Advanced Enviro-Septic®(AES) Treatment System

Georgia

Design and Installation Manual

✓Minimizes the Expense ✓Protects the Environment ✓Preserves the Site

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The information in this manual is subject to change without notice. We make a continual effort to improve our Manuals in order to ensure they are as complete, accurate and helpful as possible. Please confirm that this is the most recent and up-to-date version of this Manual by contacting us at (800) 473-5298 or visiting our website, www.presbyenvironmental.com

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This manual refers to the Alternative System Approval of Advanced Enviro-Septic® Treatment System issued April 2017 by the Environmental Health Section of the Georgia Department of Public Health.

IMPORTANT NOTICES: This Manual is intended ONLY for use in designing and installing Presby Environmental's Advanced Enviro-Septic® Wastewater Treatment System. The use of this Manual with any other product is prohibited. The processes and design criteria contained herein are based solely on our experience with and testing of Advanced Enviro-Septic®. Substitution of any other large diameter gravelless pipe will result in compromised treatment of wastewater and other adverse effects. This Manual sets forth the Manufacturer's recommendations and requirements; designers and installers are responsible for determining and complying with applicable State and/or Local regulations.

Revised 5-26-17

Table of Contents

Advanced Enviro-Septic® Treatment System
Georgia Design and Installation Manual

Section A, Introduction

What is Advanced Enviro-Septic®?

Advanced Enviro-Septic® ("AES") is an innovative onsite wastewater treatment system that is passive, non-mechanical and does not use pressure distribution. The primary component is a large diameter perforated, multi-layer fabric-wrapped pipe that is installed in a bed of specified System Sand. The Advanced Enviro-Septic® System is designed to purify wastewater that has received primary treatment in a septic tank and to disperse the treated wastewater into the underlying soils. The system is extremely versatile and can be designed in a variety of shapes and sizes, making it adaptable to virtually any residential or commercial application. The amount of pipe required and the size of the System Sand bed adjust in relation to the amount of daily design flow, the soil's characteristics and site constraints, ensuring effective treatment and adequate absorption into underlying soils.

How Does Advanced Enviro-Septic® work?

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

Why is Advanced Enviro-Septic® Better?

The Advanced Enviro-Septic® Treatment System retains solids in its pipe and provides multiple bacterial surfaces to treat effluent prior to its release into the soil. The continual cycling of effluent (the rising and falling of liquid inside the pipe) enhances bacterial activity. No other passive wastewater treatment system design offers this functionality. Our systems excel because they are more efficient, last longer, and have a minimal environmental impact.

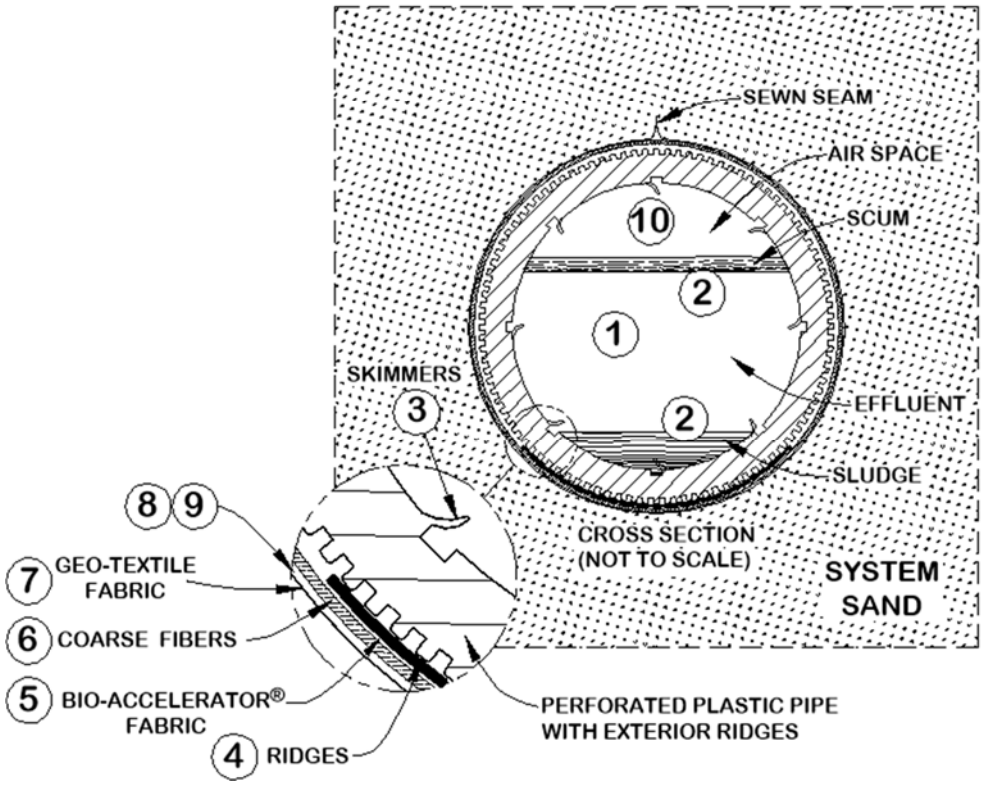
System Advantages

- Provides superior treatment
- Thoroughly tested to prove it works
- Preserves the natural terrain
- Cost-effective to construct and operate
- Completely passive, requires no mechanical devices or electricity
- Design versatility to adapt to virtually any site, any flow, any application
- Quicker and easier to install
- Enhanced function and longevity
- Requires no special maintenance
- Superior track record of reliability
- Made using recycled plastic

Purpose	The purpose of this Manual is to provide general information regarding the design criteria, installation procedures and use and care instructions for the Advanced Enviro-Septic® Treatment System. The Advanced Enviro-Septic® System is extremely versatile and, as a result, this Manual cannot possibly set forth every conceivable system configuration. We encourage you to contact our Technical Advisors, who will be happy to address any questions or concerns unique to your project or assist you in designing a system for special applications.
Presby Environmental Standards	All systems using the Advanced Enviro-Septic Treatment™ System must be designed and installed in compliance with the procedures and specifications described in this Manual. Exceptions to any requirements in this Manual require Presby Environmental, Inc. (PEI) approval.
Conflicts Between Georgia Rules & this Manual	In the event of contradictions between this Manual and Georgia and/or local rules, PEI should be contacted for technical assistance.
Certification Required	PEI requires all designers and installers to be certified. Certification is obtained by completing the "Advanced Enviro-Septic® Certification Course" presented by PEI or its sanctioned representative. We offer a variety of certification training options, including online webinars and DVDs. Please visit our website, www.PresbyEnvironmental.com. **Special note**: PEI highly recommends that all individuals involved in the approval, permitting or inspection process also complete a certification course.
Technical Support	PEI provides technical support free of charge to all individuals using our products or involved in the permitting process. For any questions about our products or the information contained in this Manual, please contact us at (800) 473-5298, send an email to info@presbyeco.com or visit our website, www.PresbyEnvironmental.com.
Disclaimer	The technical support staff at Presby Environmental, Inc. is committed to providing comprehensive product information and support via telephone, website and email at no cost to our customers. The assistance we are able to provide in this way is based on limited information and therefore should be considered general in nature. Accordingly, Presby Environmental, Inc. disclaims any liability whatsoever in connection with providing technical support.

ADVANCED ENVIRO-SEPTIC®
WASTEWATER TREATMENT SYSTEM
WITH BIO-ACCELERATOR®

TEN STEPS OF WASTEWATER TREATMENT: ADVANCED ENVIRO-SEPTIC® TREATS EFFLUENT MORE EFFICIENTLY TO PROVIDE LONGER SYSTEM LIFE AND TO PROTECT THE ENVIRONMENT.



Stage 1	Warm effluent enters the pipe and is cooled to ground temperature.
Stage 2	Suspended solids separate from the cooled liquid effluent.
Stage 3	Skimmers further capture grease and suspended solids from the existing effluent.
Stage 4	Pipe ridges allow the effluent to flow uninterrupted around the circumference of the pipe and aid in cooling.
Stage 5	Bio-Accelerator™ geo-textile fabric filters additional solids from the effluent, enhances and accelerates treatment, facilitates quick start-up after periods of non-use, provides additional surface area for bacterial growth, promotes even distribution, and further protects outer layers and the receiving surfaces so they remain permeable.
Stage 6	A mat of coarse random fibers separates more suspended solids from the effluent.
Stage 7	Effluent passes into the geo-textile fabric and grows a protective bacterial surface.
Stage 8	Sand wicks liquid from the geo-textile fabric and enables air to transfer to the bacterial surface.
Stage 9	The fabric and fibers provide a large bacterial surface to break down solids.
Stage 10	An ample air supply and fluctuating liquid levels increase bacterial efficiency.

Section B

Advanced Enviro-Septic® System Components

Advanced Enviro-Septic® pipe

- Plastic pipe made with a significant percentage of recycled material
- 10-ft units (can be cut to any length)
- Ridged and perforated with skimmer tabs on interior
- Bio-Accelerator™ layer aligned along bottom of pipe exterior
- Covered with a mat of randomly-oriented plastic fibers
- Surrounded by a non-woven geo-textile fabric stitched in place
- Exterior diameter of 12-inch
- Each 10-ft unit has a liquid holding capacity of approx. 58 gallons
- Flexible enough to bend up to 90°

Offset adapter

An offset adapter is a plastic fitting with a 12-inch diameter and a hole designed to accept a 4-inch inlet pipe, raised connection, or vent pipe. The hole is to be in the twelve o'clock position.

Note: The hole in the offset adapter will accommodate Schedule 20 to 40 PVC.

Double offset adapter

A double offset adapter is a plastic fitting with a 12-inch diameter and two holes designed to accept a 4-inch inlet pipe, raised connection, vent or vent manifold, depending upon the particular requirements of the design configuration. Double offset adapters are also used in Segmented Row construction (refer to p. 21).

The two 4-inch holes are to be aligned in the 12 o'clock and 6 o'clock positions. The holes are positioned 1 in. from the outside edge of the double offset adaptor and 2-inch from each other.

Note: The holes in the double offset adapter will accommodate Schedule 20 to 40 PVC.

Coupling

A coupling is a plastic fitting used to create a connection between two pieces of Advanced Enviro-Septic® pipe. The coupling features a snap-together locking device and ridges that are designed to fit over the ridges of the Advanced Enviro-Septic® pipe, creating a quick and easy way to join pipe sections together easily and securely.

Advanced Enviro-Septic® System Components, continued

Distribution Box

A Distribution Box, also called a "D-box," is a device used to distribute effluent coming from the septic tank. D-boxes are also sometimes used for velocity reduction (see p. 28). D-boxes come in various sizes and with a varying number of outlets. Concrete D-boxes are preferred, some are made of plastic.

Flow equalizers (see below) are installed in the D-box openings to equalize distribution; they help ensure equal distribution in the event that the D-box settles or otherwise becomes out of level. Unused openings in D-boxes are to be covered, plugged or mortared.

Dosing Device

All bed systems and all "large" systems (total trench length greater than 500 ft.) are required to utilize a mechanical dosing device (such as tip box, siphon, pump, etc.) to supply effluent to the D-box. Alternating dosing is required for all systems with more than 1000 ft. total trench length. Pressure distribution may not be used with AES pipe. Ensure that system is properly vented and that the dosing device installation allows for passage of air through the system. Some devices may require the use of by-pass venting (see illustration on p. 34) or the addition of a high vent from the D-box as described in Pump Systems, Section F, p. 30.

Flow Equalizers

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.

Raised Connection

A raised connection is a PVC pipe configuration that is used to connect Advanced Enviro-Septic® trench rows in serial distribution. Schedule 40 PVC will be used. See illustration in Section K, Installation & Construction Procedures, p. 41.

Component Handling & Storage

- 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 Advanced Enviro-Septic® 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.

Advanced Enviro-Septic® System Components, continued

Septic Tank

- The Advanced Enviro-Septic® System is designed to treat effluent that has received “primary treatment” in a standard septic tank.
- Septic tank capacity should be increased by 50% if a garbage disposal is used.
- Septic tanks used with the Advanced Enviro-Septic® System must be fitted with inlet and outlet baffles in order to retain solids in the septic tank and to prevent them from entering the Advanced Enviro-Septic® System.
- An effluent filter is required for use with the AES System in Georgia. The effluent filter selected must be designed and sized properly to allow the free passage of air to ensure the proper functioning of the system.
- Filters have the potential to cut off the oxygen supply that is essential to the functioning of the system. Some filter designs do not allow for adequate airflow, and others have a tendency to clog, blocking the passage of air. Proper maintenance and cleaning at least annually is required to ensure that the filter does not obstruct the flow of oxygen through the system.

