplings. Pull fabric back, install coupling, and then pull fabric over coupling. Also note, during installation in cold weather, couplings are easier to work with if stored in a heated location before use (such as a truck cab) before use.

4.5 Raised Connection

A raised connection is a PVC sewer & drainpipe configuration which is used to connect pipe rows. Raised connections extend 2 in to 4 in into pipe and are installed on an angle (as shown below). All PVC joints should be glued.



5.0 Presby Environmental Standards

All AES and ES systems must be designed and installed in compliance with the procedures and specifications described in this Manual and in the product's Vermont approval.

6.0 Pipe Sizing

AES and ES use the same bed sizing tables, pipe requirement and installation procedures noted in this Manual.

7.0 Vermont Rules

This Manual is to be used in conjunction with the State of Vermont Environmental Protection Rules, Chapter 1, Wastewater System and Potable Water Supply Rules, Effective April 12, 2019. Vermont linear loading requirements must always be honored for all soil types.

7.1 Conflicts between Vermont Rules & Manual

In the event of contradictions between this Manual and Vermont Wastewater System and Potable Water Supply Rules, Presby Environmental, Inc. (PEI) should be contacted for technical assistance (800-473-5298).

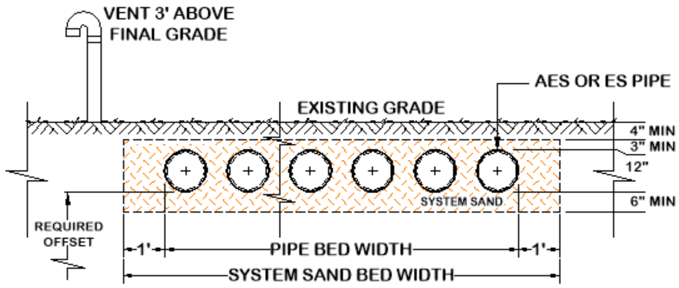
8.0 Certification Requirements

Any designers and installers who have not previously attended a PEI “Certification Course” are required to obtain Presby Certification. Certification is obtained by attending a Certification Course presented by PEI or its sanctioned representative. Certification can also be obtained by viewing tutorial videos on our website (high speed connection required) and then successfully passing a short assessment test, which is also available over the internet. All professionals involved in the inspection, review or certification of AES or ES systems should also become Presby Certified. For questions about our products or the information contained in this Manual, or to register for a Certification Course, please contact us at 1-800-473-5298.

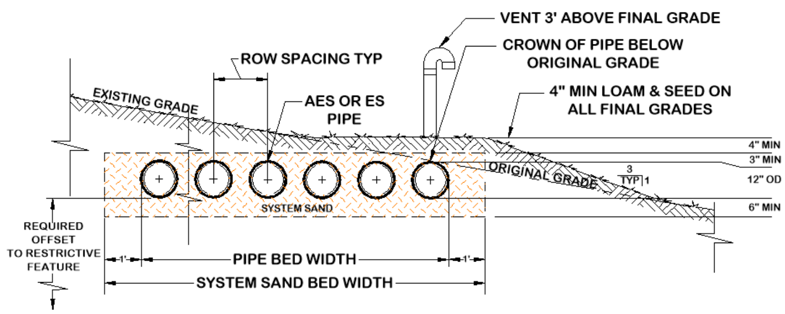
9.0 In-Ground Bed Systems

Systems are installed below existing grade for sites with no soil restrictive features to limit placement.

a) Limited to soils with a texture of coarse sand, sand, loamy coarse sand, loamy sand, fine sand, very fine sand, loamy fine sand, coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam or a perc rate of 1-60 mpi.
b) All in-ground systems must be installed level.
c) The top of all AES or ES pipes must be located below original grade (see illustration below).
d) Only 6 in of system sand are required below the pipes.
e) In-ground on level site:



f) In-ground on sloping site:



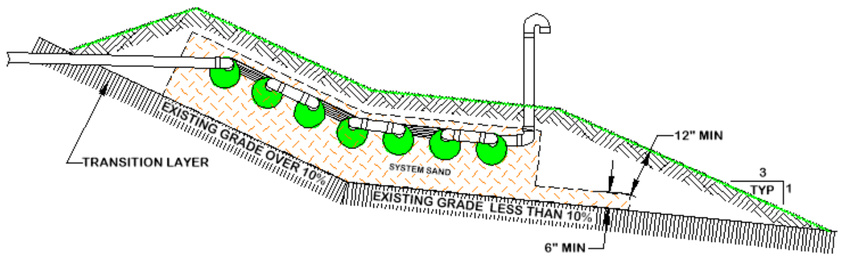
10.0 Elevated Bed Systems (Mounds)

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 pipes above original grade. Elevated system requirements:

a) All systems in soils with a texture of silt loam, silt, sandy clay loam, silty clay loam, clay loam or perc rates of 61-120 MPI must be constructed as elevated bed (“mound”) systems.
b) Elevated systems may be installed level or sloping and must be vented.
c) Elevated systems require 12 in of system sand below the AES or ES pipes.
d) For system sand beds wider than 10 ft the linear loading rate must meet the following requirements:
    1) The linear loading rate is no more than 10 gallons per linear foot per day when the site limitations allow for a mound design without a hydrogeological (groundwater mounding) analysis; or

2) the linear loading rate is more than 10 gallons per day per linear foot but is supported by a hydrogeologic (groundwater mounding) analysis and the elevation of the AES or ES pipe will comply with the required minimum vertical separation above the induced ground water mounding.
3) The linear loading rate is based on the length of the row length plus a maximum of 2 ft of system sand at the ends of the row. Refer to para. 3.0, pg. 3 for illustrations of elevated bed systems.

Beds with multiple slopes:



11.0 Table A: AES or ES Pipe Required

Minimum Pipe Length Required (ft.)				
Residential				Non-Residential (gpd/ft)
2 Bedrooms	3 Bedrooms	Additional Bedrooms		
Double Occupancy	Double Occupancy	Single Occupancy	Double Occupancy	
280 gpd	420 gpd	70 gpd	140 gpd	
140 ft	210 ft	35 ft/br	70 ft/br	2.14

12.0 Table B: System Sand Bed Area

Texture	Structure	AES & ES Application Rate gpd/ft^2	*Perc. Rate Range MPI*	Minimum Bed Area Required (ft^2) 2 Bedroom 280 gpd	3 Bedroom 420 gpd	Add'l Bedrooms 70 gpd	Non-Residential Rate 100 gpd	Max. System Slope
Very Coarse Sand or Coarser	SG							
Coarse Sand, Sand	SG	2.4*	*1 to 4*	117	175	29	42	20%
Fine Sand, Very Fine Sand, Loamy Fine Sand, Loamy Very Fine Sand	SG	1.6	*5 to 8*	175	263	47	63.5	
	MA/PL	0.8	*25 to 40*	350	525	88	125	
	PR/SBK/ABK/GR	1.2	*9 to 16*	233	350	58	83	
Sandy Loam, Coarse Sandy Loam	MA/PL	0.8	*25 to 40*	350	525	88	125	
	PR/SBK/ABK/GR	1.2	*9 to 16*	233	350	58	83	
Fine Sandy Loam, Very Fine Sandy Loam	MA/PL	0.8	*25 to 40*	350	525	88	125	
	PR/SBK/ABK/GR	1.0	*17 to 24*	280	420	70	100	
Loam	MA/PL	0.8	*25 to 40*	350	525	88	125	
	PR/SBK/ABK/GR	1.0	*17 to 24*	280	420	70	100	
Silt Loam, Silt	MA/PL	0.4	*77 to 120*	700	1,050	175	250	10%
	PR/SBK/ABK/GR	0.6	*41 to 76*	467	700	117	167	15%
Sandy Clay Loam, Clay Loam, Silty Clay Loam	MA/PL	0.4	*77 to 120*	700	1,050	175	250	10%
	PR/SBK/ABK/GR	0.4	*77 to 120*	700	1,050	175	250	
Sandy Clay, Clay, Silty Clay			See §1-926					

Table B already reflects the 50% maximum allowed reduction in bed area. This table is based on a daily design flow of 140 gpd for each of the first three bedrooms and 70 gpd thereafter.
* Maximum Application Rate for in-mound system is 2.0 gpd/ft^2.
* For high strength effluent contact Presby Environmental for recommendations.

13.0 Table C: Row Length and Pipe Layout Width

Row Length (ft)	Total Linear Feet of AES or ES Pipe													
30	60	90	120	150	180	210	240	270	300	330	360	390	420	450
35	70	105	140	175	210	245	280	315	350	385	420	455	490	525
40	80	120	160	200	240	280	320	360	400	440	480	520	560	600
45	90	135	180	225	270	315	360	405	450	495	540	585	630	675
50	100	150	200	250	300	350	400	450	500	550	600	650	700	750
55	110	165	220	275	330	385	440	495	550	605	660	715	770	825
60	120	180	240	300	360	420	480	540	600	660	720	780	840	900
65	130	190	260	325	390	455	520	585	650	715	780	845	910	975
70	140	210	280	350	420	490	560	630	700	770	840	910	980	1,050
75	150	225	300	375	450	525	600	675	750	825	900	975	1,050	1,125
80	160	240	320	400	480	560	640	720	800	880	960	1,040	1,120	1,200
85	170	255	340	425	510	595	680	765	850	935	1,020	1,105	1,190	1,275
90	180	270	360	450	540	630	720	810	900	990	1,080	1,170	1,260	1,350
95	190	285	380	475	570	665	760	855	950	1,045	1,140	1,235	1,330	1,425
100	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500
# of Rows	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1.50'	2.50	4.00	5.50	7.00	8.50	10.00	11.50	13.00	14.50	16.00	17.50	19.00	20.50	22.00
	Pipe Layout Width at 1.5(ft) Center-to-Center row spacing (outermost width of rows)													

Ex: select a row length and move right until the minimum amount of pipe is found (more is allowed). Then move down to find the number of rows required; continue downward in the same column to find the pipe layout width for your spacing.

14.0 Design Procedure and Examples

Step 1: From **Table B**, determine the application rate corresponding to the soil texture and structure. The perc. rate range column is included to determine the maximum application rate when a percolation test has been performed.

Step 2: From **Table A**, calculate the minimum amount of AES or ES pipe required using the number of bedrooms (residential) or daily design flow (non-residential). For example, a 7-bedroom residence on would require 350 ft of pipe (210 ft of pipe for the first 3 bedrooms (double occupancy) + 35 ft of pipe for each additional bedroom (single occupancy) (210 ft + 140 (4 x 35) = 350 ft).

Step 3: Calculate the minimum number of serial sections required (does not apply to parallel configuration). A serial section is a group of interconnected rows receiving effluent from one distribution box outlet. Sections are limited to 500 gpd daily design flow and 500 ft total AES or ES pipe maximum. Divide the daily design flow by 500 gpd if over 900 gpd (if answer is fractional, round up to nearest whole number). Ex: 1,000 gpd ÷ 500 gpd/section = 2 sections. Note: a 900 gpd system is not more than 900 gpd so it is not subject to this rule.

Step 4: From **Table B**, calculate the minimum bed area required using the number of bedrooms (residential) or daily design flow (non-residential) for the application rate based on soil texture and structure.

Step 5: From **Table C**, select a pipe row length suitable for the site from the left-hand column (must meet VT linear loading requirements), read across to the total length of pipe required, then read down to find the number of rows required at the base of the column. Also determine the pipe layout width based on the system's center-to-center row spacing.

Step 6: Using the values derived from **Table C**, calculate the system sand total bed length (i.e. row length + 2 ft) and the system sand total bed width (i.e. pipe layout width (PLW) + 2 ft).

Step 7: Calculate the bed width needed to provide the minimum bed area from Table B, i.e. minimum bed area from Step 4 (Table B) ÷ total bed length from Step 6 (Table C). The larger of the two total bed width values (either bed width calculated in Step 7 or the PLW + 2 ft determined in Step #6) must be used.

