# The Presby Wastewater Treatment System

# IDAHO

## Design and Installation Manual for Advanced Enviro-Septic® Wastewater Treatment Systems


**√ Minimizes the Expense**

**√ Protects the Environment**

**√ Preserves the Site**

**AES System in Idaho**




**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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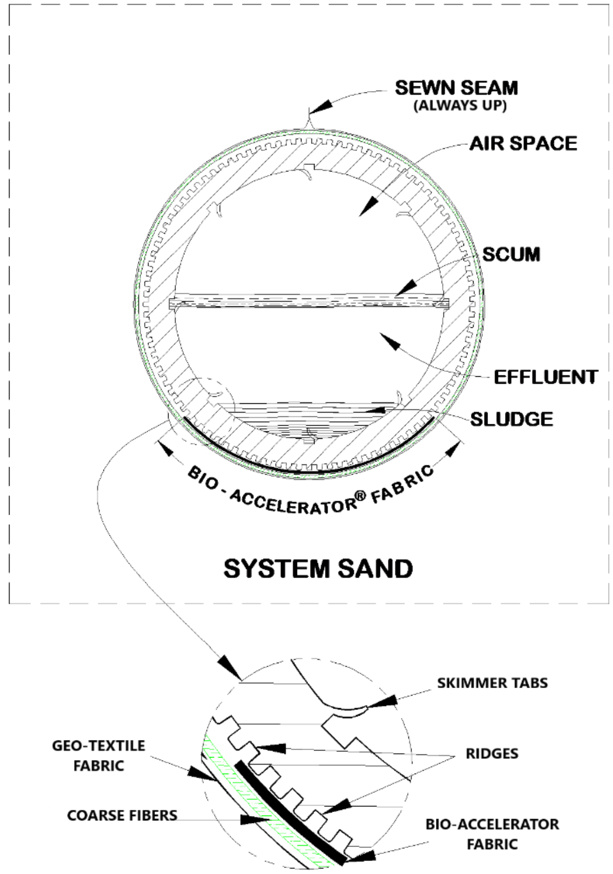
The products and methods depicted in this Manual are protected by one or more patents.

Advanced Enviro-Septic® is a registered trademark of Presby Environmental Inc.

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

## 1.0 INTRODUCTION

## *1.1 Background*




The Advanced Enviro-Septic® (AES) Wastewater Treatment System utilizes a unique combination of components that work together to treat effluent and prevent suspended solids from sealing the underlying soil. Comprised of a patented corrugated, perforated plastic pipe with interior skimmer tabs and cooling ridges, the large-diameter pipe retains solids while the Bio-Accelerator® fabric, coarse fibers, and geo-textile fabric provide multiple bacterial surfaces to treat effluent prior to its contact with the receiving soils. The continual cycling of effluent (the rising and falling of liquid inside the pipe) enhances bacterial growth. The AES system is completely passive, and yet provides increased aeration and a greater bacterial treatment area than traditional systems. The result is a system that is more efficient, lasts longer, and has a virtually no negative environmental impact.

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

Additional system benefits include:

- requires a smaller area
- installs easily and quickly
- eliminates the need for environmentally impactful washed stone
- adapts easily to residential, non-residential and difficult sites
- prevents formation of organic material at the receiving soil interface
- blends “septic mounds” into sloping terrain
- safely recharges groundwater

### Information Specific to Use of the AES System in Idaho

- The bottom of the system sand excavation and the AES system must be installed level in accordance with standard system and capping fill system requirements.
- The system sand bed bottom must be located at least 3 but not more than 48 in below the original grade.
- The minimum sizing requirement for AES systems is 150 gallons per day (gpd).
- System sand bed area cannot exceed 1,500 ft² per field.
- Maximum site slope per IDAPA 58.01.03 rules (the Rules).
- In addition to the system sand specifications on Page 4, additional critical system design specifications include the following:
    - minimum center-to-center pipe spacing is 1.5 ft;
    - maximum center-to-center pipe spacing is 3 ft;
    - maximum width of the system sand extending from the side of the outermost pipe rows is 3 ft; and
    - maximum width of the system sand extending from each end of the pipe rows is 3 ft.

### Environmental Standards and Technical Support

All AES systems shall be designed and installed in compliance with the procedures and specifications detailed in this manual (Manual) and in the product’s state approval. This Manual is to be used in conjunction the Rules. In the event of contradictions between this Manual and the Rules, PEI should be contacted for technical assistance at (800) 473-5298.

## 1.0 INTRODUCTION

### Certification Requirements

PEI strongly recommends designers and installers who have not previously attended a PEI certification to obtain certification. Certification is obtained by attending a certification course presented by PEI or its sanctioned representative or by viewing tutorial videos on our website and then successfully passing a short assessment test. PEI recommends professionals involved in the inspection or review of AES systems also become PEI certified.

## *1.2 System Components*

### AES Pipe

- nominal exterior diameter of 12 in
- holding capacity of 5.8 gallons per foot
- 10-ft length of AES pipe is flexible enough to bend up to 90° and can be cut to any length
- made with a significant amount recycled material


**Offset Adapter** - A 12 in plastic fitting with a single inlet hole oriented in the twelve o'clock position and designed to accept a 4 in sewer line, raised connection or vent pipe.

**Double Offset Adapter** - A 12 in plastic fitting 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 requirements of the design configuration.

**Coupling** - A plastic fitting used to create a connection between two pieces of AES pipe.

**System Sand** - The system sand that surrounds the AES pipes is an essential component of the system. It is critical that the correct type and amount of system sand is used during construction. System sand must be clean, granular sand, free of organic matter. System sand is placed a minimum of 3 in above and 6 in between pipe rows, and 12 in below and around the outer perimeter of the AES pipes. System sand is a manufactured material that must adhere to **all** of the quality restrictions referenced in the Technical Guidance Manual (TGM) available at https://www.deq.idaho.gov/media/1148/tgm-entire.pdf.

### System Sand Bed Height Dimension

The height of an AES sand bed measures 27 in minimum (not including cover material):

- minimum of 12 in of system sand below the AES pipe;
- 12 in diameter of the pipe; and
- minimum of 3 in of system sand above the AES pipe.

## 2.0 SYSTEM DESIGN

## *2.1 Sizing*

**Table A: Soil Loading Rates**

| Soil Group | Soil Design Subgroup | Soil Textural Classification | USDA Field Test Textural Classification | AES Application Rate (gpd/ ft²) |
|---|---|---|---|---|
| A | A-1 | Medium Sand | 30–60 Mesh | 1.7 |
| | A-2a | Medium Sand | Poorly Graded | 1.2 |
| | A-2b | Fine Sand | Sand 60-140 Mesh | 1.0 |
| | | Loamy Sand | Sand | |
| B | B-1 | Very Fine Sand | Sand 140-270 Mesh | 0.8 |
| | | Sandy Loam | Sandy Loam | |
| | | Very Fine Sandy Loam | Sandy Loam | |
| | B-2 | Loam | - | 0.6 |
| | | Silt Loam | Silt Loam | |
| | | Sandy Clay Loam | (≤27% Clay) | |
| C | C-1 | Silt | Silt Loam | 0.4 |
| | | Sandy Clay Loam | Clay Loam (≥27% Clay) | |
| | | Silty Clay Loam | Clay Loam | |
| | C-2 | Clay Loam | Clay Loam | 0.3 |

**Table B: Pipe Requirements**

| Minimum Pipe Length Required (ft.) | | |
|---|---|---|
| Residential | | Non-residential (gpd/ft) |
| 1-3 Bedroom (br) | Additional Bedrooms (br) (50 gpd) | |
| 70 ft per br | 25 ft per br | 2.14 |

## *2.2 Trench Design Procedure*

*Step #1:* *Determine Total Amount of Pipe Needed*
Calculate the minimum amount of AES pipe needed. Residential systems: multiply the first three bedrooms by 70 ft/br and add 25 ft/br for each additional br. For non-residential systems divide the daily design flow by 2.14 gpd/ft and round up to the nearest whole number. Example: 4-bedroom residence 70 ft x 3 + 25 ft = 235 ft required. 300 gpd non-residential system ÷ 2.14 gpd/ft = 140.18 ft required; round up to 141 ft.

*Step #2:* *Determine Minimum System Sand Bed Area (SSBA)*
From Table A: Find the soil's application rate using soil's texture and calculate the minimum SSBA by dividing the daily design flow (gpd) by the application rate (gpd/ ft²). Example: Group A loamy sand requires 1.0 gpd/ ft²; 300 gpd ÷ 1.0 gpd/ ft² = 300 ft² SSBA minimum.