System Sand

The System Sand that surrounds the Advanced Enviro-Septic® pipes is an **essential** component of the system. It is **critical** that the correct type and amount of System Sand is used when constructing the system. System Sand must be coarse to very coarse, clean, granular sand, free of organic matter. Refer to Section I, System Sand & Fill Material Specifications, p. 36.

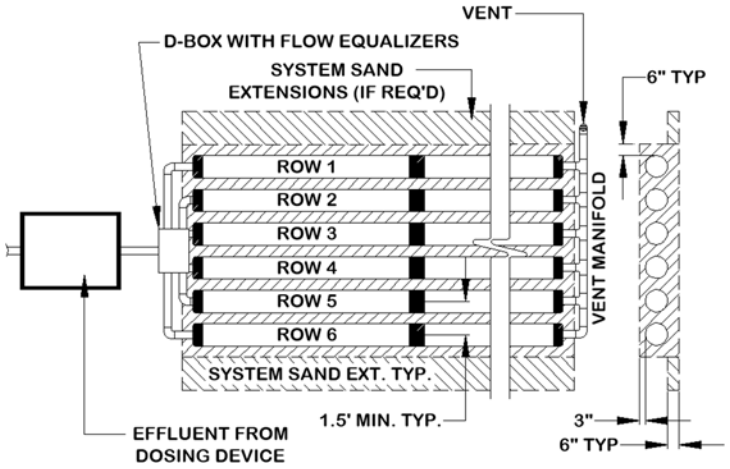
System Sand is placed a minimum of 6 inches below, 6 inches between, 6 inches around the perimeter of and 3 inches above all Advanced Enviro- Septic® pipes.

Section C
Bed and Trench System Sizing & Design Examples

TABLE A, AES System Sand Bed Sizing/ System Loading Rate ("SLR")			
Soil Group	Perc Rate (MPI)	One Foot Vertical Separation (GPD /sq ft)	Two Foot Vertical Separation (GPD /sq ft)
I	1-5	0.97	1.94
	6-10	0.71	1.42
	11-15	0.61	1.22
	16-20	0.59	1.18
	21-25	0.54	1.08
II	26-30	0.50	1.00
	31-35	0.47	0.94
	36-40	0.45	0.90
	41-45	0.42	0.84
	46-50	0.37	0.74
	51-55	0.35	0.70
	56-60	0.34	0.68
III	61-65**	0.33	0.55
	66-70**	0.32	0.53
	71-75**	0.31	0.52
	76-80**	0.31	0.52
	81-85**	0.30	0.50
	86-90**	0.30	0.50
Note: 50 ft of Advanced Enviro-Septic® pipe per bedroom (or per 150 GPD of design flow) is required			
**1:6 Minimum Width to Length Ratio and 900 GPD bed loading limit in 61-90 MPI soils			

Bed Configuration Illustration:

- Note that any part of the System Sand bed that is more than 6-inch away from the AES pipe only needs to be 6-inch deep; this is referred to as a "System Sand Extension."
- The AES pipe rows are centered on the System Sand bed.
- The center-to-center spacing between rows is a minimum of 1.5 ft.
- All bed systems require a mechanical dosing device.
- All bed systems must utilize D-Box distribution (also known as "parallel" distribution).



Bed System Sizing & Design Example

Calculating the Amount of AES pipe required

- Residential systems require 5 AES pipe units per bedroom. Each unit of AES pipe is 10 ft. long.
- Commercial system pipe requirements are calculated at 1 ft. of AES pipe per 3 gallons per day of design flow.
- Minimum AES pipe for any system is 10 units (100 ft.)

Bed Configuration Design Example

Design a four-bedroom residential AES System in soils with a perc rate of 10 MPI with a Two Foot Vertical Separation Distance to restrictive feature:

- 10 MPI perc rate = Loading Rate1.42 GPD per sq ft per Table A, p. 7.
- Daily design flow (residential) is calculated at 150 GPD per bedroom
- 4 bedrooms @ 150 GPD per bedroom = 600 GPD daily design flow
- 600 GPD ÷ 1.42 LR = 422.5 sq ft System Sand bed area (minimum)
- Minimum AES pipe for Residential System 50ft. per bedroom, 4 bedrooms x 50 ft. = 200 ft.

AES Pipe Layout Examples (a few of the many possible configurations):

- 4 rows of pipe 50 ft long or
- 5 rows of pipe 40 ft long
- Both use minimum required amount of pipe, 20 units (200 ft)

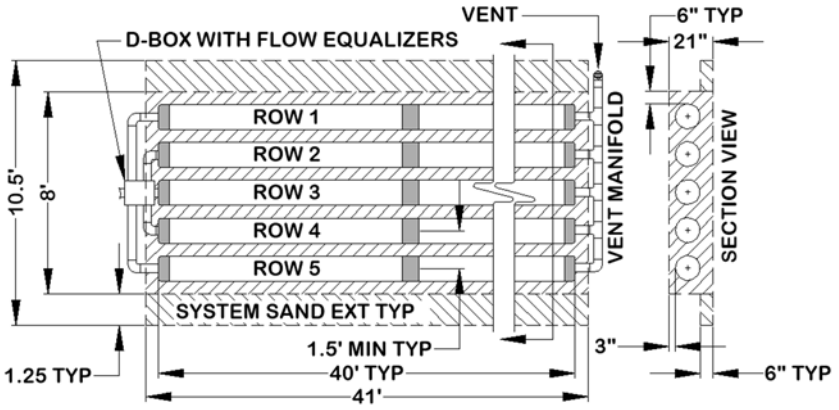
System Sand Bed Dimensions - Example:

- Assume 5 rows of pipe, 40 ft long = 200 ft AES pipe
- Sand Bed length: 40 ft row length + 1 ft System Sand (6 in. each end) = 41 ft Sand Bed length
- Minimum System Sand Bed width: 422.5 sq ft ÷ 41 ft length = 10.31 ft bed width.

Confirm Bed Width above will accommodate number of rows & check width-to-length ratio:

- Minimum System Sand bed width for 5 rows using 1.5 ft center-to-center spacing is 8 ft.
- Bed length 41 ft x bed width 8 ft = 328 sq ft System Sand bed area. These dimensions will require System Sand extensions to meet the bed area requirement of 422.5 sq ft.
- This design provides approximately a 1:4 width to length ratio. Since perc rate is less than 60 MPI, the 1:6 minimum width to length ratio is not required.

TABLE A DESIGN ILLUSTRATION



6 or more Bedrooms

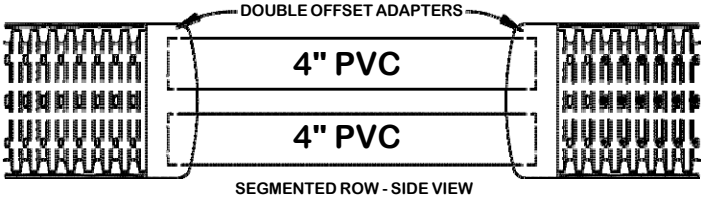
For systems larger than 5 bedrooms (greater than 750 GPD) which are not provided in sizing tables: calculate by adding together (or multiplying) using Table B on page 10 to achieve the total number of bedrooms desired.

Example: a 6-bedroom system would be sized by adding the number in the "2-bedroom" column with the number in the "4-bedroom column" [4+2= 6] OR by multiplying the number in the "3-bedroom" column by 2 [3x2=6].

Illustration using Table B: a 6-bedroom system on Group I soils with a percolation rate of 5 MPI, would require 250 ft. of trench length; this can be calculated by adding multiplying the 3-bedroom trench length by 2 (125 ft. x 2 = 250 ft.)

Segmented Rows (optional)

In some cases, the required trench length will exceed the length of AES pipe required. Segmented Rows can be utilized to distribute the AES pipe sections along the entire length of the trench without using more AES pipe than is needed. PVC connections placed between AES pipe sections extend the pipe row length in order to utilize the full trench length for infiltration. The lower PVC connector is a conduit for wastewater and the upper PVC connector is a conduit for air/gases. See illustration below and Section D, System Configurations, Segmented Rows, p. 21.



SEGMENTED ROW - SIDE VIEW

TABLE B – Fixed-Width Trenches with 1 ft. Vertical Separation Distance Perc Rates 1-15, 3.5 ft. Wide Trench with 2 Rows of AES Pipe Perc Rates 16-120, 3 ft. Wide Trench with 1 Row of AES Pipe						
Soil Type	Perc Rate (MPI)	System Loading Rate (SLR) (GPD/sq ft)	**System Sand Trench Length (ft.) minimum**			
			(2) bedrooms	(3) bedrooms	(4) bedrooms	(5) bedrooms*
Group I	**3.5 ft. Wide Trench with 2 Rows of AES Pipe: (Note: Sizing Credit Calculated based on 3 ft. width, no dosing device required)**					
	1-5	1.200	84	125	167	209
	6-10	0.909	111	166	221	276
	11-15	0.789	127	191	254	317
	3 ft. Wide Trench with 1 Row of AES Pipe:					
	16-20	0.714	141	211	281	351
	21-25	0.652	154	231	307	384
Group II	26-30	0.600	167	250	334	417
	31-35	0.566	177	266	354	442
	36-40	0.536	187	280	374	467
	41-45	0.500	200	300	400	500
	46-50	0.484	207	310	414	517
	51-55	0.462	217	325	433	542
Group III	56-60	0.448	224	335	447	559
	61-65	0.435	230	345	460	575
	66-70	0.423	237	355	473	592
	71-75	0.411	244	365	487	609
	76-80	0.405	247	371	494	618
	81-85	0.400	250	375	500	625
	86-90	0.395	254	380	507	633
Group IV	91-95	0.390	257	385	513	642
	96-100	0.385	260	390	520	650
	101-105	0.380	264	395	527	658
	106-110	0.375	267	400	534	667
	111-115	0.370	271	406	541	676
	116-120	0.366	274	410	547	684
Note: 50 ft of Advanced Enviro-Septic® pipe per bedroom (or per 150 GPD of design flow) is required						
*See p. 9, "6 or more bedrooms" for instructions for using Tables for sizing systems larger than 750 GPD.						

Design Example: **Design a three (3) bedroom AES residential system, fixed-width trench format, 110 MPI perc rate, with 1 foot vertical separation distance:**

- A three (3) bedroom system requires total trench length 400 ft. (Table B, p. 10).
- Number of trenches to be determined by site conditions; for this example, assume five (5) trenches each 80 ft. long (5 x 80 ft. = 400 ft.)
- Since perc rate is 110 MPI, a 3 ft wide trench with one row of AES pipe is required.
- A three (3) bedroom system requires 150 ft of AES pipe (3 bedrooms. x 50 ft each)
- 5 trenches each containing one row of AES pipe 30 ft long provides the required amount of AES pipe: 5 trenches x 1 row of AES each x 40 ft long rows = 200 ft AES pipe. Rows can be segmented; see illustration below. Using more than the minimum amount of AES pipe may result in less cutting and therefore quicker and easier installation. Advanced Enviro-Septic® pipe per trench must equal at least 50% of trench length.
- Minimum 4 ft undisturbed soil required between trenches.
- Since a 3 ft wide trench is used and total trench length is less than 500 ft., no dosing device is required.
- Illustration below utilizes D-Box distribution; serial distribution may also be used.