Step 8: Determine if system sand extensions are required. If the final system sand bed width from Step 7 exceeds the PLW + 2, there will be a system sand extension.

a) if the bed is level, the pipe is placed in the middle of the sand bed and the system sand extension is divided evenly on both sides of the pipes.

b) if the bed is sloping, the system sand extension is placed entirely on the down slope side of the pipes. Please note that systems that slope > 10% require a 3 ft minimum sand extension (4 ft measured from the pipe). See sloping bed illustration in para. 3.0, pg. 3.

14.1 Design Example #1: Single Family Residence

3 Bedrooms (420 gpd), loamy fine sand, subangular blocky soil structure, in-mound leachfield design with 10% system slope, row spacing 1.5 ft.

Step 1: From **Table B**, the application rate corresponding to loamy fine sand texture with subangular block structure is 1.2 gpd/ft². (The equivalent perc. rate range is 9 to 16 MPI.)

Table B: System Sand Bed Area

Texture	Structure	Application Rate GPD/ft²	Perc. Rate Range MPI
Very Coarse Sand or Coarser	SG		
Coarse Sand, Sand	SG	2.4*	1 to 4
Fine Sand, Very Fine Sand, Loamy Fine Sand, Loamy Very Fine Sand	SG	1.6	5 to 8
	MA/PL	0.8	25 to 40
	PR/SBK/ABK/GR	1.2	9 to 16

Step 2: From **Table A**, the minimum length of AES or ES pipe for a three-bedroom residence is 210 ft.

Step 3: System is less than 500 gpd, skip this step.

Step 4: From **Table B**, the minimum bed area for a three-bedroom residence with a design flow of 420 gpd and an application rate of 1.2 gpd/ft² is 350 ft².

Step 5: From **Table C**, using a row length of 70 ft and minimum total pipe length of 210 ft three rows are required. Table C also shows the pipe layout width (with 1.5 ft center-to-center spacing) is 4 ft.

Table C: Row Length a

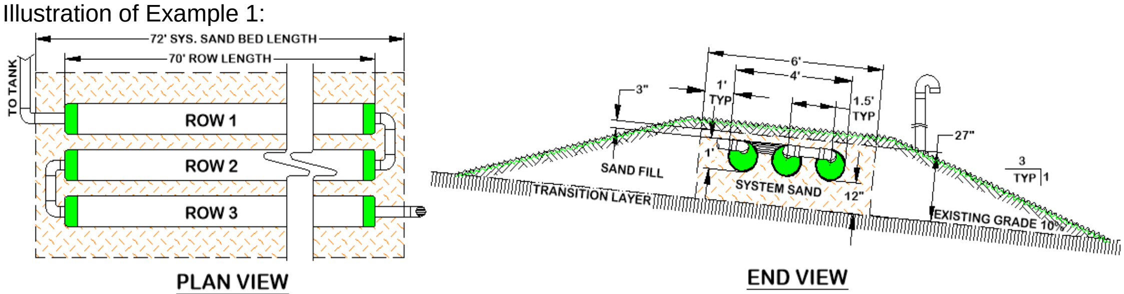
Row Length (ft)			
30	60	90	12
35	70	105	140
40	80	120	160
45	90	135	18
50	100	150	200
55	110	165	22
60	120	180	24
65	130	190	26
70	140	210	28
75	150	225	30
80	160	240	32
85	170	255	34
90	180	270	360
95	190	285	380
100	200	300	40
# of Rows	2	3	4
1.50'	2.50	4.00	5.5
	Pipe Lay		

Step 6: Using the values derived from **Table C** the system sand total bed length = 72 ft (70 ft + 2 ft), the system sand total bed width = 6 ft (PLW of 4 ft + 2 ft).

Step 7: The bed width needed to provide the minimum bed area from **Table B** = 350 ft². ÷ 72 ft = 4.87 ft (round up to 5 ft). 5 ft is smaller than the PLW + 2 ft, therefore use the 6 ft minimum system sand bed width determined in Step 6.

Step 8: The final system sand bed width from Step 7 was determined to be the PLW + 2 ft. No system sand extensions are required. Skip this step.

Illustration of Example 1:



14.2 Design Example #2: Single Family Residence

7 Bedrooms (700 gpd), silt loam, silt, granular soil structure, design for a 20% sloping system (sloping systems must be mounds) and 1.5 ft row spacing.

Step 1: From **Table B**, the application rate corresponding to silt loam, silt texture with granular structure is 0.6 gpd/ft^2. (The equivalent perc. rate range is 41 to 76 mpi.)

Step 2: From **Table A**, the minimum length of AES or ES pipe for a seven-bedroom residence with single occupancy for each bedroom after the first three is 350 ft [210 + (35x4].

Step #3: Calculate the minimum number of serial sections required: 700 is less than 900 gpd so 1 serial section required.

Step 4: From **Table B**, the minimum bed area for a seven-bedroom residence with a design flow of 700 gpd and an application rate of 0.6 gpd/ft^2 is 1,168 ft^2 (700 + (117 x 4)).

Step 5: From **Table C**, using a row length of 70 ft and minimum total pipe length of 350 ft, five rows are required. Table C also shows the pipe layout width (with 1.5 ft center-to-center spacing) is 7 ft.

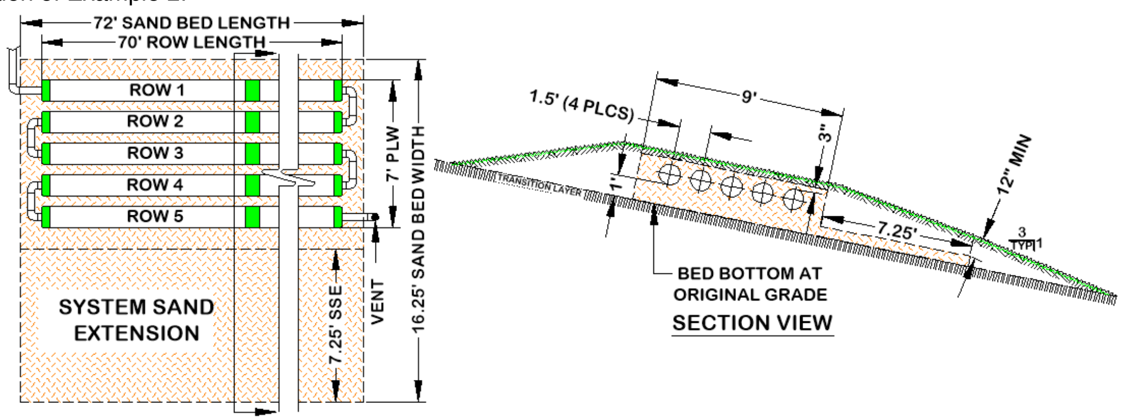
Step 6: Using the values derived from **Table C** the system sand total bed length = 72 ft (70 ft + 2 ft), the system sand total bed width = 9 ft (PLW of 9 ft + 2 ft).

Step 7: The bed width needed to provide the minimum bed area from **Table B** = 1,168 ft^2 ÷ 72 ft = 16.23 ft (round up to 16.25 ft). 16.25 ft is larger than 9 ft (PLW + 2 ft.), therefore use the 16.25 ft minimum system sand bed width.

Step 8: Determine if system sand extensions are required. The final system sand bed width from Step 7 exceeds the PLW + 2 so there will be a system sand extension.

a) Skip this step as bed is sloping.
b) Since the bed is sloping, the system sand extension is placed entirely on the down slope side of the pipes. The system will slope > 10% so it will require a 3 ft minimum sand extension (4 ft measured from the pipe). The system sand extension will be the system sand bed width from Step 7 – (PLW + 2). 16.25 – (7 + 2) = 7.25 ft on the downslope side of the bed. This meets the 3 ft minimum sand extension requirement.

Illustration of Example 2:



14.3 Design Example #3: Non-Residential System

Daily design flow = 500 gpd, silt loam, subangular blocky structure, design for a level site, row spacing 1.5 ft, in-ground system.

Step 1: From **Table B**, the application rate corresponding to silt loam texture with subangular blocky structure is 0.6 gpd/ft^2. (The equivalent perc. rate range is 41 to 76 mpi.)

Step 2: From **Table A**, the minimum length of AES or ES pipe for a non-residential application is 233.64 ft (500 ÷ 2.14). Round up to 240 ft for ease of construction.

Step 3: System does not exceed 500 gpd, skip this step.

Step 4: From **Table B**, the minimum bed area for a non-residential application with a design flow of 500 gpd and an application rate of 0.6 gpd/ft^2 is 835 ft^2 (167 x 5).

Step 5: From **Table C**, using a row length of 80 ft and minimum total pipe length of 240 ft, three rows are required. Table C also shows the pipe layout width (with 1.5 ft center-to-center spacing) is 4 ft.

Step 6: Using the values derived from **Table C** the system sand total bed length = 82 ft (80 ft + 2 ft), the system sand total bed width = 6 ft minimum. (PLW of 4 ft + 2 ft).

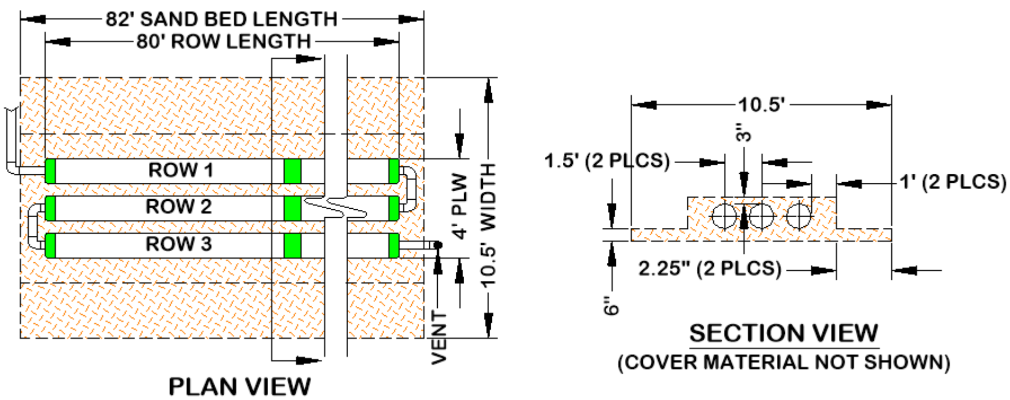
Step 7: The bed width needed to provide the minimum bed area from **Table B** = 835 sq. ft.÷ 82 ft = 10.18 ft (round up to 10.5 ft for ease of construction). 10.5 ft is larger than 6 ft (PLW + 2 ft), therefore use the 10.5 ft minimum system sand bed width.

Step 8: Determine if system sand extensions are required. The final system sand bed width from Step 7 exceeds the PLW + 2 so there will be a system sand extension.

a) The bed is level so the pipes are placed in the middle of the sand bed and the system sand extensions are divided evenly on both sides of the pipes. (10.5 – 6) ÷ 2 = 2.25 ft sand extension on each side of the bed.

b) Skip this step as bed is level.

Illustration of Example 3:



14.4 Design Example #4: Single Family Residence

4 Bedrooms (490 gpd), sandy clay loam, platty soil structure), design for a level site. row spacing 1.5 ft (a texture of silt loam, silt, sandy clay loam, silty clay loam, clay loam or a perc rate of 61-120 mpi requires a mound).

Step 1: From **Table B**, the application rate corresponding to sandy clay loam texture with platy soil structure is 0.4 gpd/ft^2. (The equivalent perc. rate range is 41 to 76 mpi.)

Step 2: From **Table A**, the minimum length of AES or ES pipe for a 4-bedroom residence is 245 ft (three bedrooms at 210 ft + one bedroom with single occupancy at 35 ft).

Step 3: System is less than 500 gpd, skip this step.

