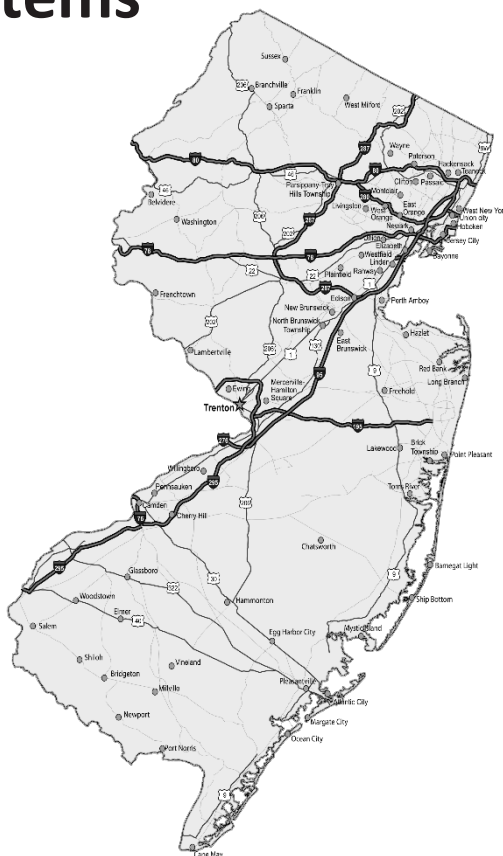


Design and Installation Manual for Advanced Enviro-Septic® (AES) Wastewater Systems



For more detailed design and installation information on AES, please contact Infiltrator Water Technologies at (800) 221-4436 or Presby Environmental, Inc. at (800) 473-5298.

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New Jersey



INFILTRATOR®
water technologies

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JUNE 2020

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

Presby Environmental, Inc.
143 Airport Road
Whitefield, NH 03598
Phone: 1-800-473-5298 Fax: (603) 837-9864
Website: www.presbyenvironmental.com

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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 large diameter gravelless pipe is prohibited.

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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 of Quebec 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, commercial 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 New Jersey

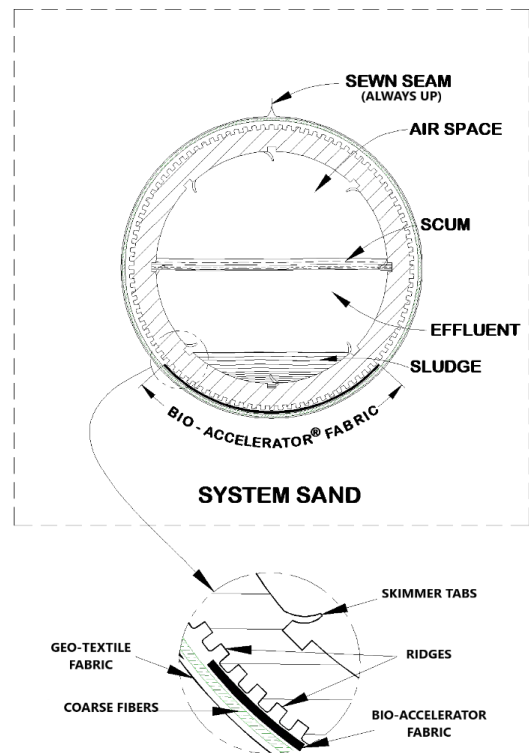
The AES has been approved for use in septic designs that are utilized for an alteration to an existing malfunctioning system, provided the design meets the requirements of NJAC 7:9A and the procedures and specifications detailed within this approved design and installation manual (Manual). Disposal field sizing for the AES technology systems may be calculated utilizing NJAC 7:9A-10.2, Table 10.2(e) for bed designs and Table 10.2(d) for trench designs. Please note that any proposal to utilize the AES technology for a new site will require the applicant to obtain a Treatment Works Approval from the New Jersey Department of Environmental Protection (DEP).

Environmental Standards and Technical Support

All AES systems shall be designed and installed in compliance with the procedures and specifications detailed in this Manual, the DEP product permit, and the New Jersey Rules (Rules). In the event of contradictions between this Manual and the Rules, Presby Environmental, Inc. (PEI) should be contacted for technical assistance at (800) 473-5298.

Certification Requirements

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



1.0 INTRODUCTION

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 shall be coarse to very coarse, clean, granular sand, free of organic matter. System sand is placed a minimum of 3 in above and 6 in below, between, and around the outer perimeter of the AES pipes (12 in perimeter sand required in bed designs). It shall adhere to all of the following percentage and quality restrictions:

System Sand Specification

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

System Sand Bed Height Dimension

The height of an AES sand bed measures 21 in minimum (not including cover material):

- minimum of 6 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.

When a system sand extension is required it shall be a minimum of 6 in thick.

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

Sand Fill - Fill material used below the AES system shall comply with NJAC 7:9A-10.1(f)4. Sand fill may be used to raise the elevation of the system in order to meet the required separation distance from the SHWT or restrictive feature or in side-slope tapers. No organic material or stones larger than 6 in are allowed in the sand fill. System sand may be used in place of sand fill.