*Step #3:* *Select a Trench Length*
Select a trench length suitable for the site that does not exceed 102 ft (100 ft of pipe + 12 in of system sand on each end).

*Step #4:* *Determine Number of Pipe Rows Required Based on Selected Trench Length*
Divide the pipe required calculation from Step #1 by the selected trench length from Step #5. (Round up to the next whole number.)

*Step #5:* *Determine Trench Width and Number of Trenches Needed*
Based on the number of rows needed, calculate the number of trenches needed that will allow equal amount of pipe in each trench.

- 1, 5, or 7 rows use 3 ft trench
- 2 or multiples of two rows use 4.5 ft trench (2 rows can be placed in a 6 ft trench to meet SSBA requirements if needed)
- 3 or multiples of 3 rows use 6 ft trench

*Step 6:* *Verify SSBA is Met and Adjust as Needed*
Multiply trench length from Step #3 by trench width and number of trenches from Step #5. Increase trench length or width as needed by adding additional sand.

**Trench Design Example #1:** ***3-bedroom single family residence at 250 gpd placed on A-1 soils (medium sand)***

*Step #1:* *Determine Total Amount of Pipe Needed*
3 bedrooms x 70 ft/br = 210 ft minimum.

*Step #2:* *Determine Minimum System Sand Bed Area (SSBA)*
From Table A: Find soils application rate and calculate SSBA→ A-1 soils require 1.7 gpd/ $ft^2$, 250 gpd ÷ 1.7 gpd/ $ft^2$ = 148 $ft^2$.

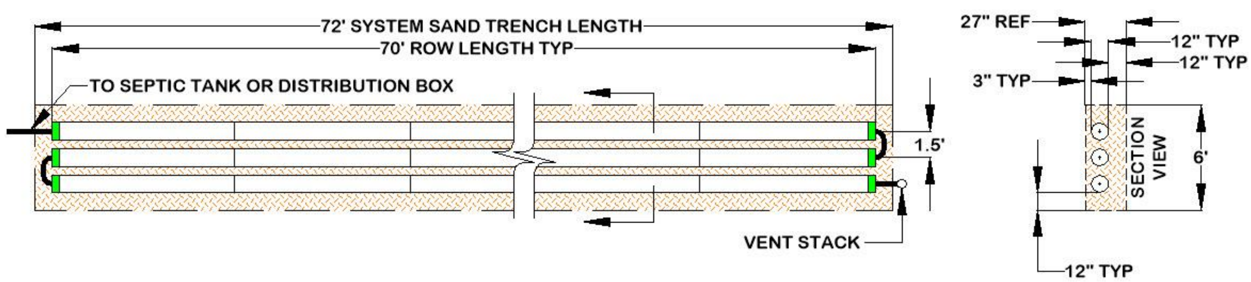
*Step #3:* *Select a Trench Length*
The site will accommodate a 72 ft trench (70 ft of pipe + 12 in of sand on each end), which will evenly divide into the pipe requirement so use 72 ft trench length.

*Step #4:* *Determine Number of Pipe Rows Required Based on Selected Trench Length*
210 ft (Step #1) ÷ 70 ft (Step #3) = 3 pipe rows per trench.

*Step #5:* *Determine Trench Width and Number of Trenches Needed*
Based on the number of rows needed, use one 6 ft wide trench containing 3 rows of pipe.

*Step 6:* *Verify SSBA is Met and Adjust as Needed*
SSBA Provided = 6 ft x 72 ft = 432 $ft^2$, which is greater than the 148 $ft^2$ required by Step #2. No adjustments are needed.

Illustration of Trench Example #1:




**Trench Design Example #2:** ***3-bedroom single family residence at 250 gpd placed on C-2 soils (clay loam)***

*Step #1:* *Determine Total Amount of Pipe Needed*
3 bedrooms x 70 ft/br = 210 ft minimum.

*Step #2:* *Determine Minimum System Sand Bed Area (SSBA)*
From Table A: Find soils application rate and calculate SSBA→ C-2 soils require 0.3 gpd/ $ft^2$, 250 gpd ÷ 0.3 gpd/ $ft^2$ = 834 $ft^2$.

*Step #3:* *Select a Trench Length*
The site will accommodate a 93 ft trench (91 ft of pipe + 12 in of sand on each end).

*Step #4:* *Determine Number of Pipe Rows Required Based on Selected Trench Length*
210 ft (Step #1) ÷ 91 ft (Step #3) = 2.31 (round up to 3 pipe rows).

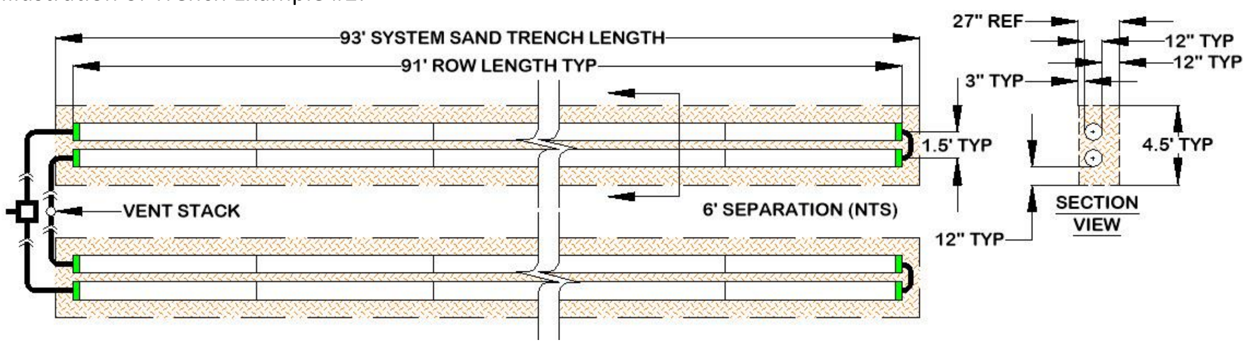
## 2.0 SYSTEM DESIGN

*Step #5:* *Determine Trench Width and Number of Trenches Needed*
Based on the number of rows needed, this system can be designed using three 3 ft wide trenches, one 6 ft wide trench, or two 4.5 ft wide trenches. A 6 ft wide trench will not meet the SSBA requirement from Step #2. Three 3 ft wide trenches will require a larger total footprint on the lot but will use less pipe than two 4.5 ft wide trenches. This side has limited depth so I will choose to use two 4.5 ft trenches with 2 rows of pipe in each trench.

*Step 6:* *Verify SSBA is Met and Adjust as Needed*
SSBA Provided = two trenches 4.5 ft x 93 ft = 837 $ft^2$, which is greater than the 834 $ft^2$ required by Step #2. No adjustments are needed.

Alternatively, if the site limited the length of the system to 72 ft, the system could have been designed using two 6 ft. wide trenches with two 70 ft rows of pipe in each trench.

Illustration of Trench Example #2:




**Trench Design Example #3:** ***5-bedroom single family residence at 350 gpd on A-1 soils (medium sand)***

*Step #1:* *Determine Total Amount of Pipe Needed*
3 bedrooms x 70 ft/br + 2 bedrooms x 25 ft/br = 260 ft minimum.

*Step #2:* *Determine Minimum System Sand Bed Area (SSBA)*
From Table A: Find soils application rate and calculate SSBA→ A-1 soils require 1.7 gpd/ $ft^2$, 350 gpd ÷ 1.7 gpd/ $ft^2$ = 205.88 $ft^2$ (round up to 206 $ft^2$).

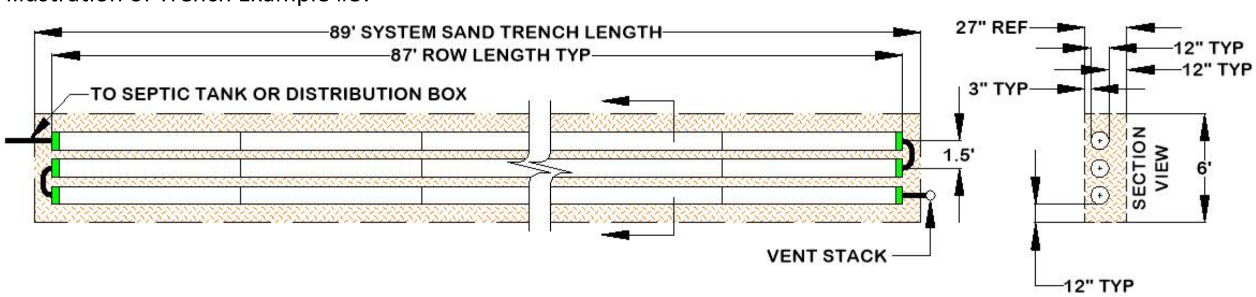
*Step #3:* *Select a Trench Length*
The site will accommodate an 89 ft trench (87 ft of pipe + 12 in of sand on each end).

