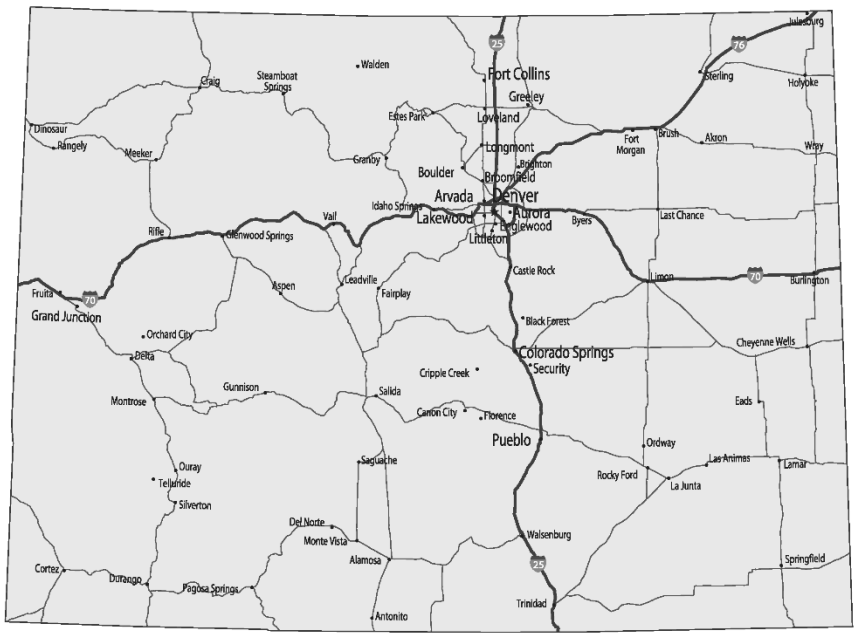
ADVANCED ENVIRO-SEPTIC[MD]

Colorado

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



The purpose of this manual is to provide specific design and installation information pertinent for the use of the Advanced Enviro-Septic product in Colorado. This product must be used in conjunction with the standards described in 5 CCR 1002-43 (Regulation 43). This document provides a brief description of the product and its design and sizing specifications.

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.

INFILTRATOR® water technologies

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June 2022

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

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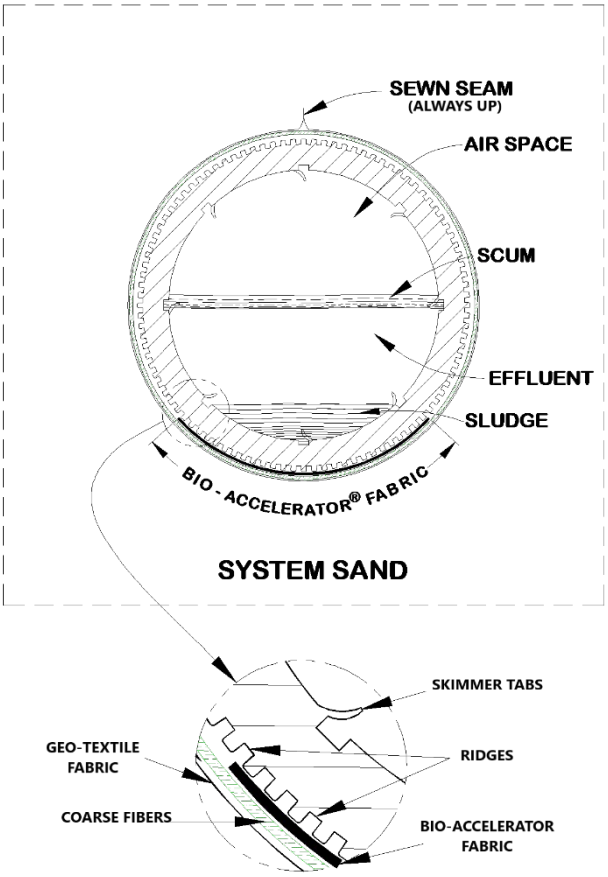
IMPORTANT NOTICE: This Manual is intended ONLY for use in designing and installing Presby Environmental's Advanced Enviro-Septic® Wastewater Treatment Systems. The processes and design criteria contained herein are based solely on our experience with and testing of Advanced Enviro-Septic®. Substitution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



Testing in accordance with NSF/ANSI 40 has determined that the AES system is capable of treating domestic strength wastewater to Class 1 levels 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, commercial and difficult sites
- prevents formation of organic material at the receiving soil interface
- blends “septic mounds” into sloping terrain
- safely recharges groundwater

Environmental Standards and Technical Support

All AES systems shall be designed and installed in compliance with the procedures and specifications detailed in this Manual and in the product’s state and/or local approval. In the event of contradictions between this Manual and state rules, 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 12 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.