2.0 SYSTEM DESIGN

2.1 Sizing

Table A: System Sand Bed Area and Bed Configuration Requirements

Soil Permeability Class	Permeability (in/hr)	Percolation Rate (min/in)	Adjusted A/Q (ft ² /gpd)	% Site Slope Maximum
K4	>6-20	<3-15	1.233	10
K3	>2-6	<15-30	1.704	
K2	>0.6-2	<30-45	2.190	
K1	>0.2-0.6	<45-60	2.596	

Notes/Additional Requirements:

- Adjusted A/Q means the minimum required bottom area in ft² of disposal field per gallon of daily sewage volume.
- Where garbage disposal units or grinder/ejector pumps are installed or proposed, the value obtained from this table shall be increased by a factor of 50 percent for use in disposal field sizing.
- Any system designed in accordance with Table A above shall not be sized less than 400 ft² of total bottom area.
- Systems placed on slopes > 10% must be designed as trenches.

Table B: Minimum Required Disposal Trench Length Per Gallon of Daily Volume

Soil Permeability Class	Permeability (in/hr)	Percolation Rate (min/in)	Adjusted L/Q (ft/gpd) based on Trench Width (ft)			% Site Slope Maximum
			2.0	2.5	3.0	
K4	>6-20	<3-15	0.42	0.36	0.31	25
K3	>2-6	<15-30	0.57	0.49	0.43	
K2	>0.6-2	<30-45	0.73	0.63	0.55	
K1	>0.2-0.6	<45-60	0.86	0.74	0.65	15

Notes/Additional Requirements:

- Adjusted L/Q means the minimum required length of trenches in ft per gallon of daily sewage volume.
- Where garbage disposal units or grinder/ejector pumps are installed or proposed, the value obtained from this table shall be increased by a factor of 50 percent for use in disposal field sizing.
- Any system designed in accordance with Table B above shall not be sized less than 400 ft² of total bottom area.
- Systems placed on slopes > 10% must be designed as trenches.

Table C: Pipe Requirements

System Type	AES Pipe Loading Rate
Residential System	70 ft per bedroom (br)
Commercial System	2.14 gpd/ft

Notes/Additional Requirements:

Assumes residential strength, contact PEI for technical assistance with high strength wastewater.

2.0 SYSTEM DESIGN

2.2 Bed Design Procedure

Step #1: Determine Daily Design Flow (DDF)

Calculate the DDF in gallons per day (gpd) in accordance with NJAC 7:9A-7.4. *Note: If system design includes a water purification system, increased design flow considerations are required (see daily design flow information on pg. 9).*

Step #2: Calculate System Sand Bed Area (SSBA)

From Table A: Find the soil's application rate (Adjusted A/Q) using the percolation rate, permeability, or permeability class. Calculate the minimum SSBA by multiplying the daily design flow (gpd) from Step #1 by the Adjusted A/Q. If result is less than 400 ft² adjust size of SSBA to meet required minimum. *Note: Beds are limited to a site slope not exceeding 10%. If site slope exceeds 10% use trench design.*

Step #3: Calculate Minimum Amount of AES Pipe Needed

From Table C: Calculate the minimum amount of AES pipe needed: use 70 ft/br for residential applications (# br x 70) or 2.14 gpd/ft for commercial applications treating residential strength effluent. *Note: Contact Technical Support for high strength wastewater.*

Step #4: Determine Number of Rows Needed

Select a row length suitable for the site and calculate the number of rows needed: Take the minimum amount of pipe required from Step #4 and divide by the selected row length, then round up to a whole number.

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

Calculate the PLW using a 1.5 ft minimum center-to-center row spacing (larger spacing allowed).
 $PLW = [(# \text{ of rows} - 1) \times \text{spacing (1.5)}] + 1.$

Step #6: Determine System Sand Bed Width (SSBW)

Calculate the minimum SSBW by dividing the SSBA from Step #2 by the selected row length from Step #4 plus 2 ft (to allow for 12 in of system sand on each end of AES rows).

Step #7: Verify Calculations Will Cover the PLW Requirement

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.

Step #8: Determine System Sand Extensions (SSE)

SSEs are evenly divided and placed on each side of AES pipes = $[SSBW - (PLW + 2)] \div 2$. There will be no SSEs if the SSBW is equal to or greater than (PLW + 2 ft).

Note: If additional area is needed to meet the required SSBA, additional SSEs may be placed on the ends of the bed not to exceed 3 ft from the edge of the pipe, spacing between pipe rows may be increased (up to three ft) or additional rows of pipe may be added.

Bed Design Example - Single family residence, three (3) bedrooms, percolation rate of 10 mpi (K4 Soils), 10% sloping site, no water softener on site.

Step #1: Determine Daily Design Flow

3 br (200 gpd for first br + 150 gpd each additional br) = 500 gpd.

Step #2: Calculate System Sand Bed Area

The soil application rate from Table A using the percolation rate, permeability, or permeability class is 1.233 gpd/ft². $SSBA = 1.233 \text{ gpd/ft}^2 \times 500 \text{ gpd} = 616.5 \text{ ft}^2$ minimum. Note that this complies with the minimum 400 ft² requirement.

Step #3: Calculate Minimum Amount of AES Pipe Needed

Minimum amount of AES pipe required at 70 ft/br for 3 br is 210 ft (70 ft x 3 br = 210 ft).

2.0 SYSTEM DESIGN

Step #4: Determine Number of Rows Needed

Using a row length of 70 ft requires three rows: $(210 \text{ ft} \div 70 \text{ ft} = 3 \text{ rows})$.

Step #5: Determine the Pipe Layout Width

Calculate the PLW using a 1.5 ft minimum center-to-center row spacing (larger spacing allowed).

$$PLW = [(\# \text{ of rows} - 1) \times \text{spacing (1.5)}] + 1. \quad PLW = [(3-1) \times 1.5] + 1 = 4 \text{ ft.}$$

Step #6: Determine System Sand Bed Width

Minimum SSBW: $616.5 \text{ ft}^2 \div (70 \text{ ft} + 2 \text{ ft}) = 8.57 \text{ ft}$ (round up to 8.75 ft for ease of construction).