*Step #4:* *Determine Number of Pipe Rows Required Based on Selected Trench Length*
260 ft (Step #1) ÷ 87 ft (Step #3) = 2.98 (round up to 3 pipe rows).

*Step #5:* *Determine Trench Width and Number of Trenches Needed*
Based on the number of rows needed, use one 6 ft wide trench containing 3 rows of pipe.

*Step 6:* *Verify SSBA is Met and Adjust as Needed*
SSBA Provided = 6 ft x 89 ft = 534 $ft^2$, which is greater than the 206 $ft^2$ required by Step #2. No adjustments are needed.

Illustration of Trench Example #3:



## 2.0 SYSTEM DESIGN

**Trench Design Example #4:** ***Non-residential system - daily design flow of 570 gpd on B-1 soils (sandy loam)***

*Step #1:* *Determine Total Amount of Pipe Needed*
570 gpd ÷ 2.14 gpd/ft = 267 ft minimum.

*Step #2:* *Determine Minimum System Sand Bed Area*
From Table A: Find soils application rate and calculate SSBA→ B-1 soils require 0.8 gpd/ $ft^2$, 570 gpd ÷ 0.8 gpd/ $ft^2$ = 712.5 $ft^2$ (round up to 713 $ft^2$).

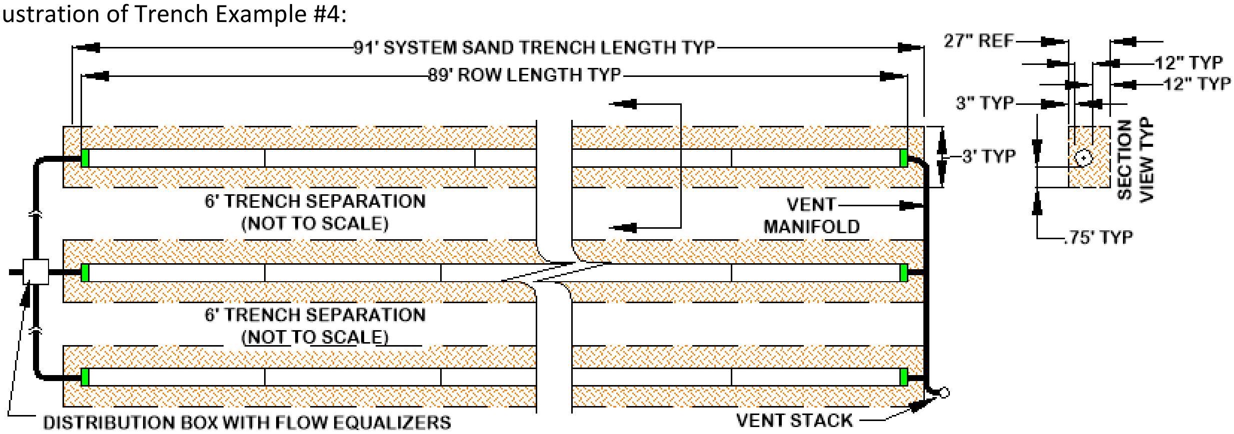
*Step #3:* *Select a Trench Length*
The site will accommodate a 91 ft trench (89 ft of pipe + 12 in of sand on each end).

*Step #4:* *Determine number of Pipe Rows Required Based on Selected Trench Length*
267 ft (Step #1) ÷ 89 ft (Step #3) = 3 pipe rows.

*Step #5:* *Determine Trench Width and Number of Trenches Needed*
Because we are working in B-1 soils, our required bed area will not allow for one 6 ft wide trench so we will design the system using three 3 ft wide trenches.

*Step 6:* *Verify SSBA is Met and Adjust as Needed*
SSBA Provided = (3 ft x 91 ft) x 3 rows = 819 $ft^2$, which exceeds the 713 $ft^2$ SSBA from Step #2. No adjustments are needed.

Illustration of Trench Example #4:




## *2.3 Bed Design Procedure and Example*

Bed configurations are allowed only when sites cannot accommodate trenches and have terrain slopes of 8% or less. All absorption beds must be approved to be used by the permitting health district prior to design or installation. Beds offer an advantage only when multiple trenches would normally be required.

*Step #1:* *Determine Total Amount of Pipe Needed*
Calculate the minimum amount of AES pipe needed. Residential systems: multiply the first three bedrooms by 70 ft/br and add 25 ft/br for each additional br; for non-residential systems divide the daily design flow by 2.14 gpd/ft (round up to the nearest whole number). Example: 4-bedroom residence 70 ft x 3 + 25 ft = 235 ft required; 300 gpd non-residential system ÷ 2.14 gpd/ft = 140.18 ft required (round up to 145 ft. for ease of construction).

*Step #2:* *Determine the Minimum System Sand Bed Area (SSBA)*
From Table A: find the soil's application rate using soil's texture and calculate the minimum SSBA by dividing the daily design flow (gpd) by the application rate (gpd/ $ft^2$). Gravity systems limited to 1,500 $ft^2$ by the Rules.

## 2.0 SYSTEM DESIGN

*Step #3:* *Calculate the Number of Serial Sections Required*
Calculate the minimum number of serial sections required (does not apply to parallel configuration): divide the daily design flow by 750 gpd (round up to nearest whole number).

*Step #4:* *Select a Row Length and Calculate Number of Rows Required*
Select a row length suitable for the site and calculate the number of rows (round up to whole number). The number of rows must be evenly divisible by the number of serial sections required (add rows as necessary).

*Step #5:* *Determine Pipe Layout Width (PLW)*
Select a center-to-center spacing for the pipe rows (center-to-center spacing may be a minimum of 1.5 ft to a maximum of 3 ft). The width of the resulting layout is the PLW. PLW is calculated using: PLW = [(# of rows – 1) x spacing (1.5)] + 1.

*Step #6:* *Determine Minimum System Sand Bed Width (SSBW)*
Calculate the minimum SSBW by dividing the SSBA from Step #2 by the selected row length from Step #4 + 2 ft (allows 12 inches of sand beyond the end of the rows).

*Step #7:* *Verify Bed Sizing*

a) Verify the minimum SSBW from Step #6 will cover all the rows in the bed: If the minimum SSBW is less than the (PLW + 2 ft), use (PLW + 2 ft) as the new minimum SSBW.
b) Verify the distance from the outermost edges of the AES pipe are not more than 3 ft from the outermost edges of the system sand. Increase the center-to-center row spacing as necessary.

**Bed Design Example #1: 5-bedroom single family residence at 350 gpd placed on C-2 soils (clay loam)**

*Step #1:* *Determine Total Amount of Pipe Needed*
Pipe required → 3 bedrooms x 70 ft/br + 2 bedrooms x 25 ft/br = 260 ft.

*Step #2:* *Determine the Minimum System Sand Bed Area (SSBA)*
Find soils application rate from Table A and calculate SSBA→ C-2 soils require 0.3 gpd/ ft², 350 gpd ÷ 0.3 gpd/ ft²= 1,167 ft².

*Step #3:* *Calculate the Number of Serial Sections Required*
Serial sections required → 350 gpd ÷ 750 gallons/section = 0.47 (round up to one).

*Step #4:* *Select a Row Length and Calculate Number of Rows Required*
Select a row length and calculate number or rows→ use 75 ft which requires 3.4 rows minimum. The criteria for this example will require 4 rows to accommodate the minimum pipe requirements and the minimum SSBA from Step #2.

*Step #5:* *Determine Pipe Layout Width (PLW*)

Select a center-to-center spacing for the pipe rows (center-to-center spacing may be a minimum of 1.5 ft to a maximum of 3 ft). The width of the resulting layout is the PLW. Because the SSBA from Step #2 is 1,167 ft² we will start by using the maximum row spacing to ensure outer pipe rows are equal to or less than 3 ft from the edge of the bed. PLW = [(4 rows – 1) x spacing (3] + 1 = 10 ft.