Step 4: From **Table B**, the minimum bed area for a four-bedroom residence with sandy clay loam and an application rate of 0.4 gpd/ft^2 is 1,225 ft$^{2.}$

Step 5: Using a row length of 82 ft and minimum total pipe length of 245 ft, three rows are required. Table C shows the pipe layout width (with 1.5 ft center-to-center spacing) for 3 rows is 4 ft. *Please note: This row length will require cutting AES or ES pipe into smaller lengths. This is acceptable and common practice on tight sites where rounding to even lengths is not possible.*

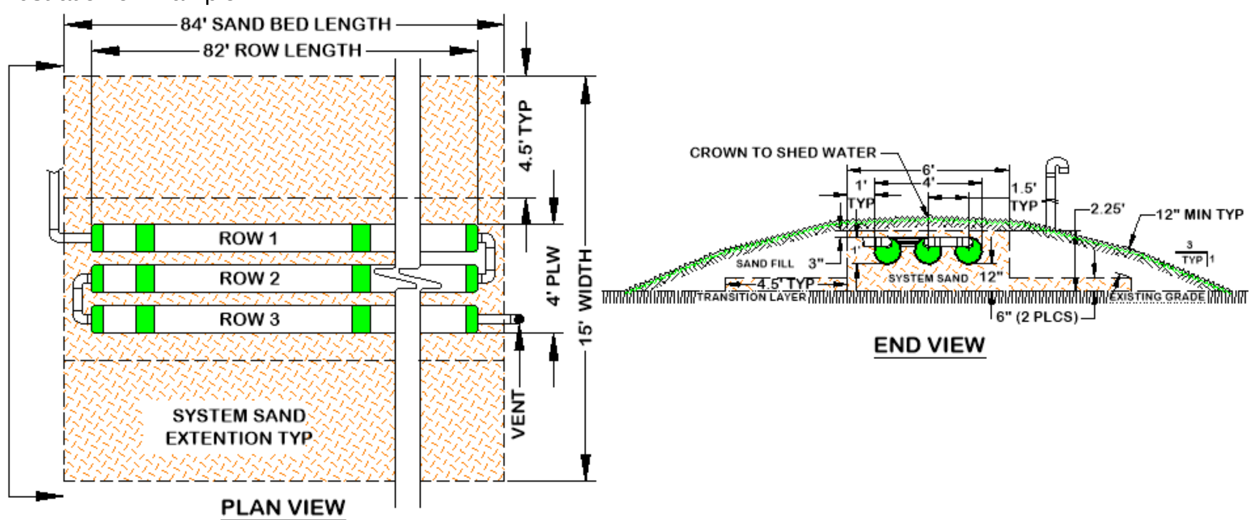
Step 6: Using the values derived from **Step 5** the system sand total bed length = 84 ft (82 ft + 2 ft), the system sand total bed width = 6 ft (PLW of 4 ft + 2 ft).

Step 7: The bed width needed to provide the minimum bed area from **Table B** = 1,225 ft^2÷ 84 ft = 14.58 ft (round up to 14.75 ft for ease of construction). 14.75 ft is larger than 6 ft (PLW + 2 ft), therefore use the 14.75 ft minimum system sand bed width.

Step 8: Determine if system sand extensions are required. The final system sand bed width from Step 7 exceeds the PLW + 2 so there will be a system sand extension.

a) The bed is level so the pipes are placed in the middle of the sand bed and the system sand extensions are divided evenly on both sides of the pipes. (14.75 – 6) ÷ 2 = 4.375 ft (round up to 4.5 for ease of construction) sand extension on each side of the bed (5.5 ft from edge of pipe).
b) Skip this step as bed is level.

Illustration of Example 4:



15.0 General Design Criteria

The material described in this section applies to all soil types unless otherwise specified.

15.1 Alarms & Baffles

a) All pump systems to have a high-water alarm float or sensor installed inside the pump chamber.
b) All septic tanks must be equipped with baffles to prevent excess solids from entering the system.

15.2 Barrier Materials over System Sand

No barrier materials (hay, straw, tarps, etc.) are to be placed between the system sand and cover material; such materials may cut off necessary oxygen supply to the system.

15.3 Daily Design Flow

Residential daily design flow for AES and ES systems is calculated in accordance with Vermont rules. Systems servicing more than two residences shall use the non-residential portions of all Tables. The minimum daily design flow for any single-family residential system on its own lot is two bedrooms and 300 gpd for any non-residential system.

a) Certain fixtures, such as jetted tubs, may require an increase in the size of the septic tank.
b) Daily design flow for a single bedroom apartment with a kitchen connected to a residence (also sometimes referred to as a “studio” or “in-law apartment”) shall be calculated by adding two additional bedrooms (280 gpd).
c) When daily design flow is determined by water meter use for non-residential systems, refer to Vermont Rules, Section 1-804.
d) PEI recommends taking the average daily flow from a peak month and multiplying it by a peaking factor of 2 to 3 times.
e) Note that “daily design flows” are calculated to assume occasional “peak” usage and a factor of safety; Systems are not expected to receive continuous dosing at full daily design load.

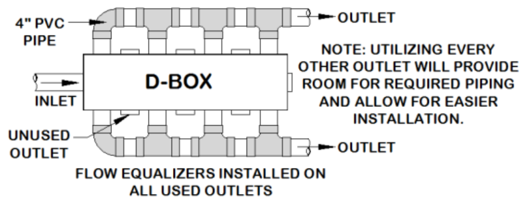
15.4 Distribution Box (D-box)

A device used to divide effluent flow to the field(s) or provide velocity reduction of incoming effluent to reduce turbulence. A D-box is required when using combination serial distribution (see para. 18.0, pg. 16) or when pumping effluent to the field (see para. 24.0, pg. 20). Basic serial systems (see para. 16.0, pg. 15) gravity feeding to a field do not require a D-box. All used D-box outlets, except outlets used for venting, must have flow equalizers.

15.5 Distribution Box Manifold

A manifolded D-box is utilized to evenly divide daily flows to multiple beds. Several D-box outlets are joined by means of a manifold, which helps to compensate for uneven distribution. All used outlets must have a flow equalizer. If a distribution box manifold is utilized to divide **large** flows, velocity reduction of the incoming effluent is necessary.

Illustration of Manifolded D-box:



15.6 Effluent Filters

a) Effluent filters are required in Vermont.
b) Effluent filters **must** be maintained on at least an annual basis. Follow manufacturer's instructions regarding required inspections, cleaning and maintenance of the effluent filter.
c) Effluent filters must allow the free passage of air to ensure the proper functioning of the system. A blocked filter in any on-site septic system could interfere with venting, causing the system to convert to an anaerobic state and result in a shortened life.
d) 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.

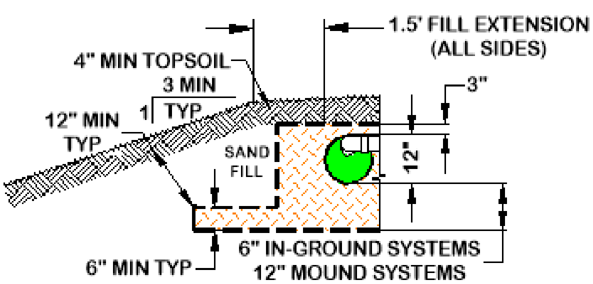
15.7 End-to-End Preferred Over Side-to-Side

If site conditions permit, end-to-end multiple bed configurations are preferable to side-to-side configurations (see para. 20.0, pg. 18).

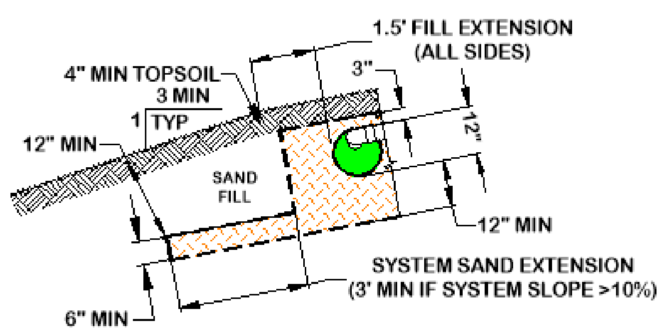
15.8 Fill Extensions for Raised (Mound) Systems

If any portion of the bed extends above the original grade the fill covering the field cannot begin the 3:1 side slope taper (tapering is to be 3 horizontal ft minimum for each 1 ft of vertical drip) for a distance of 1.5 ft minimum from the outmost edge of any AES or ES pipe. If the bed has system sand extension(s), the side slope taper must allow at least 12 in of cover over the outmost edge of the extension.

Level Bed:



Sloping Bed:



15.9 Flow Equalizers Required

All distribution boxes used to divide effluent flow require flow equalizers in their outlets. Flow equalizers are limited to a maximum of 20 gpm per equalizer (10 gpm is recommended).

15.10 Garbage Disposals (a.k.a. Garbage Grinders)

No additional pipe is required when using a garbage disposal (grinder). If a garbage disposal is utilized, follow the state's requirements regarding septic tank sizing. Multiple compartment septic tanks or multiple tanks are preferred and should be pumped as needed.

15.11 Percolation Rates 61-120 MPI Additional Criteria

a) System must be designed as an elevated bed (mound).
b) Non-conventional systems cannot be used.
c) Multiple beds are common in these soils.
d) Separate multiple beds in accordance with Vermont rules.
e) Systems should be designed as long and narrow as the site allows.
f) A minimum of 12 in of system sand required below all pipes.

15.12 Pipe Substitutions

Due to superior characteristics, it is acceptable to substitute AES for specified ES or SS pipe; or to substitute ES for specified SS pipe for permitted wastewater designs. All other substitutions to the pipe shown on the approved septic system design are not allowed without the written approval of the system's designer and a Wastewater System and Potable Water Supply Permit amendment. This includes substituting another manufacturer's pipe.

15.13 Pressure Distribution

The use of pressure distribution lines in AES or ES systems is **prohibited**. Pumps may be utilized when necessary only to gain elevation and to feed a distribution box which then distributes effluent by gravity to the field.

15.14 Replacement Field for Mound Systems

In the event of system malfunction, contact PEI for technical assistance prior to attempting rejuvenation procedures. Refer to System Bacteria Rejuvenation, para. 28.0, pg. 25. In the unlikely event that a system needs to be replaced:

a) An elevated system can be reinstalled in the same location, eliminating the need for a replacement field reserve area if allowed by state and local authorities.
b) All unsuitable material must be removed prior to replacement system construction.
c) Disposal of hazardous materials to be in accordance with state and local requirements.
d) Contact the appropriate local or state department for necessary permits.

15.15 Replacement Field for In-Ground Systems

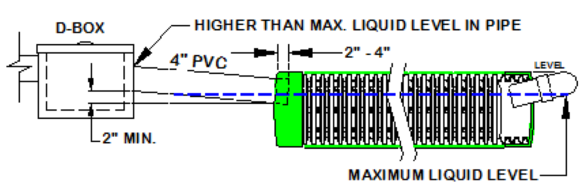
In-ground systems must be replaced in accordance with Vermont rules and may require the replacement system to be located in the reserve area.

15.16 Row Requirements

a) Maximum row length for any system is 100 ft.
b) Minimum row length is 30 ft (For acceptable exceptions to this rule, refer to Non-Conventional System Configurations, para. 23.0, pg. 19.)
c) Row center-to-center spacing is 1.5 ft min. for all soil types. Row spacing may be increased if desired.
d) For sloping beds: the elevations must be provided on the construction drawing for each pipe row in the sloping bed system.
e) All rows must be laid level to within +/- ½ in (total of 1 in) of the specified elevation and preferably should be parallel to the contour of the site.
f) It is easier if row lengths are designed in exact 10 ft increments since AES or ES pipe comes in 10 ft sections. However, if necessary, the pipe is easily cut to any length to meet site constraints.

15.17 Septic Tank and Distribution Box Elevations

The outlet of a septic tank or distribution box must be set at least 2 in above the highest inlet of the AES or ES row, with the connecting pipe slope not less than 1% (approximately 1/8 in per foot.)



15.18 Serial Section Limits

a) Each serial section in a combination system is limited to a daily design flow of 500 gpd.
b) Total AES or ES pipe in any serial section is limited to a maximum of 500 ft.

15.19 Setbacks (Horizontal)

Horizontal setbacks are measured from the outer perimeter of the system sand. Elevated bed (mound) system setbacks are measured according to Vermont rules.