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) is recommended by the manufacturer.

System Sand Dimensions

System sand is placed a minimum of 3 in above and 6 in below, between, and around the outer perimeter of the AES pipes.

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.

Sand Fill - Sand fill may be used to raise the elevation of the system in order to meet the required separation distance from the seasonal high water table (SHWT) or restrictive feature or in 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: Daily Design Flow

# Bedrooms	Occupancy (# of Persons)	Wastewater Flow Per Person (gallons/day)	Design Flow* (gallons/day)
2	4	75	300
3	6	75	450
4	7	75	525
5	8	75	600
6	9	75	675

***Note:** Check with local county regulations as some counties require 2 persons per bedroom regardless of the number of bedrooms in a design.

Table B: Minimum AES Pipe Requirements

System Type	Minimum AES Pipe Loading Rate
Residential System	70 ft/br
Commercial (Non-Residential) System	2.14 gpd/ft

Assumes domestic strength effluent. Contact Presby Environmental for technical assistance with high strength wastewater.

Table C: System Sand Basal Area Application Rates for TL1 Systems

Soil Type Texture, Structure and Percolation Rate Range						Adjustment Factor	
Soil Type	**USDA Soil Texture**	**USDA Soil Structure-Shape**	**USDA Soil Structure-Grade**	**Percolation Rate (MPI)**	**Treatment Level 1 LTAR**	**Beds**	**Trenches**
1	Sand, Loamy Sand	--	0	5 – 15	0.80	0.84[1]	0.70
2	Sandy Loam, Loam, Silt Loam	PR (Prismatic) BK (Blocky) GR (Granular)	2 (Moderate) 3 (Strong)	16 – 25	0.60		
2A	Sandy Loam, Loam, Silt Loam	PR, BK, GR 0 (none)	1 (Weak) Massive	26 – 40	0.50		
3	Sandy Clay Loam, Clay Loam, Silty Clay Loam	PR, BK, GR	2, 3	41 – 60	0.35		
3A	Sandy Clay Loam, Clay Loam, Silty Clay Loam	PR, BK, GR 0	1 Massive	61 – 75	0.30		
4	Sandy Clay, Clay, Silty Clay	PR, BK, GR	2, 3	76 – 90	0.20		
4A	Sandy Clay, Clay, Silty Clay	PR, BK, GR 0	1 Massive	91 – 120	0.15		
5	Soil Types 2-4 A	Platy	1, 2, 3	121	0.10		

Note: 1. The 0.84 adjustment factor is calculated by combining bed adjustment factor from Table 10-2 (1.2) and the Enhanced Manufactured Media adjustment factory from Table 10-3 (0.7) of Regulation 43.

2.0 SYSTEM DESIGN

2.2 Design Procedure

Step #1 *Determine Daily Design Flow*
From Table A: Determine the system Daily Design Flow (DDF) in gallons per day (GPD) based on number of bedrooms and occupants. Non-residential systems design flow is calculated per Regulation 43.

Step #2: *Determine the Minimum Amount of AES Pipe Required*
From Table B: Determine the minimum amount of AES pipe required. Use 70 ft/br for residential systems, or 2.14 gpd/ft for commercial/non-residential systems treating domestic strength effluent. Contact Technical Support for high strength wastewater.

Step #3: *Calculate the System Sand Basal Area Required*
From Table C: Based upon accepted methodologies from Regulation 43, determine the long-term acceptance rate (LTAR). To calculate the minimum system sand basal area in square feet (SF):

1. Divide the DDF in GPD by the LTAR.
2. Multiply the result by the appropriate adjustment factor (bed or trench) from Table C.

Step #4: *Design the AES Layout*
Using the minimum amount of AES pipe required from Step 2 and the minimum system sand basal area in square feet (SF), design a system layout which meets all of the requirements of Regulation 43. With respect to AES, the following are critical design requirements; there may be others in Regulation 43:

Bed layout:

- AES pipe rows may be no longer than 100 ft in length. Longer designs may be accommodated with a raised connection or placement of a distribution box at the center of the row.
- The distance between parallel AES pipe rows must not exceed six feet (center-to-center).
- The distance allowed from the edge of the system sand basal area to the outermost AES pipe row may be up to 24 inches.