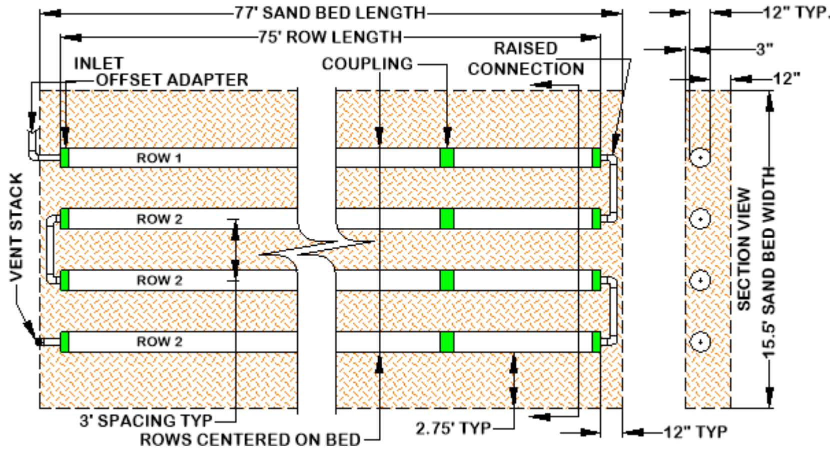
*Step #6:* *Determine Minimum System Sand Bed Width (SSBW)*
Calculate minimum SSBW → 1,167 ft² ÷ 77 ft (row length + 2 ft) = 15.15 ft (round up to 15.5 ft for ease of construction).

*Step #7: Verify Bed Sizing*

a) Verify SSBW wide enough to cover rows and less than DEQ's maximum allowed width of 20 ft →10 PLW + 2 ft = 12 ft, which is less than the 15.5 ft SSBW as well as the 20 ft maximum allowed bed width, therefore the SSBW of 15.5 ft is acceptable.
b) Verify distance from pipe edge to sand bed edge → (15.5 ft SSBW - 10 ft PLW) ÷ 2 = 2.75 ft. 2.75 ft is acceptable as it does not exceed the 3 ft maximum requirement beyond the edge of the outermost pipes to the edge of the system sand.

## 2.0 SYSTEM DESIGN

Illustration of Bed Example:




## *2.4 Design Specifications*

The AES system shall be designed in accordance with this Manual and the Rules and can be installed using either bed or trench design utilizing any of the design configurations outlined in this Manual.

### Daily Design Flow

Residential daily design flow for AES systems is calculated in accordance with the Rules. Systems servicing more than two residences shall use the non-residential specifications detailed in the sizing tables. In accordance with the Rules, the daily design flow for any single-family residential system in Idaho is 150 gpd for the first bedroom and 50 gpd for each additional bedroom. When daily design flow is determined by empirical wastewater flow data for non-residential systems, refer to the Rules.

### Water Purification Systems

- Water purification systems and water softeners should not discharge into any AES system.
- If there is no alternative means of disposing of this backwash other than in the system, 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.
- Water purification systems and water softeners require regular routine maintenance; consult and follow the manufacturer’s maintenance recommendations.

### Effluent (Wastewater) Strength

The AES pipe requirement for bed or trench systems is based on residential strength effluent, which has received primary treatment in a septic tank. Designing a system that will treat higher strength wastes requires additional AES pipe. In these situations, our Technical Advisors shall be consulted for recommendations at (800) 473-5298.

### Filters and Baffles

- Effluent filters are not recommended for use with AES systems.
- If used, effluent filters shall be maintained on at least an annual basis. Follow manufacturer’s instructions regarding required inspections, cleaning and maintenance of the effluent filter.
- Effluent filters must allow the free passage of air to ensure the proper functioning of the system.
- All septic tanks shall be equipped with baffles to prevent excess solids from entering the AES system.
- Charcoal filters in vent stacks (for odor control) are not recommended by PEI. They can block air flow and potentially shorten system life.

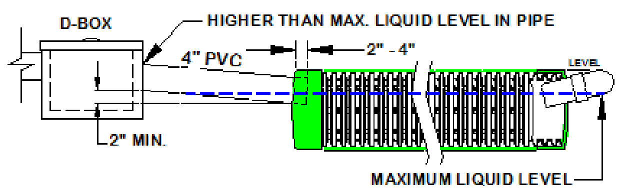
## 2.0 SYSTEM DESIGN

### Flow Equalizers Required

All distribution boxes used to divide effluent flow require flow equalizers in their outlets. A flow equalizer is an adjustable plastic insert installed in the outlet holes of a distribution box to equalize effluent distribution to each outlet whenever flow is divided. Each bed or section of combination serial distribution is limited to a maximum of 15 gallons per minute (gpm), due to the flow constraints of the equalizers. Example: pumping to a combination system with 3 sections (using 3 D-box outlets). The maximum delivery rate is (3 x 15) = 45 gpm. Always provide a means of velocity reduction when needed. All systems with combination serial distribution or multiple bed distribution shall use flow equalizers in each distribution box outlet.

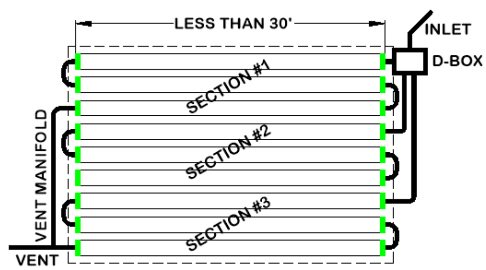
### Two Inch Rule

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




### Row Requirements

- All beds and trenches wider than 3 ft shall have at least 2 rows.
- Maximum row length for any system is 100 ft of pipe.
- Recommended minimum row length is 30 ft of pipe.
  - A combination (or D-box) distribution system shall be used if any row length is less than 30 ft. The D-box shall feed at least 30 ft of AES pipe, a minimum of two D-box outlets must be used and the field must be vented.




- Minimum center-to-center spacing is 1.5 ft. Larger spacing is allowed at the discretion of the designer but, in accordance with DEQ's guidance, cannot exceed 3 ft to meet minimum storage capacity requirements.
- The distance from the edge of the outermost rows to the outermost edge of the system sand bed must be no less than 1 ft and no more than 3 ft.
- Sewn seam must be oriented in the twelve o'clock position. This correctly orients the Bio-Accelerator® fabric in the six o'clock position.
- In bed applications, AES rows shall be centered in the middle of the system sand bed area.
- Each row 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.
- It is most convenient if row lengths are designed in exact 10 ft increments to accommodate the length of the AES pipe as manufactured. However, AES pipe lengths can be cut to any length.

### Separation Distances (Horizontal and Vertical)

Separation distances to the seasonal high-water table (SHWT) or other restrictive features are measured from the outermost edge of the system sand bed for horizontal separations and the sand/soil interface for vertical separations. Vertical separation distances shall meet the specifications detailed in TGM Table 4-19.

**AES System Vertical Separation to Limiting Layers (ft)**

| Limiting Layer | Flow < 2,500 GPD<br>All Soil Types |
|---|---|
| Impermeable layer | 2 |
| Fractured rock or very porous layer | 1 |
| Normal high ground water | 1 |
| Seasonal high ground water | 1 |

## 2.0 SYSTEM DESIGN

### Barrier Materials Over System Sand

No barrier materials (hay, straw, tarps, etc.) are to be placed between the system sand and cover material. Additionally, according to the Rules, Idaho does not allow drainfields of any type to be covered by an impermeable surface barrier, used for parking or driving, or any other activity that may cause compaction of the soils above, below, or around the drainfield.

## *2.5 System Configurations*

### Trench Systems

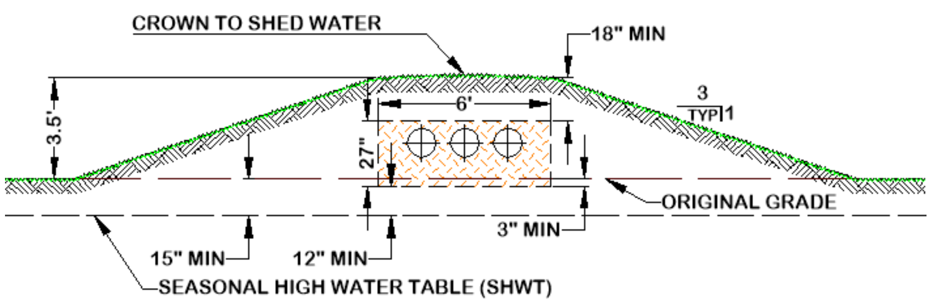
AES pipe must be installed in trench configurations whenever the site conditions allow. Trench systems may be placed on level or sloping terrain in accordance with the Rules and may utilize serial, combination, butterfly, or parallel distribution. Trench systems incorporate one or more rows of AES pipe per trench. Bed configurations may be used only when the site will not accommodate trenches.