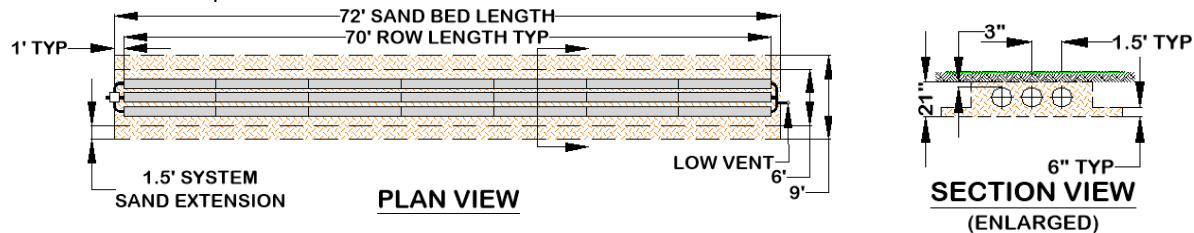
Step #7: Verify Calculations Will Cover the PLW Requirement

8.75 ft is greater than 6 ft (PLW 4 ft + 2 ft), therefore utilize 8.75 ft as the minimum SSBW.

Step #8: Determine System Sand Extensions

SSEs are evenly divided and placed on each side of AES pipes = $[SSBW - (PLW + 2)] \div 2$. There will be no SSEs if the SSBW is equal to or greater than (PLW + 2 ft). $SSE = [8.75 - (4 + 2)] \div 2 = 1.375$ (round up to 1.5 ft for ease of construction).

Illustration of Example:



2.3 Trench Design Procedure

Step #1: Determine Daily Design Flow

Determine the DDF in accordance with NJAR7:9A-7.4. *Note: If system design includes a water purification system, increased design flow considerations are required (see Water Purification Systems, pg. 9).*

Step #2: Calculate Minimum Amount of AES Pipe Needed

From Table C: Calculate the minimum amount of AES pipe needed: use 70 ft/br for residential applications or 2.14 gpd/ft for commercial applications treating residential strength effluent.

Step #3: Select Trench Width and Calculate Minimum Total Trench Length

From Table B: find the applicable soil absorption rate (Adjusted L/Q) for trenches using the percolation rate, permeability, or soil's permeability class and selected trench width. Calculate trench length options for each corresponding Adjusted L/Q to determine best trench width option based on pipe requirement from Step #2. Trench length is calculated by multiplying the Adjusted L/Q by the design flow from Step #1.

Step #4: Determine the Number of Trenches and the Individual Trench Lengths; Verify Minimum Total Trench Bottom Area (TTBA) is Met.

- If the AES pipe requirement is greater than or equal to the total trench length required, the pipe requirement determines total trench length. Choose a pipe row length that evenly divides the pipe requirement into trenches of equal lengths, then verify that the TTBA requirement of 400 ft² is met.
- If the total trench length required is greater than the AES pipe requirement, the total trench length required will determine the amount of AES pipe needed. Choose a trench length that evenly divides the required total trench length from Step #3 into individual trenches equal to or less than 101 ft. The pipe required per trench will be the selected trench length minus 1 ft.

The TTBA is $[(\text{Trench Length} \times \text{Trench Width}) \times \text{Number of Trenches} = \text{TTBA}]$. The resulting calculation shall meet the 400 ft² minimum. Add additional trench length if necessary, to satisfy TTBA requirement.

2.0 SYSTEM DESIGN

Trench Design Example #1 - Single family residence, three (3) bedrooms, percolation rate of 10 mpi (K4 soils), 15% site slope, no water softener on site.

Step #1: Determine Daily Design Flow

500 gpd (200 gpd for first br + 150 gpd for each additional br).

Step #2: Determine Total Amount of Pipe Needed

AES pipe required at 70 ft/br for three br is 210 ft.

Step #3: Select Trench Width and Calculate Minimum Total Trench Length

Calculate trench width to determine a width that provides the closest trench length needed to meet AES pipe requirement of 210 ft:

A 3 ft wide trench would require 155 ft of trench ($500 \text{ gpd} \times .31 \text{ ft/gpd} = 155 \text{ ft}$).

A 2.5 ft wide trench would require 180 ft of trench ($500 \text{ gpd} \times .36 \text{ ft/gpd} = 180 \text{ ft}$).

A 2 ft wide trench would require 210 ft of trench ($500 \text{ gpd} \times .41 \text{ ft/gpd} = 210 \text{ ft}$).

A 2 ft wide trench is exactly 210 ft in length. Therefore, the design will use a 2 ft wide trench with 210 ft of AES pipe.