Trench layout:

- AES pipe rows may be no longer than 100 ft in length. Longer designs may be accommodated with a raised connection or placement of a distribution box at the center of the row.
- The distance allowed from the edge of the trench to the outermost AES pipe row may be up to six inches.

2.3 Design Specifications

The AES system shall be designed in accordance with this Manual and Regulation 43 and can be installed in either bed or trench configuration.

Septic Tank

The AES system is designed to treat effluent that has received “primary treatment” in a standard two-compartment, DPHE-approved septic tank. Septic tanks shall be sized according to state/local 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 2, 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.

2.0 SYSTEM DESIGN

Effluent (Wastewater) Strength

The AES pipe requirement for bed or trench systems is based on domestic 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.

Effluent Filters

- 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.
- Charcoal filters in vent stacks (for odor control) are not recommended by PEI. They can block air flow and potentially shorten system life.

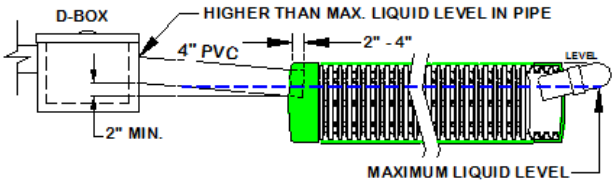
Flow Equalizers Required



All distribution boxes (D-box) 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 D-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 D-box outlet.

Two Inch Rule

The outlet of a septic tank or D-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 shall have at least 2 rows.
- Maximum length for any individual AES row is 100 ft of pipe, unless a raised connection or center-located distribution box is utilized.
- Recommended minimum row length is 30 ft of pipe.
- Minimum center-to-center spacing is 1.5 ft for all systems. Spacing may be increased at the discretion of the system designer.
- Sewn seam must be oriented in the 12 o'clock position. This correctly orients the Bio-Accelerator® fabric in the 6 o'clock position.
- 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.

Sloping Sites

Maximum site slope is 25%.

2.0 SYSTEM DESIGN

Separation Distances (Horizontal and Vertical)

Horizontal separation distances are measured from the outermost edge of the system sand basal area. Vertical separation distances are measured from the system sand/receiving soil interface.

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. Contact Presby Environmental; for design assistance.

2.4 System Configurations

Elevated Bed Systems (Mounds)

Elevated beds are designed for sites with soil, depth to groundwater or restrictive feature constraints that do not allow for in-ground bed systems. Side-slope tapering is used to blend the raised portion of the system with the existing grade. Side-slope tapering is to be a maximum of 3 horizontal feet for each 1 ft of vertical drop until it meets existing grade.

In-Ground Bed Systems

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

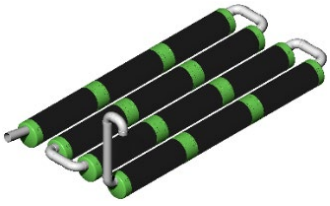
Trench Systems

AES pipe may be installed in trench configurations on level or sloping terrain and may utilize serial, combination, butterfly, or parallel distribution. Trench systems incorporate one or more rows of AES pipe per trench. A minimum of 6 inches of system sand is required below, between, and around the perimeter of the AES pipe.

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 and multiple beds where each bed receives 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 and row lengths to avoid site obstacles or meet setback requirements.

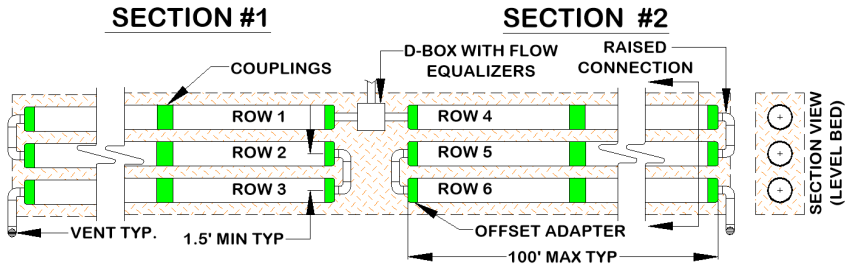


Butterfly Configuration

- 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.
- Beds can contain any number of serial sections.
- The system sand between the sections is included in the total system sand basal area requirement.
- Rows shall meet requirements outlined in the design criteria above.