### Bed Systems

Bed configurations are only allowed when the site will not accommodate trench systems. All beds must be constructed level. Beds may not be placed on terrain with slopes in excess of 8%. All absorption beds must be approved to be used by the permitting health district prior to design or installation.

### Capping Fill Systems

AES systems (trench or bed configuration) must meet the capping fill requirements of the Rules when the system sand bed bottom is installed 3 to 24 inches below the original grade. When the system sand bed bottom is installed more than 24 inches and up to a depth of 48 inches below the original grade, follow the standard system construction requirements in the Rules.




Critical installation considerations include, but are not limited to, the following. Please consult the TGM for more detailed information.

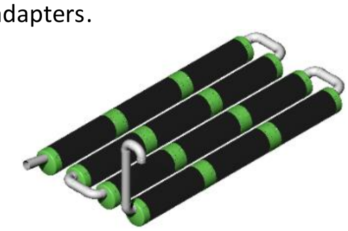
- If any aspect of the capping soil system is above grade, the natural soil must be scarified to a depth of 6-8 inches;
- Materials used for the cap must meet the requirements of the TGM; and
- Compaction of the scarified area must be prevented.

For details on design of AES in capping fill system applications go to: "https://www.infiltratorwater.com/resource-center/manuals-guides-and-cad-details/", click on the map of the United States, select "Idaho" (either by clicking on the state on the map or by selecting Idaho in the "Select a state" options block), then click on the block labeled Presby Environmental", then click on the bullet point labeled "Capping Fill Design".

### Basic Serial Distribution

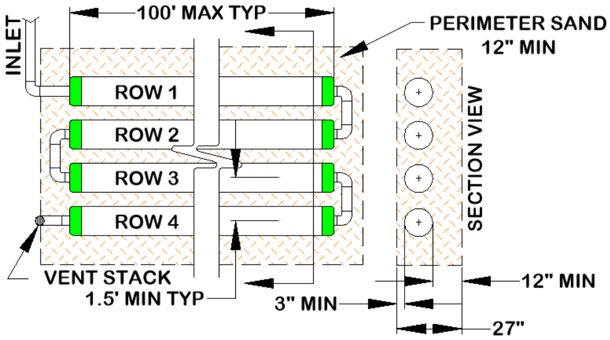
AES rows are connected in series at the ends with raised connections, using offset adapters.

- Used for single beds of 750 gpd or less.
- Incorporates rows in serial distribution in a single bed.
- Rows shall meet requirements outlined in the design criteria above.
- Gravity fed basic serial systems may be fed directly from the septic tank.
- Bed may be constructed with unusual shapes to avoid site obstacles or meet setback requirements.



## 2.0 SYSTEM DESIGN

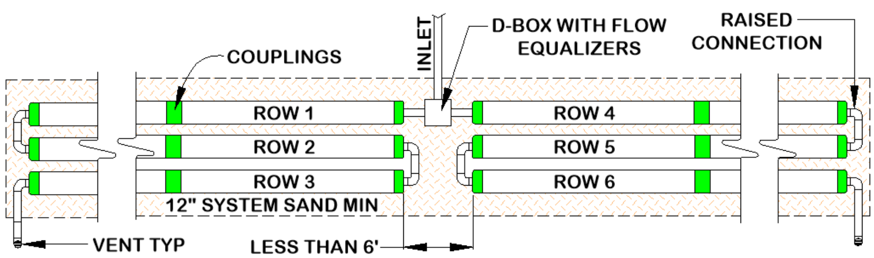
Illustration of basic serial systems bed designs:




### Butterfly Configuration

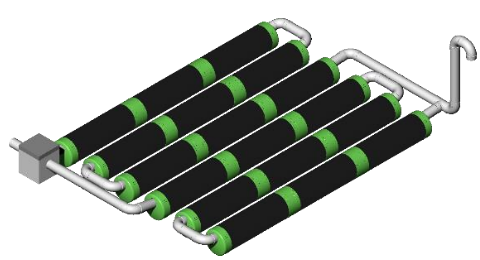
- A "butterfly configuration," is considered a single bed system with two or more sections extending in opposite directions from the D-box along the contour.
- Maximum length of any in-line rows when added together (like rows 1 & 4 below) is 100 ft.
  - Note: if the rows to the right and left of the distribution box are separated by 6 ft or more each individual row can be up to 100 ft long. This could provide up to 200 ft of AES pipe along a common contour.
- Butterfly configurations are generally used to accommodate bed lengths longer than the maximum row length of 100 ft.
- Serial section loading limit is 750 gpd.
- Beds can contain any number of serial sections.
- Rows shall meet requirements outlined in the design criteria above.

Illustration of a butterfly configuration bed design:




### Combination Serial Distribution

Combination serial distribution within one bed, or multiple beds, is required for systems with daily design flows greater than 750 gpd. Effluent flow is divided evenly to each section using a distribution box with flow equalizers.

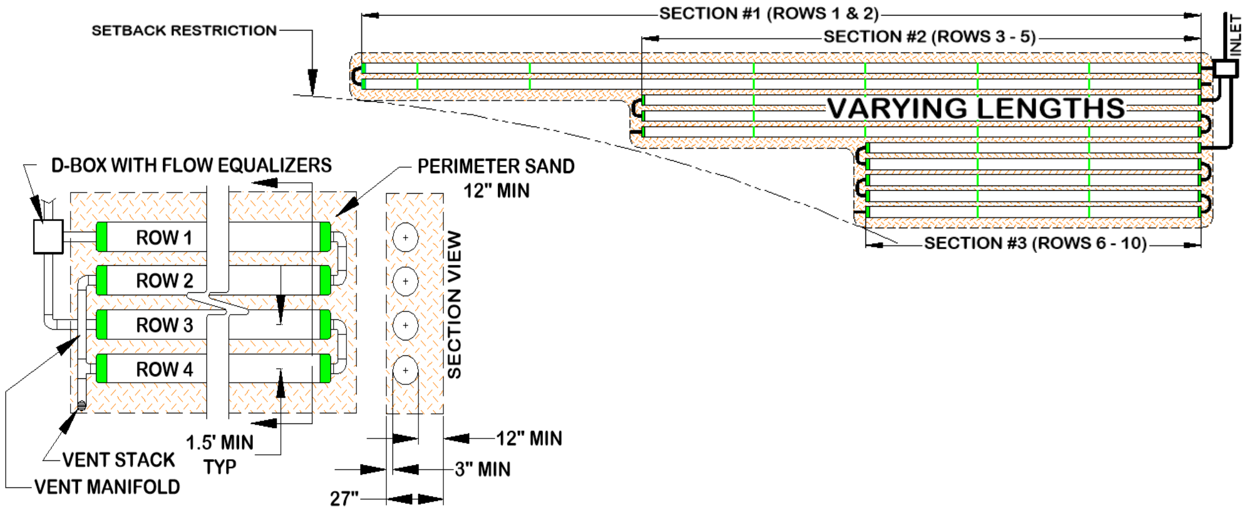


- Consists of two or more serial sections (with a maximum loading of 750 gpd/section) installed in a single bed.
- Each section consists of a series of AES rows connected at the ends with raised connections, using offset adapters and PVC sewer and drainpipe.
- Requires the use of an adequately sized D-box.
- There is no limit on the number of sections within a bed.
- Each section shall have the same total linear feet of pipe.
  determined by dividing the total linear feet required in the system by the number of sections required.