TABLE B DESIGN ILLUSTRATION USING SEGMENTED ROW OPTION:

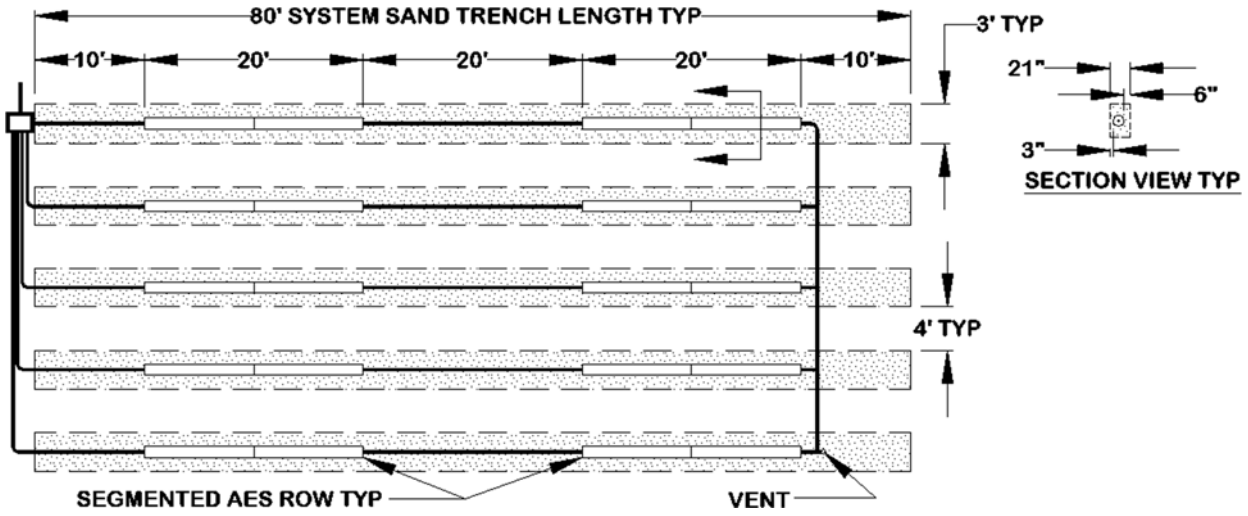


TABLE C – Fixed-Width Trenches - 2 ft. Vertical Separation Distance

Soil Type	Perc Rate (MPI)	System Loading Rate (SLR) (GPD/sq ft)	Sand Trench Length (ft.) minimum			
			(2) bedrooms	(3) bedrooms	(4) bedrooms	(5) bedrooms
Group I	1-5	2.400	51	76	101	126
	6-10	1.818	56	83	111	138
	11-15	1.579	64	95	127	159
	16-20	1.429	70	105	140	175
	21-25	1.304	77	116	154	192
Group II	26-30	1.200	84	125	167	209
	31-35	1.132	89	133	177	221
	36-40	1.071	94	141	187	234
	41-45	1.000	100	150	200	250
	46-50	0.968	104	155	207	259
	51-55	0.923	109	163	217	271
Group III	56-60	0.896	112	168	224	280
	61-65	0.725	138	207	276	345
	66-70	0.704	143	214	285	356
	71-75	0.685	146	219	292	365
	76-80	0.676	148	222	296	370
	81-85	0.667	150	225	300	375
	86-90	0.658	152	228	304	380
Group IV	91-95	0.649	155	232	309	386
	96-100	0.641	157	235	313	391
	101-105	0.633	158	237	316	395
	106-110	0.625	160	240	320	400
	111-115	0.617	163	244	325	406
	116-120	0.610	164	246	328	410

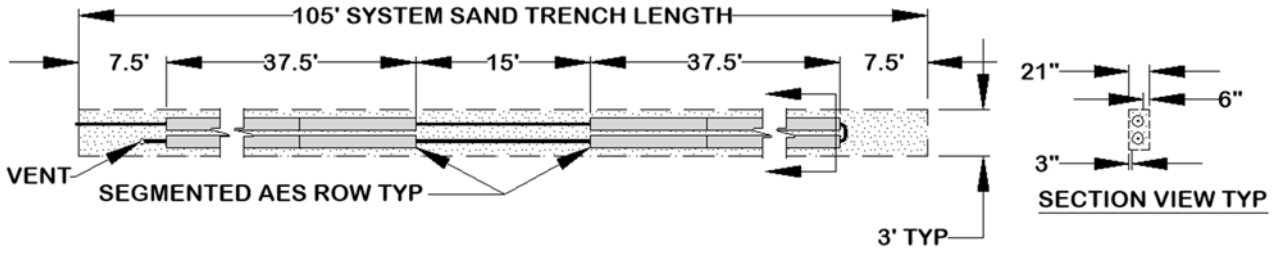
Note: 50 ft of Advanced Enviro-Septic® pipe per bedroom
(or per 150 GPD of design flow) is required

*See p. 9, "6 or More Bedrooms," for instructions for using Tables for sizing systems larger than 750 GPD.

Design Example: **Design a three (3) bedroom AES residential system, fixed-width trench format, 20 MPI perc rate, two (2) foot vertical separation distance:**

- A three (3) bedroom system requires total pipe length of 150 ft and total trench length of 105 ft. (Table C, p. 12). The trench can be 3.5 ft wide with two rows of Presby pipe because the percolation rate is 20 MPI.
- Number of trenches to be determined by site conditions; for this example, assume the site will accommodate one trench up to 105 ft long.
- Total AES pipe of 150 ft. total pipe ÷ 2 rows per trench ÷ 1 trench = 150 ft. of pipe per trench (2 rows 75 ft. long per trench).
- Because the trench length is longer than the row lengths, the rows will be segmented within the trench. Use two 35 ft row segments per row, with 15 ft separating each segment.
- Two rows of AES pipe in each trench results in 150 ft. total AES pipe: (2 rows x 1 trenches x 75 ft = 150 ft)
- Actual width of trenches is fixed at 3.5 ft. to allow for a minimum 6 inches of System Sand in every direction around AES pipe.
- Area calculations in Table C, p. 12, are based on 3 ft. trench width, so a dosing device is not required unless total length of all trenches exceeds 500 ft.
- Minimum 4 ft of undisturbed soil is required between trenches (when needed).
- Illustration below utilizes serial distribution; however, a distribution box may also be used.

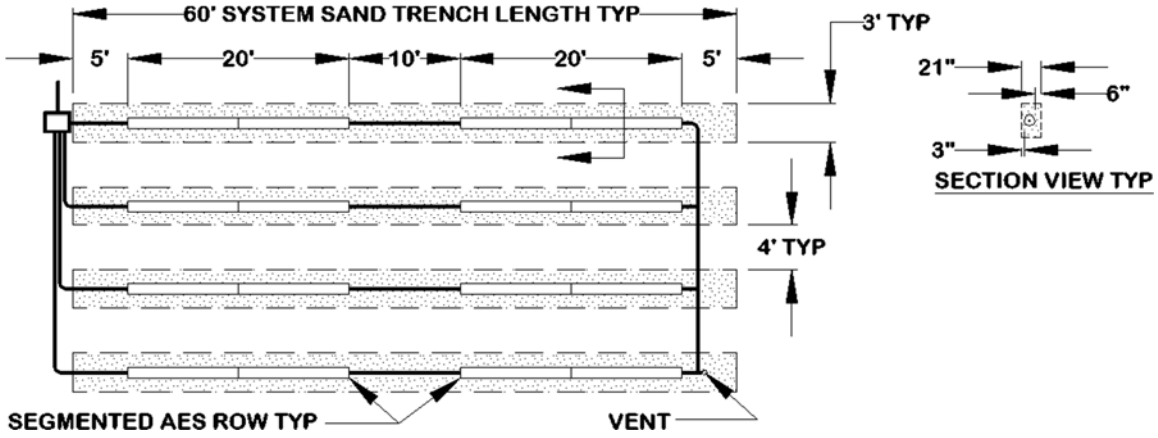
TABLE B DESIGN ILLUSTRATION:



Design Example: **Design a three (3) bedroom AES residential system, fixed-width trench format, 110 MPI perc rate, two (2) foot vertical separation distance:**

- A three (3) bedroom system in soils with perc rate of 110 MPI requires 3 ft wide trench with one (1) row of AES pipe and total trench length 240 ft. (Table C, p. 12).
- Number of trenches to be determined by site conditions; for this example, assume four (4) trenches.
- Total trench length required 240 ft divided by 4 trenches = 60 ft per trench.
- A three (3) bedroom system requires 150 ft. of AES pipe (3 bedrooms. x 50 ft each)
- Four (4) rows of AES pipe (one per trench) each 40 ft long (segmented) results in 160 ft total AES pipe: (1 row x 4 trenches x 40 ft = 160 ft). The minimum 37.5 ft per row could have been used, but 40 ft per row was used for ease of construction.
- Minimum 4 ft undisturbed soil required between trenches.
- No dosing device required for 3 ft wide trenches.
- Illustration below utilizes D-Box distribution; serial distribution may also be used.

TABLE D DESIGN ILLUSTRATION:



Section D
System Configurations

Introduction The table below presents the various design configurations of the Advanced Enviro-Septic® System and summarizes design criteria and limitations presented in this Section:

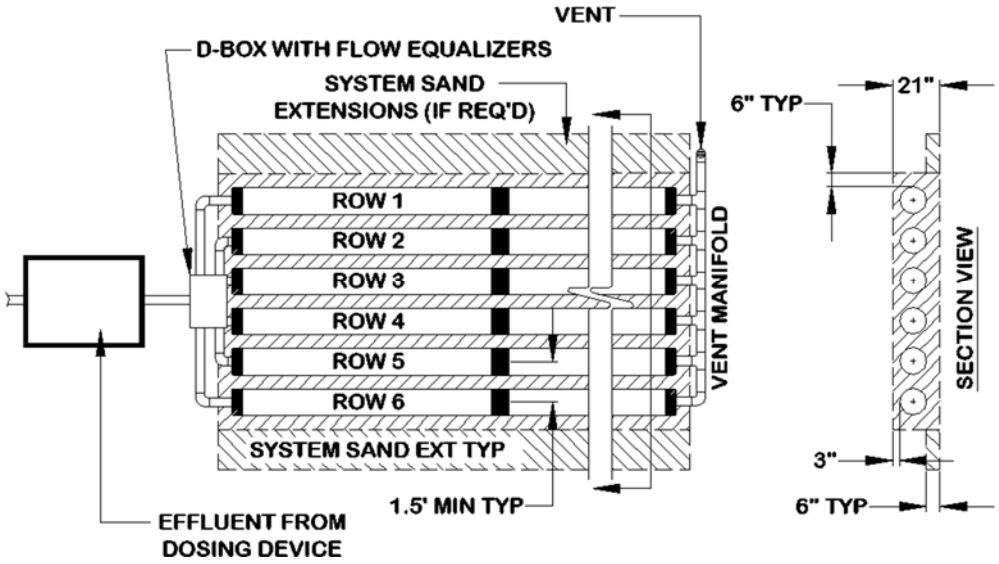
System Type	Configuration & Vertical Separation Distance ("VSD")	Perc Rates in Minutes per Inch ("MPI")	Slope Limitations	Dosing Requirements	Other Limitations & Requirements
TRENCHES	3.5 ft. Width 2 ft. VSD (Table B) 2 Rows pipe/trench	1 – 65 MPI	All Trenches Installed Level & generally Parallel to Contours Site Slope Maximum 45% per PEI (GA Rules no site slope limit)	All trenches are calculated based on 3 ft. width. Some may require 3.5 ft. to fit AES pipe, no credit for extra width.	D-Box or Serial Distribution OK
	3 ft. Fixed Width 1 ft. VSD (Table C) 1 Row pipe/trench	16 – 120 MPI		Trenches calculated based on 3 ft. width do not require dosing unless total trench length is greater than 500 ft.	Segmented Rows Optional (see p. 21)
	3.5 Fixed Width 1 ft. VSD (Table C) 2 Rows pipe/trench	1 - 15 MPI		500 ft. or more total trench length requires dosing (regardless of trench width)	Min. 4 ft. undisturbed soil between Trenches (see p. 17)
	3 ft. Fixed Width 2 ft. VSD (Table D) 1 Row pipe/trench	66 – 120 MPI		1000 ft. or more total trench length requires Alternating Pump (regardless of trench width)	Maximum row length is 100 ft.
	3.5 ft. Fixed Width 2 ft. VSD (Table D)	1 – 65 MPI		Dosing device must allow passage of air through venting system	Minimum recommended trench/row length is 30 ft.
BEDS	1 ft. VSD (Table A)	1 – 90 MPI 61 – 90 MPI requires 1:6 width to length ratio	All beds installed level	Dosing Required for all Bed Systems	Bed Loading Limit 900 GPD in 61+ MPI
	2 ft. VSD (Table A)		Max. Site Slopes: Mounds: 12%* In-ground Beds: 33%	Max. row length 100 ft./ Minimum recommended row length 30 ft.	Beds must use D-Box (parallel) distribution
MOUNDS* "Raised Beds"	Wisconsin	31 – 120 MPI	25% Max. Site Slope	If any part of System is above original grade 5 ft. fill extension tapering 5:1 required.	Engineered System sized per GA Rules
	Area Fill	1 - 30 MPI high water table	12% Max. Site Slope		Sizing and design per PEI's AES GA Manual
ALL ADVANCED ENVIRO-SEPTIC SYSTEMS IN GEORGIA REQUIRE:					
Primary Treatment by Septic Tank (200 mg/L or less BOD and 200 mg/L or less TSS)	Venting Required (Section G, pp. 31-34) Replacement Area Required (p. 26) Effluent Filter Required (p. 6)	Minimum Separation Distance to Restrictive Features is 1 ft. (measured from bottom of 6 in. System Sand)	Min. 6 in. Specified System Sand in all directions around AES pipe (System Sand Specs. Section I, p. 36) 1.5 ft. Minimum Center-to-Center Spacing of rows	50 ft. AES pipe (per bedroom or 150 GPD) minimum Designer & Installer Certification Required (p. 2)	2000 GPD + must be an Engineered System 10,000 GPD + requires GA EPD permit

AES Bed Systems

Bed System Requirements

- All bed systems must utilize D-Box (“parallel”) distribution.
- All bed systems contain a minimum of 2 rows of AES pipe.
- All bed systems must utilize a mechanical dosing device (not shown in illustration).
- All rows must be the same length.
- D-box outlets must utilize flow equalizers to ensure effluent is distributed equally to each row in the system.
- Use a vent manifold to ensure adequate air flow through each row.
- Row lengths less than 30 ft using this configuration are limited to use in soils with perc rates 1-60 MPI.
- In soils with perc rates 61 MPI to 90 MPI, there is a 900 GPD bed loading limit and a required 1:6 width-to-length ratio.
- AES pipe rows are centered on the System Sand bed.