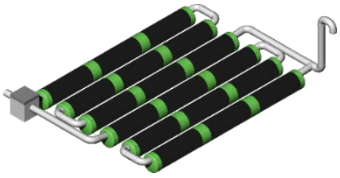
2.0 SYSTEM DESIGN

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 750 gpd. Effluent flow is divided evenly to each section using a D-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 receiving an equal amount of effluent from a D-box with flow equalizers.
- Each section consists of a series of AES rows connected at the ends with raised connections, using offset adapters and PVC sewer and drainpipe.
- There is no limit on the number of sections within a bed.
- Each section shall have the same linear feet of pipe determined by dividing the total minimum linear feet required in the system by the number of sections required.
- A section may exceed the minimum linear feet required.
- Rows within a serial section may vary in length.
- 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.

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.

2.0 SYSTEM DESIGN

- Bed separation distance is measured from the edge of the system sand basal area and is dependent on state requirements.

Illustration of End-to-End multiple beds:

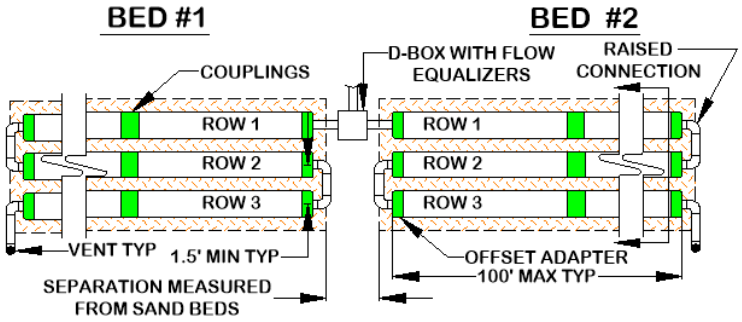
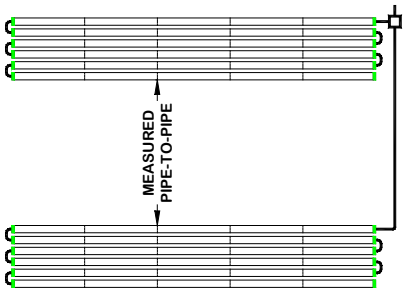


Illustration of Side-to-Side multiple beds:

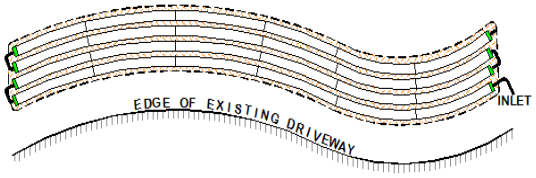


Angled and Curving Beds

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 through the use of offset adapters
- Rows shall meet requirements outlined in the design criteria above.

Illustration of curving bed:



2.5 Pump Systems

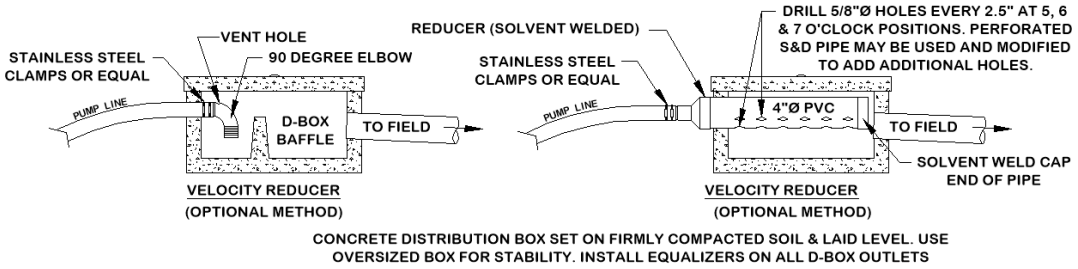
Pumped systems supply effluent to the system using a pump and D-box when site conditions do not allow for a gravity system. Dosing siphons are also an acceptable means of delivering effluent to the system.

- Pump volume per dose shall be no greater than 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. Follow state, local and national code requirements.
- 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 pumped systems require a D-box with baffles, a velocity reducing tee or other means to be used for velocity reduction.