15.20 Sloping Sites and Sloping Mound Systems

a) The percentage of slope in all system drawings refers to the slope of the system, <u>not</u> the existing terrain ("site slope") and refers to the slope of the bed itself ("system slope").
b) All sloping beds must be constructed entirely above the original grade (mound system).
c) The system slope and the site slope do not have to be the same.

d) Maximum site slope is 30% and maximum system slope is 20% for elevated systems; permissible slope varies depending on the soil texture and structure, or perc rate range (See Table B on page 6.) The slope of the site and/or the system may contain more than one slope provided the maximum allowed slope is not exceeded (see illustration in para. 10.0, pg. 5.)
e) All mound systems must conform to the linear loading rate requirements of Vermont as described in para.10.0, pg.5.

15.21 System Sand Bed Height Dimension

The height of the sand bed measures 21 in minimum for in-ground systems and 27 in minimum for elevated systems (not including cover material) .

a) 6 in minimum of system sand below the pipe for in-ground systems or 12 in minimum of system sand below the pipe for elevated and sloping systems; and
b) 12 in diameter of the pipe; and
c) 3 in minimum of system sand above the pipe.
d) The system sand extension area (any part of the system sand bed that is more than 1 ft away from the AES or ES pipe) is required to be a minimum of 6 in deep.

15.22 System Sand Extensions

In systems sloping more than 10%, a system sand extension is required. The system sand extension area is additional system sand added to the down slope side of all systems sloping more than 10%. The system sand extension area is a minimum of 6 in deep and extends a minimum of 3 ft beyond the tall portion of the system sand bed on the down slope edge of the bed (see illustration of system sand extension in para. 15.8, pg. 12). For multiple slope beds, if any portion of the bed has a system slope greater than 10% a system sand extension is required.

15.23 System Sand Requirements for All Beds

It is **critical** to the proper functioning of the AES or ES system that the proper amount and type of system sand be installed. System sand must be clean, granular sand free of organic matter and must adhere to Vermont §1-921(g),(1) Table 9-9 fill material, except: A maximum of 3% of total sand may pass through a #200 sieve (verified by washing sample per requirements of ASTM C-117). ASTM C-33 ("concrete sand") is acceptable for use as system sand providing that no more than 3% can pass a #200 sieve (verified by washing sample per requirements of ASTM C-117 as noted in the ASTM C-33 specification).

System sand is placed a minimum of 6 in below the pipe rows for below grade systems, a minimum of 12 in below the pipe rows for mound/elevated/sloping systems, a minimum of 3 in above the pipe rows, and a minimum of 12 in horizontally around the perimeter of the rows. Note: System sand may be used in place of sand fill.

15.24 Sand Fill

Sand fill is used to raise the elevation of the system in order to meet the required separation distance from the SHWT or other restrictive feature. Sand fill is defined by Vermont §1-921(g)(1). No organic material is allowed. If §1-913(g)(1) Tables 9-8 or 9-10 material is used, no more than 5% shall pass a #200 sieve (tested per ASTM C-117) and no stones over 3/4 inch is size.

15.25 System Side Slopes (Side Slope Tapers)

Side slope tapering is to be a maximum of 3:1; steeper side slope tapering requires a state waiver. There must always be a minimum of 12 in of cover over the ends of any system sand extension (see illustration in para. 15.8, pg. 12).

15.26 Topsoil

Suitable earth cover, similar to the naturally occurring soil at the site and capable of sustaining plant growth, is required as the uppermost layer over the entire system (including fill extensions, side slope extensions and system sand extensions). The topsoil layer should be a minimum of 4 in deep and should be immediately seeded or mulched in order to prevent erosion.

15.27 Topographic Position Requirement

The system location must 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.

15.28 Venting Requirements

Venting is required for all AES or ES systems (see Venting Requirements, para. 25.0, pg. 20).

15.29 Velocity Reduction
Reduce the velocity of liquid entering the AES or ES pipe. A distribution box with a baffle or inlet tee may be adequate for velocity reduction in most systems. When pumping to gain elevation, pump to an oversized distribution box or equivalent with proper baffles or tee at the end of the delivery line.

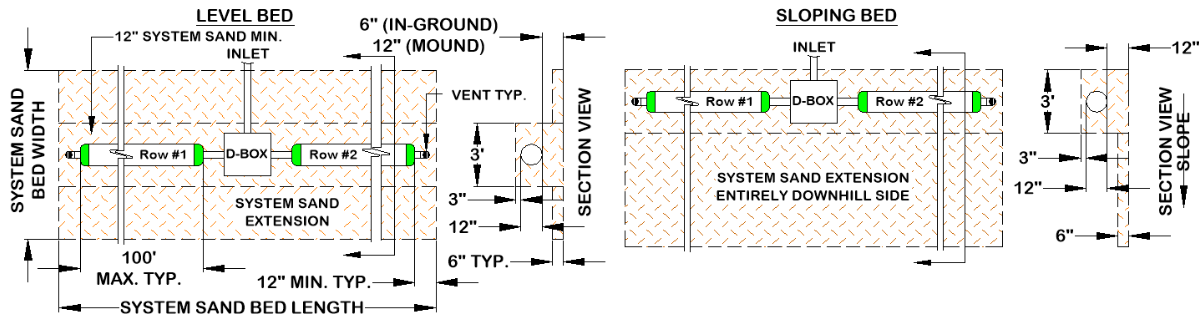
15.30 Vertical Separation Distances
Required minimum vertical separation distance to seasonal high water table (SHWT) is 36 in and 48 in to ledge/bedrock. Vertical separation distances are measured from the bottom of the AES or ES pipe (see illustration in para. 3.0, pg. 3).

15.31 Wastewater Strength
AES or ES systems are approved for use when treating low and moderate strength wastewater as defined by our approval and the Vermont rules. Systems to treat high strength wastewater may be approved on a case by case basis. Please contact Presby Environmental for design recommendations.

15.32 Water Purification Systems
a) Water purification systems and water softeners should **not** discharge into any AES or ES system. This "backwash" does not require treatment and the additional flow may overload the system.
b) Consult with your designer for alternative means of dispersal.
c) If there is no alternative means of disposing of this backwash other than in the system, then the system will need to be "oversized." Calculate the total amount of backwash in gpd, multiply by 3, and add this amount to the daily design flow when determining the field and septic tank sizing.
d) Water purification systems and water softeners require regular routine maintenance; consult and follow the manufacturer's maintenance recommendations.

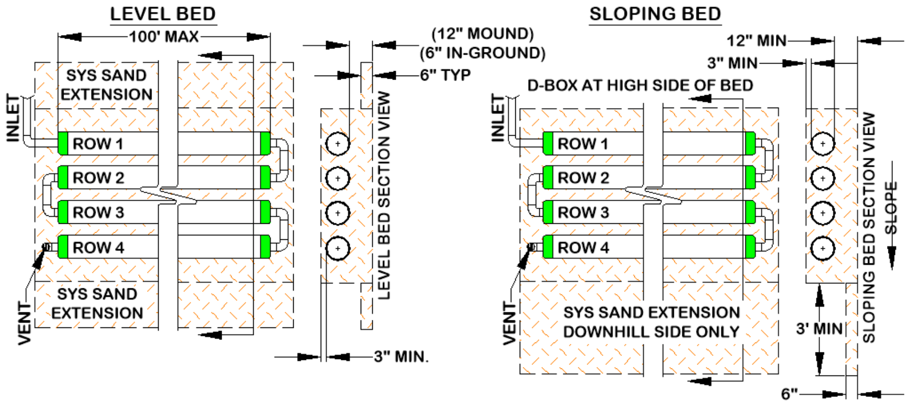
15.33 Long, Narrow Systems Recommended
All AES or ES are recommended to be designed and installed as long and narrow as possible for the site. Long, narrow configurations provide the optimal liquid distribution conditions. Vermont linear loading rates must always be honored.

Example of a long and narrow system using two rows:



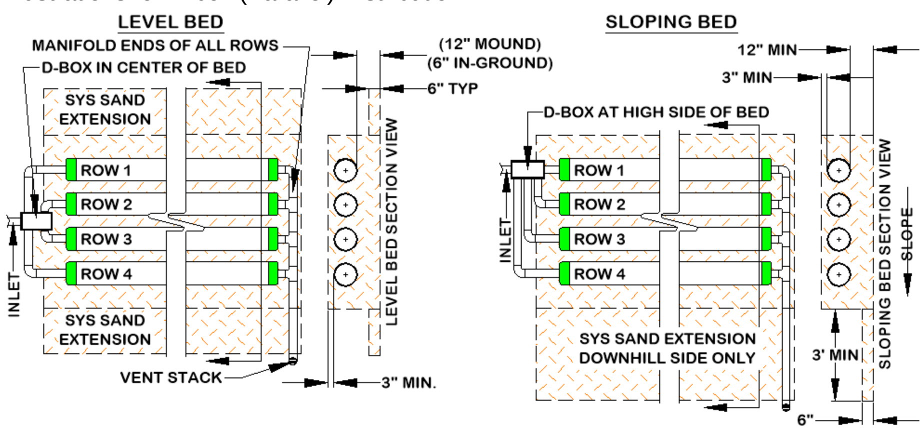
16.0 Basic Serial Distribution
AES or ES rows are connected in series at the ends with raised connections, using offset adapters. Basic serial distribution systems are quick to develop a strong biomat in the first row, provide a longer flow route, improved effluent treatment and ensure air will pass through all the rows. Other criteria:
a) May be used for single beds of 900 gpd or less.
b) Basic serial distribution incorporates rows in serial distribution in a single bed.
c) Does not require the use of a D-box unless utilizing a pump.
d) A maximum of 500 ft of AES or ES pipe per basic serial bed.
e) When a D-box is being used, a flow equalizer is not required because effluent flow is not being divided.
f) For sloping beds, the system sand extension is placed entirely on the downhill side and must be at least 3 ft (4 ft when measured from the pipe).
g) System sand extensions (if required) is divided symmetrically for level beds (as shown).
h) System sand extension (if required) is placed entirely on downhill side of a sloping bed (as shown).

i) Illustration of Level and Sloping Basic Serial Systems:



17.0 D-box (Parallel) Distribution

a) All rows in this configuration must be the same length and never longer than 100 ft.
b) Flow equalizers must be used in the D-box outlets feeding the rows.
c) Use a vent manifold to connect the ends of all rows to ensure adequate air flow. Manifold to be sloped toward AES or ES pipes (like the raised connection).
d) Place the D-box on level, firmly compacted soil.
e) A 2 in min. drop is required between the D-box outlets and the AES or ES pipe inlets.
f) System sand extensions (if required) divided symmetrically for level beds (as shown).
g) System sand extension (if required) placed entirely on downhill side of a sloping bed (as shown).
h) Illustrations for D-box (Parallel) Distribution:

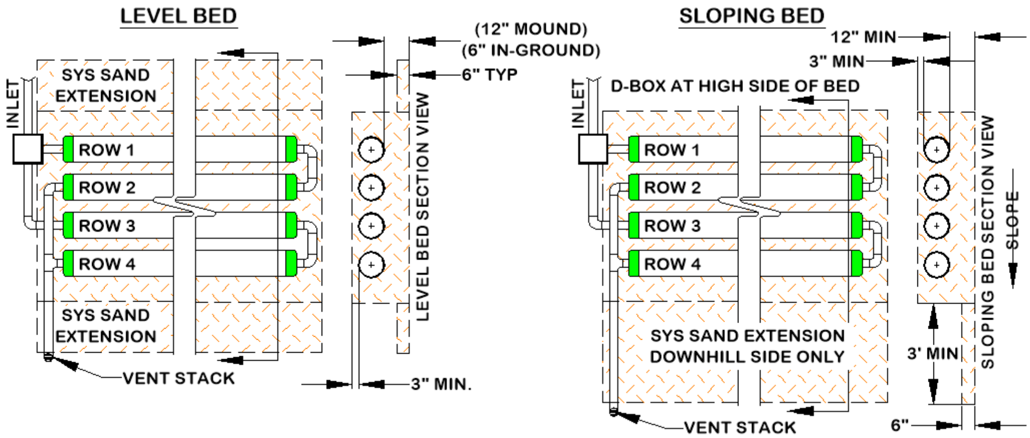


18.0 Combination Serial Distribution

Combination serial distribution within one bed, or multiple beds, is required for systems with daily design flows greater than 900 gpd. Combination serial distribution is quick to develop a strong biomat in the first row of each section, providing improved effluent treatment. Each combination serial section is limited to a maximum loading of 500 gpd and a maximum of 500 ft of AES or ES pipe.

a) Combination serial distribution consists of two or more serial sections installed in a single bed.
b) Each section in a combination serial system consists of a series of rows connected at the ends with raised connections, using offset adapters and PVC sewer and drainpipe.
c) Maximum length of any row is 100 ft.
d) Maximum 500 ft AES or ES pipe in any serial section.
e) Serial section loading limit is 500 gpd.
f) There is no limit on the number of combination serial sections within a bed.
g) System sand extensions (if required) divided symmetrically for level beds (as shown).
h) System sand extension (if required) placed entirely on downhill side of a sloping bed (as shown).
i) When the vent manifold is on the same side as the serial section inlets, the manifold runs over the top of these inlets (as shown).

j) Illustrations of Combination Serial Systems:



18.1 Section Loading

Each section in a combination serial system has a maximum daily design flow of 500 gpd. More than the minimum number of sections may be used. Ex: Daily design flow = 1,000 gpd requires (1,000 ÷ 500) = 2 sections min.