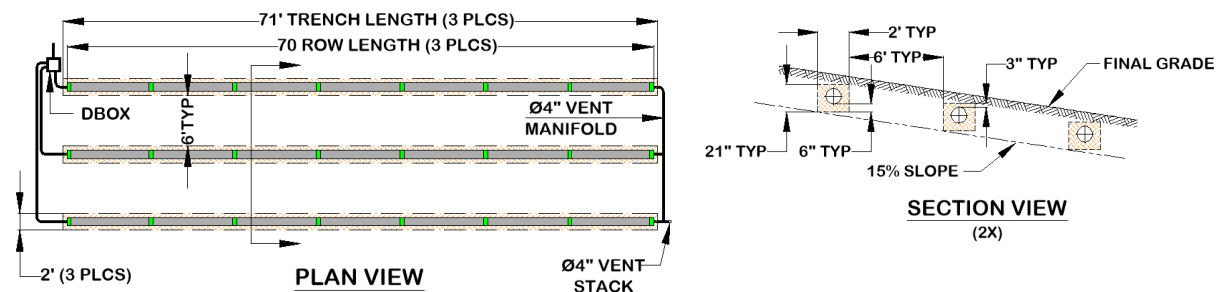
Step #4: Determine the Number of Trenches and the Individual Trench Lengths; Verify Minimum TTBA is Met.

a) The pipe requirement is equal to the required total trench length. Divide the 210 ft pipe requirement into three 70 ft long rows within each trench. The final individual trench lengths will be a minimum of one foot longer than the pipe row length to allow for 6 in of sand on each end resulting in a total trench length of 71 ft.

b) In this example, the AES pipe required is equal to the total trench required, so this step would not be used (see subsection "a" above).

The TTBA is $[(71 \times 2 \text{ ft}) \times 3 = 426 \text{ ft}^2]$. This is greater than the 400 ft^2 required, therefore no additional trench length is needed to satisfy TTBA requirement.

Illustrations Example #1:



2.4 Design Specifications

The AES system shall be designed in accordance with NJAC 7:9A Subchapter 10 and can be installed using either bed or trench design utilizing any of the design configurations outlined in this Manual. System design should be based on site limitations and can be either a:

- conventional installation;
- soil replacement, bottom-lined installation;
- soil replacement, fill-enclosed installation; or
- a mounded installation or a mounded soil-replacement installation.

Note: PEI prefers serial distribution be used in bed configurations, however serial distribution systems are prohibited by NJAC 7:9A and therefore cannot be used at this time.

2.0 SYSTEM DESIGN

Since the AES system meets NSF/ANSI 40 advanced wastewater pretreatment device standards, the “zone of treatment” is outlined in NJAC 7:9A10.1(d)5. The “zone of dispersal” begins at the bottom of the “zone of treatment” and is designed in accordance with NJAC 7:9A10.1(e).

Daily Design Flow

Residential DDF for AES systems is calculated in accordance with the Rules. Systems servicing more than two residences shall use the commercial specifications detailed in the sizing tables. The minimum daily design flow shall be two bedrooms (350 gpd) for any single-family residential system and 300 gpd for any commercial system.

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.
- No additional AES pipe is required when using a garbage disposal (grinder). Multiple compartment septic tanks or multiple tanks are preferred and should be pumped as needed.

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

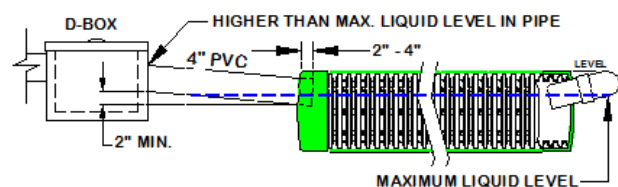
- Effluent Filters are not recommended for use with AES systems.
- If used, effluent filters shall be maintained on at least an annual basis. Follow manufacturer’s instructions regarding required inspections, cleaning and maintenance of the effluent filter.
- Effluent filters must allow the free passage 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.

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 row is limited to a maximum of 15 gallons per minute (gpm), due to the flow constraints of the equalizers.

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 two-inch rule:



Row Requirements

- All beds shall have at least 2 rows.
- Maximum row length for any system is 100 ft of pipe.
- All rows must be the same length.
- Flow equalizers must be used in the D-box.

2.0 SYSTEM DESIGN

- Use a vent manifold to connect the ends of all rows. Manifold shall be sloped toward AES pipes.
- D-box placement shall be installed in compliance with NJAC 7:9A-9.4.
- Minimum center-to-center spacing is 1.5 ft for all systems. Spacing may be increased at the discretion of the system designer or as needed to meet the required SSBA.
- For beds: the AES rows shall be centered in the middle of the SSBA and any SSEs divided evenly on both sides up to 3 ft from the edge of the outermost row. If additional area is needed, either increase spacing between rows or add additional rows of pipe.
- For trenches: sites sloping more than 10% must be designed in trenches. The row of pipe shall be centered in the trench.
- Sewn seam must be oriented in the twelve o'clock position. This correctly orients the Bio-Accelerator® fabric in the six o'clock position.
- Each row must be laid level to within $\pm \frac{1}{2}$ 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.

System Sand Extensions (SSE)

SSEs are a minimum of 6 in deep equally divided on each side of the level systems. The SSE is measured from the tall portion of the system sand bed. Extensions may also be added to the end of the rows up to 2 ft to meet required bed area sizing.

Sloping Sites and Sloping Mound Systems

- The bed bottom must be level.
- Maximum site slope is 10% for bed systems.
- Sites sloping greater than 10% require the system to be designed in trench layout.

Separation Distances (Horizontal and Vertical)

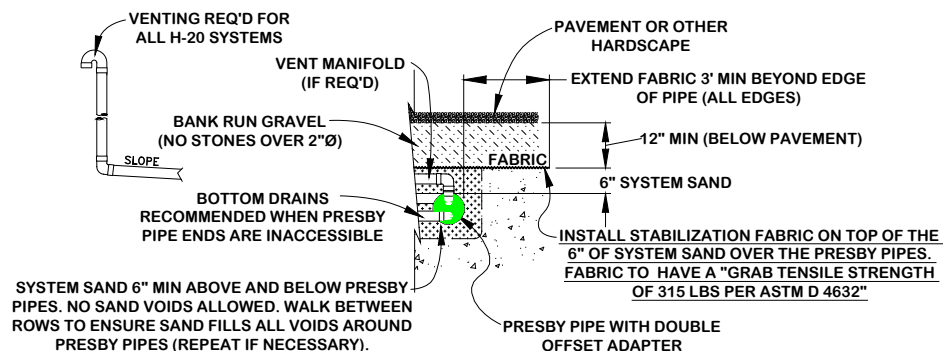
Separation distances to the seasonal high-water table (SHWT) or other restrictive features are measured from the outermost edge of the system sand.