2.0 SYSTEM DESIGN

- 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 D-box or tank shall be installed between the pumping chamber and the AES pipe to reduce effluent velocity.
    - Force mains shall discharge into a D-box (or equivalent) with velocity reducer such as a baffle, 90° bend, tee or equivalent.

Two methods of velocity reduction:



2.6 Venting

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

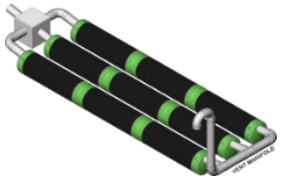
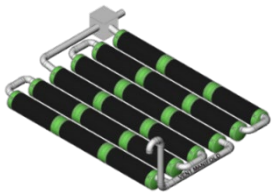
General Rules

- 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.
- Roof vent diameter must be a minimum of 3 in, 4 in diameter is recommended. If the roof vent is less than 3 in, an additional high vent is recommended.
- Vent openings shall be located to ensure the unobstructed flow of air through the entire system.
- The low vent inlet shall be a minimum of 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.

2.0 SYSTEM DESIGN

Vent Manifolds

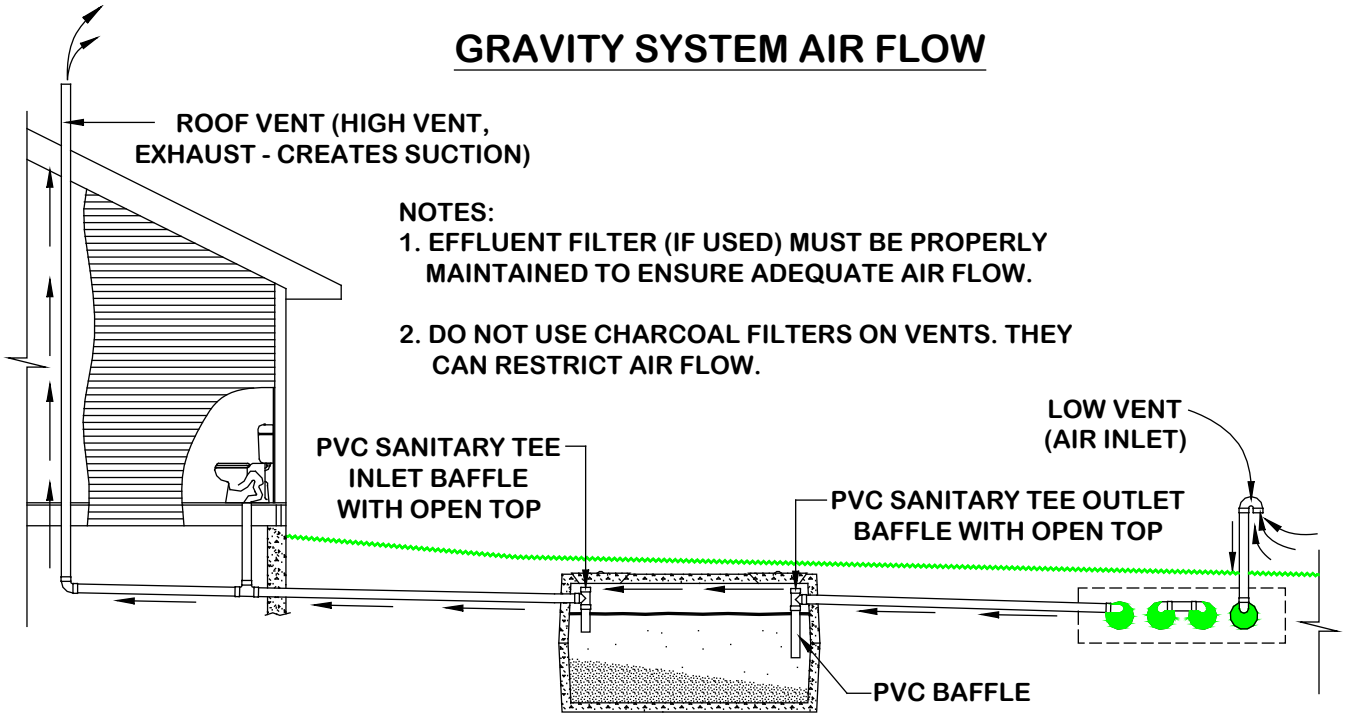
A vent manifold may be incorporated to connect the ends of a number of sections or rows of AES pipe to a single vent opening. Slope the lines connecting the manifold to the AES pipes to drain condensation.