D-Box Distribution Configuration



AES Bed Systems, Multiple Bed Distribution

Introduction

Multiple Bed distribution may be used to accommodate site constraints or to handle large daily design flows (bed loading limit is 900 GPD in perc rates 61-90 MPI). It incorporates:

- Two or more beds
- Each bed receives an equal amount of effluent from a D-box with equalizers.

Flow Equalizers Required

All D-boxes used to divide effluent flow require flow equalizers in their outlets. Each flow equalizer is limited to a maximum of 20 GPM in both gravity and pumped systems.

Bed Requirements

- Each bed must have the same minimum total feet of pipe.
- Each bed must have at least two rows.
- The minimum linear feet of pipe per bed is determined by dividing the total linear feet required in the Advanced Enviro-Septic® System by the number of beds.
- Beds may be of different dimensions, provided that rows are not more than 100 ft long. Longer, more narrow beds work best.
- Recommended minimum row length is 30 ft. Designs with rows shorter than 30 ft are restricted to use in soils with perc rates 1-60 MPI.
- Rows within a bed must be of equal length.
- In soils with a perc rate 61 MPI or greater, each bed is limited to a maximum of 900 gallons/day and a 1:6 width-to-length ratio is required.

Multiple Bed Orientation

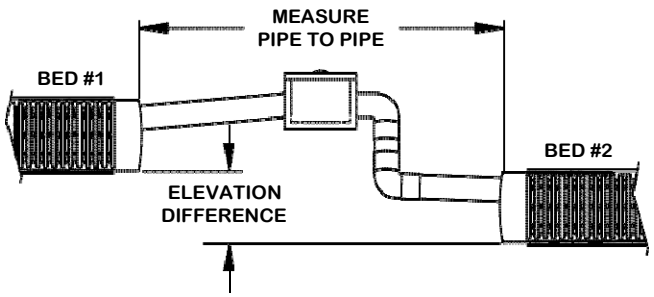
Multiple beds may be oriented along the contour of the site or along the slope of the site. End-to-end configurations are preferred; however, side-to-side configurations may be allowed with sufficient horizontal separation distance (see Bed Separation Distances, below).

Bed Systems Horizontal Separation Distances

Minimum bed horizontal separation distances:

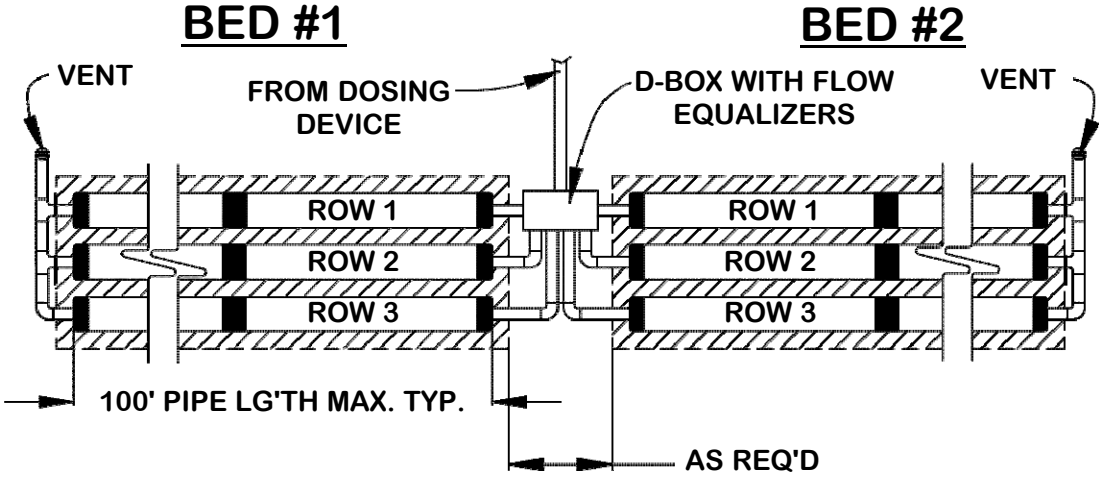
- 4 ft. separation for end-to-end system beds (measured pipe to pipe) if elevation difference is 1 ft. or less.
- 10 ft. separation for end-to-end system beds (measured pipe to pipe) if elevation difference is greater than 1 ft. but less than 3 ft.
- 20 ft. separation for end-to-end beds if elevation difference is greater than 3 ft.
- 20 ft. separation for side-to-side beds regardless of elevation difference.

Minimum Bed Separation	
Elevation Differential	**Required Bed Separation**
12 in. or less	4 ft.
12 in. – 36 in.	10 ft.
> 36 in.	20 ft.
Side-to-Side	20 ft.



AES Bed Systems, Multiple Bed Distribution, continued

Multiple Bed Distribution – equal linear footage of Advanced Enviro-Septic® pipe in each bed. Also referred to as a "Butterfly System."



AES Bed Systems, Unique Site Solutions for any soil type

Introduction

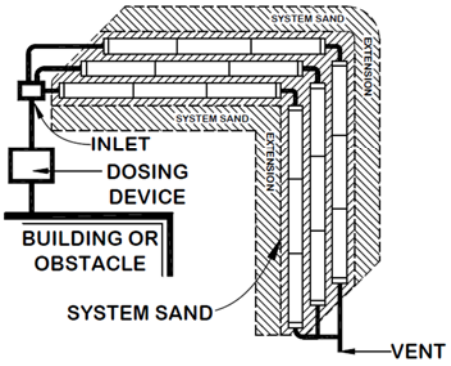
The configurations described in this Section may be used to accommodate site constraints. These configurations may be used in any soil type (perc rates 1-90 MPI).

Angles

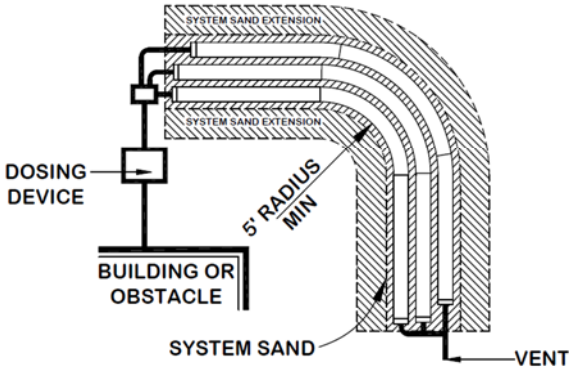
Angled configurations generally have one or more specific bends, but the rows should follow the contour of the site. Rows are angled by bending pipes or through the use of offset adapters. The following layouts may be used in any soil type.

Note: A 10 ft. length of Advanced Enviro-Septic® pipe may be bent up to 90°.

SYSTEM LAYOUT AT 90°

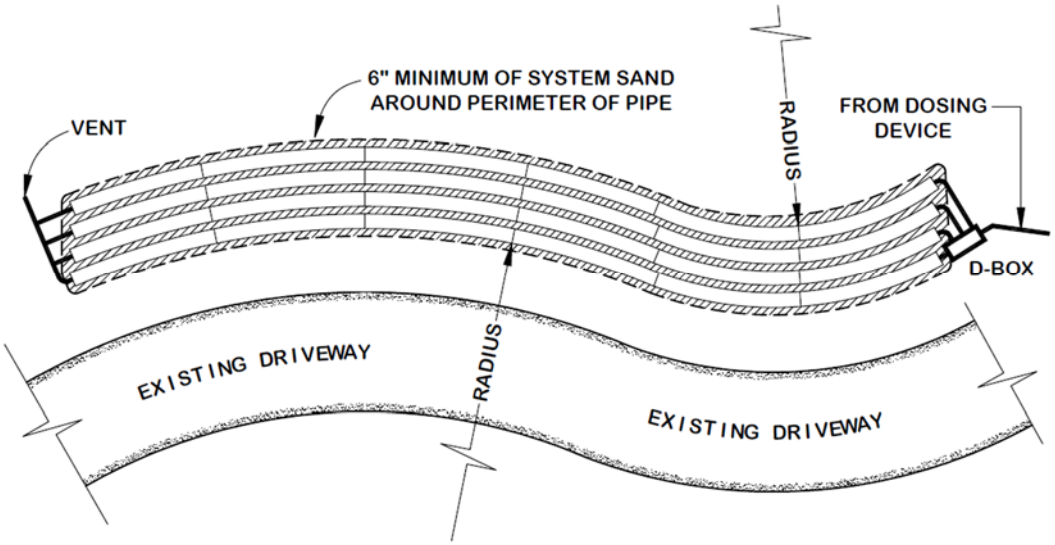


SYSTEM CURVED ABOUT RADIUS



Curves

Curved configurations work well around structures to achieve required setbacks. Multiple curves can be used if dictated by the contour of the site.



AES Trench Systems

AES Pipe in Trench Configurations	Trench configurations are either 3.5 ft wide with two rows of pipe, or 3 ft wide with one row of pipe. Refer to Sizing Tables B, C and D, pp. 9-13.
AES Pipe in 3.5 ft. wide trenches	• Each trench contains two rows of AES pipe of equal length. • Center-to-center spacing between rows of AES is 1.5 ft. • Minimum 6 inches System Sand below, 6 inches between, 6 inches around the perimeter of and 3 inches over all AES pipe. • Georgia rules regarding trench sizing give credit for trench width up to 36-inch maximum; sizing tables for 3.5 ft wide trenches take this into consideration when stating required trench length, no further calculation is needed. • Since required sizing in Table B, p. 10 and Table C, p. 12 is calculated based on 3 ft width, no dosing device is required unless total trench length is greater than 500 ft.
AES Pipe in 3 ft. wide trenches	• Each trench contains one row of AES pipe. • AES pipe is positioned in the middle of the trench with 1 ft of System Sand on each side of the pipe. • Segmented rows may be utilized to extend the pipe row length across the entire length of the trench. See Segmented Row Option, p. 21.
Distribution Methods	AES trench configurations may utilize either serial distribution OR parallel distribution. Serial distribution utilizes Raised Connections to connect AES pipe rows, see illustration on p. 41. **Note**: Pressure distribution may not be used with AES pipe.
Separation Distance Between Trenches	There must be a minimum of 4 ft of undisturbed soil between trenches. Horizontal separation distance between trenches is measured from the edge of System Sand in one trench to the nearest edge of System Sand in the next trench.
Separation Distance (Vertical) to Restrictive Features	• AES can be used with either a 2 ft or 1 ft vertical separation distance to SHWT, ledge, bedrock or impermeable soils. • When a 2 ft vertical separation distance is used, the required trench length is reduced by a sizing reduction. This is reflected in sizing tables provided and no further calculation is required. • Vertical separation distance required is measured from the bottom of the 6-inches of System Sand below the AES pipes.

AES Trench Systems, Segmented Row Option

Segmented Rows

In certain soils, the required trench length will exceed the AES pipe required. In order to distribute the pipe evenly across the entire length of the trench, Segmented Rows (Patent Pending) are used to extend the AES pipe row length as needed to "fill" the trench length, taking full advantage of greater infiltrative surface area without the expenditure for more AES pipe than is required for treatment.