18.2 Section Length Requirement

a) Each section must have the same minimum linear feet of pipe.
b) The minimum linear feet of pipe per section is determined by dividing the total linear feet required in the system by the number of sections required.
c) A section may exceed the minimum linear length.
d) Rows within a section may vary in length to accommodate site constraints (See Non-Conventional Configurations, para. 23.0, pg. 19).

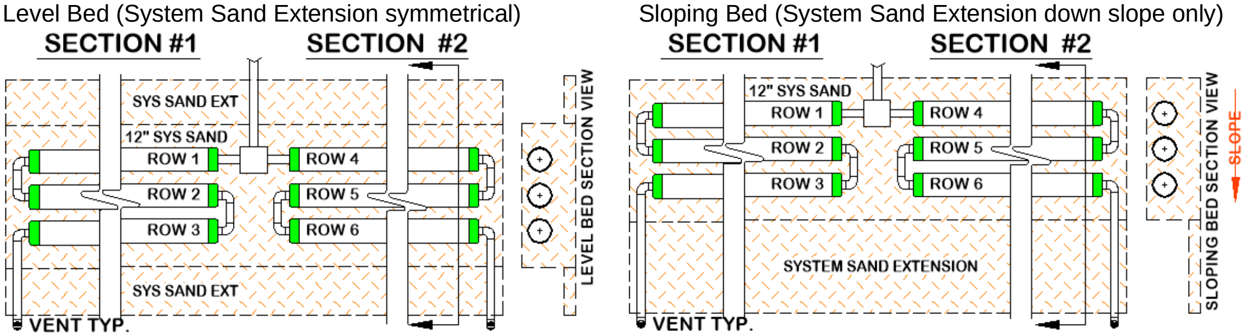
19.0 Butterfly Configuration

A butterfly configuration system is considered a single bed system and therefore separation distance between the left and right halves of the system is a minimum of 2 ft.

a) A "butterfly configuration," such as the one shown below, is considered a single bed system with two or more sections (can also be D-box or combination configurations).
b) A minimum 2 ft separation distance (measured pipe to pipe) is required between the left and right sides provided that the elevation of the two sides is the same or within 1 ft of the same elevation. In the event of an elevation differential greater than 1 ft, the two sides would be considered separate beds.
c) Maximum length of any row is 100 ft.
d) Serial section loading limit is 500 gpd.
e) Serial sections are limited to a maximum of 500 ft of AES or ES pipe.
f) Beds can contain any number of serial sections.
g) System sand extensions (if required) divided symmetrically for level beds.
h) System sand extension (if required) placed entirely on downhill side of a sloping bed.
i) The configuration shown below can accept up to 1,000 gpd (2 sections x 500 gpd/section = 1,000 gpd)

Illustration of a Butterfly configuration:

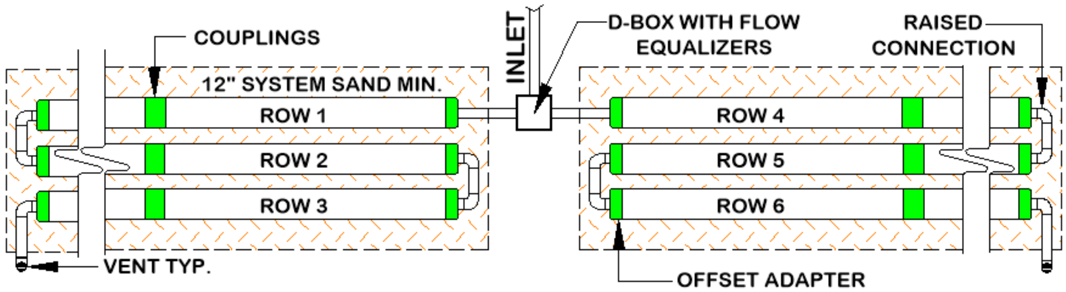
Level Bed (System Sand Extension symmetrical) Sloping Bed (System Sand Extension down slope only)



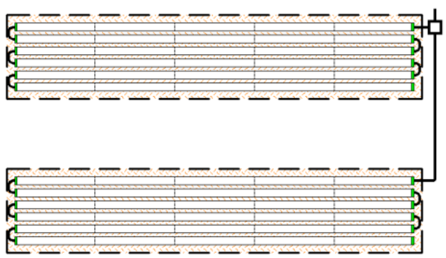
20.0 Multiple Bed Distribution

Multiple bed distribution incorporates two or more beds, each bed with basic serial, combination serial, or D-box distribution, and each receiving an equal amount of effluent from a D-box. Multiple beds may be oriented along the contour of the site or along the slope of the site.

a) Each bed must have the same minimum linear feet of pipe. The minimum linear feet of pipe per bed is determined by dividing the total linear feet required in the system by the number of beds.
b) Rows within a bed may vary in length to accommodate site constraints, except with D-box configuration which requires all rows to be the same length.
c) End-to-end configurations are preferred to side-to-side configurations.
d) In side-to-side configuration one bed is placed beside another or one bed is place down slope of another. Vermont linear loading must be considered when choosing this multiple bed layout.
e) Illustration of End-to-End Multiple Beds:



f) Illustration of Side -to-Side Multiple Beds:



20.1 Bed Separation Distances

A 10 ft separation distance is required by the state of Vermont between multiple beds.

a) For in-ground systems, this distance is measured from the closest edges of the system sand beds.
b) For mound systems, the 10 ft separation distance is measured from toe-of-slope of one bed to nearest toe-of-slope of other bed(s). To accommodate construction access and site constraints, additional separation distance may be necessary.

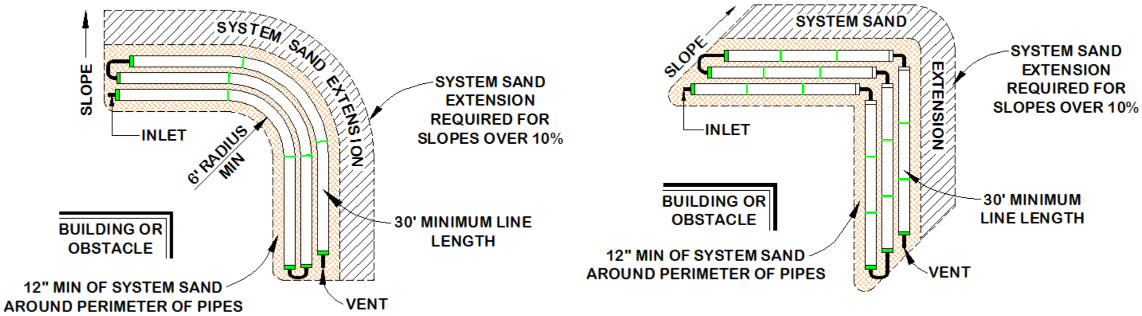
20.2 Total Linear Feet Requirement

a) Each section or bed must have at least the minimum linear feet of pipe (total feet of pipe required divided by number of sections equals the minimum number of feet required for each section or bed).
b) A section or bed may exceed the minimum linear length.
c) Rows within a section or bed may vary in length to accommodate site constraints.
d) Total AES or ES pipe in any serial section is limited to a maximum of 500 ft.

21.0 Angled Beds

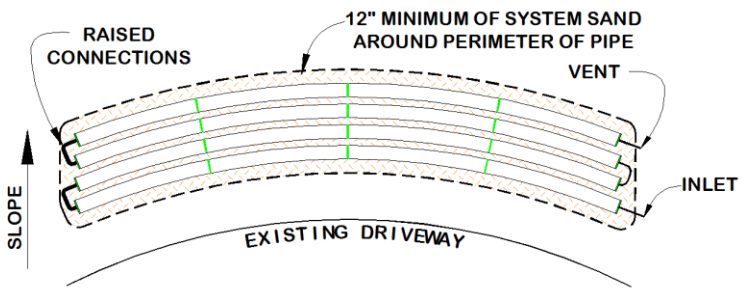
Angled configurations generally have one or more specific bends, but the rows should follow the contour of the site as much as possible. Rows are angled by bending pipes (first drawing, below) or by using offset adapters (second drawing, below). A 10 ft length of AES or ES pipe may be bent up to 90°. The angled system shown to the right requires 30 ft minimum row lengths.

Illustrations of Angled Beds:



22.0 Curved Beds

Curved configurations work well around structures, setbacks, and slopes. Multiple curves can be used within a system to accommodate various contours of the site.

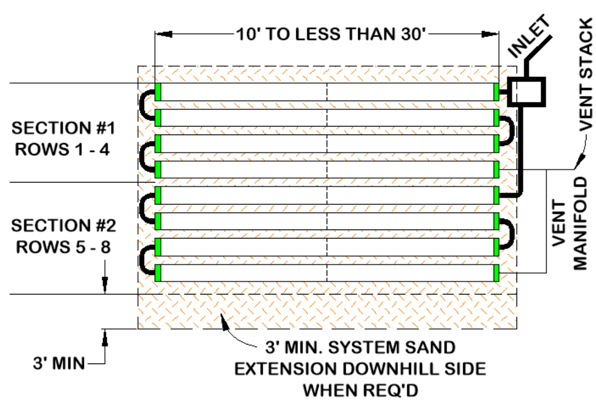


23.0 Non-Conventional System Configurations

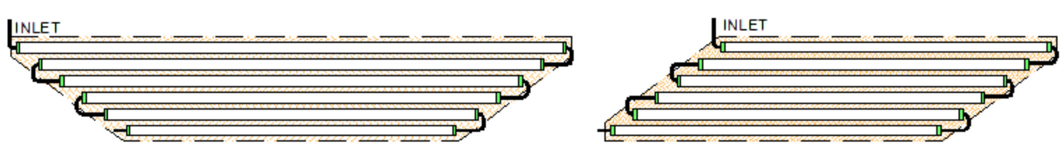
Non-conventional system configurations may have irregular shapes to accommodate site constraints and are limited to coarse sand, sand, loamy coarse sand, loamy sand, fine sand, very fine sand, loamy very fine sand, coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam or perc rates of 1-60 mpi. A site-specific waiver from the state may be required for non-conventional configurations.