Barrier Materials over System Sand

No barrier materials (hay, straw, tarps, etc.) are to be placed between the system sand and cover material. The only exception is the placement of the specified fabric to achieve H-20 loading requirements.

H-20 Loading

If a system is to be installed below an area that will be subjected to vehicular traffic, it must be designed and constructed as depicted in order to protect the system from compaction and/or damage. Note that a layer of stabilization fabric is added between the 6 in system sand and the cover material. All H-20 systems require venting.



NOTE:

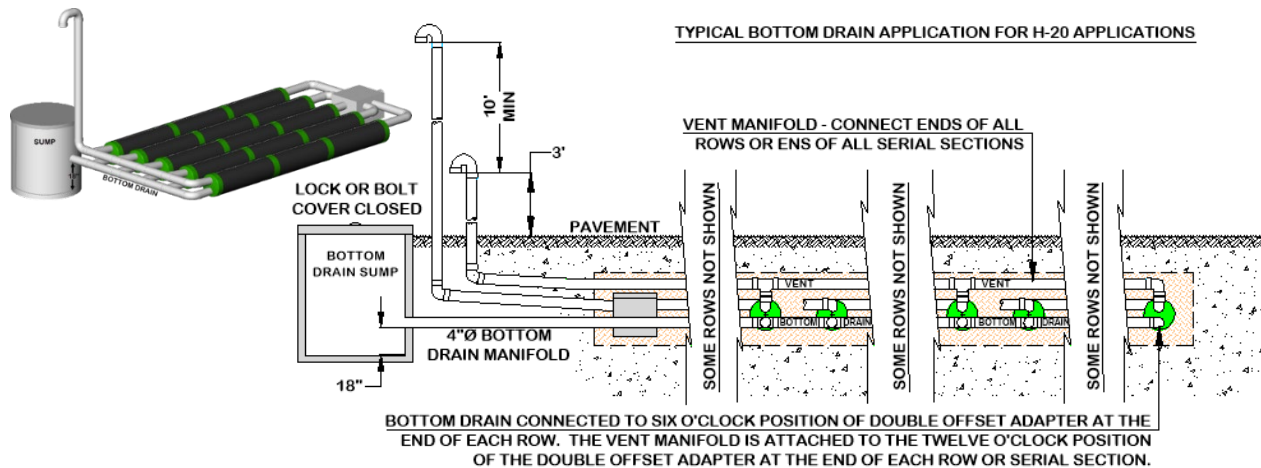
THE ONLY SOIL COMPACTION THAT SHOULD TAKE PLACE IS AT THE POINT OF PREPARATION FOR PAVEMENT.

2.0 SYSTEM DESIGN

Bottom Drain

A bottom drain is a line connected to the hole in the six o'clock position of a double offset adapter at the end of each row which drains to a sump and is utilized to lower the water level in a saturated system or to facilitate system rejuvenation. There must be 18 in from the bottom of the sump to the bottom of the drain. The sump should be brought above the final grade and have a locking or mechanically fastened cover.

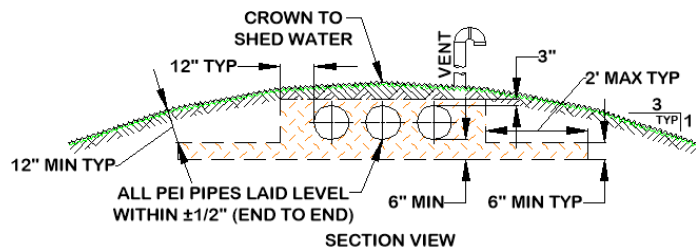
Illustrations of a bottom drain:



2.5 System Configurations

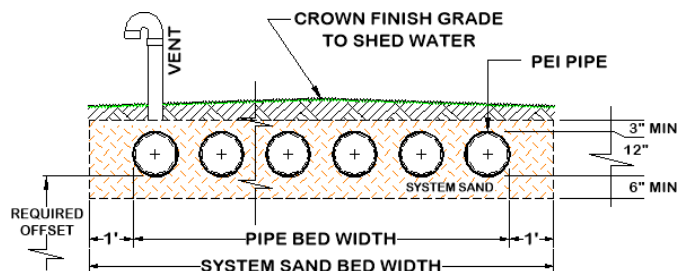
Elevated Bed Systems (Mounds)

Elevated beds are designed for sites with soil, depth to groundwater or restrictive feature constraints that do not allow for in-ground bed systems. An elevated bed system is a soil absorption field with any part of the system above original grade. Fill extensions are used to blend the raised portion of the system with the side slope tapering to meet the existing grade. Fill extensions are extended 3 ft on all sides. Side slope and shall be no steeper than 3:1 until it meets existing grade. There must be a minimum of 12 in of cover material over the ends of all SSEs (if present). Illustration of an elevated bed:



In-Ground Bed Systems

Systems are installed below existing grade for sites with no soil restrictive features to limit placement. In-ground systems on sites that slope over 10% shall be designed as trenches. In-ground on level site:



Trench Systems

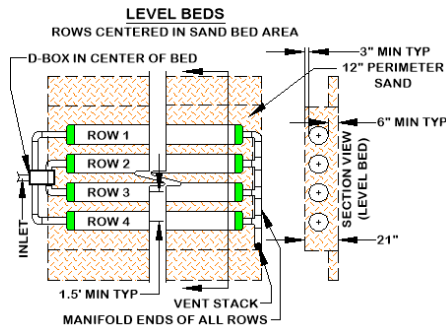
AES pipe may be installed in trench configurations on level or sloping terrain. Trench systems incorporate one row of AES pipe per trench. Trench width can be designed at either 2.0, 2.5, or 3 ft wide as needed to meet the minimum trench bottom area requirement of 400 ft². The Rules require a 6 ft separation (sidewall to sidewall) between trenches.