How to Construct

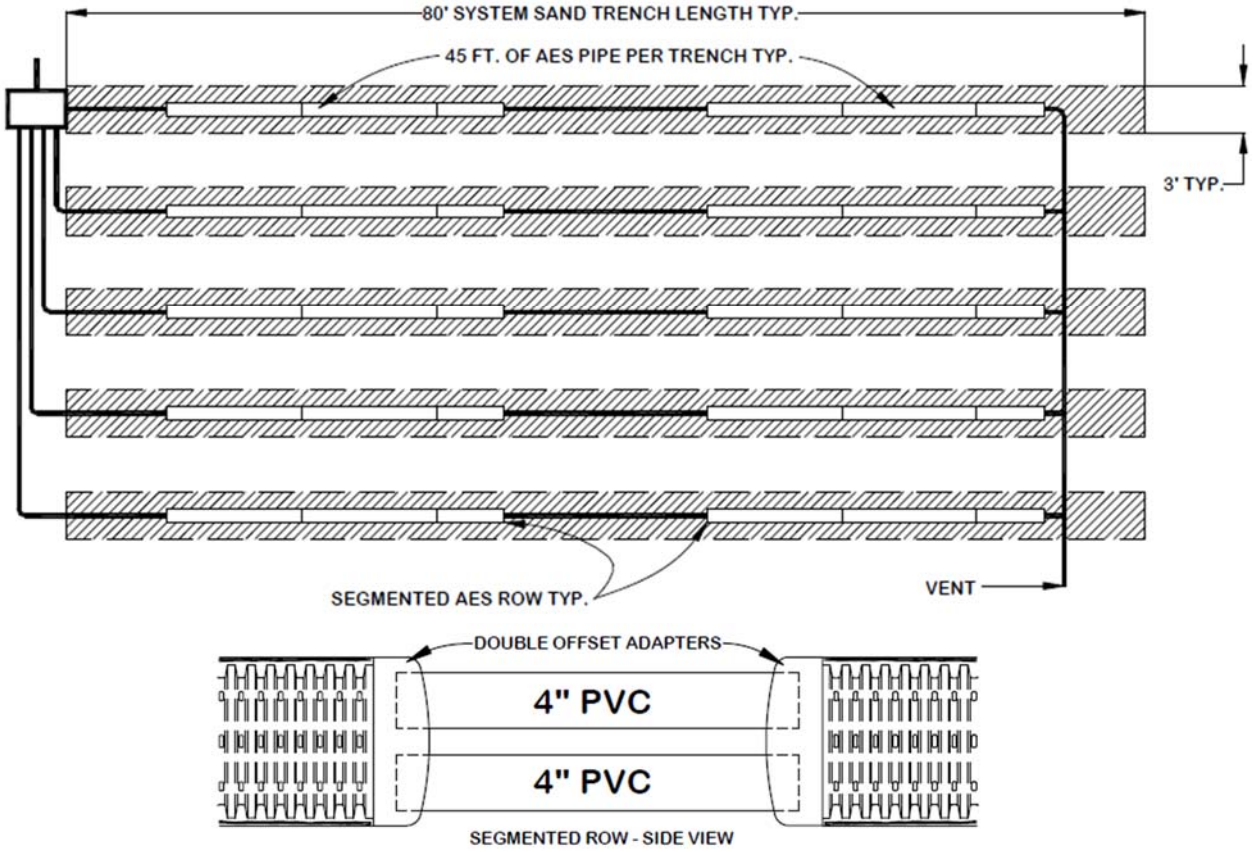
Sections of AES pipe are connected with PVC piping using Double Offset Adapters. The lower PVC connector pipe is a conduit for wastewater, and the upper PVC connector pipe is a conduit for air/gases. See illustration below.

Parameters for Segmented Rows

There is considerable flexibility in using this feature depending on the particulars of the design. The intent of this option is to maximize even distribution, so Segmented Rows should be constructed in a balanced manner, alternating somewhat standard length pipe sections with PVC connectors of approximately equal length. See illustration below:

- The maximum length of a PVC connector is 20 ft.
- At least 50% of the Segmented Row's overall length must be provided by AES pipe.
- PVC connectors extend 2 to 4 in. into the Double Offset Adapter.

SEGMENTED ROW OPTION ILLUSTRATION:



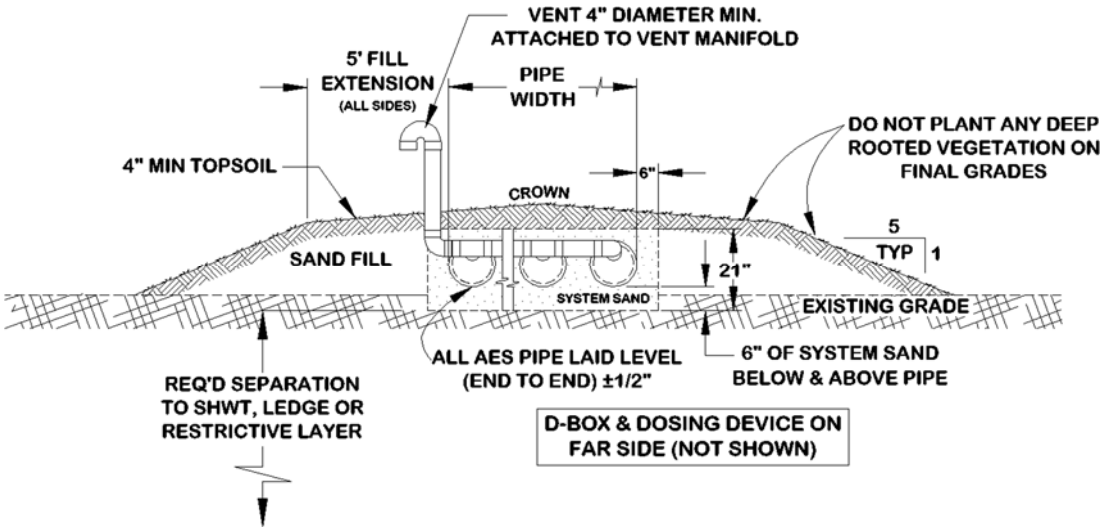
Vertical Placement of the System

Configuration Not Requiring Side-Slope Tapering

If all parts of the system, including cover material, are at or below original grade, the system will not require side-slope tapering.

Configuration Requiring Side-Slope Tapering

- If any part of the system (including soil cover) is above original grade, the system will require fill extensions and side-slope tapering as illustrated below.
- Fill extensions and side-slope tapering are used to blend the system into the terrain, making it both less susceptible to erosion and less noticeable.
- Fill extensions extend a minimum of 5 ft. before tapering side-slopes to a minimum of 5:1 slope. Refer to Section I, System Sand and Fill Material Specifications, p. 36, for more information about the specifications for the soil material to be used to construct side-slopes.
- Also refer to Section L, Final Grading, p. 42.



Site Preparation

Refer to Section K, Installation & Construction Procedures, pp. 39-41, for instructions regarding site preparation for systems requiring side-slopes.

Beds Must be Dosed

Any configuration taking credit for more than 36 in. width will be considered a "bed" and must be sized and dosed as required by Georgia rules. Gravity systems can be utilized via mechanical dosing. Pressure distribution may not be used with AES pipe.

Center-to-Center Spacing of Rows

- Center-to-center spacing of Advanced Enviro-Septic® rows is a minimum of 1.5 ft.
- Center-to-center spacing is measured from the center of one pipe to the center of the pipe in the next row.
- Center-to-center spacing of 1.5 ft. results in the minimum of 6 in. of System Sand between each row of Advanced Enviro-Septic® pipe.

Daily Design Flow and Sizing Calculations Commercial

Non-residential Systems will use 1 ft. of AES pipe for every 3 GPD of daily design flow: Daily Design Flow (gal/day) ÷ 3 = Minimum AES pipe (ft.)

When determining the required bed area or trench length for a commercial system, divide Daily Design Flow (gal/day) by the Soil Loading Rate (SLR) based on the soil's perc rate. Sizing is the same for residential and commercial systems.

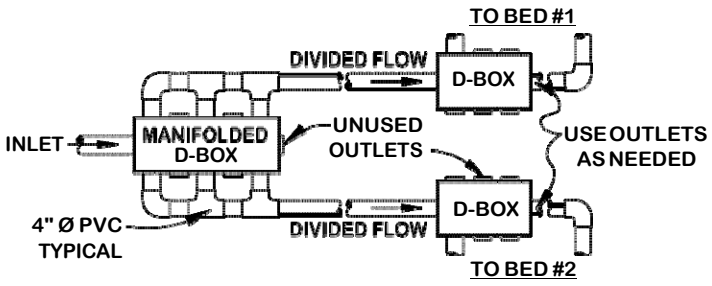
Daily Design Flow Calculations Residential

Residential Daily Design Flows are calculated at 150 gallons per day (GPD) per bedroom. Minimum daily design flow for any system is 300 GPD (2 bedrooms).

D-BBox Manifold

- A D-box manifold is utilized to equalize flow.
- Flow equalizers should be used on all D-box outlets.
- Unused D-box outlets must be covered, plugged or mortared.
- This configuration is especially useful when designing for large daily design flows. See "Velocity Reduction," this Section, p. 28.

Distribution box manifold is used to divide flow evenly to multiple beds:



Note: Utilizing every other outlet will provide room for required piping and allow for easier installation. Install flow equalizers on all used outlets.

Design Criteria for Georgia, continued

Dose Volume	• Volume per dose must be no greater than 1 gallon times the total length (ft.) of all AES pipe. • Dosing must be a **minimum** of 4 times per day; 6-8 cycles per day are recommended. • The dosing cycle should provide at least one hour between doses. • Pump dose volume is limited to 20 GPM per equalizer.
End-to-End Preferred Over Side-to-side	If site conditions permit, end-to-end multiple bed configurations are preferable to side-to-side system bed configurations.
Filters	• All septic tanks must be equipped with baffles to reduce the amount of solids exiting the tank and entering the Advanced Enviro-Septic® System. • An effluent filter is required for use with the AES System in Georgia. The effluent filter selected must be designed and sized properly to allow the free passage of air to ensure the proper functioning of the system. • Filters have the potential to cut off the oxygen supply that is essential to the functioning of the system. Some filter designs do not allow for adequate airflow, and others have a tendency to clog, blocking the passage of air. Proper maintenance and cleaning at least annually is required to ensure that the filter does not obstruct the flow of oxygen through the system.
Garbage Disposals	• If a garbage disposal is utilized, we recommend that the required liquid capacity of the septic tank be increased by 50%. • Multiple compartment septic tanks or multiple tanks are preferred. • If a garbage disposal is used, the septic tank will likely require more frequent pumping (see Operation & Maintenance, Section M, p. 43).
Horizontal Separation Distances	Minimum horizontal separation distances (also called “set-backs”) must comply with state and/or local requirements. Horizontal separation distances are measured from the outermost edge of the System Sand bed.
Interceptor Drains	• Interceptor Drains, if used, must be upslope of the AES System and a minimum of 10 ft. away from all AES pipe. • Advanced Enviro-Septic® pipe is excellent for use in constructing interceptor drains.
Longer Advanced Enviro-Septic® Systems Recommended	• All Advanced Enviro-Septic® Systems are recommended to be designed and installed as long and narrow as practical for the site. • Bed systems designed for soils with perc rates 61-90 MPI require a minimum width-to-length ratio of 1:6; see Sizing Table A. p. 7. • Maximum length for any pipe row is 100 ft.

Design Criteria for Georgia, continued

Minimum Number of Rows	All beds must have at least 2 parallel rows of AES pipe. Trenches contain either 1 or 2 rows of AES pipe.
Minimum and Maximum Row Lengths	To maintain efficient effluent cycling within the Advanced Enviro-Septic® pipe, the maximum row length is 100 ft and the minimum recommended row length is 30 ft. Designs with row lengths shorter than 30 ft are limited to use in perc rates 1-60 MPI.
Minimum and Maximum System Size	• Minimum daily design flow for any system is 300 GPD (2 bedrooms) • Maximum daily design flow for any system without PEI guidance is 10,000 GPD. Systems over 10,000 GPD also require an EPD permit.
Orientation of Pipes on System Sand Bed	Advanced Enviro-Septic® System Sand extends horizontally a minimum of 6 inches beyond the outer perimeter of the Advanced Enviro-Septic® pipes, with the pipes centered on the System Sand bed. All bed systems are to be installed level.
Pipe Requirements	Residential Systems: Total length of Advanced Enviro-Septic® pipe is 50 ft per bedroom. Minimum size for any AES system is 2 bedrooms (100 ft. AES pipe).

Design Criteria for Georgia, continued

Pumped System Requirements

- Pumped systems to gain elevation are allowed with the Advanced Enviro-Septic® System.
- The use of pressure distribution with the Advanced Enviro-Septic® System is **not** permitted.
- Systems incorporating pumps to gain elevation must use differential venting (see Section G, Venting Requirements, pp. 31-34) and velocity reduction (see p. 28) to control liquid flow.
- Equalizers are required; dose volume is limited to 20 GPD per flow equalizer.

Reference: See Section F, Pumped System Requirements, p. 30.

Replacement Area

Georgia requires that the site have sufficient area reserved for a replacement system.

In the unlikely event that an Advanced Enviro-Septic® System needs to be replaced…

- It can be reinstalled in the same location.
- All unsuitable material and components must be removed prior to replacement system construction.
- Dispose of hazardous materials properly.
- Permits are sometimes required for system replacement; contact the appropriate approving authority to determine if a permit is required.

Note: Attempt Rejuvenation procedures **before** replacing the system. This simple process can often restore normal system function in a matter of days. Refer to Section N, Rejuvenation and Expansion, p. 44, and call PEI for technical assistance.