23.1 Non-Conventional Row Lengths Less than 30 ft

In general, we recommend that rows are from 30 ft to 100 ft in length. However, if site constraints require a system design with ANY row shorter than 30 ft, the design must be combination serial configuration. The D-box must feed a total of 30 ft minimum of pipe, when adding the length of the rows in each serial section. All D-box outlets must have flow equalizers and row lengths must conform to Vermont linear loading rates if constructed as a mound (see para. 10.0, pg. 5). Illustration of non-conventional row length bed shown to right:

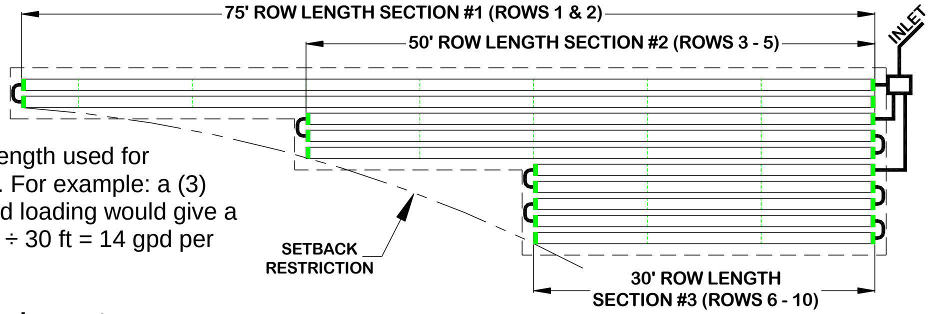


23.2 Non-Conventional Basic Serial Configuration



23.3 Non-Conventional Combination Serial Configuration

(Venting not shown)



Note: The shortest row length must honor Vermont's linear loading rate. For this illustration, the length used for the calculation would be 30 ft. For example: a (3) bedroom residence at 420 gpd loading would give a linear loading rate of 420 gpd ÷ 30 ft = 14 gpd per linear foot.

24.0 Pumped System Requirements

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

24.1 Alarm

Vermont requires all pump systems to have a high-water alarm float or sensor installed inside the pump chamber.

24.2 Basic Serial Distribution Limit

Pumped systems with basic serial distribution are limited to a maximum dose rate of 40 gallons per minute. Never pump directly into AES or ES pipe.

24.3 Combination and Multiple-Bed Distribution Limit

All systems with combination serial distribution or multiple bed distribution must use flow equalizers in each distribution box outlet. Each bed or section of combination serial distribution is limited to a maximum of 20 gallons per minute, due to the flow constraints of equalizers. Example: pumping to a combination system with 3 sections (using 3 D-box outlets). The maximum delivery rate is (3 x 20) = 60 gpm. Always provide a means of velocity reduction.

24.4 Differential Venting Required

All pump systems and dosing siphons must use differential venting (see Differential Venting, para. 25.2, pg. 21).

24.5 Distribution Box Required

All pump systems require a distribution box (see Velocity Reduction, para. 24.7, pg. 20).

24.6 Dose Volume

a) Pump dosing should be designed for a minimum of 6 cycles per day.
b) Pump volume per dose must be no greater than 1-gallon times the total linear feet of AES or ES pipe.
c) If possible, the dosing cycle should provide one hour of drying time between doses.

24.7 Velocity Reduction

The rate at which effluent enters the pipe must be controlled. Excessive effluent velocity can disrupt solids that settle in the pipes.

a) Effluent must never be pumped directly into AES or ES pipe.
b) A distribution box or tank must be installed between the pumping chamber and the AES or ES pipe to reduce effluent velocity.
c) Force mains must discharge into a distribution box (or equivalent) with velocity reducer and a baffle, 90° bend, tee or equivalent.

25.0 Venting Requirements

25.1 General Rules

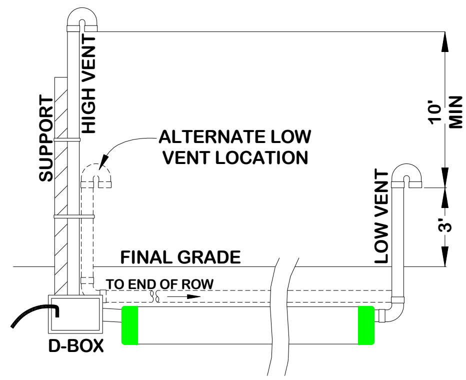
a) Adequate air supply is essential to the proper functioning of the system.
b) Venting as described in this section is required for all systems.
c) Vent openings must be located to ensure the unobstructed flow of air through the entire system.
d) The low vent inlet must be a minimum of 3 ft above final grade.
e) One 4 in vent is required for every 1,000 ft of AES or ES pipe.
f) A single 6 in vent may be installed in place of up to three 4 in vents.
g) If a vent manifold is used, it must be at least the same diameter as the vent(s).
h) When venting multiple beds, it is preferred that each bed be vented separately rather than manifolding bed vents together.
i) Remote Venting (see, para. 25.7, pg.22) may be utilized to minimize the visibility of vent stacks.

25.2 Differential Venting

a) Differential venting is the use of high and low vents in a system.
b) In a gravity system, the roof stack acts as the high vent.
c) High and low vent openings must be separated by a minimum of 10 vertical feet.
d) If possible, the high and low vents should be of the same capacity.
e) Sch. 40 PVC or equivalent should be used for all vent stacks.

25.3 Pump System Vent Locations

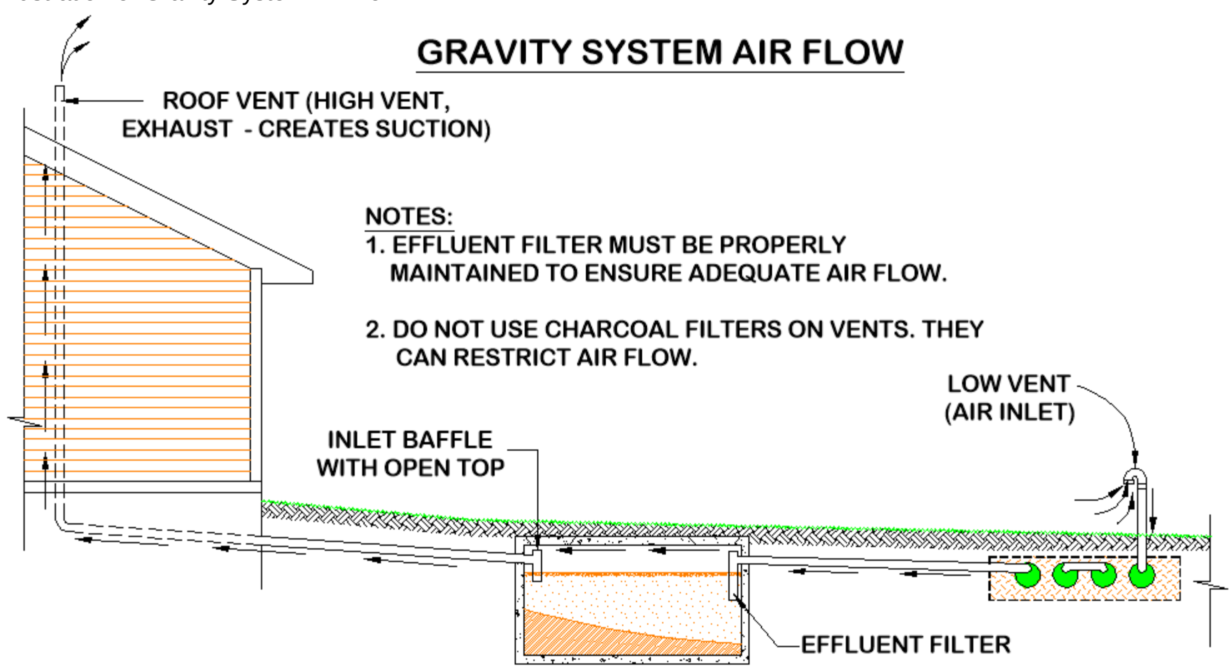
a) A low vent is installed through an offset adapter at the end of each section, basic serial bed or attached to a vent manifold.
b) A high vent is installed through an unused distribution box outlet (see diagram to right).
c) A 10 ft minimum vertical differential is required between high and low vent openings.
d) 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.
e) The low vent may be attached to the D-box and the high vent attached to the end of the last row (or manifold) only when the D-box is insulated against freezing.



25.4 Vent Locations for Gravity Systems

a) A low vent through an offset adapter is installed at the end of the last row of each section or the end of the last row in a basic serial bed, or at the end of each row in a D-box distribution configuration system. A vent manifold may be used to connect the ends of multiple sections or rows.
b) 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.
c) When the house (roof) vent functions as the high vent, there must be a minimum of a 10 ft vertical differential between the low and high (roof) vent openings.

Illustration of Gravity System Air Flow:

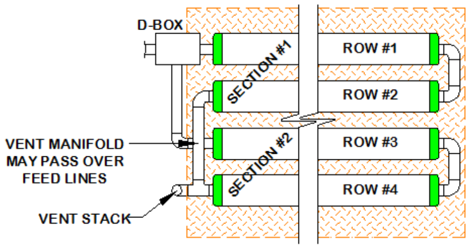


VENTING IS ESTABLISHED THROUGH SUCTION (CHIMNEY EFFECT) CREATED BY THE DRAW OF AIR FROM THE HIGH VENT, WHICH DRAWS AIR FROM THE LOW VENT, THROUGH THE LEACH FIELD, THROUGH THE SEPTIC TANK, AND EXHAUSTED THROUGH THE (HIGH) ROOF VENT.

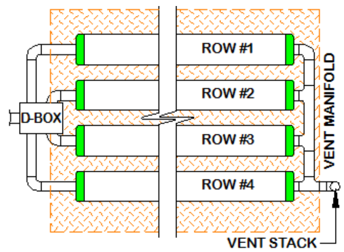
25.5 Vent Manifolds

A vent manifold may be incorporated to connect the ends of a number of sections or rows of pipe to a single vent opening. See diagrams below.

Combination system:



D-box system:



25.6 Vent Piping Slope

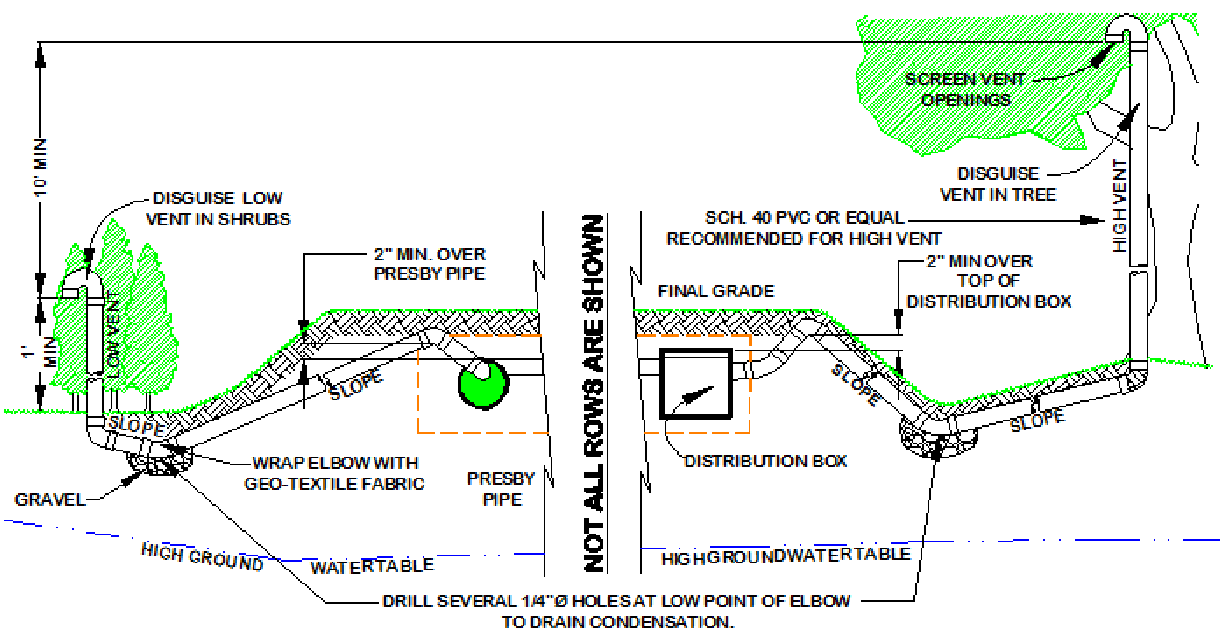
Vent piping should slope downward toward the system to prevent moisture from collecting in the pipe and blocking the passage of air.