Gravity Systems Vent Location

- 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.
- 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:

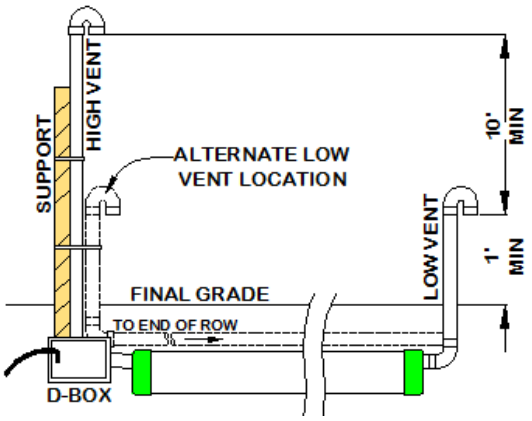


VENTING IS ESTABLISHED THROUGH SUCTION (CHIMNEY EFFECT) CREATED BY THE DRAW OF AIR FROM THE HIGH VENT, WHICH DRAWS AIR INTO THE LOW VENT AT THE LEACH FIELD THEN THROUGH THE SEPTIC TANK AND EXHAUSTED THROUGH THE (HIGH) ROOF VENT.

2.0 SYSTEM DESIGN

Pump System Vent Locations

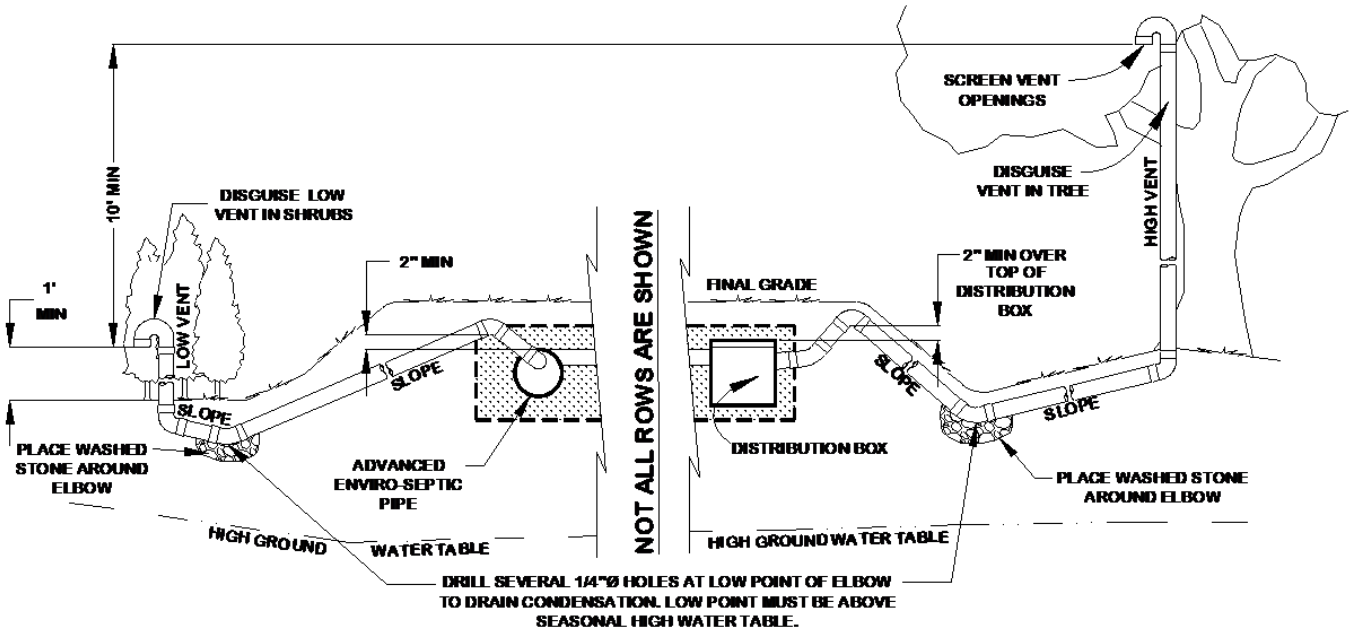
- A low vent is installed through an offset adapter at the end of each section, basic serial bed or attached to a vent manifold.
- A high vent is attached to an unused D-box outlet.
- The low and high vents may be swapped, provided the D-box is ins ulated against freezing in cold climates.
- For options 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 (2 in minimum for each); and,
- A low point opened for drainage which is above the SHWT (see diagram below).