Required Vertical Separation Distances

- In order for a site to be acceptable for an AES System, there must be at least 9 in. of in situ unsaturated soil. Refer to Section H, Site Selection, p. 35.
- The minimum vertical separation distance between the AES pipe and restrictive features is 18 in. (6 in. System Sand below pipes + 12 in. minimum vertical separation distance = 18 in.)
- The required vertical separation distances referred to in Sizing Tables is measured from the bottom of the 6 inches of System Sand below the AES pipes.
- AES systems can be used with either 1 ft. or 2 ft vertical separation distance to restrictive features (measured from the bottom of the System Sand).
- Systems using 2 ft vertical separation distance instead of 1 ft are entitled to sizing reductions (higher loading rates) which are reflected in AES sizing criteria, no further calculations are required. Refer to Sizing Tables A, B and C on, pp. 7-13.

Row Orientation

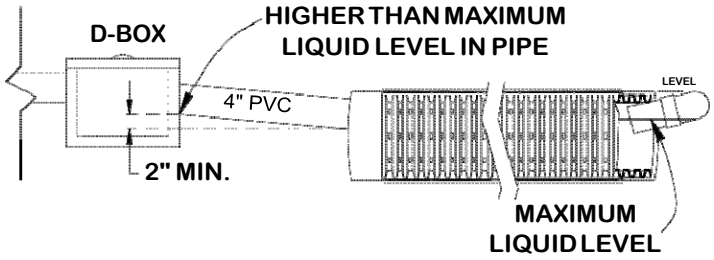
Advanced Enviro-Septic® rows must be laid level to within 1 in. end-to-end and side-to-side.

Segmented Row Option

PVC Connectors can be used to extend the length of the AES pipe row in order to distribute the pipe along the entire trench length. See Segmented Row Option p. 21.

Septic Tank and D-Box Elevations

The outlet of a septic tank or D-box must be set at least 2 in. above the highest inlet to the first Advanced Enviro-Septic® row, with the connecting pipe slope not less than 1% (approximately 1/8 in. per foot.)



Side-slope Tapering

Side-slope tapering is to be a minimum of 5:1 after 5 ft. fill extensions.

Site Slope Limitations

Maximum Site Slopes for Beds: Area Fill Mounds 12%, Wisconsin Mounds 25%, In-ground 33%.

Maximum Site Slope for Trenches: PEI recommends 45%, GA rules do not state site slope limitations for trenches.

System Sand Bed Area (Minimum)

For Residential and Commercial Bed Systems, refer to System Loading Rate (SLR) from Table A on p. 7. Daily design flow ÷ SLR = Minimum System Sand bed area (sq. ft.).

System Sand Bed Vertical Dimensions

The overall height of an Advanced Enviro-Septic® System measures 21 inches (including System Sand, not including fill or cover materials):

- 6 in. of System Sand below the Advanced Enviro-Septic® pipe;
- 12 in. diameter of the Advanced Enviro-Septic® pipe; and
- 3 in. of System Sand above the Advanced Enviro-Septic® pipe.

System Sand Specifications

It is **critical** to the proper functioning of the Advanced Enviro-Septic® System that the proper amount and type of System Sand be installed. Refer to Section I, System Sand and Fill Material Specifications, p. 36.

Ten Foot Increments Work Best

It is easier if row lengths are designed in 10 ft increments since Advanced Enviro-Septic® pipe comes in 10 ft. sections. However, if necessary, the pipe is easily cut to **any** length to meet site constraints. Using 5 ft increments minimizes waste of pipe material.

Design Criteria for Georgia, continued

Trench Area Calculations	For residential and commercial systems, refer to the System Loading Rate (SLR) column in Sizing Tables B and C on pp. 10 & 12. Daily Design Flow (GPD) ÷ SLR ÷ 36 inches maximum trench width credit = Required minimum trench length. (**Note**: Georgia sizing criteria calculates the area of all trenches at a maximum of 36-inch width. Sizing tables take this into consideration and no further calculation is required for 3.5 ft wide trenches. Since sizing calculations for 3.5 ft wide trenches only take credit for 36-inch width, a dosing device is not required.)
Trenches Horizontal Separation Distance Requirements	There must be a minimum horizontal separation distance of 4 ft of undisturbed soil between trenches. Horizontal separation distance between trenches is measured from the edge of System Sand in one trench to the nearest edge of System Sand in the next trench.
Topographic Position Requirement	The topographic position of the site must be convex, hill slope, or flat. 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. Refer to Section H, Site Selection, p. 40 for additional information and tips about selecting the right location for an Advanced Enviro-Septic® System.
Velocity Reduction	• Velocity reducers are needed when there is excessive slope between the septic tank and the Advanced Enviro-Septic® System. • A velocity reducer at the system inlet is required if the velocity of the fluid entering the Advanced Enviro-Septic® pipes would create enough turbulence to disrupt the natural settling of suspended solids within the Advanced Enviro-Septic® pipes. • D-boxes with baffles or a velocity reducing tee are commonly used for velocity reduction. • Velocity reduction is required in pumped systems. Refer to Section F, Pumped System Requirements, p. 30.
Venting Requirements	**All** Advanced Enviro-Septic® Systems require venting. Pumped systems and some dosed systems require differential venting. Refer to Section G, Venting Requirements, pp. 31-34.
Wastewater Strength	All design criteria in this Manual assume “usual” or “typical” domestic wastewater strength after primary treatment in a septic tank (less than 200 mg/L BOD and 200 mg/L TSS). Designers should take any unusual wastewater characteristics into consideration when designing a system. Where wastewater strength is high or wastes are unusual, additional Advanced Enviro-Septic® pipe is recommended. Please contact us for technical assistance.

Design Criteria for Georgia, continued

Water Purification Systems

- Water purification systems and water softeners should **not** discharge into an Advanced Enviro-Septic® System.
- This “backwash” does not require treatment and the additional flow may overload the system. Designs should include an alternative means of dispersal.
- If there is no alternative means of disposing of this backwash, then 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 and increase septic tank size accordingly.
- Water purification systems and water softeners require regular routine maintenance; consult and follow the manufacturer’s recommendations.

Section F
Pumped System Requirements

Introduction	Pumped systems supply effluent to the Advanced Enviro-Septic® System using a pump and D-box when site conditions do not allow for a gravity system.
Differential Venting	**All** pumped systems must use differential venting. Reference: See Section G, Venting Requirements, pp. 31-34.
D-Box	**All** pumped systems require a D-box. See "Velocity Reduction," below.
Velocity Control	The rate at which effluent enters Advanced Enviro-Septic® pipe must be controlled. Excessive effluent velocity can disrupt solids that settle in the Advanced Enviro-Septic® pipes.
Velocity Reduction	• Effluent must never be pumped directly into Advanced Enviro-Septic® pipe. • A D-box or tank must be installed between the dose tank (sometimes called a "pump chamber") and Advanced Enviro-Septic® pipe to reduce effluent velocity. • Force mains must discharge into a D-box with a velocity reducer such as a baffle or tee.
Dose Volume	• Pump volume per dose must be no greater than 1 gallon times the total length of all AES pipe. • Pump dosing must be a **minimum** of 4 times per day; 6-8 cycles per day are recommended. • The dosing cycle should provide at least one hour between doses. • Pump dose volume is limited to 20 GPM per equalizer.

Section G
Venting Requirements

General Rule

- Adequate ventilation is **essential** to the proper functioning of the Advanced Enviro-Septic® System.
- Vent openings must be located to ensure the unobstructed flow of air through the entire Advanced Enviro-Septic® System.
- The low vent inlet must be a minimum of 1 ft above final grade, or above elevation of expected snow accumulation, whichever is greater.

When to Vent

- High and low vents are **required** for **all** systems.
- The roof (house) vent is the "high vent" in gravity systems.
- One 4 in. diameter low vent is required for every 1,000 ft of Advanced Enviro-Septic® pipe.
- A single 6-inch diameter low vent may be installed instead of three 4-inch diameter vents.
- The diameter of the vent manifold must match the vent stack diameter.

Differential Venting

- Differential venting is the use of high and low vents in a system.
- High and low vent openings must be separated by a minimum of 10 vertical ft.
- The high and low vents should be of the same capacity.
- Roof vent diameter must be a minimum of 3 inches, 4-inch diameter is recommended. If the roof vent is less than 3 inch, an additional high vent is recommended.
- Sch. 40 PVC or equivalent should be used for all high vents.
- Vents extending more than 3 ft above grade must be anchored.

Vent Locations

Vent locations depend upon the type of system. For ease of illustration, most illustrations show high and low vents on opposite ends of the field; however, high and low vents may be installed on the same end of the field as long as the 10 ft differential between high and low vents are maintained. Refer to illustrations on next page.

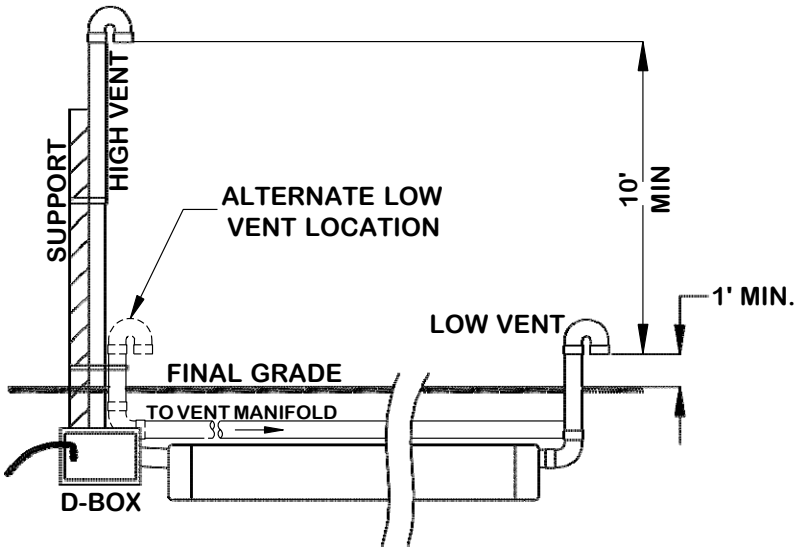
Gravity Systems

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

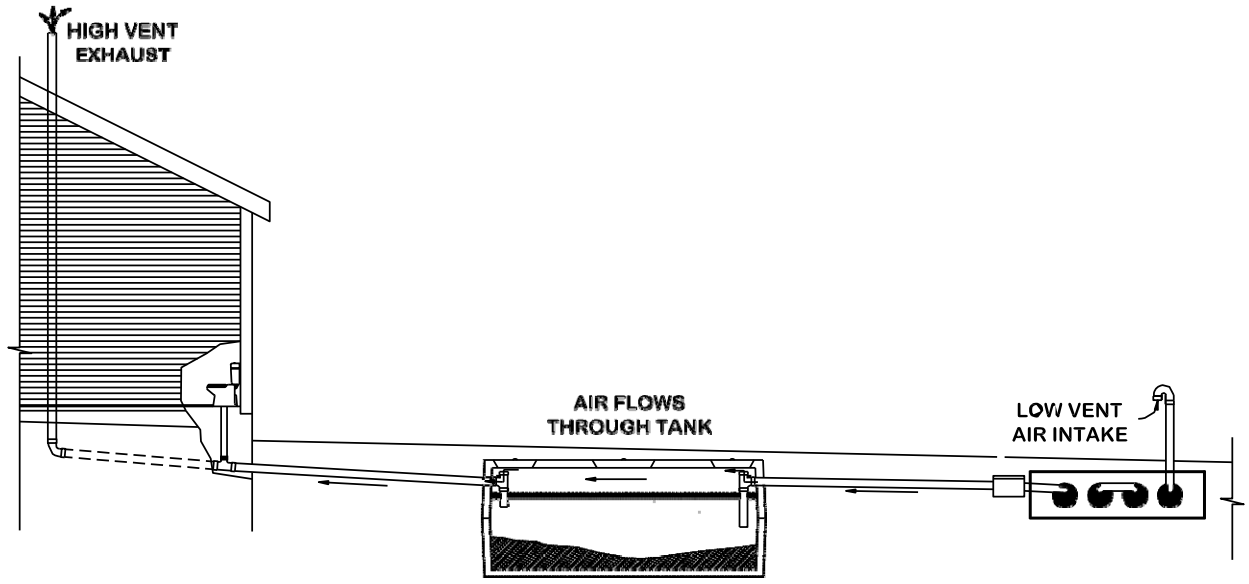
Pumped Systems (and some systems using Dosing Device):

- A low vent is installed through an offset adapter at the end of each row or bed.
- A high vent is installed through an unused D-box outlet.
- Alternatively, the low vent may be attached to the D-box and the high vent may be attached to the end of the last Advanced Enviro-Septic® row. If this configuration is used in cold climates, the D-box must be insulated to prevent it from freezing.

Differential Venting for Pumped Systems



Proper gravity system vent configuration



Air flow is established by the High Vent's chimney effect, which draws air into the Low Vent, through the Advanced Enviro-Septic® pipes, through the septic tank and exhausting through the roof vent.

Vent Manifolds

A vent manifold may be incorporated to connect the ends of a number of rows of Advanced Enviro-Septic® pipe to a single vent opening.