25.7 Remote Venting

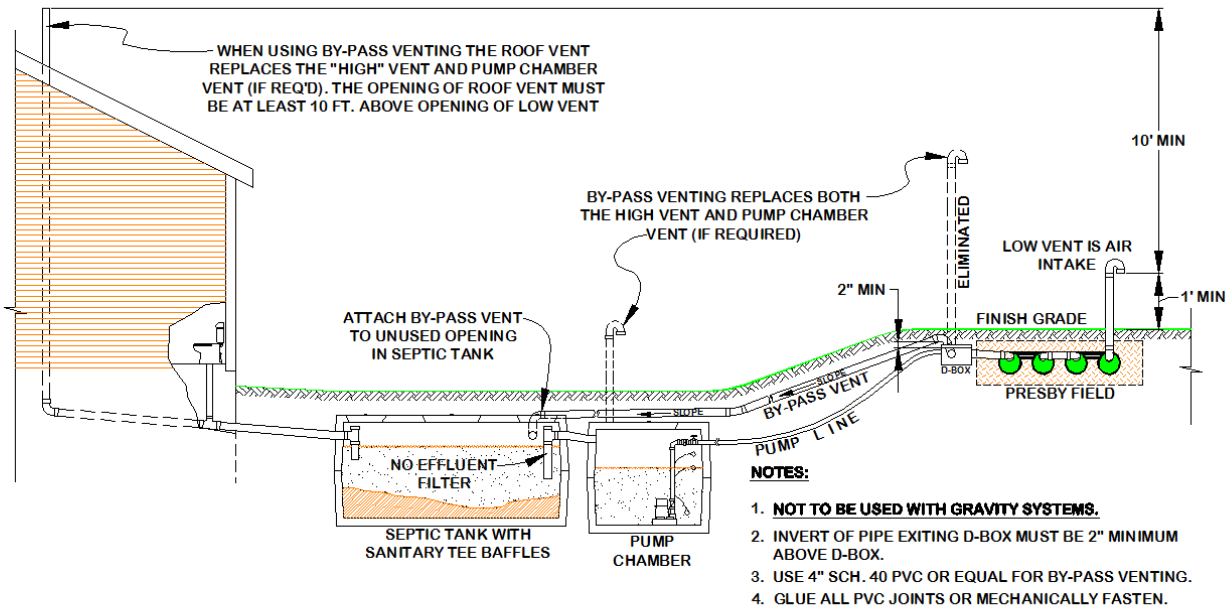
If site conditions do not allow the vent pipe to slope toward the system, or the owner chooses to utilize remote venting for aesthetic reasons (causing the vent pipe not to slope toward the system), the low point of the vent line must be drilled creating several ¼ in holes to allow drainage of condensation.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

a) A **high point** that is above the highest point of all AES or ES pipes or the distribution box; and,
b) A **low point** opened for drainage which is at least 36 in above the SHWT and outside any water supply isolation zone(s).

Illustration of Remote Venting:



25.8 By-Pass Venting



26.0 Site Selection

26.1 Access
Systems should be located to allow access for septic tank maintenance and to at least one end of all AES or ES rows. Planning for future access will facilitate rejuvenation in the unlikely event the system malfunctions (see System Bacteria Rejuvenation para. 28.0, pg. 25).

26.2 Containment
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.

26.3 Determining Site Suitability
Refer to Vermont rules regarding site suitability requirements.

26.4 Hydraulic loading
Systems should not be located where lawn irrigation, roof drains, or natural flows increase water loading to the soils around the system.

26.5 Reserve Area
Vermont rules require a reserve area for in-ground replacement systems; mound systems do not require a reserve area and replacement system can be installed in the same location. In-ground systems must be replaced in accordance with Vermont rules and may require the replacement system to be located in the reserve area.

26.6 Rocky or Wooded Areas
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.

26.7 Systems under Traffic Bearing Surfaces
The state of Vermont does not permit systems to be installed under traffic bearing surfaces.

26.8 Surface Water Diversions
Surface water runoff must be diverted away from the system. Diversions must be provided up-slope of the system and designed to avoid ponding. Systems must not be located in areas where surface or groundwater flows are concentrated.

26.9 Topography
Locate systems on convex, hill, slope or level locations that do not concentrate surface flows. Avoid swales, low areas, or toe-of-slope areas that may not provide sufficient drainage away from the system.

27.0 Component Handling, Site Preparation and Installation Requirements

27.1 Backfilling Rows

a) Spread system sand between the rows.
b) If using AES, confirm pipe rows are positioned with Bio-Accelerator along the bottom (sewn seam up).
c) Stand between two rows of pipe and walk heel-to-toe its entire length, ensuring that system sand fills all void spaces beneath the pipe.
d) Finish spreading system sand to the top of the rows and leave them exposed for inspection purposes.
e) After inspection, apply at least 3 in of additional system sand over all the pipes.
f) A minimum of 4 in of suitable earth cover (topsoil or loam), with a texture similar to the soil at the site and capable of sustaining plant growth, must be placed above the installed system. Refer to Topsoil (para. 15.26, pg. 14).
g) Construction equipment should not travel over the installed system area until at least 12 in of cover material is placed over the system.
h) Final grades must direct precipitation away and around the field. Crown the top of level beds enough to shed water.

27.2 Component Handling

a) Keep mud, grease, oil, etc. away from all components.
b) Avoid dragging pipe through wet or muddy areas.
c) Store pipe on high and dry areas to prevent surface water and soil from entering the pipes or contaminating the fabric prior to installation.
d) The outer fabric of the AES or ES pipe is ultra-violet stabilized; however, this protection breaks down over time in direct sunlight. To prevent damage to the fabric, cover the pipe with an opaque tarp if stored outdoors.

27.3 Connect Rows Using Raised Connections

Raised connections consist of offset adapters, 4 in PVC sewer and drainpipe, and 90° elbows. They enable greater liquid storage capacity and increase the bacterial surfaces being developed. Use raised connections to connect the rows of the system (see para. 4.5, pg. 4).

27.4 Correct Alignment of Advanced Enviro-Septic Bio-Accelerator Fabric

The Bio-Accelerator (white geo-textile fabric) is to be positioned centered along the bottom of the pipe rows (sewn seam up).

27.5 Critical Reminder 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.

27.6 Distribution Box Installation

To prevent movement, be sure D-boxes are placed level on compacted soil, sand, pea gravel base, or concrete pad.

27.7 Erosion Control

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.

27.8 Fill Extensions Requirements

All systems with any portion of the system sand bed above original grade require fill extensions on each side beyond the outside edge of all pipes starting at the edge of the system sand then tapering to meet existing grade at a maximum slope of 3:1 (see illustrations in para. 3.0, pg. 3).

27.9 Level Row Tolerances

Use a laser level or transit to install rows level. Variations beyond 1 in (±1/2") may affect system performance and are not acceptable.

27.10 Raking and Tilling Procedures

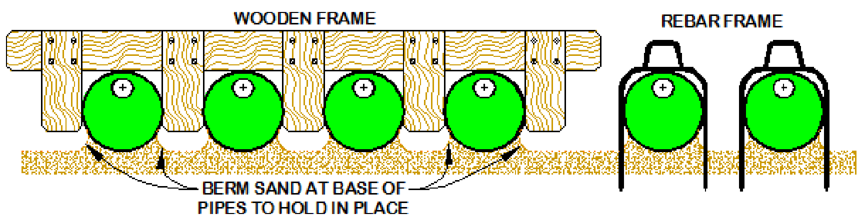
All areas receiving system sand, sand fill and fill extensions **must** be raked or tilled. If a backhoe/excavator is used to till the site, fit it with chisel teeth and till the site. The excavator should remain outside of the proposed system sand area and extensions. Equipment with tires must never enter the receiving area due to likely wheel compaction of underlying soil structures.

a) 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").

b) For **elevated bed systems** remove the “O” horizon (all organics), then use an excavator or backhoe to rake furrows 7 in – 8 in deep into the receiving area. Create a transition layer by tilling 6 in of system sand or sand fill into the receiving layer prior to bed construction.

27.11 Row Spacers

System sand may be used to keep pipe in place while covering, but simple tools may also be constructed for this purpose. Two examples are shown. One is made from rebar, the other from wood. Center-to-center row spacing may be larger than specified by this Manual. Caution: Remove all tools used as row spacers before final covering.



27.12 Site Preparation

a) Locate and stake out the system sand bed, extension areas and soil material cover extensions on the site according to the approved plan.
b) Install sediment/erosion control barriers prior to beginning excavation to protect the system from surface water flows during construction.
c) Do not travel across or locate excavation equipment within the portion of the site receiving system sand.
d) Do not stockpile materials or equipment within the portion of the site receiving system sand.
e) It is especially important to avoid using construction equipment down slope of the system to prevent soil compaction.
f) Remove all grass, leaves, sticks, brush and other organic matter or debris from the excavated system site. Tree stumps shall be cut flush with surface of the ground and roots shall not be pulled. Avoid soil disturbance, relocation, or compaction. Avoid mechanical leveling or tamping of dislodged soil. Fill all voids created by unintentional stump or root removal with system sand. Remove topsoil for in ground beds and excavate soil to specified elevation in preparation for System Sand. When constructing systems at or above grade, do not remove the topsoil.
g) Place a few inches of system sand on the prepared surface and till into the subsoil to create a transition layer (see para.27.10, pg. 24 for tilling instructions).

27.13 System Sand Installation and/or Sand Fill Immediately After Excavation

a) To protect the tilled area (system sand bed area and system sand extension area) from damage by precipitation, system sand should be installed immediately after tilling (6 in for below grade and 12 in for elevated systems).
b) When installing the system sand, work off either end or the uphill side of the system to avoid compacting soil (see “Critical Reminder” in para. 27.5, pg. 24).
c) When installing system sand, 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.
d) Track construction equipment should not travel over the installed system area until at least 12 in of cover material is placed over the pipes.
e) Heavy equipment with tires must never enter the receiving area due to likely wheel compaction of underlying soil structures.

27.14 Trees and Shrubs

No trees or shrubs should be located within 10 ft of the system perimeter to prevent roots from growing into and damaging the system.

27.15 When to Excavate

a) 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.
b) Do not excavate the system area immediately after, during or before precipitation.

28.0 System Bacteria Rejuvenation

28.1 Contact Presby Environmental and VT DEC Prior to Rejuvenation

This section covers procedures for bacteria rejuvenation. VT DEC and PEI must be contacted for technical assistance prior to attempting rejuvenation procedures for any model of pipe. Please note that state and/or local permits may be required.

28.2 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 limiting liquids from passing through. A unique feature of the AES and ES systems is their ability to be rejuvenated in place.

28.3 How to Rejuvenate AES and ES Bacteria

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

1. Contact VT DEC and Presby Environmental before attempting Rejuvenation for technical assistance.
2. Determine the problem causing the bacteria conversion.
3. Drain the tank and field of wastewater using a state approved septage hauler. This may need to be done in conjunction with step 4 to gain access to the wastewater in the field. No effluent is allowed to reach ground or surface waters.
4. Excavate a ditch at the far end of all the rows; remove the offset adapters; expose and open the distribution box (if present). <u>Note:</u> No portion of the rejuvenation ditch can ever be closer than 36 in to the seasonal high-water table.
5. If foreign matter has entered the system, flush the pipes.
6. Safeguard all open excavations.
7. Guarantee a passage of air through the system.
8. Allow all rows to dry for 72 hours minimum. The system sand should return to its natural color.
9. Re-assemble the system to its original design configuration. As long as there is no physical damage to the AES or ES components, the original components may be reused.

29.0 System Expansion

29.1 AES or ES Systems are Expandable

Systems are easily expanded by adding equal lengths of pipe to each row of the original design, by adding additional rows or by adding additional equal sections. All system expansions must comply with state and local regulations. Contact VT DEC prior to commencement of any work to obtain required permits. If product is not readily available, AES or ES pipe may be used to expand existing SS systems.

29.2 Reusable Components

Pipe and 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.

30.0 System Replacement

30.1 System Replacement Procedure

If a system requires replacement:

a) Contact VT DEC prior to commencement of any work to obtain required permits.
b) Remove the existing components and contaminated sand.
c) Replace in the same excavated location with new system sand.
d) If components are not damaged, they may be flushed and reused.
e) All system replacements must comply with state and local regulations.

31.0 Operation & Maintenance

31.1 Proper Use

Systems require minimal maintenance, 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.PresbyEnvironmental.com or via mail upon request to (800) 473-5298 or info@presbyeco.com.