2.0 SYSTEM DESIGN

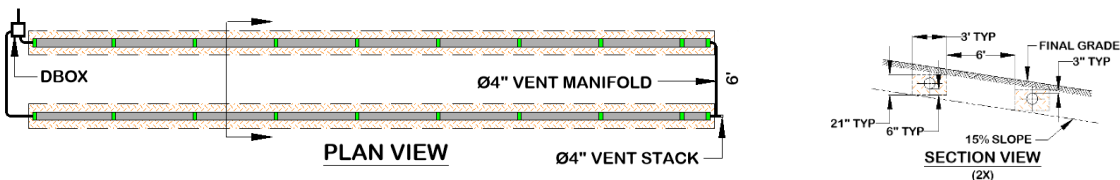
D-box (Parallel) Distribution

- Rows shall meet requirements outlined in the design criteria above.

Bed design:

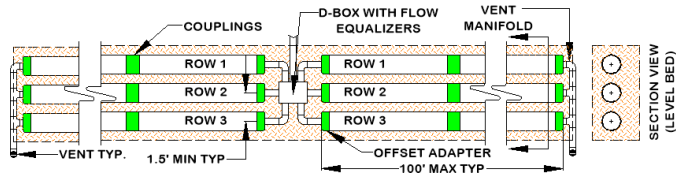


Trench design:



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.
- Butterfly configurations are generally used to accommodate bed lengths longer than the maximum row length of 100 ft.
- 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.
- End-to-end configurations are preferred to side-to-side configurations.
- Bed separation distance is measured from the edge of the SSBA and is dependent on state requirements.

Illustration of End-to-End multiple beds:

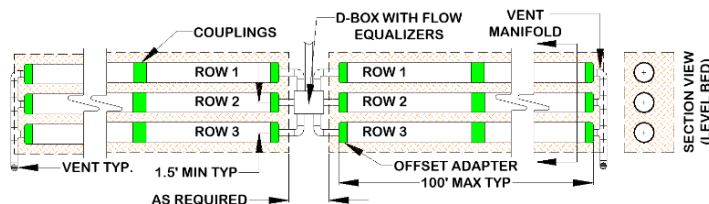
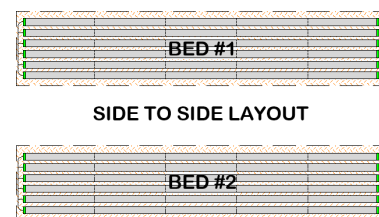


Illustration of Side-to-Side multiple beds:



2.0 SYSTEM DESIGN

Angled and Curving Beds or Trenches

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.

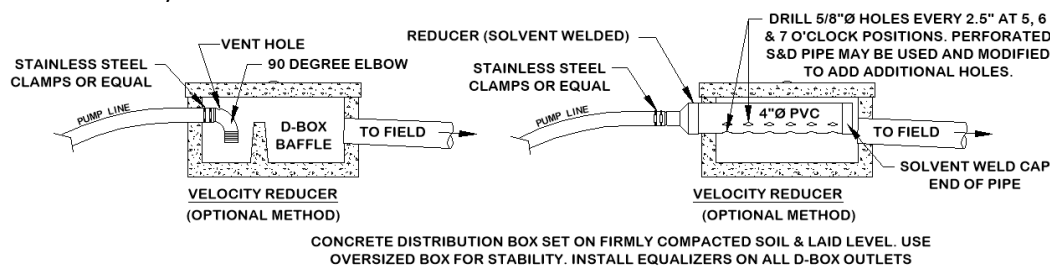
- Rows are angled by bending pipes up to 90 degrees or through the use of offset adapters.
- Rows shall meet requirements outlined in the design criteria above.

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.
- If possible, the dosing cycle should provide one hour of drying time between doses.
- Per NJAC 7:9-9.2(f)7.iii, pump systems must have a high-water alarm float or sensor installed inside the pump chamber.
- All pump systems require differential venting.
- All systems shall use flow equalizers in each distribution box outlet with each row limited to a maximum of 15 gpm, due to the flow constraints of the equalizers.
 - *Example: pumping to a system with 3 rows (using 3 D-box outlets). The maximum delivery rate is $(3 \times 15) = 45$ 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.

Two methods of velocity reduction:



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.

2.0 SYSTEM DESIGN

- 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.