Vent Piping Slope

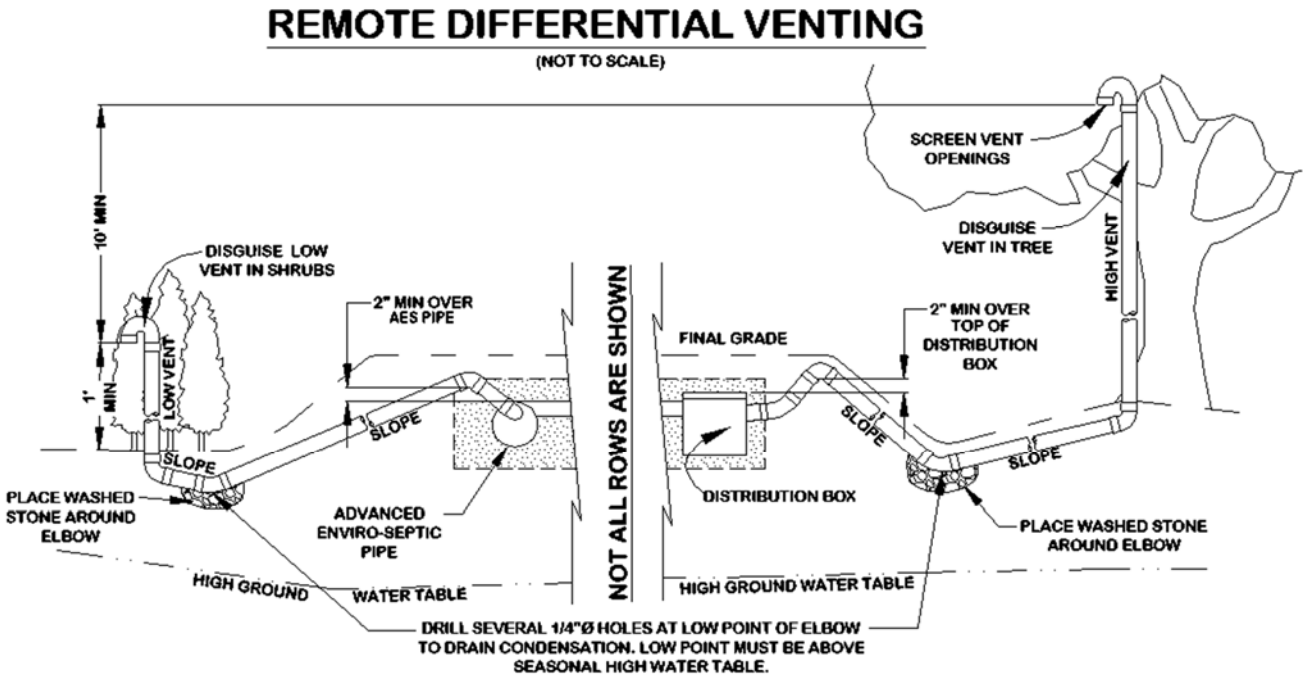
Vent piping should slope downward toward the system to prevent moisture from collecting in the pipe and blocking the passage of air.

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 in the vent line must be drilled creating several ¼ in. holes to allow drainage. 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 the Advanced Enviro-Septic® row or D-box that it is connected to; and,
- A **low point** opened for drainage which is above the SHWT.

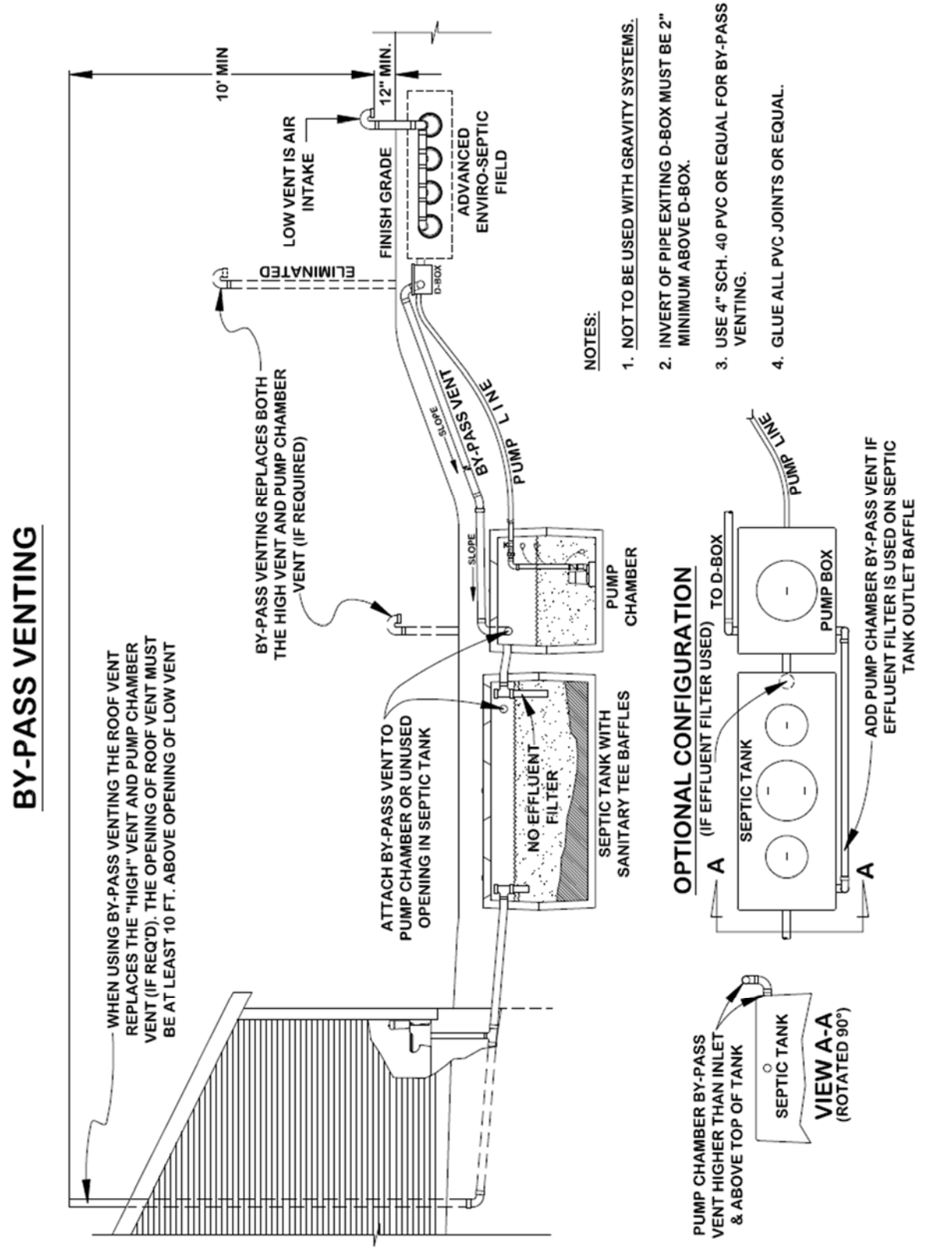
(See illustration below.)



By-Pass Venting

By-Pass Venting is an alternative method of venting for use with pumped systems or if the dosing device used restricts oxygen flow. See illustration on the following page.

Venting Requirements, continued



Section H
Site Selection

Determining Site Suitability	In order to decide if a particular site is suitable for an Advanced Enviro-Septic® System, measure the distance down from existing grade to the highest layer of SHWT, ledge, bedrock or impermeable soil in the soil horizon in the proposed system site and a 50 ft perimeter. There must be a minimum of 9 inches of unsaturated in situ soil in order to install an Advanced Enviro-Septic® System, or the distance required by Georgia regulations.
Topography	Locate systems on convex, hill slope or level locations that do not concentrate surface flows. Avoid swales, low areas, or toe-of-slope areas that may not provide sufficient drainage away from the system.
Surface Water Diversions	Surface water runoff must be diverted away from the system. Diversions must be provided up-slope of the system and designed to avoid ponding. Systems must not be located in areas where surface or groundwater flows are concentrated.
Dispersal Area	Systems must be located where adjacent soils in the proposed system location and a 50 ft perimeter are suitable for dispersing water away from the system.
Containment	Systems should not be located where structures such as curbs, walls or foundations might adversely restrict the soil's ability to transport water away from the system.
Hydraulic Loading	Systems should not be located where lawn irrigation, roof drains, or natural flows increase water loading to the soils around the system.
Access	Systems should be located to allow access for septic tank maintenance and to at least one end of all Advanced Enviro-Septic® rows in case Rejuvenation is needed.
Rocky or Wooded Areas	Use caution when preparing a rocky or wooded site, since removal of trees, stumps, roots, rocks, etc. may alter the soil's ability to accept water. No trees or shrubs should be located within 10 ft of the system to prevent root infiltration.
Reserve Area	Georgia requires that the site provide sufficient area for a replacement system. Since Advanced Enviro-Septic® preserves the characteristics of the underlying soils, it is not necessary to designate a reserve area for a replacement system. If system replacement is necessary, it can be done in the same location with new System Sand, provided that the components are undamaged and clean, and the underlying soils have not been compromised.

Section I
System Sand & Fill Material Specifications

System Sand Specifications

The System Sand that surrounds the Advanced Enviro-Septic® pipes is an **essential** component of the system. It is **critical** that the correct type and amount of System Sand is used when constructing the system. System Sand must be coarse to very coarse, clean, granular sand, free of organic matter. It must satisfy one of the three specifications set forth below:

System Sand Specifications for AES in Georgia (% by weight) (# Refers to Standard US Sieve Sizes. Fines determined by washing)		
ORIGINAL SYSTEM SAND	**ASTM-C33 Modified for SYSTEM SAND**	**ALTERNATIVE SYSTEM SAND**
0% larger than ¾ in.	100% passing 3/8 in.	100% passing 3/8 in.
0-35 % retained by #10	95-100% passing #4	95-100 % passing #4
40-90% retained by #35	80-100% passing #8	70-90% passing #8
3% max. passing #200	50-85% passing #16	45-80% passing #16
Comment: System Sand is coarse to very coarse clean, granular sand, free of all organic matter. The correct sand provides pore space for gas transfer and encourages efficient dispersal into soil below.	25-60% passing #30	0-40% passing #30
	5-30% passing #50	0-20% passing #50
	0-10% passing #100	0-8% passing #100
	0-3% passing #200	0-5% passing #200
	***Comment*:** This specification was derived in order to provide reference to a readily available, standardized sand product. The added restriction on fines content (3% max.) makes ASTM C-33 appropriate material for System Sand.	***Comment:*** This specification allows for slightly more fines content by incorporating a higher percentage of coarse content.

System Sand is placed a minimum of 6 in. below all Advanced Enviro-Septic® pipes, a minimum of 3 inches above the Advanced Enviro-Septic® pipes, a minimum of 6 inches between Advanced Enviro-Septic® rows, and a minimum of 6 inches horizontally around the perimeter of the Advanced Enviro-Septic® pipes.

Sand fill or Fill Material

Sand fill is to be used to raise the elevation of the system in order to meet the required vertical separation distance from the SHWT or other restrictive feature. It is also used in constructing fill extensions and side-slope tapering. This sand shall meet Georgia specifications of ASTM C-33 with no more than 5% passing a #200 sieve.

Naturally-occurring soils removed when excavating the site may be used for constructing side-slope tapering, provided the soil contains no organics, stones larger than 6 in., stumps or other debris.

Note: System Sand may be used in place of sand fill.

Topsoil (a.k.a. "Loam")

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

Section J
Preparing for Installation

Avoid compaction	Avoid compaction of the soils in the area receiving System Sand, the side-slope tapering and the area down-slope of the proposed system. Materials and equipment must not be stored or transported over the receiving soils.
Excavation Procedures	• Locate machinery up-grade or alongside of the proposed system area when excavating, avoiding the system area. • Excavate the receiving area with a toothed bucket only. Do not excavate the receiving area with a finish bucket because this will compact or smear the soil. • A minimum of 6 inches of System Sand or sand fill must be installed prior to equipment traveling above the system to avoid compaction and destruction of soil structure.
Avoid Drying Soil	Dispersal area soils must not be allowed to dry. Sun or extended dry air conditions may alter soil structure. System Sand must be installed immediately following excavation of the receiving area.
Avoid Precipitation and Erosion	• Do not excavate the system receiving area immediately after, during or prior to precipitation. • Install sediment/erosion control barriers prior to beginning excavation to protect the system from possible surface water flows during construction. • Warm, dry weather conditions are ideal for system installation. Check the weather forecast and schedule installation accordingly.
Avoid Frozen Soil Conditions	If possible, do not excavate the soils in the system area during frozen conditions. If you have no alternative but to install the system in cold weather, be prepared to work quickly, do not allow excavated soil to cool, and install System Sand immediately. Cover the System Sand with a protective layer of insulation or hay/straw and canvas if overnight temperatures may be below freezing during the installation process.
Avoid Wet Soil Conditions	Do not excavate in and around the system area when the soil is wet. If soil forms a rod 1/8 inch or less in diameter when rolled with the fingers, or if it does not crumble easily, it contains too much moisture to be worked.
Install Sand	System Sand or sand fill must be installed immediately following excavation of the system area. If it is not, repeat the “Excavation Procedures” above.
Construction Equipment	Construction equipment may travel across the system area only after the installation of a minimum of 6 inches of sand fill or System Sand. If at all possible, keep equipment off the System Sand.