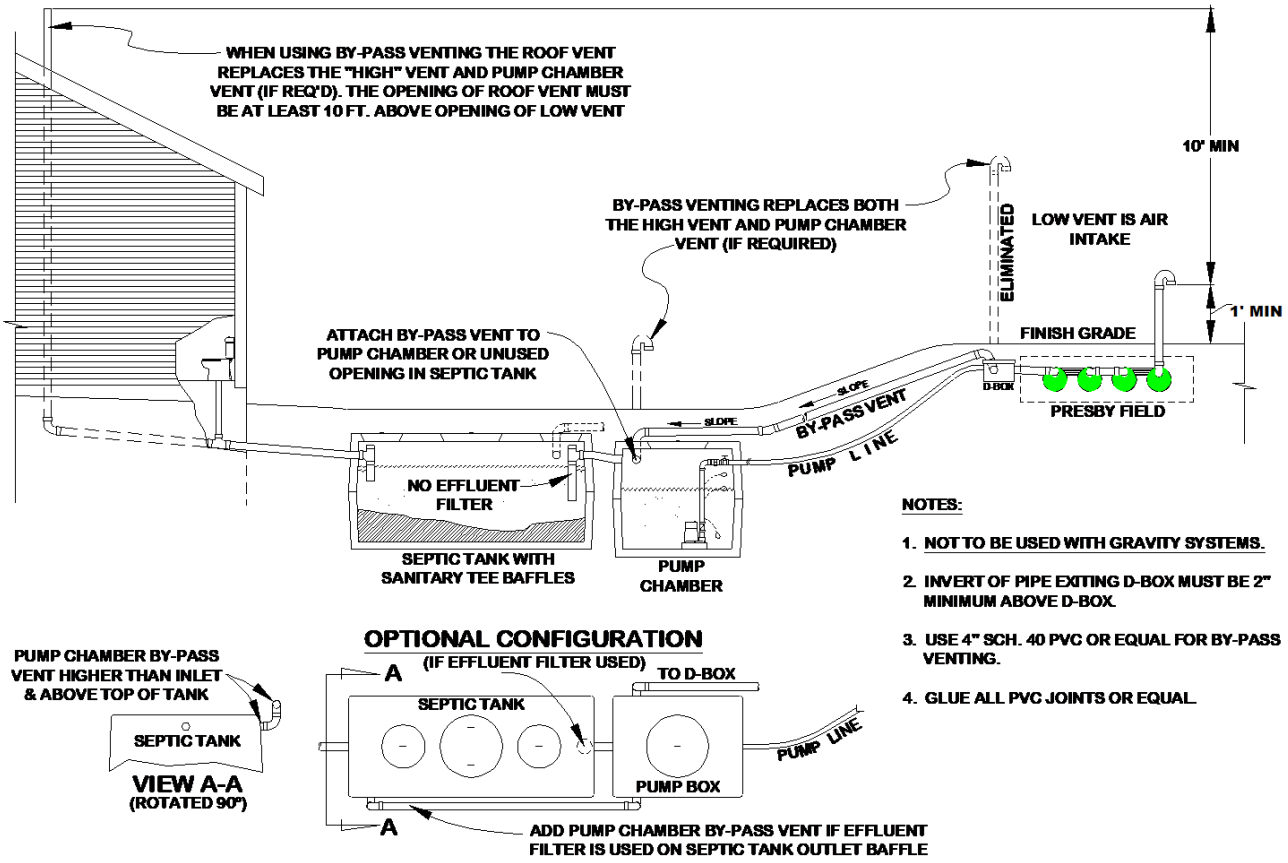


2.0 SYSTEM DESIGN

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 PVC from the D-box back to the septic tank or pump chamber if no effluent filter is present. This process “by-passes” the pump line and allows air to flow from the low vent to the roof vent which functions as the high vent. The bypass vent line invert must rise 2 in above the D-box before dropping to the pump chamber or septic tank.

Illustration of by-pass venting:



2.7 Site Selection

Determining Site Suitability

Refer to state or local rules regarding site suitability requirements.

Topographic Position Requirement

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

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

AES as a Replacement System

If an AES system is being installed in the same location where another onsite system has previously been installed:

- Remove the existing components and contaminated sand and soil.
- If the soils under and around the system have not been compromised, it is permissible to install the AES system in the same excavated location using new system sand.