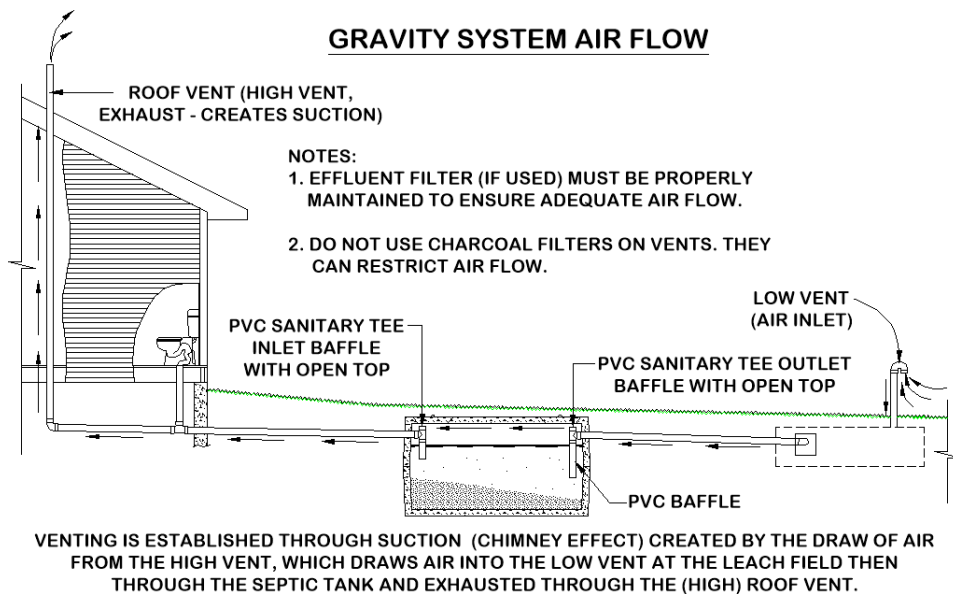
Vent Manifolds

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



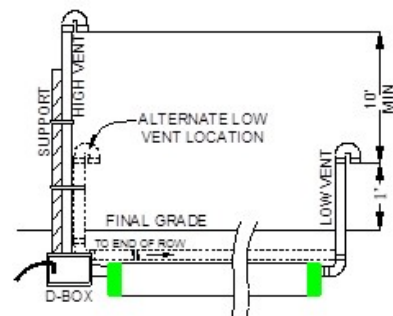
Gravity Systems Vent Locations

- A low vent is installed at the end of each row in a D-box distribution system. A vent manifold may be used to connect the ends of multiple rows.
- 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.



Pump System Vent Locations

- A low vent is installed through an offset adapter at the end of each row 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.

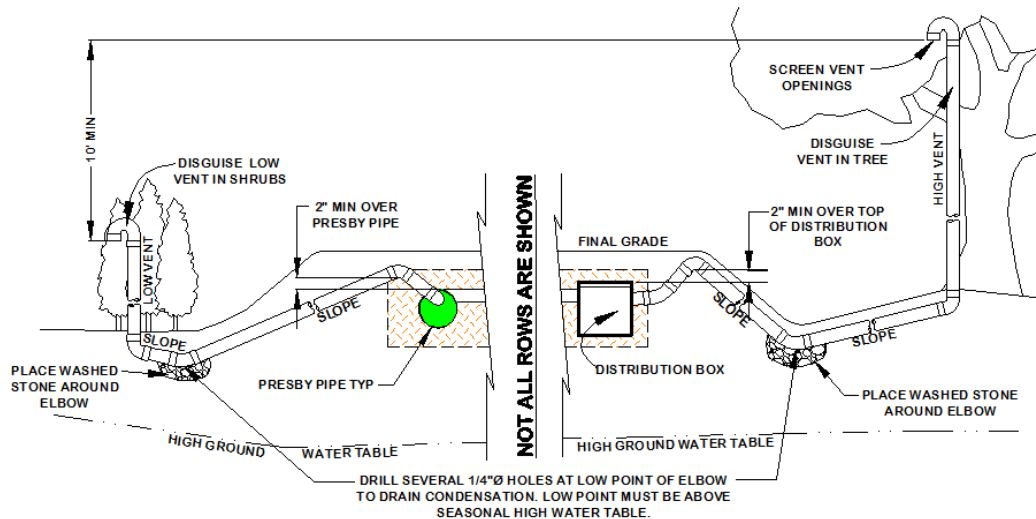


2.0 SYSTEM DESIGN

Remote Venting

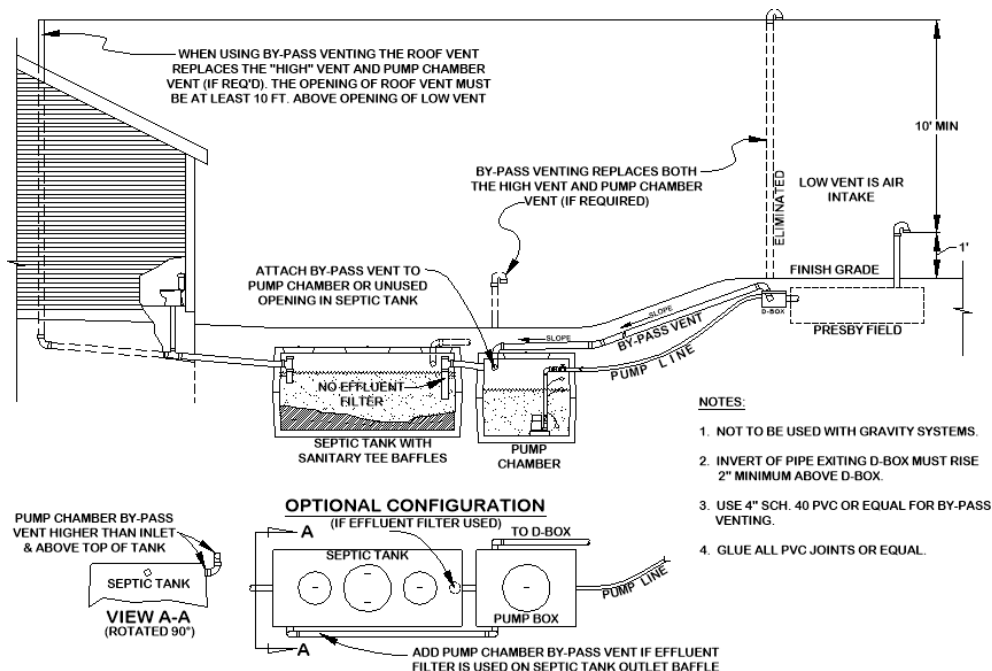
If site conditions do not allow the vent pipe to slope toward the system, or the owner chooses to utilize remote venting for aesthetic reasons (causing the vent pipe not to slope toward the system), the low point of the vent line must be drilled creating several $\frac{1}{4}$ " holes to allow drainage 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; and,
- A low point opened for drainage which is above the SHWT. (See diagram below.)