## 2.0 SYSTEM DESIGN

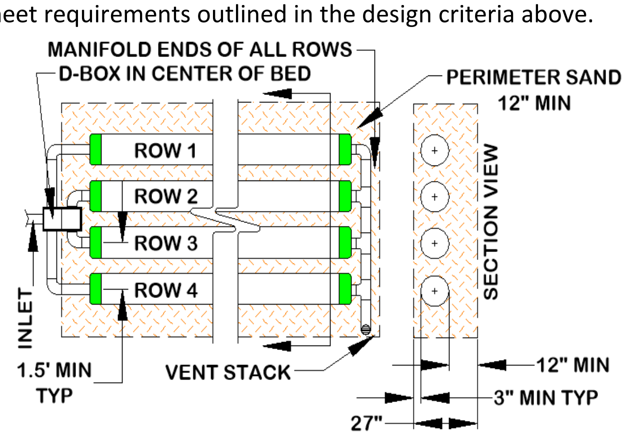
- When the vent manifold is on the same side as the serial section inlets, the manifold runs over the top of these inlets. Rows must meet requirements outlined in the design criteria above except rows within a section may vary in length to accommodate site constraints (as shown below).

Illustrations of combination serial systems:




### D-box (Parallel) Distribution

- All rows in this configuration must be the same length.
- Flow equalizers must be used in the D-box.
- Use a manifold to connect the ends of all rows. Manifold shall be sloped toward AES pipes.
- D-box placement shall be installed on level, firmly compacted soil.
- All rows shall be laid level end-to-end.
- A 2 in min. drop is required between the D-box outlets and the AES pipe inlets.
- Rows shall meet requirements outlined in the design criteria above.




### Multiple Bed Distribution

Incorporates two or more beds, each bed 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.

- Each bed shall 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.
- 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.
- End-to-end configurations are preferred to side-to-side configurations.
- Bed separation distance is measured from the edge of the system sand and must be at least 6 ft of undisturbed soil.

## 2.0 SYSTEM DESIGN

Illustration of End-to-End multiple beds:

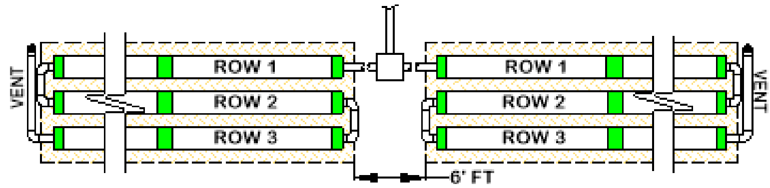
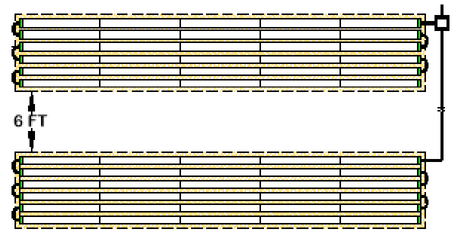



Illustration of Side-to-Side multiple beds:

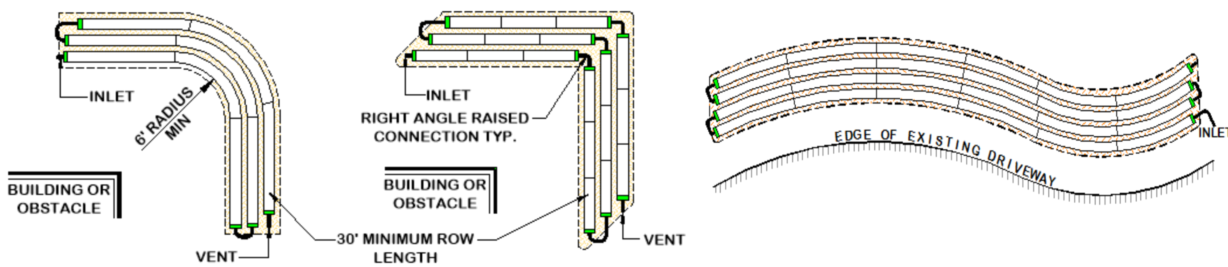



### Angled and Curving Beds

Unique system configurations may have irregular shapes to accommodate site constraints. A site-specific allowance from the state may be required for non-conventional configurations. Angled and curving beds are used to avoid obstacles and work well around structures, setbacks, and slopes. Multiple curves can be used within a system to accommodate various contours of the site.

- Rows are angled by bending pipes up to 90 degrees or using offset adapters
- Rows shall meet requirements outlined in the design criteria above.

Illustrations of angled and curving beds:




## *2.6 Pump Systems*

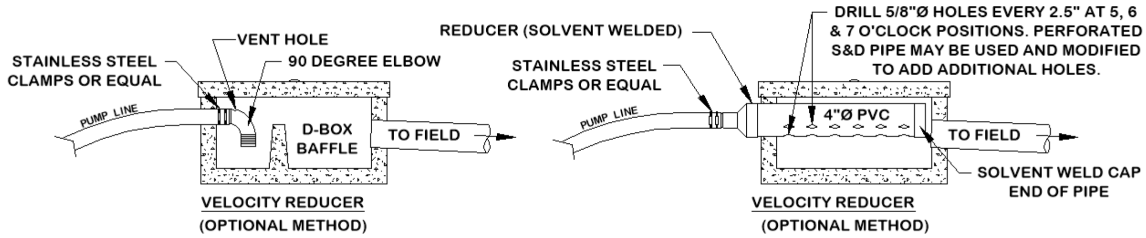
Pumped systems supply effluent to the system using a pump and distribution box when site conditions do not allow for a gravity system. Dosing siphons are also an acceptable means of delivering effluent to the system.

- Pump volume per dose shall be no greater than 1-gallon times the total linear feet of AES pipe.
- Pump dosing should be designed for a minimum of 6 cycles per day; 6-8 cycles per day are recommended.
- If possible, the dosing cycle should provide one hour of drying time between doses.
- Pump systems must have a high-water alarm float or sensor installed inside the pump chamber.
- Pumped systems with basic serial distribution are limited to a maximum dose rate of 40 gpm and do not require the use of a flow equalizer on the D-box outlet.
- All pump systems require differential venting.
- All systems with combination serial distribution or multiple bed distribution shall use flow equalizers in each D-box outlet with each bed or section limited to a maximum of 15 gpm, due to the flow constraints of the equalizers.
    - *Example: pumping to a combination system with 3 sections (using 3 D-box outlets). The maximum delivery rate is (3 x 15) = 45 gpm. Higher flow rates can be accommodated by connecting multiple D-box outlets to each line.*
- The rate at which effluent enters the AES pipe shall be controlled. Excessive effluent velocity can disrupt solids that settle in the pipes.
    - Effluent shall never be pumped directly into AES pipes.
    - A distribution box or tank shall be installed between the pumping chamber and the AES pipe to reduce effluent velocity.
    - Force mains shall discharge into a distribution box (or equivalent) with velocity reducer and a baffle, 90° bend, tee or equivalent.

## 2.0 SYSTEM DESIGN

- Velocity reducers are also needed for gravity systems when there is excessive slope between the septic tank and the AES system.

Two methods of velocity reduction:




CONCRETE DISTRIBUTION BOX SET ON FIRMLY COMPACTED SOIL & LAID LEVEL. USE OVERSIZED BOX FOR STABILITY. INSTALL EQUALIZERS ON ALL D-BOX OUTLETS

## *2.7 Venting*

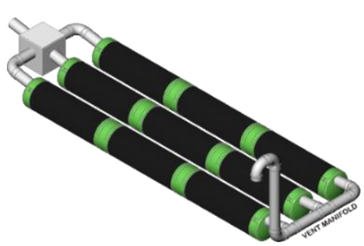
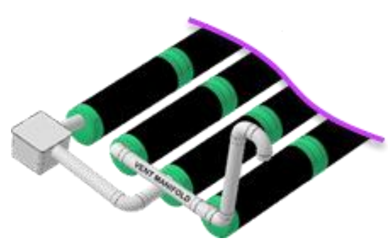
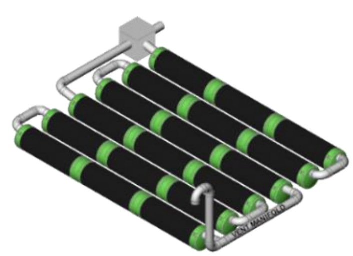
An adequate air supply is essential to the proper functioning of AES systems. Venting is always required. All systems shall utilize differential venting.