Note: Permits may be required for system replacement.

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

- For in-ground bed systems, excavate the system bed as necessary below original grade. Using an excavator or backhoe, tilt the bucket teeth perpendicular to the bed and use the teeth to rake furrows 2 in – 6 in deep into the bottom of the entire area receiving system sand or sand fill.
- For elevated bed systems, remove all organics and topsoil (O & A soil horizons) in the footprint of the dispersal area prior to installing system sand; for percolation rates of 61 – 120 MPI, remove the organics,

the topsoil may be left in-place and tilled. Next, use an excavator or backhoe to rake furrows 2 in – 6 in deep into the receiving area.

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

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

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

Row Installation Sequence

1. Install a minimum of 6 in of system sand to the elevation where the bottom of AES pipes will be and install the sand for side-slope tapering to allow machinery movement around the perimeter of the system. Rake the system sand where the AES pipes will be installed so it is as level as possible before placing pipes on the system sand. This will make it easier to level the pipe rows.
2. Locate AES rows horizontally.
3. Locate AES rows vertically using a laser level or transit. Lift or lower the pipes at couplings using a hand shovel and adding or removing system sand as necessary.
4. Drop system sand along each row of couplings being careful to avoid moving the rows.
5. Add or remove system sand along rows to level. The rows may be raised by pushing additional system sand below the pipes. A hand shovel may be scraped along the system sand below the pipes to remove a small amount if needed.
6. Re-check horizontal and vertical locations. Re-check that pipes are level to within 1 in end-to-end.
7. Add system sand between and around the AES pipes, leaving the uppermost surface of the pipe exposed to allow for system inspection (if required by local approving authority).

Level Row Tolerances

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

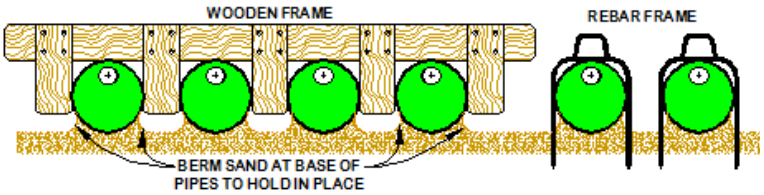
Correct Alignment of AES Bio-Accelerator® Fabric

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

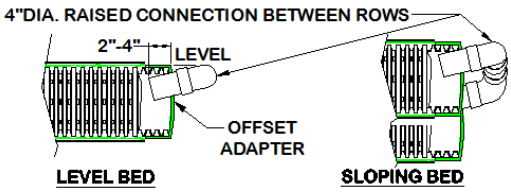
3.0 INSTALLATION

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.

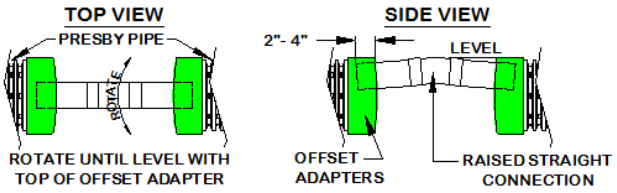


Connect Rows Using Raised Connections



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). If the ends are not at least 2 in into the pipe, they may become dislodged during backfilling. If the ends extend more than 4 in into the pipe, this may cut off the flow of oxygen to the system. The top of the raised connections should be level with the top of the AES pipe as shown. All PVC joints should be glued or mechanically fastened.

Raised Straight Connection



A raised straight connection is a Sch. 40 or SDR 35 PVC sewer & drain pipe configuration which is used to connect AES rows that are placed end to end along the same contour. When a raised straight connection is used, it creates the end and beginning of rows. These rows may all follow 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.

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.
2. Spread a minimum of 4 in of suitable earth cover (topsoil or loam) free of organics, stones over 4 in and building debris, having a texture similar to the soil at the site, without causing compaction.
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 EXPANSION

4.1 System Expansion

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. 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.

System Replacement

If an AES system requires replacement…

- Remove the existing components and contaminated sand
- If the soils under and around the system have not been compromised, replace in the same excavated location with new system sand.
- If components are not damaged, they may be cleaned and reused.

Note: Permits may be required for system replacement.

5.0 OPERATION AND MAINTENANCE

5.1 Operation and Maintenance

Proper Use

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.infiltratorwater.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

6.1 PRESBY ENVIRONMENTAL, INC. 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.