Preparing for Installation, continued

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 Advanced Enviro-Septic® 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 or store indoors.

Stake Out System Location

- Locate and stake out the System Sand bed (including System Sand extension area if needed), and areas impacted by side-slope tapering on the site according to the approved plan.
- Double-check that all set-back requirements are met. Horizontal set-backs are measured from the end of the AES pipe rows.
- Confirm that the site complies with the parameters in Section H, Site Selection, p. 35, and that an adequate reserve area for system replacement is provided on the site.

Section K
Installation & Construction Procedures

Critical Reminder Prevent Soil Compaction

It is critical to keep excavators, backhoes, and other equipment off the excavated or tilled surface under and around where the treatment system will be located. Before installing the System Sand, excavation equipment should be operated around the bed perimeter and not on the bed itself. During all stages of installation, avoid compacting soil adjacent to the bed as much as possible.

Tree Stump Removal

- 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.
- Do not locate equipment within the limits of the system area.
- 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 and side-slope tapering **must** have the organic layer (grass, leaves, forest litter, etc.) removed. If a backhoe/excavator is used to till the site, fit it with chisel teeth and till the site. The backhoe/excavator must remain outside of the proposed system location, including the entire System Sand bed area and all areas that will be impacted by side-slope tapering.

- For systems installed in soils with perc rates from 1 to 60 MPI, remove all organics and topsoil (O & A soil horizons) in the footprint of the dispersal area prior to installing System Sand.
- For systems installed in soils with perc rates from 61-120 MPI with the bottom of the System Sand bed at the same approximate elevation as original grade, remove the organics, leave the topsoil in place and till it. Mix 6 inches of System Sand with the tilled topsoil to create a transition layer. This will prevent ponding at the interface of System Sand and underlying soil.

Stone and Organic Material Removal

While tilling, remove all stones larger than 6 inches, stumps, roots, grass, brush and other organic matter or debris from the excavated system site. Refer to Tree Stump Removal, above, for proper procedures for removing stumps.

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 Fill Immediately After Excavation

- To protect the tilled area (System Sand bed area and area impacted by side-slope tapering) from damage by precipitation, System Sand or sand fill should be installed immediately after tilling.
- When installing the System Sand, work off either end or the uphill side of the system to avoid compacting soil (see "**Critical Reminder**" at the beginning of this section).
- When installing sand, keep at least 6 in. of sand between the vehicle tracks and the tilled soil of the site.
- Tracked construction equipment should not travel over the installed system area until at least 1 ft of cover material is placed over the Advanced Enviro-Septic® pipes.
- Construction equipment with wheels/tires should not travel over the installed system area until at least 18 inches of cover material is placed over the Advanced Enviro-Septic® pipes.

Row installation sequence

1. Install a minimum of 6 inches of System Sand to the elevation where the bottom of Advanced Enviro-Septic® pipes will be, and install the sand on side-slope tapering to allow machinery movement around the perimeter of the system. Rake the System Sand where the Advanced Enviro-Septic® 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 Advanced Enviro-Septic® rows horizontally to tie points on site.
3. Locate Advanced Enviro-Septic® 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 straddling them and pushing additional System Sand below the pipes with your feet. 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 rows are level to within 1 in. end-to-end and side-to-side.
7. Add System Sand between and around the Advanced Enviro-Septic® pipes, leaving the uppermost surface of the pipe exposed to allow for system inspection (if required by local approving authority).

D-Box Installation

It is essential that the D-box remain level after installation in order to ensure even distribution to the all pipes within the system. Be sure D-boxes are placed level on undisturbed soil, compacted sand, pea gravel base, or concrete pad. Take care when backfilling that the D-box remains level. Flow equalizers are required in d-box outlets whenever flow is being divided. Unused d-box outlets to be mortared.

Level Tolerances

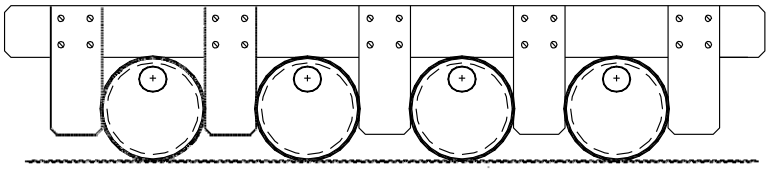
Use a laser level or transit to install the rows level within 1 inch end-to-end and side-to- side. Out-of-level pipe installation may affect system performance. Variations beyond a total of 1 in. are **not acceptable.**

Row Spacers

Sand may be used to keep pipe in place while covering, but simple tools may also be constructed for this purpose. An example is shown below.

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

WOODEN FRAME SECURES PIPES DURING BACKFILL



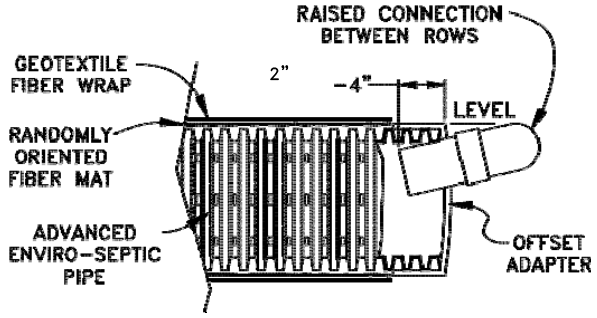
Connect Rows Using Raised Connections

Raised connections consist of offset adapters, PVC pipe, and 90° elbows. They enable greater liquid storage capacity within the pipes and increase the bacterial surfaces being developed. Use raised connections to connect multiple trenches in serial distribution.

Correct Placement of Raised Connections

It is essential to the proper functioning of the system that the ends of the Raised Connections extend 2 inches to 4 inches into the Advanced Enviro-Septic® pipe. If the ends are not at least 2 inches into the pipe, they may become dislodged during backfilling. If the ends extend more than 4 inches into the pipe, this may cut off the flow of oxygen to the system. Refer to illustration below.

The top of the Raised Connections should be level with the top of the Advanced Enviro-Septic® pipe as shown below.



RAISED CONNECTION LEVEL BED

Install System Sand

- Spread System Sand between the rows.
- Straddle each row of pipe and walk heel-to-toe its entire length, ensuring that System Sand fills all void spaces beneath the Advanced Enviro-Septic® pipe.
- Finish spreading System Sand to the top of the pipes for inspection purposes (if required in your area).
- Confirm that all rows of pipe are level to within 1 in. end-to-end and side-to-side.
- After inspection (if required) proceed to backfilling and final grading.

Section L
Final Grading

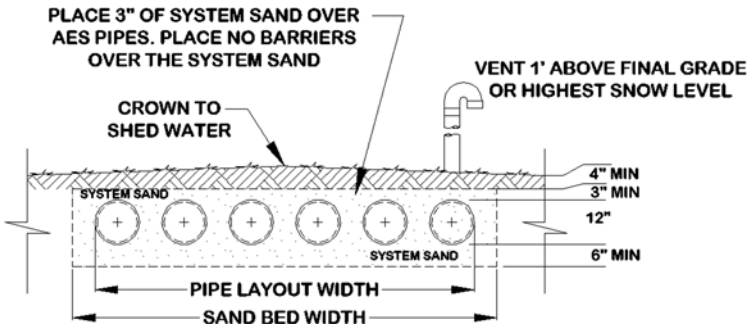
Side-Slope Tapering

To prevent erosion, all Advanced Enviro-Septic® Systems with any part of the system (including cover material) above original grade require side-slope tapering on each side beyond the outer edge of the System Sand bed. Georgia rules require 5 ft. fill extensions before tapering to a 5:1 slope (maximum).

See Section I, p. 36 for fill material specifications.

Install Remaining 3 in. of System Sand

After the installed system has been inspected (if required by local approving authority), install 3 inches of System Sand above the pipes. DO NOT install any barrier materials on top of the System Sand.



Final Grading

Final grading of the entire site should redirect surface water flows so that they do not collect in the system bed area. The system bed must slope or have a crown to ensure that surface water runoffs do not collect on the system. Systems should not be located where lawn irrigation, roof drains, or natural flows increase water loading to the soils around the system.

Erosion control

Construct and maintain surface diversions, grading, silt fence, seeding and mulching to minimize concentration of surface water flows and erosion.

Cover requirements

A minimum of 4 inches of topsoil (loam) capable of supporting plant growth is required over the System Sand or sand fill.

Mulch or Seed

Immediately apply mulch or seed with grass, wildflowers or other shallow-rooted native vegetation to prevent erosion of the system bed.

What not to Plant

No trees or shrubs should be located on or within 10 ft of the system perimeter (including side-slope tapering) to prevent roots from growing into and damaging the system. If the system includes a perimeter drain, there should be no trees or shrubs planted closer than 10 ft from the location of the perimeter drain. Do not plant gardens for human consumption in the vicinity of the wastewater treatment system.

Section M
Operation & Maintenance

Proper use

The Advanced Enviro-Septic® Wastewater Treatment System requires minimal maintenance provided the system is not subjected to abuse. An awareness of proper use and routine maintenance will guarantee system longevity. All system owners are encouraged to obtain a copy of our Owner's Manual, which Is available from our website, www.PresbyEnvironmental.com.

System abuse conditions

The following conditions constitute system abuse:

- Liquid in high volume (excessive number of occupants, excessive use of water in a short period of time, leaking fixtures, whirlpool tubs, hot tubs, water softening equipment or additional water discharging fixtures if not specified in system design).
- 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)
- Antibiotic 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.)

Special Note: Presby Environmental, Inc., and most regulatory agencies do 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 are not recommended because of their tendency to clog and cut off oxygen to the system. If a filter is used, it will require diligent maintenance and cleaning to prevent it from becoming clogged. 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 to within a minimum of 10 ft of the system, including the entire System Sand bed area, and areas impacted by side-slope tapering and perimeter drains (if used). Roots can infiltrate and cause damage or clogging of system components.

If a perimeter drain is used, it is important to make sure that the outfall pipes are screened to prevent animal activity. Also, check outfall pipes regularly to ensure that they are not obstructed in any way.

Section N
Rejuvenation and Expansion of Advanced Enviro-Septic® Systems

Introduction

This section provides an overview of bacteria rejuvenation and explains how to expand existing systems. These procedures may only be used with Advanced Enviro-Septic® Systems; it is difficult or impossible to rejuvenate other systems. The local approving authority must be contacted and permits obtained prior to Advanced Enviro-Septic® System rejuvenation, expansion, or replacement. Please contact PEI at 800-473-5298 for technical assistance before attempting rejuvenation procedures.

What is Bacteria Rejuvenation?

Bacteria rejuvenation is the return of bacteria to an aerobic state. Flooding, improper venting, alteration or improper depth of soil material cover, use of improper sand instead of System Sand, introduction of chemicals or medicines, and a variety of other conditions can contribute to converting bacteria in the Advanced Enviro-Septic® pipe from an aerobic to an anaerobic state. This conversion severely limits the bacteria's ability to effectively treat effluent, as well as making it more difficult for wastewater to pass through.

How to Rejuvenate Bacteria

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

1. Determine and correct the problem causing the bacteria conversion.
2. Dig a trench at the far end of the field, remove the Offset Adapters and have the system pumped dry (no surface discharge of wastewater allowed).
3. If foreign matter has entered the system, flush the pipes.
4. Safeguard any open excavation.
5. Guarantee a passage of air through the system.
6. Allow pipes to dry for a minimum of 72 hours. When the System Sand around the pipes returns to its natural color, this is an indication that the conversion to aerobic conditions has taken place.
7. Re-assemble the system to its original design configuration. As long as there is no damage to the Advanced Enviro-Septic components, the original components may be reused.

Note: Contact Presby Environmental, Inc., for more detailed instructions before attempting to rejuvenate an Advanced Enviro-Septic® System.

System Expansion

Advanced Enviro-Septic® Systems are easily expanded by adding equal lengths of pipe to each row of the original design, or by adding additional rows of equal length, or by adding additional beds. Check with the appropriate approving authority to determine if a permit is required.

Reusable Components

Advanced Enviro-Septic® 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 Advanced Enviro-Septic® 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.