### General Rules

- Differential venting is the use of high and low vents in a system.
- In a gravity system, the roof stack acts as the high vent.
- High and low vent openings shall be separated by a minimum of 10 vertical ft.
- If possible, the high and low vents should be of the same capacity.
- Vent openings shall be located to ensure the unobstructed flow of air through the entire system.
- The low vent inlet shall be a minimum of 1 ft above final grade or anticipated snow level. Vents extending more than 3 ft above grade must be anchored.
- Sch. 40 or SDR 35 PVC (or equivalent) should be used for all vent stacks.
- One 4 in vent is required for every 1,000 ft of AES pipe.
- A single 6 in vent may be installed in place of up to three 4 in vents.
- If a vent manifold is used, it shall be at least the same diameter as the vent(s).
- Vent piping should slope downward toward the system to prevent moisture from collecting in the pipe and blocking the passage of air.
- Remote venting may be utilized to minimize the visibility of vent stacks.
- When venting multiple beds, it is preferred that each bed be vented separately rather than connecting bed vents together. Multiple vents can be remotely located to the same location if desired.

### Vent Manifolds

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

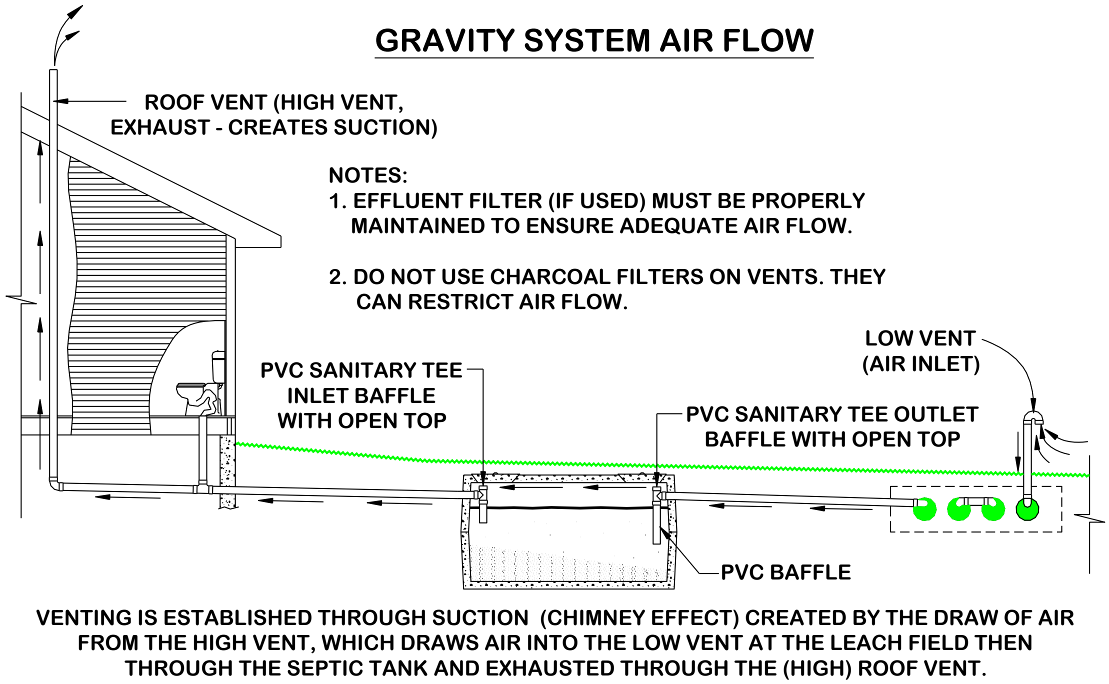
### Gravity Systems Vent Locations

- A low vent 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.

## 2.0 SYSTEM DESIGN

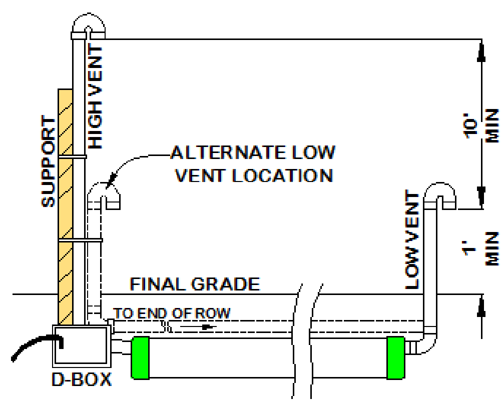
- The house (roof) vent functions as the high vent as long as there are no restrictions or other vents between the low vent and the house (roof) vent.
- When the house (roof) vent functions as the high vent, there shall be a minimum of a 10 ft vertical differential between the low and high (roof) vent openings.

Illustration of gravity system air flow:




### Pump System Vent Locations

- A low vent is installed through an offset adapter at the end of each section, basic serial bed or attached to a vent manifold.
- A high vent is attached to an unused distribution box outlet.
- The low and high vents may be swapped, provided the distribution box is insulated against freezing in cold climates.
- For options to relocate the high vent, see Remote Venting.
- For options to eliminate the high vent, see Bypass Venting.



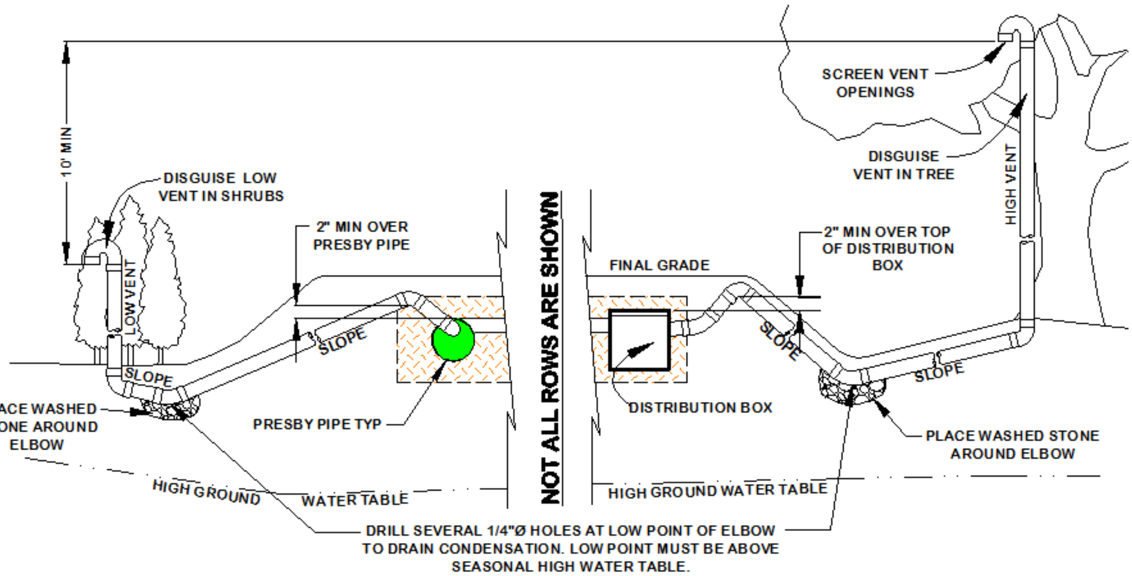

### Remote Venting

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

- A high point that is above the highest point of all AES pipes or the D-box (a minimum of 2 in for each); and,
- A low point opened for drainage which is above the SHWT. (See diagram below.)

## 2.0 SYSTEM DESIGN

Illustration of Remote Venting when vent line slopes away from field:

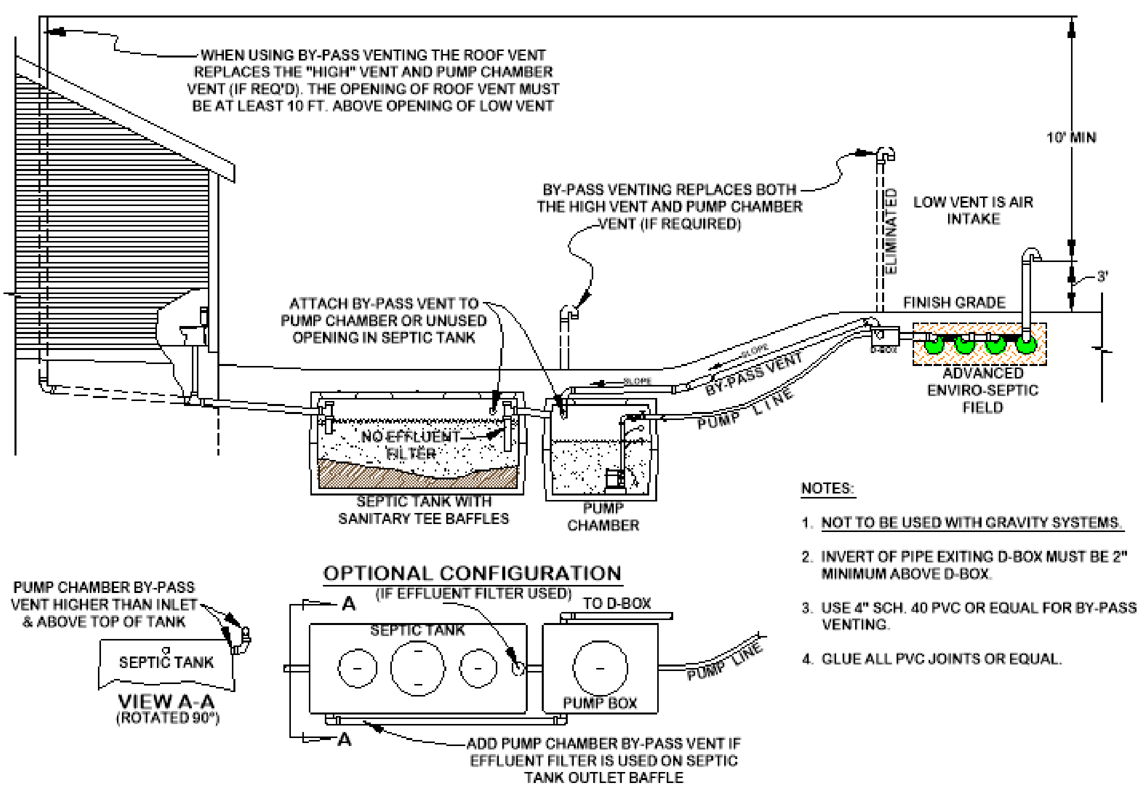



### By-Pass Venting

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

Illustration of by-pass venting:

BY-PASS VENTING



## 3.0 INSTALLATION

## *3.1 Installation Requirements*

### Component Handling

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

### Site Preparation Prior to Excavation

a) Locate and stake out the system sand bed 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 stockpile materials or equipment within the portion of the site receiving system sand.

### Critical Reminder to Prevent Soil Compaction

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

### When to Excavate

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

### Tree Stumps

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

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

### Raking and Tilling Procedures

All areas receiving system sand, sand fill and fill extensions shall be raked or tilled. If a backhoe/excavator is used to till the site, fit it with chisel teeth and till the site. The backhoe/excavator shall remain outside of the proposed system sand area and extensions.

- 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 – 6 in deep into the bottom of the entire area receiving system sand or sand fill.
- For elevated bed systems remove the "A" horizon, then use an excavator or backhoe to rake furrows 2 – 6 in deep into the receiving area.

### Install System Sand and/or Sand Fill Immediately After Excavation

- To protect the tilled area from damage by precipitation, system sand should be installed immediately after tilling.
- Work off either end or the uphill side of the system to avoid compacting soil.
- Keep at least 6 in of sand between the vehicle tracks and the tilled soil of the site if equipment must work on receiving soil.

## 3.0 INSTALLATION

- Track construction equipment should not travel over the installed system area until at least 12 in of cover material is placed over the AES pipes.
- Heavy equipment with tires shall never enter the receiving area due to likely wheel compaction of underlying soil structures.

### Distribution Box Installation

To prevent movement, D-box shall be set on a layer of compacted soil, sand, pea gravel base or a concrete footing.

### Level Row Tolerances

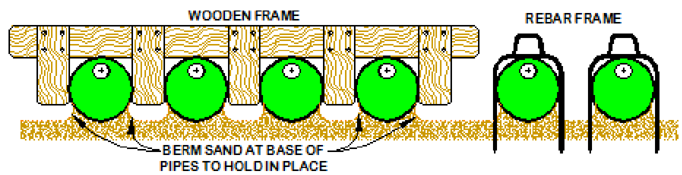
Use a laser level or transit to install rows level. Variations beyond 1 in (±½") may affect system performance and are not acceptable.

### Correct Alignment of AES 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).

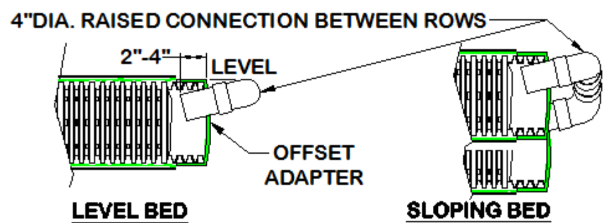
### Row Spacers

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. Caution: Remove all tools used as row spacers before final covering.



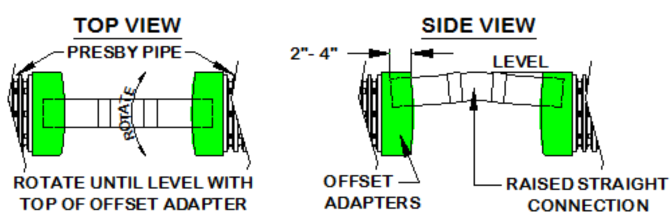

### Connect Rows Using Raised Connections

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 basic serial and combination serial configurations. Raised connections extend 2 in to 4 in into pipe and are installed on an angle (as shown in the drawing to the right). All PVC joints should be glued or mechanically fastened.




### Raised Straight Connection

A raised straight connection is a PVC sewer & drain pipe configuration which is used to connect AES rows that are placed end to end along the same contour. Raised straight connections extend 2 in to 4 in into pipe and are installed on an angle (as shown in the drawings to the right). All PVC joints should be glued or mechanically fastened.




### Backfilling Rows

1. Spread system sand between the rows.
2. Confirm pipe rows are positioned with Bio-Accelerator along the bottom (sewn seam up).
3. Straddle each row of pipe and walk heel-to-toe its entire length, ensuring that system sand fills all void spaces beneath the AES pipe.
4. Finish spreading system sand to the top of the rows and leave them exposed for inspection purposes.
5. Confirm that all rows of pipe are level to within 1 in end-to-end.
6. After inspection (if required) proceed to backfilling and final grading.

## 3.0 INSTALLATION

### Backfilling and Final Grading

1. After the installed system has been inspected (if required by local approving authority), spread system sand to a minimum of 3 in over the pipe and a minimum of 6 in on all four sides of the bed beyond the AES pipes. Barrier materials on top of the system sand are not required or allowed unless specified for H-20 Loading requirements.
2. Spread soil material free of organics, stones over 4 in and building debris, having a texture similar to the soil at the site, a minimum of 4 in deep without causing compaction.
3. Final grading of the entire site should redirect surface water flows so that they do not collect in the system bed area. The system bed must slope or have a crown to ensure that surface water runoffs do not collect on the system.
4. 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.
    a. No trees or shrubs should be located on or within 10 ft of the system perimeter (including side slope tapering) to prevent roots from growing into and damaging the system. If the system includes a perimeter drain, there should be no trees or shrubs planted closer than 10 ft from the location of the perimeter drain. Do not plant gardens for human consumption in the vicinity of the wastewater treatment system.

## 4.0 REJUVENATION AND EXPANSION

### *4.1 Bacteria Rejuvenation and Expansion*

**Why Would System Bacteria Rejuvenation Be Needed?**

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

**How to Rejuvenate System Bacteria**

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

1. Contact PEI before attempting rejuvenation for technical assistance.
2. Determine and rectify the problem(s) causing the bacteria conversion.
3. Drain the system by excavating at least one end of all the rows and removing the offset adapters.
4. If foreign matter has entered the system, flush the pipes.
5. Safeguard the open excavation.
6. Guarantee a passage of air through the system.
7. Allow all rows to dry for 72 hours minimum. The system sand should return to its natural color.
8. Re-assemble the system to its original design configuration. If there is no physical damage to the AES components, the original components may be reused.
9. According to the Rules, permits are required for system replacement or rejuvenation, except for repairing of solid piping between the septic tank and the drainfield. Contact the appropriate local or state agency for more information.

**System Expansion**

AES systems are easily expanded by adding equal lengths of pipe to each row of the original design or by adding additional equal sections. All system expansions shall comply with state and local regulations. According to the Rules, permits are required for system expansion.

**Reusable Components**

AES 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.

**Replacement System**

In the event of system malfunction, contact PEI for technical assistance prior to attempting rejuvenation procedures. In the unlikely event that an AES system needs to be replaced, permits may be required. Contact the appropriate local or state agency.

# 5.0 OPERATION AND MAINTENANCE

## *5.1 Operation and Maintenance*

### Proper Use

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

### System Abuse Conditions

The following conditions constitute system abuse:

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

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

### System Maintenance/Pumping of the Septic Tank

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

### Site Maintenance

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