By-Pass Venting

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



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

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

Critical Reminder to Prevent Soil Compaction

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

3.0 INSTALLATION

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. 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 gravel or a concrete footing in trench designs or placed over the directly on the system sand within the disposal area in bed designs in accordance with state Rules.

Level Row Tolerances

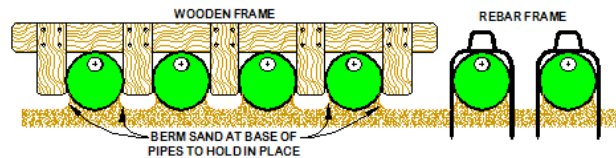
Use a laser level or transit to install rows level. Variations beyond 1 in ($\pm 1/2"$) may affect system performance and are not acceptable.

Correct Alignment of AES Bio-Accelerator® Fabric

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

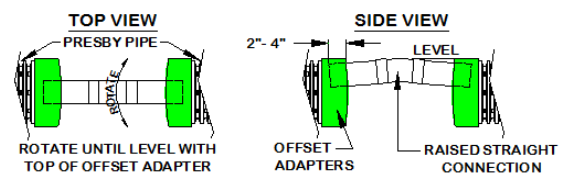
Row Spacers

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.



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 below). 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.

Backfilling and Final Grading

1. 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 (12 inches on all four sides in bed designs).
2. Spread 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 above the installed system.
3. 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.

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.

System Expansion

AES systems are easily expanded by adding equal lengths of pipe to each row of the original design or by adding additional rows. All system expansions shall comply with state and local regulations. Permits may be required prior to 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 ...

- It can be reinstalled in the same location, eliminating the need for a replacement field reserve area.
- All unsuitable material shall be removed prior to replacement system construction.
- Disposal of hazardous materials to be in accordance with state and local requirements.
- Permits may be required for system replacement; 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.

6.0 WARRANTY

PRESBY ENVIRONMENTAL, INC.
AES SYSTEM STANDARD LIMITED WARRANTY

- (a) The structural integrity of each unit, endcap and other accessory manufactured by Presby Environmental, Inc. (collectively referred to as "Units"), when installed and operated in an onsite wastewater system in accordance with Presby Environmental's installation instructions, is warranted to the original purchaser ("Holder") against defective materials and workmanship for one year from the date upon which a septic permit is issued for the septic system containing the Units; provided, however, that if a septic permit is not required for the septic system by applicable law, the one (1) year warranty period will begin upon the date that installation of the septic system commences. In order to exercise its warranty rights, Holder must notify Presby Environmental in writing at its corporate headquarters in Whitefield, New Hampshire within fifteen (15) days of the alleged defect. Presby Environmental will supply replacement Units for those Units determined by Presby Environmental to be defective and covered by this Limited Warranty. Presby Environmental's liability specifically excludes the cost of removal and/or installation of the Units.
 - (b) THE LIMITED WARRANTY AND REMEDIES IN SUBPARAGRAPH (a) ARE EXCLUSIVE. THERE ARE NO OTHER WARRANTIES WITH RESPECT TO THE UNITS, INCLUDING NO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.
 - (c) This Limited Warranty shall be void if any part of the Presby Environmental system (unit, endcap or other accessory) is manufactured by anyone other than Presby Environmental. The Limited Warranty does not extend to incidental, consequential, special or indirect damages. Presby Environmental shall not be liable for penalties or liquidated damages, including loss of production and profits, labor and materials, overhead costs, or other losses or expenses incurred by the Holder or any third party. Specifically excluded from Limited Warranty coverage are damage to the Units due to ordinary wear and tear, alteration, accident, misuse, abuse or neglect of the Units; the Units being subjected to vehicle traffic or other conditions which are not permitted by the installation instructions; failure to maintain the minimum ground covers set forth in the installation instructions; the placement of improper materials into the system containing the Units; failure of the Units or the septic system due to improper siting or improper sizing, excessive water usage, improper grease disposal, or improper operation; or any other event not caused by Presby Environmental. This Limited Warranty shall be void if the Holder fails to comply with all of the terms set forth in this Limited Warranty.
- Further, in no event shall Presby Environmental be responsible for any loss or damage to the Holder, the Units, or any third party resulting from installation or shipment, or from any product liability claims of Holder or any third party. For this Limited Warranty to apply, the Units must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and Presby Environmental's installation instructions.
- (d) No representative of Presby Environmental has the authority to change this Limited Warranty in any manner whatsoever, or to extend this Limited Warranty. No warranty applies to any party other than the original Holder.

* * * * *

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