31.2 System Abuse Conditions

The following conditions constitute system abuse:

a) Liquid in high volume (excessive number of occupants, excessive 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).
b) 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)

c) Antibiotic medicines in high concentrations
d) Cleaning products in high concentrations
e) Fertilizers or other caustic chemicals in any amount
f) Petroleum products in any amount
g) Latex and oil paints
h) System suffocation (compacted soils, barrier materials, etc.)

Special Note: PEI and most regulatory agencies do not recommend the use of septic system additives.

31.3 System Maintenance/Pumping of the Septic Tank

a) Inspect the septic tank at least once every two years under normal usage.
b) Pump the tank when surface scum and bottom sludge occupy one-fourth or more of the liquid depth of the tank.
c) If a garbage disposal is used, the septic tank will likely require more frequent pumping.
d) 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.
e) Inspect the system to ensure that vents are in place and free of obstructions.
f) 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.

31.4 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 system sand bed area, 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.

32.0 Glossary

This Manual contains terminology which is common to the industry and terms that are unique to AES or ES systems. While alternative definitions may exist, this section defines how these terms are used in this Manual.

32.1 Advanced Enviro-Septic® (AES) Pipe

A single unit comprised of corrugated plastic pipe, Bio-Accelerator (see para. 32.5, pg. 27) fabric along its bottom which is surrounded by a layer of randomized plastic fibers and a sewn geo-textile fabric, is 10 ft in length, with an outside diameter of 12 in and a storage capacity of approximately 58 gallons. Each foot of AES provides over 40 sq ft of total surface area for bacterial activity. The sewn seam is always oriented up (12 o'clock position) within the bed. A white tag is sewn into the seam indicating the product is AES pipe. Pipes are joined together with couplings to form rows. AES is a combined wastewater treatment and dispersal system (see illustration in para. 2.0, pg. 2).

32.2 Enviro-Septic® (ES) Pipe

A single unit comprised of corrugated plastic pipe which is surrounded by a layer of randomized plastic fibers and a sewn geo-textile fabric, is 10 ft in length, with an outside diameter of 12 in and a storage capacity of approximately 58 gallons. Each foot of ES provides over 25 sq ft of total surface area for bacterial activity. A white tag is sewn into the seam indicating the product ES pipe. Pipes are joined together with couplings to form the rows. ES is a combined wastewater treatment and dispersal system (see illustration in para. 2.0, pg. 2).

32.3 Simple-Septic® (SS) Pipe

A single unit comprised of corrugated plastic pipe which is surrounded by a single layer of sewn geo-textile fabric, is 10 ft in length, with an outside diameter of 12 in and a storage capacity of approximately 58 gallons. A white tag is sewn into the seam indicating the product is SS pipe. Pipes are joined together with couplings to form rows. Each foot of SS pipe provides over 15 sq ft of total surface area for bacterial activity.

32.4 Basic Serial Distribution

Basic serial distribution incorporates pipe rows in serial distribution in a single bed. See Basic Serial Distribution in para. 16.0, pg. 15.

32.5 Bio-Accelerator®

Bio-Accelerator fabric screens additional solids from the effluent, enhances and accelerates treatment, facilitates quick start-up after periods of non-use, provides additional surface area for bacterial growth, promotes even distribution, and further protects outer layers and the receiving surfaces so they remain permeable. Bio-Accelerator is only available with AES pipe (see para. 1.5, pg.1).

32.6 Butterfly Configuration
A variation of a standard, single bed system with the D-box located in the center, with rows oriented symmetrically on either side, and with each side or section receiving an equal volume of flow from the D-box. See Butterfly Configuration, para. 19.0, pg. 17.

32.7 Center-to-Center Row Spacing
Center-to-center spacing is the distance from the center of one pipe row to the center of the adjacent row.

32.8 Coarse Randomized Fiber
A mat of coarse, randomly-oriented fibers which separates more suspended solids from the effluent, provides a large surface area for bacterial activity and keeps the biomat, which develops in the geo-textile fabric, from being in direct contact with the pipe (see illustration in para. 2.0, pg. 2).

32.9 Combination Serial Distribution
Combination serial distribution incorporates two or more sections of pipe in a single bed, with each section receiving a maximum of 500 gpd of effluent from a distribution box (see para. 18.0, pg. 16).

32.10 Cooling Ridges
Pipe ridges that allow the effluent to flow uninterrupted around the circumference of the pipe and aid in cooling.

32.11 Coupling
A plastic fitting that joins two pipe pieces in order to form rows (see para.4.4, pg. 4).

32.12 Daily Design Flow
The peak daily flow of wastewater to a system, expressed in gallons per day (gpd); systems are typically sized based on the daily design flow. Design flow calculations are set forth in the Vermont rules. In general, actual daily use is expected to be one-half to two-thirds less than “daily design flow.”

32.13 Differential Venting
A method of venting a system utilizing high and low vents (see para. 25.2, pg. 21).

32.14 Distribution Box or “D-box”
A device designed to divide and distribute effluent from the septic tank equally to each of the outlet pipes that carry effluent into the system. D-boxes are also used for velocity reduction, see Velocity Reduction, para. 24.7, pg. 20.

32.15 D-box Distribution Configuration
D-box distribution configuration is a design in which each row receives effluent from a distribution box outlet. Such a system is also called a “parallel system” or a “finger system.” See D-box (Parallel) Distribution, para. 17.0, pg. 16.

32.16 Distribution Box Manifold
A distribution box manifold is a PVC configuration which connects several distribution box outlets together in order to equalize effluent flow. Refer to drawing in para. 15.5, pg. 12.

32.17 End-to-End Configuration
Consists of two or more beds constructed in a line (i.e., aligned along the width of the beds). See para. 20.0, pg. 18.

32.18 Fill Extension
Utilized in constructing elevated (mound) systems to blend the raised portion of the system with side slope tapering to meet the existing grade. All systems require 1.5 ft minimum fill extension on all sides (measured from the edge of the AES or ES pipes).

32.19 Flow Equalizer
An adjustable plastic insert installed in the outlet pipes of a D-box to equalize effluent distribution to each outlet.

32.20 gpd and gpm
gpd and gpd are acronyms for "gallons per day" and "gallons per minute" respectively.

32.21 High and Low Vents
Pipes used in differential venting. Detailed information about venting requirements can be found in para. 25.0, pg. 20.

32.22 MPI
MPI is an acronym for minutes per inch and is the numerical value by which percolation rates (also called “perc rates”) are expressed.

32.23 Multiple Bed Distribution
Multiple bed distribution incorporates two or more beds, each bed with basic serial, combination serial, or D-box distribution and receiving effluent from a distribution box (see para. 20.0, pg. 18).

32.24 Non-Conventional Configurations
Have irregular shapes or row lengths shorter than 30 ft to accommodate site constraints (see para. 23.0, pg. 19).

32.25 Offset Adapter
A plastic fitting with a 4 in hole installed at the 12 o'clock position which allows for connections from one row to another and for installation of venting (see para. 4.2, pg. 4).

32.26 Percolation Rate
Also known as "perc rate" is a numerical indication of a soil's hydraulic capacity, expressed in minutes per inch (mpi).

32.27 Pressure Distribution
A pressurized, small-diameter pipe system used to deliver effluent to an absorption field. Pressure distribution is not permitted to be used with an AES or ES system. Systems are designed to promote even distribution without the need for pressure distribution.

32.28 Pump Systems
Utilize a pump to gain elevation in order to deliver effluent to a D-box, (see para. 24.0, pg. 20).

32.29 Raised Connection
A U-shaped, 4" diameter, PVC pipe configuration which is used to connect rows oriented in a serial configuration and to maintain the proper liquid level inside each row (see drawing, para. 4.5, pg. 4).

32.30 Raking and Tilling
Raking and tilling refers to methods of preparing the native soil that will be covered with system sand or sand fill, creating a transitional layer between the sand and the soil (see para.27.10, pg. 24).

32.31 Row
A row consists of a number of pipe sections (sticks) connected by couplings with an offset adapter on the inlet end and an offset adapter on the opposite end. Rows are typically between 30 ft and 100 ft long.

32.32 Sand Fill
Clean sand, free of organic materials and meeting the specifications set forth in Sand Fill, para.15.24, pg. 14. Sand fill is used to raise the elevation of the system to meet required separation distance or in side slope tapers. System sand may be used in place of sand fill.

32.33 Section / Serial Section
A serial section is a group of interconnected rows receiving effluent from one distribution box outlet. Sections are limited to 500 gpd daily design flow and 500 ft total AES or ES pipe maximum.

32.34 Serial Distribution
Serial distribution is when two or more rows are connected by a raised connection. Basic serial distribution is described in para. 16.0, pg. 15, Combination serial distribution is described in para. 18.0, pg. 16.

32.35 SHWT
SHWT is an acronym for seasonal high-water table.

32.36 Skimmer Tabs
Projections into the pipe that help to capture grease and suspended solids from the existing effluent.

32.37 Side-to-Side Configuration
Consist of two or more beds arranged so that the rows are parallel to one another.

32.38 Slope (3:1)
In this Manual's illustrations, slope is expressed as a ratio of run to rise. Example: A slope with a grade of (3:1) is the difference in horizontal distance of three (3) horizontal feet (run) over an elevation difference of one (1) ft (rise).

32.39 Slope (%)
Expressed as a **percent**, is the difference in elevation divided by the difference in horizontal distance between two points on the surface of a landform. Example: A site slope of one (1) percent is the difference in elevation of one (1) foot (rise) over a horizontal distance of one hundred (100) feet (run).

32.40 Smearing
Smearing is the mechanical sealing of soil air spaces along an excavated, tilled or compressed surface. This is also referred to as "compacting." It is critical to avoid smearing or compacting the soils under and around the field.

32.41 Surface Diversion
Surface diversion is a natural or manmade barrier that changes the course of water flow around an onsite system's soil absorption field.

32.42 System Sand Bed
The system sand bed is the sand area required/used in systems. The system sand bed extends a minimum of 6 in below (in-ground systems), 12 in below (mound systems), 3 in above and 12 in horizontally from the outside edges of the pipes in the system.

32.43 System Sand
System sand must be clean, granular sand free of organic matter and must adhere to Vermont §1-921(g)(1) Table 9-9 fill material with no more than 3% passing the #200 sieve (see complete details in para. 15.23, pg. 14).

32.44 System Sand Extension Area (SSE)
The SSE is any portion of the system sand bed that is more than 1 ft away from AES or ES pipe. The SSE area is a minimum of 6 in deep. A SSE area is required on the down slope side of mound systems with more than 10% slope and extends a minimum of 3 ft beyond the tall portion of the down slope edge of the system sand bed (see illustration in para. 3.0, pg. 3). This shouldn't be confused with the fill extension (see para. 32.18, pg. 28).

32.45 Topsoil (a.k.a. Loam or Soil Cover Material)
Topsoil, also known as Loam, is soil material cover capable of sustaining plant growth which forms the topmost layer of cover material above the system.

33.0 Vermont System Installation Form

Installers must complete and fax or mail a copy of this form to the local approving authority and to:

Presby Environmental, Inc., 143 Airport Rd, Whitefield, NH 03598 Fax: (603) 837-9864

Installer's Name:	Installer's PEI Certification Number:	
Company Name:		
Street Address:		
City:	State:	Zip:
Installer's Phone Number:		
Designer's Name:	Company Name:	
Street Address:		
City:	State:	Zip:
Phone Number:		
Property Owner(s):		
Site Street Address:		
City:	State:	Zip:

System Information *(check all that apply)*:

☐ Advanced Enviro-Septic® Pipe ☐ Enviro-Septic® Pipe

☐ New Construction ☐ Replacement ☐ Mound ☐ In ground ☐ Gravity ☐ Sloping ☐ Gravity

☐ Pump to D-box ☐ Serial Distribution ☐ Combination Distribution ☐ Parallel Distribution # of Beds: ___________

☐ Effluent Filter Used Design Flow (bedrooms or gpd):_____________ Perc Rate: ___________

Installation Date:	System Startup Date:
State Permit Number:	Local Construction Permit Number:

Comments: