July 2026

Design and Installation Manual for **Advanced Enviro-Septic**

Indiana

This manual aims to outline the essential design and installation guidelines for the Advanced Enviro-Septic System in Indiana. All local ordinances, requirements, and procedures must be followed. Each revised version of this manual supersedes the previous version. **For more detailed design information, please contact Infiltrator Water Technologies at (800) 221-4436.**

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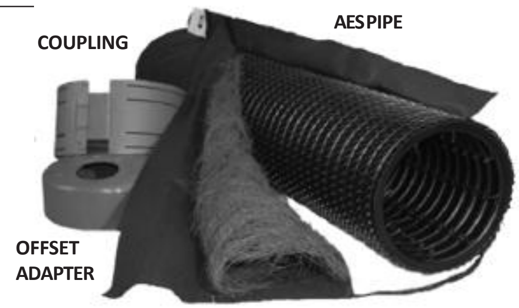
INTRODUCTION

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, 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 reintroduces highly treated water directly back into the water cycle.

Testing in accordance with NSF/ANSI Standard 40 has determined that the AES System is capable of treating domestic strength wastewater to Class 1 (secondary) treatment levels.

AES Pipe

- Nominal exterior diameter of 12 inches
- Holding capacity of 5.8 gallons per foot
- 10-foot length of AES pipe is flexible enough to bend up to 90° and can be cut to any length
- Made with recycled material
- Made in USA



Offset Adapter

A plastic fitting with a single inlet hole oriented in the 12 o'clock position used at the end of an AES pipe row and designed to accept a 4-inch sewer line, raised connection or vent pipe.

Coupling

A coupling is a plastic fitting used to create a connection between two pieces of pipe. Note that the couplings are wide enough to cover 1 or 2 pipe corrugations on each of the two pipe ends being joined (minimum of 1 corrugation coverage; 2 corrugations coverage preferred). The couplings feature a tool free snap lock design.

(Part Number ESC) When assembling pipes into rows, note that the geo-textile fabric does not go under couplings. When using original ESC coupling, pull the fabric back, install coupling, and then pull the fabric over the end of the coupling. A minimum 1-inch overlap is required between the end of the coupling and end of the fabric on each side of the connection.

(Part Number ESC-2) When installing a system using Coupling ESC-2, there is no need to pull the fabric back. Simply put the two segments of pipe together and wrap the coupling over the pipe and fabric. Verify the teeth of the coupling are engaging with the inner corrugations of the pipe and engage the clasp.

Endcap

A plastic fitting, much like an Offset Adapter without a predrilled hole, designed to cap the end of a conduit row when no outlet to additional rows or no venting is included in the design.

System Sand (INDOT Spec 23 SAND)

System sand must be clean, granular sand, free of organic matter and must adhere to Indiana DOT 23 sand requirements. Material passing the #200 sieve must be verified by washing the sample. In this manual the terms system sand and Indiana DOT 23 sand are used interchangeably. In addition, Indiana DOT 23 sand is to be used as "sand fill" whenever sand fill is required.

System sand requirements are as follows:

- 6 inches minimum below the AES pipe for subsurface systems
- 12 inches minimum below the AES pipe for elevated systems
- 3 inches minimum above the AES pipe
- 6 inches minimum between AES pipe rows
- 12 inches surrounding the perimeter of the AES pipe rows

Information Specific to Use of the AES System in Indiana

The Infiltrator AES System is approved for use in the State of Indiana by the Indiana Department of Health (IDOH). The AES system has been approved for use when designed and installed in bed configurations using gravity or pump-to-gravity distribution.

The approval allows for the design and installation of the AES System in the State of Indiana, in accordance with the specifications and instructions in this manual and the products state approval. The manual is to be used in conjunction with Rule 410 IAC 6-8.3 for residential systems and with Rule 410 IAC 6-10.1 for commercial systems. In the event of contradictions between this manual and these regulations, contact Infiltrator Water Technologies (Infiltrator) for technical assistance at (800) 221-4436. To resolve any conflicts with the exceptions to any requirements in this manual, the IDOH and Infiltrator must be contacted.

Training and Certification Requirements

Designers and installers are required to attend an in-person or online training/certification course on AES presented by Infiltrator or its authorized representative. IDOH requires that professionals involved in the review of AES system designs and inspection of installed systems also become trained and certified. For your state offerings, visit www.infiltratorwater.com/online-training-programs/.

AES Pipe Substitutions

Substitutions to the AES pipe shown on the approved septic system design is not allowed without the written approval of the health department that approved the design and the system's designer. An amended design plan will be required for approval. AES may be used as a substitute for Enviro-Septic products that have been specified by the approved plan with an amendment.

Design Daily Flow (DDF)

DDF is calculated in accordance with Indiana Rules. Residential units require a 2-bedroom minimum sizing, commercial systems have no minimum sizing. Residential outbuildings (a building for the private use of the owner not intended to be used for permanent or seasonal human habitation or sleeping) may be sized at a 1 bedroom minimum.

Effluent (Wastewater) Strength

The loading rates and sizing tables provided in this manual are based on residential (domestic) strength wastewater. For high strength waste systems, visit our website at www.infiltratorwater.com/ for a copy of the *High Strength Waste Recommendations* document.

Separation Distances and Setbacks

Horizontal setbacks are measured from the outermost edge of the SSBA. Vertical separation distances are measured from 6 inches below the AES pipe for subsurface systems and 12 inches below the AES pipe for elevated systems

Table A: Required minimum vertical separation distance to the infiltrative surface

Bed Elevation	Distance to Restrictive Feature[1]	Distance to SHWT[2]
Subsurface (Infiltrative Surface $\geq$ 4" Below Original Grade)	24 inches for daily flows < 450 GPD 30 inches for daily flows $\geq$ 450 GPD	24 inches
Elevated (Infiltrative Surface < 4" Below Original Grade)	20 inches regardless of daily flow	20 inches

NOTES:
1. Individual bed loading is used to determine separation.
2. May be lowered to that level with the use of subsurface drainage, as specified in Indiana rules.

System Soil Cover Material

A minimum of 9 inches of suitable earth cover (topsoil or loam) with a texture similar to the soil at the site and capable of sustaining plant growth, must be placed above the installed system. The addition of geotextile barrier materials between the system sand and soil cover material is not recommended as such materials may cut off oxygen to the system. No hay, straw, tarps, or other materials that restrict air flow are to be placed between the system sand and cover material.

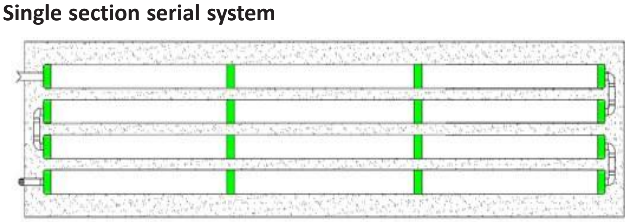
Acceptable Distribution Methods:

Serial Distribution

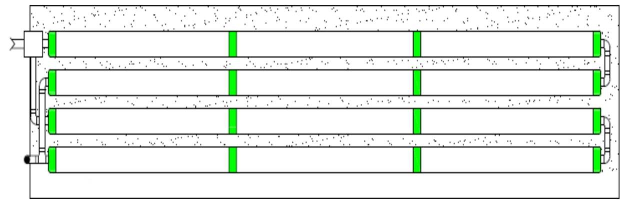
All rows are connected in series at the ends with raised connections, using offset adapters. Systems designed to receive 750 gpd or less may be designed in one or more serial sections. Systems receiving more than 750 gpd require multiple serial sections.

Serial sections must contain equal sections (same linear feet) of AES pipe fed from a D-box. Minimum linear feet of AES pipe per section is determined by dividing the total linear feet required in the system by the number of sections required. A section may exceed the minimum linear length and rows within a section may vary in length to accommodate site constraints. See non-conventional section on page 21 for more details.

Single section serial system

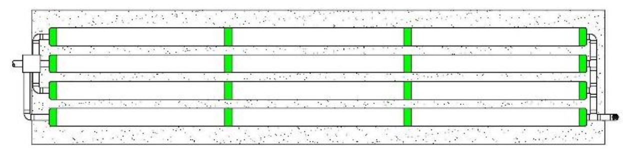


Multiple section serial system



Parallel Distribution

Systems may be designed using a distribution box to feed each individual row of AES conduit. This distribution method may be used for any design daily flow and conduit rows must be of equal length. There is no minimum separation distance requirement from a D-box to the AES pipe.

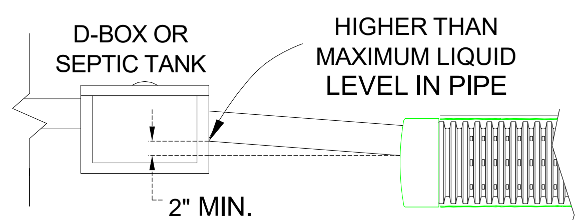


Distribution Boxes (D-box)

Distribution boxes are required for all systems with multiple serial sections, parallel distribution systems, and pump assisted systems, but NOT for single serial section systems. There is no minimum separation distance requirement from a D-box to the AES pipe. All distribution boxes used to divide effluent flow require flow equalizers in outlets feeding AES pipe. Equalizers are designed to help compensate for an out of level distribution box, which is likely to occur over time, and maintain a balanced flow to each distribution box outlet leading to the field

Two-Inch Rule

The outlet of a septic tank or D-box shall be set at least 2 inches above the highest inlet of the AES. Illustration of 2-inch rule:



Filters

If used, effluent filters shall be maintained following the manufacturer's instructions regarding required inspections, cleaning and maintenance.

AES in Beds

AES may be designed and installed as a bed using the soil application rates from the sizing tables provided in this manual. Bed bottoms may be sloped with the existing terrain to minimize impact to a site. Multiple beds may be designed if site conditions do not allow for a single bed. A recommended design procedure, which shows minimum spacing, is provided in this manual. The minimum center-to-center spacing is 1.5 ft. The center-to-center spacing may be larger, but not less than the minimum requirement. The system shall be designed as long and narrow as site conditions allow.

AES System Definitions

In this document, the minimum treatment cell area refers to the surface onto which the AES rows are placed, and the 6 inches of system sand between and 12 inches on the outer side of the AES pipes. Maintaining this minimum treatment cell area is required to ensure adequate treatment. Minimum System Sand Bed Area (SSBA) refers to the minimum treatment area required based upon the soil loading rate for a given DDF. Maintaining this SSBA is required to ensure long-term hydraulic performance.

System Sand Extensions (SSE)

AES will treat the wastewater in a properly designed treatment cell, based on the design flow to the system, without regard for the soils the system is placed in or upon. To ensure long-term hydraulic performance, it may be necessary to increase the treatment cell beyond what is needed to accommodate the flow-based design treatment area. This additional area is made up of system sand extension(s) (SSEs). SSEs are any part of the bed that is more than 1 foot away from the AES pipe and is required to be a minimum of 6 inches deep. See system configuration section of this manual for illustrations depicting information referenced herein.

SSEs are placed entirely on the downslope side of the SSBA for sloping AES systems and equally divided on each side of the SSBA for level AES systems. In systems sloping more than 10%, a minimum 3-foot-wide SSE is required. SSEs should not be confused with the "cover material extension," which refers to the material used to cover the field.

Cover Material Extensions and Side Slope Tapers

All systems with any portion of the system sand bed above original grade require cover material extensions before side slope tapering can begin. Side slope tapers are to be a minimum of 3:1. Cover material extension requirements are as follows:

- Systems sloping 10% or less - 3 foot minimum
- System sloping greater than 10% - 5-foot minimum downslope, 3 foot minimum other 3 sides.

See system configuration section of this manual for illustrations depicting information referenced herein.

Sloped Subsurface Systems with Modified Bed Slopes

When site slopes are steep, it may be desirable to install the infiltration area of a subsurface AES system at a lesser slope. The original site slope cannot exceed 15%; however, the slope of the absorptive surface may be excavated to be more level than the actual site slope for ease of installation and to prevent the movement of effluent to the downslope toe of the system too rapidly. The minimum vertical separation to the restrictive layer must be maintained throughout the system. The excavated bed must have at least ½% slope in the same direction as the original site slope. See System Configurations for details.

Table B: System and Site Slopes

Bed Elevation	Bed Configuration		Maximum Site Slope
	Level	Sloping	
Subsurface (Infiltrative Surface ≥ 4" Below Original Grade)	≤ 1/2 % Site Slope	> 1/2 % Site Slope	15%
Elevated (Infiltrative Surface < 4" Below Original Grade)	≤ 1/2 % Site Slope	>1/2 % Site Slope	6%

NOTES:

1. The percentage of system slope in all drawings refers to the slope of the AES system and not the existing terrain unless otherwise noted.
2. The slope of the site and/or the system may contain more than one slope provided the maximum allowed slope is not exceeded.
3. Maximum site slope specification is dictated by the Rule.

Row Requirements

- All beds shall have at least two rows.
- The maximum row length is 100 feet (not including system sand). The recommended minimum row length is 30 feet of pipe. For repair or replacement systems, the "best judgment" clause of 410 IAC 6-8.3-53(i) must be followed. If the site permits, promote long and narrow systems.
- Minimum center-to-center spacing is 1.5 feet 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.
- For level beds, the rows are centered in the middle of the SSBA.
- For sloping beds, system sand extensions should be placed entirely on the downslope side of the bed.
- Each row must be placed along the contour of the site and laid level to within +/- ½ inch (total of 1 inch) of the specified elevation. It is a best practice to include row elevations for each AES row in the system on the construction drawing(s).
- Systems should be located to allow access for septic tank maintenance and to at least one end of all rows. Planning for future access will facilitate rejuvenation in the unlikely event the system malfunctions.
- It is best to design row lengths in 10' increments, however AES pipe can be cut to any length.

Pump Assisted Systems

The use of pressure distribution within an AES system is not permitted in Indiana.

Pump assisted systems supply effluent to the system using an effluent pump and D-box when site conditions do not allow for a system to flow by gravity or if the designer prefers dosing. Dosing siphons are also an acceptable means of delivering effluent to a gravity fed AES system. Never pump directly into AES pipe.

- Pump dosing should be designed for a minimum of six cycles per day (≤1/6 of Design Daily Flow); 6-8 cycles per day are recommended.
- Pump volume per dose shall be no greater than one-gallon

times the total linear feet of AES pipe.

- If possible, the dosing cycle should provide one hour of drying time between doses.
- Pump assisted systems shall follow state, local, and national code requirements.
- All pump assisted systems require a D-box with a rule compliant baffle, a 90-degree bend with weep hole, or an inlet tee to reduce velocity.
- Pump assisted systems are limited to a maximum dose rate of 40 GPM/serial section.

Venting

Venting is optional at the discretion of the designer when the system design includes 18 inches of cover or less (measured from the top of the AES pipe). If venting is included in the design, it can be accomplished using differential venting (the use of high and low vents in a system with a 10-foot vertical separation). Vent openings should be located to ensure the unobstructed flow of air through the entire system. When using the house roof vent as the high vent, the roof vent must be a minimum of 3 inches in diameter. A low vent is installed through an offset adapter at the end of each section or bed and shall be a minimum of 4 inches in diameter. A vent manifold may be used to connect the ends of multiple sections or rows. The low vent inlet shall be a minimum of 1 foot above final grade or anticipated snow level. Vents extending more than 3 feet above grade should be anchored. More detailed information on venting an AES system is available on the Infiltrator website at www.infiltratorwater.com.

Observation Ports

All beds require at least one 4-inch diameter perforated observation port wrapped with geo-textile fabric and installed at the bottom of the infiltrative surface (bed bottom). More detailed information on construction of observation ports is provided in the Installation Instructions portion of this manual. Observation ports shall be brought to final grade and have a watertight cap to prevent debris from entering the system. For level beds, the observation port is to be located at the outermost edge of the SSBA at any point from mid-point to the distal end of the bed. For sloping beds, locate the observation port at the lowest elevation of the system sand extension any point from midpoint to the distal end of the bed.

Subsurface Drainage, Surface Diversions and Segment Drains

Systems must not be located where surface or groundwaters will converge, causing surface water flow to become concentrated or restricted within the soil absorption field.

Subsurface drainage and surface diversions shall be included in system design when required in 410 IAC 6-8.3-59 or 410 IAC 6-10.1-63, whichever is applicable. Subsurface drains and surface diversions shall be designed and installed in accordance with those sections of the state rules.

A segment drain is a subsurface drainage system that is constructed between two beds in the same on-site sewage system. The purpose of the segment drain is to intercept and divert subsurface water away from the downslope soil absorption field. Segment drains require a 10-foot separation between the drain and each field.

Tree Stumps

Cut and remove excessive vegetation at the bed site. If possible, locate the system on the site such that no tree stumps greater than 3” in diameter are located in the system bed or dispersal area. Avoid soil disturbance, relocation, or compaction. Avoid mechanical leveling or tamping of dislodged soil. Fill all voids created by unintentional stump or root removal with System Sand.

Elevated Systems
Cut tree stumps 3 inches in diameter and smaller, measured at the ground surface, flush with the ground surface. Remove tree stumps larger than 3 inches in diameter, measured at the ground surface, and the central root system below grade. Use a backhoe or excavator with a mechanical “thumb” or similar extrication equipment, lifting or leveraging stump in a manner that minimizes soil disturbance. Fill all voids created by stump removal with system sand. If possible, do not locate the down slope edge of the system bed directly above tree stumps greater than 3” in diameter.

Subsurface Systems
Remove all tree stumps and the central root system below grade. Use a backhoe or excavator with a mechanical “thumb” or similar extrication equipment, lifting or leveraging stump in a manner that minimizes soil disturbance. Fill all voids created by stump removal with system sand.

Table C - Pipe Required

Application Type	Quantity
Residential Applications	70 feet per bedroom
Commercial Applications (residential strength effluent)	2.14 GPD/linear foot of AES pipe[1]

NOTE:

1. Commercial applications calculate AES pipe requirement by dividing Design Daily Flow (DDF) by 2.14 GPD/LF.

Table D - System Sand Bed Area (SSBA) Required

Indiana Soil Loading Rate (IN-SLR) Class[1]	AES Soil Loading Rate (AES-SLR) (GPD/ft^2)	Bedrooms / Gallons per Day								
		2 /300	3 /450	4 /600	5 /750	6 /900	7 /1,050	8 /1,200	9 /1,350	10 /1,500
1.20	1.80	167	250	334	417	500	584	667	750	834
0.75	1.12	268	402	536	670	804	938	1,072	1,206	1,340
0.60	0.90	334	500	667	834	1,000	1,167	1,334	1,500	1,667
0.50	0.75	400	600	800	1,000	1,200	1,400	1,600	1,800	2,000
0.30	0.45	667	1,000	1,334	1,667	2,000	2,334	2,667	3,000	3,334
0.25	0.37	811	1,217	1,622	2,028	2,433	2,838	3,244	3,649	4,055
		System Sand Bed Area Minimum [2, 3] (ft^2)								

NOTE:

1. Any horizon that has an IN-SLR less than 0.25 GPD/ft^2 or greater than 1.20 GPD/ft^2 are considered restrictive layers.
2. SSBA may be divided into multiple beds provided the total SSBA is equal to or greater than the value shown above. The SSBA may only include the system sand one foot beyond the ends of the pipe rows.
3. SSBA is calculated by dividing the design daily flow (DDF) by the AES-SLR.

Indiana 410 IAC 6-8 Tables IV & V -- Soil Loading Rates (GPD/ft^2)								
Texture \ Structure	Single Grain	Granular	Strong: Angular, Sub-Angular Blocky, Prismatic	Moderate: Angular, Sub-Angular Blocky, Prismatic	Weak: Angular, Sub-Angular Blocky, Prismatic, Platy[1]	Fragic Characteristics: Very Coarse Prismatic	Structureless, Massive, Friable, Very Friable	Structureless Massive, Compact, Firm, Very Firm, Platy[2]
Gravel, Coarse Sand,	>1.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Loamy Coarse Sand, Medium Sand	1.2	1.2	N/A	N/A	1.2	N/A	N/A	N/A
Fine Sand, Loamy Sand, Loamy Fine Sand	0.60 / 0.75	0.60	N/A	0.60 / 0.75	0.60 / 0.75	N/A	0.60 / 0.75	N/A
Very Fine Sand, Loamy Very Fine Sand	0.50	0.50	N/A	0.50 / 0.75	0.50 / 0.60	N/A	0.50 / 0.60	N/A
Sandy Loam, Coarse Sandy Loam	N/A	0.60 / 0.75	N/A	0.60	0.60	0.00	0.60	0.00
Fine Sandy Loam, Very Fine Sandy Loam	N/A	0.60 / 0.75	N/A	0.60	0.60	0.00	0.60	0.00
Loam	N/A	0.50 / 0.75	0.50 / 0.75	0.50	0.50	0.00	0.50	0.00
Silt Loam, Silt	N/A	0.50 / 0.75	0.50 / 0.75	0.50	0.50 / 0.30	0.00	0.50 / 0.30	0.00
Sandy Clay Loam	N/A	0.50 / 0.60	0.50 / 0.60	0.50	0.50 / 0.30	0.00	0.50 / 0.30	0.00
Silty Clay Loam, Clay Loam, Sandy Clay	N/A	0.25 / 0.60	0.25 / 0.60	0.25 / 0.30	0.25	0.00	0.25	0.00
Silty CLay, Clay	N/A	0.25 / 0.60	0.25 / 0.50	0.25 / 0.30	0.25	N/A	0.25	0.00
Organic Soil Material	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Limnic Soil Materials	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bedrock	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Upper left of diagonally split cells = above ground systems, Lower right value in split cells = subsurface systems.

NOTE:

1. Naturally occurring platy structure.
2. Platy structure caused by compaction has a soil loading rate of 0.00 GPD/ft^2 unless broken up by methods approved by IDOH

Design Procedure - Single Bed

Step 1: Determine Minimum AES Pipe Required

Residential applications: Multiply the number of bedrooms in design by 70 feet per bedroom. Commercial applications treating residential strength effluent: Divide the design daily flow by 2.14, round up to the next whole number.

Step 2: Determine Minimum System Sand Bed Area (SSBA)

From Table D, find the minimum SSBA using the IN-SLR. SSBA requirements are calculated by dividing the design daily flow by the AES-SLR and rounding to the next whole number.

Step 3: Calculate the Number of Serial Sections Required

The serial sections required = design daily flow ÷ 750 GPD/section (always round up to nearest whole number). Skip this step if using parallel distribution.

Step 4: Determine Row Length and Number of Rows in Design

Select a row length that is suitable for the bed's site and calculate the number of rows required by dividing the pipe required by the selected row length. The number of rows must be evenly divisible by the number of serial sections required. Increase the number of rows if needed.

Step 5: Calculate the Pipe Layout Width (PLW)

Calculate the PLW using the PLW formula as follows: PLW = [(Number of rows - 1) x row spacing (1.5 foot minimum)] + 1.

Step 6: Calculate the minimum System Sand Bed Width (SSBW)

a) Beds sloping 10% or less: Divide the SSBA from Step 2 by the (row length + 2 feet). If the resulting number is greater than the PLW from Step 5 + 2 feet, system sand extensions will be required. If the bed is level (1/2% slope or less) the rows are centered in the middle of the SSBA. If the bed is sloping, the rows are grouped at the top of the SSBA .
b) Beds sloping over 10%: Beds sloping over 10% require a minimum 3-foot system sand extension (4 foot when measured from the edge of the pipe) and placed entirely on the down slope side of the pipes. To determine the minimum SSBW, divide the SSBA from Step 2 by the (row length + 2 feet). If the result is greater than or equal to (PLW + 5 feet) no increase to the sand bed width is needed otherwise the minimum SSBW = (PLW + 5 feet). The system sand extension is placed entirely on the down slope side of the bed.

Design Example #1:

Design criteria = Single Family Residence (3) bedrooms, 450 GPD, IN-SLR = 0.75 GPD/square foot, AES-SLR = 1.12 GPD/square foot, level site, subsurface bed, site constraint will not allow row length greater than 30 feet.

Step 1: Determine Minimum AES Pipe Required

This is a residential application being designed for 3 bedrooms. 70 feet x 3 bedrooms = 210 feet of AES pipe minimum.

Step 2: Determine Minimum System Sand Bed Area (SSBA)

Minimum SSBA from Table D = 402 square feet (450 GPD ÷ 1.12 GPD/square foot).

Step 3: Calculate the Number of Serial Sections Required

Number of serial sections required = 450 GPD ÷ 750 = 0.6 (rounding up to one = single serial section layout).

Step 4: Determine Row Length and Number of Rows in Design

Choosing a row length of 30 feet provides 7 rows in this bed
(210 feet ÷ 30 feet). The total system sand bed length is equal to 32 feet (the row length + 2 feet).

Step 5: Calculate the Pipe Layout Width (PLW)

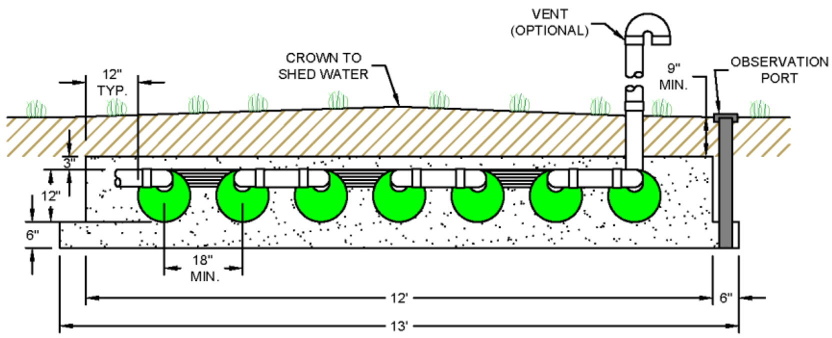
Using the PLW formula: PLW = [(Number of rows – 1) x spacing (1.5 min.)] + 1. PLW = [(7 – 1) x spacing (1.5 min.)] + 1= 10 feet.

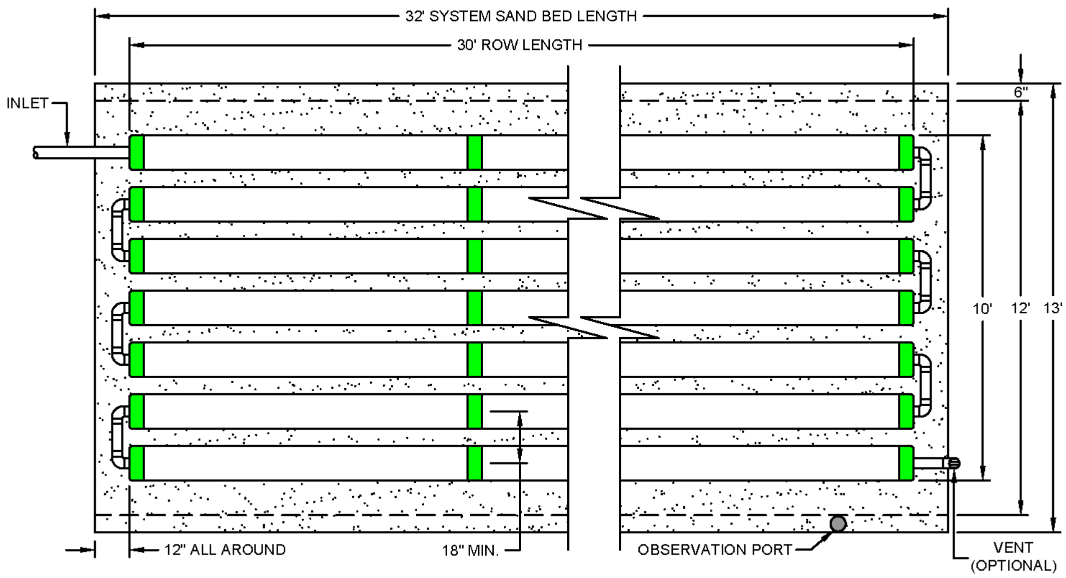
Step 6: Calculate the minimum System Sand Bed Width (SSBW)

Use step "a" because the bed will be level.

a) Minimum SSBW = 402 square feet ÷ 32 feet (row length + 2 feet) = 12.57 feet (use 13 feet for ease of construction), which is greater than the PLW of 10 feet + 2 feet = 12 feet. System sand extensions are needed. The system sand extensions are = [13 feet - (10 feet PLW + 2 feet)] ÷ 2 = 0.5 foot each. Final SSBA provided by this bed = 32 feet x 13 feet = 416 square feet which exceeds the 402 square feet minimum from Step 2.

ILLUSTRATION OF EXAMPLE #1 SYSTEM (NOT TO SCALE):





Design Example #2

Design Criteria: Single family residence (4) bedrooms, IN-SLR = 1.2 GPD/square foot (loamy coarse sand), AES-SLR 1.80 GPD/square foot, subsurface bed sloping 11%.

Step 1: Determine Minimum AES Pipe Required

This is a residential application being designed for 4 bedrooms. 4 bedrooms x 70 feet = 280 feet of AES pipe minimum.

Step 2: Determine Minimum System Sand Bed Area (SSBA)

Minimum SSBA from Table D = 334 square feet (600 GPD ÷ 1.80 GPD/square foot).

Step 3: Calculate the Number of Serial Sections Required

Number of serial sections required = 600 GPD ÷ 750 = 0.8 (rounding up to one = single serial section layout).

Step 4: Determine Row Length and Number of Rows in Design

Choosing a row length of 70 feet provides 4 rows in this bed (280 feet ÷ 70 feet). The total system length is equal to 72 feet (the row length + 2 feet).

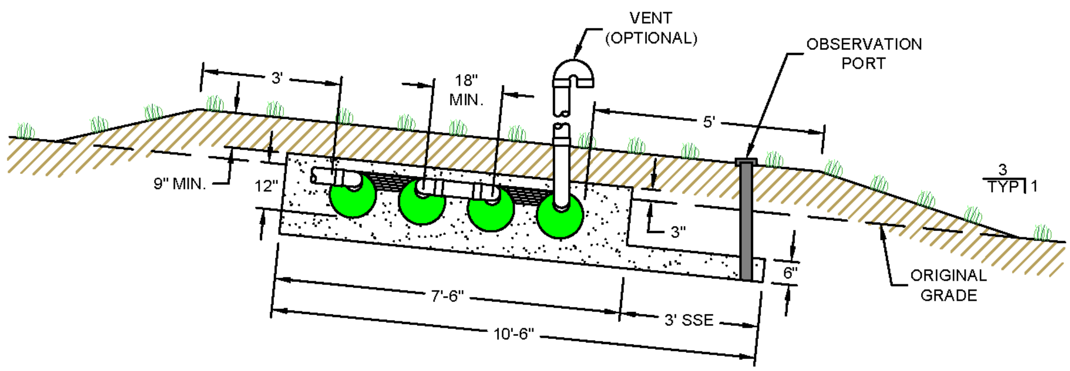
Step 5: Calculate the Pipe Layout Width (PLW)

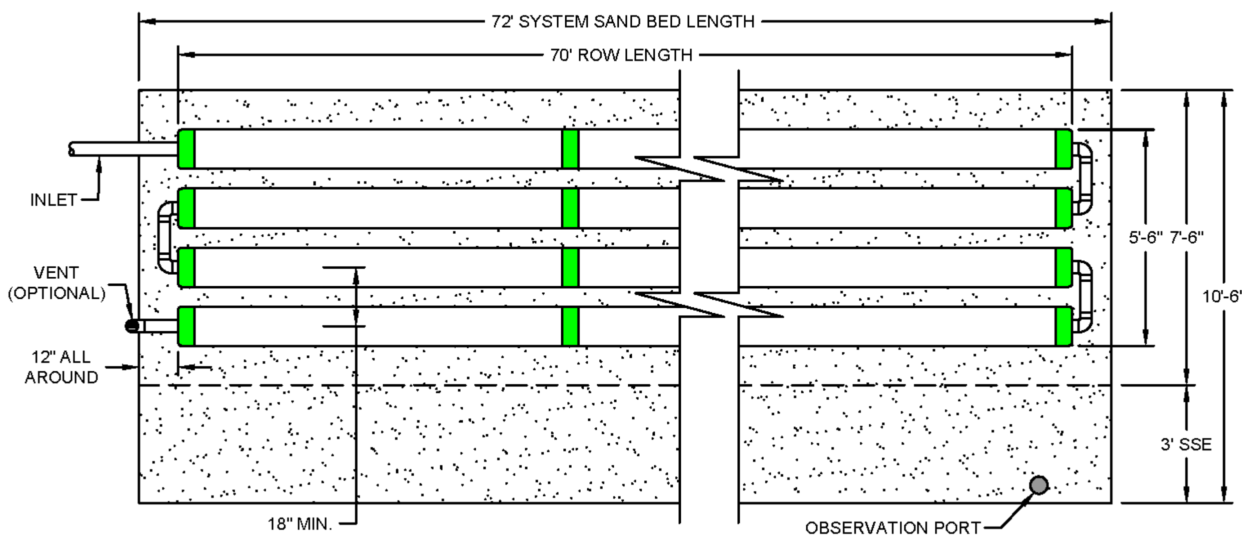
Using the PLW formula: PLW = [(Number of rows – 1) x spacing (1.5 min.)] + 1. PLW = [(4 – 1) x spacing (1.5 min.)] + 1= 5.5 feet.

Step 6: Calculate the minimum System Sand Bed Width (SSBW)

a) Use step b because the bed will have a slope > 10%.
b) Minimum SSBW = 334 square feet ÷ 72 feet (row length + 2 feet) = 4.7 feet, which is less than the 10.5 feet (PLW of 5.5 feet + 5 feet), so the minimum SSBW = (5.5 feet PLW + 5 feet) = 10.5 feet. The system sand extension must be placed entirely on the down slope edge of the sand bed because this bed is sloping over 10%. The system sand extension = 10.5 feet – (5.5 feet PLW + 2 feet) = 10.5 feet – 7.5 feet = 3 feet.

ILLUSTRATION OF EXAMPLE #2 SYSTEM (NOT TO SCALE):





Design Example #3:

Design Criteria: Single family residence (4) bedrooms, IN-SLR = 0.25, (silty clay, clay), AES-SLR 0.37 GPD/square foot, level site with subsurface drainage.

Step 1: Determine Minimum AES Pipe Required

This is a residential application being designed for 4 bedrooms. 70 feet x 4 bedrooms = 280 feet of AES pipe minimum.

Step 2: Determine Minimum System Sand Bed Area (SSBA)

Minimum SSBA from Table D = 1,622 square feet (600 GPD ÷ 0.37 GPD/square foot).

Step 3: Calculate the Number of Serial Sections Required

Number of serial sections required = 600 GPD ÷ 750 = 0.8 (rounding up to one = single serial section layout).

Step 4: Determine Row Length and Number of Rows in Design

Choosing a row length of 100 feet provides 3 rows in this bed (300 feet of pipe). The system sand bed length is the row length + 2 feet (102 feet).

Step 5: Calculate the Pipe Layout Width (PLW)

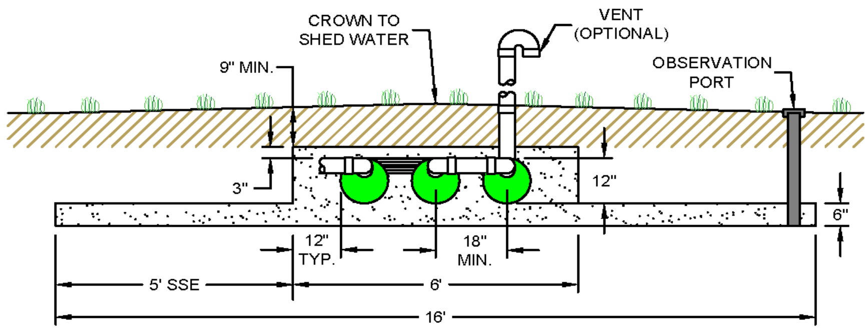
Using the PLW formula: PLW = [(Number of rows – 1) x spacing (1.5 min.)] + 1. PLW = [(3 – 1) x spacing (1.5 min.)] + 1= 4 feet.

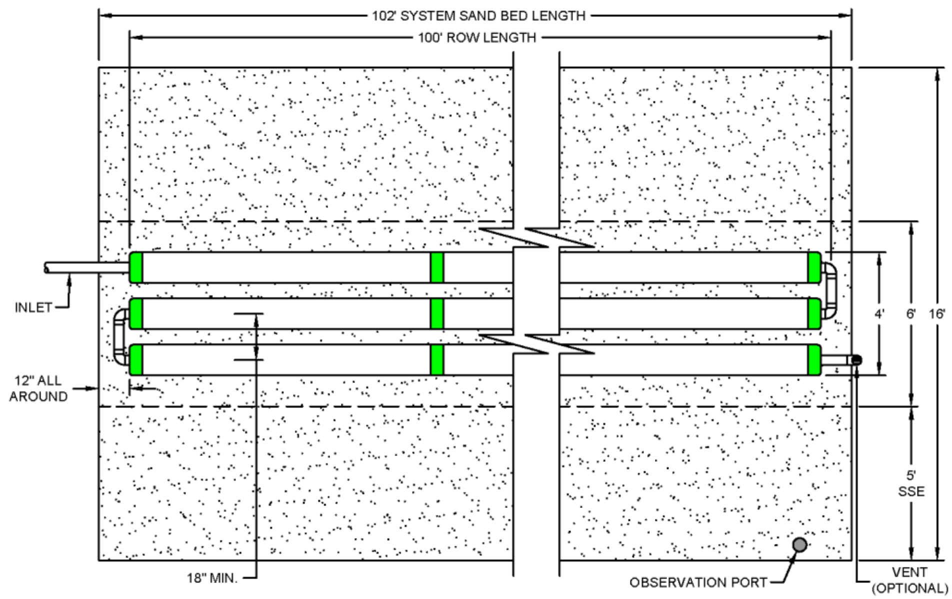
Step 6: Calculate the minimum System Sand Bed Width (SSBW)

Use step a because the bed will be level.

a) The minimum SSBW is 1,622 square feet ÷ 102 foot (row length + 2 feet) = 15.9 feet (use 16 feet for ease of construction), which is greater than the PLW of 4 feet + 2 feet for perimeter sand = 6 feet. System sand extensions are needed. The system sand extensions are = [16 feet - (4 feet PLW + 2 feet)] ÷ 2 = 5 foot each. SSBA provided by this bed = 102 feet x 16 feet = 1,632 square feet.

ILLUSTRATION OF EXAMPLE #3 SYSTEM (NOT TO SCALE):





Design Example #4:

Design Criteria: Single family residence (6) bedrooms, IN-SLR = 0.5, (Loam), AES-SLR 0.75 GPD/square foot, level site, 20 inches to restrictive feature, no subsurface drainage included, design as an elevated system.

Step 1: Determine Minimum AES Pipe Required

This is a residential application being designed for 6 bedrooms. 70 feet x 6 bedrooms = 420 feet of AES pipe minimum.

Step 2: Determine Minimum System Sand Bed Area (SSBA)

Minimum SSBA from Table D = 1,200 square feet (900 GPD ÷ 0.75 GPD/square foot).

Step 3: Calculate the Number of Serial Sections Required

Number of serial sections required = 900 GPD ÷ 750 = 1.2 (rounding up to two = a multiple serial section layout using a D-box to divide flow).

Step 4: Determine Row Length and Number of Rows in Design

Choosing a row length of 70 feet provides 6 rows in this bed (420 feet of pipe). The system sand bed length is the row length + 2 feet (72 feet).

Step 5: Calculate the Pipe Layout Width (PLW)

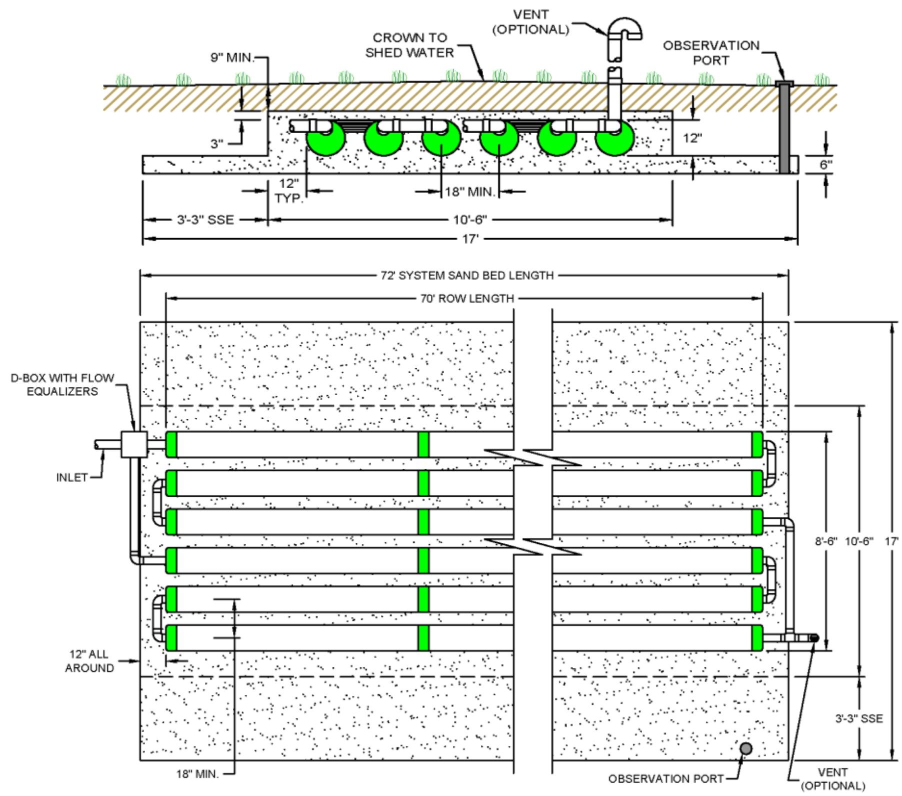
Using the PLW formula: PLW = [(Number of rows – 1) x spacing (1.5 min.)] + 1. PLW = [(6 – 1) x spacing (1.5 min.)] + 1 = 8.5 feet.

Step 6: Calculate the minimum System Sand Bed Width (SSBW)

Use step a because the bed will be level.

a) The minimum SSBW is 1,200 square feet ÷ 72 foot (row length + 2 feet) = 16.7 feet (use 17 feet for ease of construction), which is greater than the PLW of 8.5 feet + 2 feet = 10.5 feet. System sand extensions are needed. The system sand extensions are = [17 feet - (8.5 feet PLW + 2 feet)] ÷ 2 = 3.25 foot each. SSBA provided by this bed = 72 feet x 17 feet = 1,224 square feet.

ILLUSTRATION OF EXAMPLE #4 SYSTEM (NOT TO SCALE):



Design Procedure - Multiple Beds

Step 1: Determine Minimum AES Pipe Required

Residential applications: Multiply the number of bedrooms in design by 70 foot per bedroom. Commercial applications treating residential strength effluent: Divide the design daily flow by 2.14. Divide the pipe requirement proportionally for each bed. Example: the total number of bedrooms is (5) and two beds will be used, one bed will be sized for (2) bedrooms and one will be sized for (3) bedrooms. The pipe required for the first bed would be 140 feet (2-bedrooms x 70 feet) and the pipe required for the second is 210 feet (3 bedrooms x 70 feet).

Step 2: Determine Minimum System Sand Bed Area (SSBA)

From Table D, find the minimum SSBA using the IN-SLR. The SSBA is divided proportionally for each bed using the soil conditions at the location of each bed. Example using (5) bedrooms: bed #1 will be designed for (2) bedrooms in a (IN-SLR 0.6) AES-SLR of 0.9, which will require a SSBA of 334 square feet (300 GPD ÷ 0.9) and bed #2 will be designed for (3) bedrooms with a (IN-SLR 0.5) AES-SLR of 0.75, which will require a SSBA of 600 square feet (450 GPD ÷0.75). The total SSBA needed is 934 square feet.

Step 3: Calculate the Number of Serial Sections Required

Calculate the number of serial sections required for each bed. The serial sections required = design daily flow ÷ 750 GPD/section (always round up to nearest whole number). Skip this step if using parallel distribution.

Step 4: Determine Row Length and Number of Rows in Design

Select a row length that is suitable for the bed's site and calculate the number of rows required by dividing the pipe required for each bed (from Step #1) by your selected row length. The number of rows must be evenly divisible by the number of serial sections required. Increase the number of rows if needed.

Step 5: Calculate the Pipe Layout Width (PLW) for Each Bed

Calculate the PLW for each bed using the PLW formula as follows: PLW = [(Number of rows - 1) x row spacing (1.5 foot minimum)] + 1.

Step 6: Calculate the minimum System Sand Bed Width (SSBW) for each bed

a) Beds sloping 10% or less: Divide the SSBA from Step 2 by the (row length + 2 feet). If the resulting number is greater than the PLW from Step 5 + 2 feet, system sand extensions will be required. If the bed is level (1/2% slope or less) the rows are centered in the middle of the SSBA. If the bed is sloping, the rows are grouped at the top of the SSBA.

b) Beds sloping over 10%: Beds sloping over 10% require a minimum 3-foot system sand extension (4 foot when measured from the edge of the pipe) and placed entirely on the down slope side of the pipes. To determine the minimum SSBW, divide the SSBA from Step 2 by the (row length + 2 feet). If the result is greater than or equal to (PLW + 5 feet) no increase to the sand bed width is needed otherwise the minimum SSBW = (PLW + 5 feet). The system sand extension is placed entirely on the down slope side of the bed.

SYSTEM DESIGN

Design Example #5

Design criteria: Residential system with flows of 750 GPD. Site conditions make it necessary to split the system into multiple beds with the first bed receiving 300 GPD in soils with an IN-SLR = 0.6 (AES-SLR 0.9), the second bed receiving 450 GPD in soils with an IN-SLR = 0.5 (AES-SLR 0.75), both beds are subsurface (18” below grade) and on a level site.

Design first bed as a 300 GPD system, AES-SLR = 0.9:

Step 1: Determine Minimum AES Pipe Required

This is a residential application with this bed being designed for 2 bedrooms: 2 bedrooms x 70 feet = 140 feet of AES pipe minimum.

Step 2: Determine Minimum System Sand Bed Area (SSBA)

Minimum SSBA from Table D = 334 square feet (300 GPD ÷ 0.9 GPD/square foot).

Step 3: Calculate the Number of Serial Sections Required

Number of serial sections required = 300 GPD ÷ 750 = 0.4 (rounding up to one = single serial section layout).

Step 4: Determine Row Length and Number of Rows in Design

Choosing a row length of 70 feet provides 2 rows in this bed (140 feet of pipe). The system sand bed length is the row length + 2 feet (72 feet).

Step 5: Calculate the Pipe Layout Width (PLW)

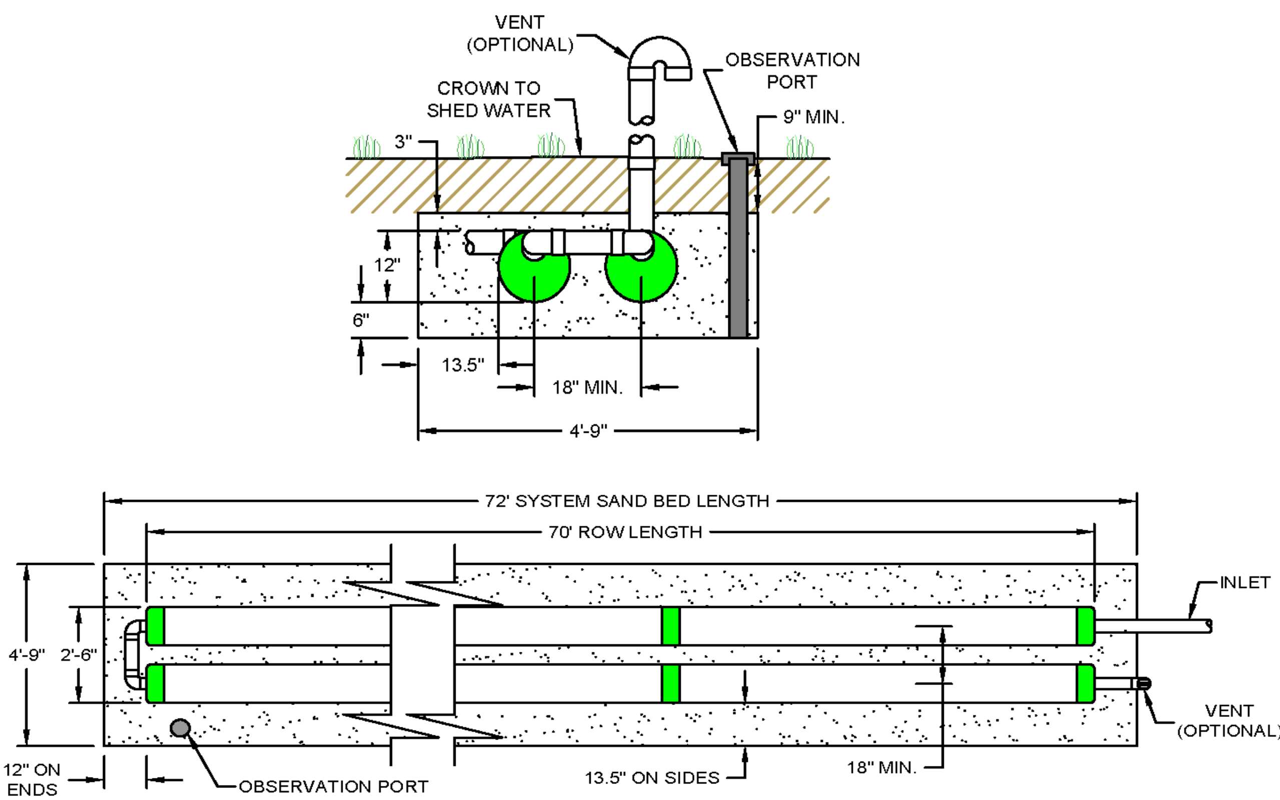
Using the PLW formula: PLW = [(Number of rows – 1) x spacing (1.5 min.)] + 1. PLW = [(2 – 1) x spacing (1.5 min.)] + 1 = 2.5 feet.

Step 6: Calculate the minimum System Sand Bed Width (SSBW)

Use Step a) because the bed will be level.

a) The minimum SSBW is 334 square feet ÷ 72 foot (row length + 2 feet) = 4.64 feet (use 4.75 feet for ease of construction), which is greater than the PLW of 2.5 feet + 2 feet = 4.5 feet. System sand extensions are needed. The system sand extensions are = [4.75 feet - (2.5 feet PLW + 2 feet)] ÷ 2 = 0.125 foot each. SSBA provided by this bed = 72 feet x 4.75 feet = 342 square feet.

ILLUSTRATION OF EXAMPLE 5 - BED 1 SYSTEM (NOT TO SCALE)



NOTES:

1. Due to the design resulting in narrow (1.5 inch) SSEs, the system is designed with full height SSEs for ease of construction. SSEs are therefore not depicted in the image provided but are included in the perimeter sand.

Design second bed as a (3) bedroom system, AES-SLR = 0.75:

Step 1: Determine Minimum AES Pipe Required

This is a residential application with this bed being designed for 3 bedrooms. 70 feet x 3 bedrooms = 210 feet of AES pipe minimum.

Step 2: Determine Minimum System Sand Bed Area (SSBA)

Minimum SSBA from Table D = 600 square feet (450 GPD ÷ 0.75 GPD/square foot).

Step 3: Calculate the Number of Serial Sections Required

Number of serial sections required = 450 GPD ÷ 750 = 0.6 (rounding up to one = single serial section layout).

Step 4: Determine Row Length and Number of Rows in Design

Choosing a row length of 70 feet provides 3 rows in this bed (210 feet of pipe). The system sand bed length is the row length + 2 feet (72 feet).

Step 5: Calculate the Pipe Layout Width (PLW)

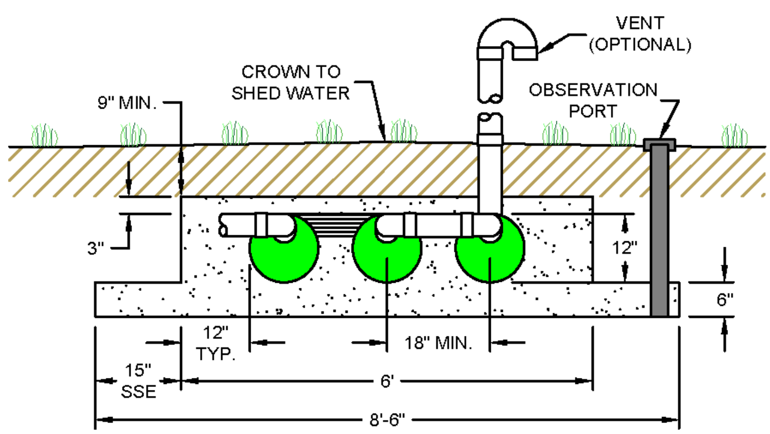
Using the PLW formula: PLW = [(Number of rows – 1) x spacing (1.5 min.)] + 1. PLW = [(3 – 1) x spacing (1.5 min.)] + 1= 4 feet.

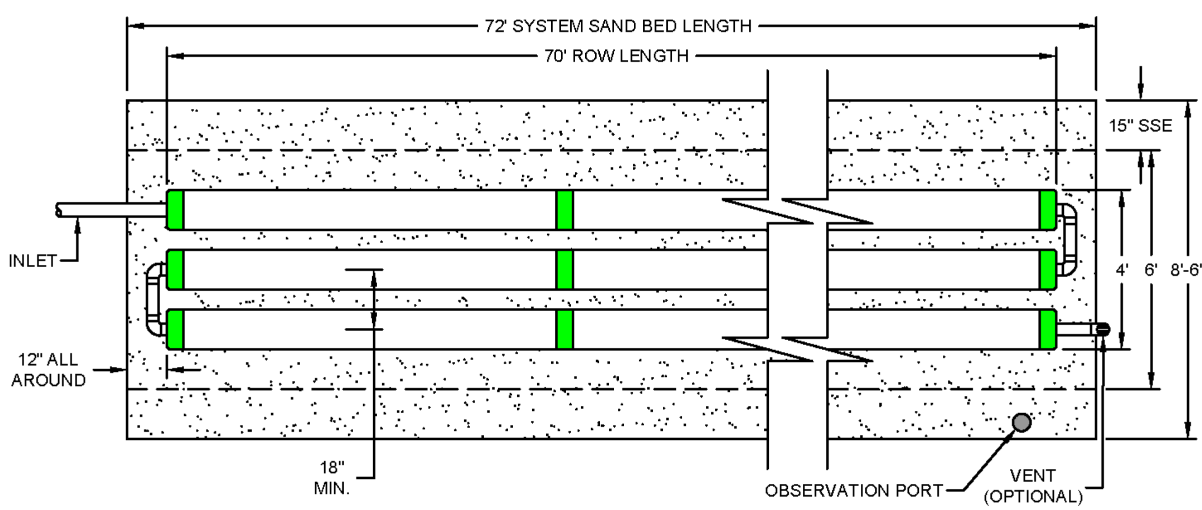
Step 6: Calculate the minimum System Sand Bed Width (SSBW)

Use Step a) because the bed will be level.

a) The minimum SSBW is 600 square feet ÷ 72 foot (row length + 2 feet) = 8.34 feet (use 8.5 feet for ease of construction), which is greater than the PLW of 4 feet + 2 feet = 6 feet. System sand extensions are needed. The system sand extensions are = [8.5 feet - (4 feet PLW+ 2 feet)] ÷ 2 = 1.25 foot each. SSBA provided by this bed = 72 feet x 8.5 feet = 612 square feet.

ILLUSTRATION OF EXAMPLE 5 - BED 2 SYSTEM (NOT TO SCALE)





SYSTEM DESIGN

A manifolded D-box will be used to divide flow proportionally to each treatment field (other methods allowed, if approved). Two and three distribution box outlets respectively will be manifolded together and directed to the appropriate system.

Illustration of Manifolded D-box:

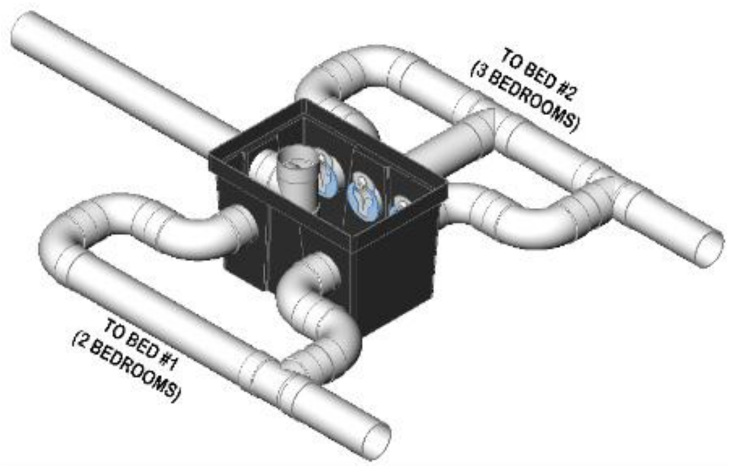
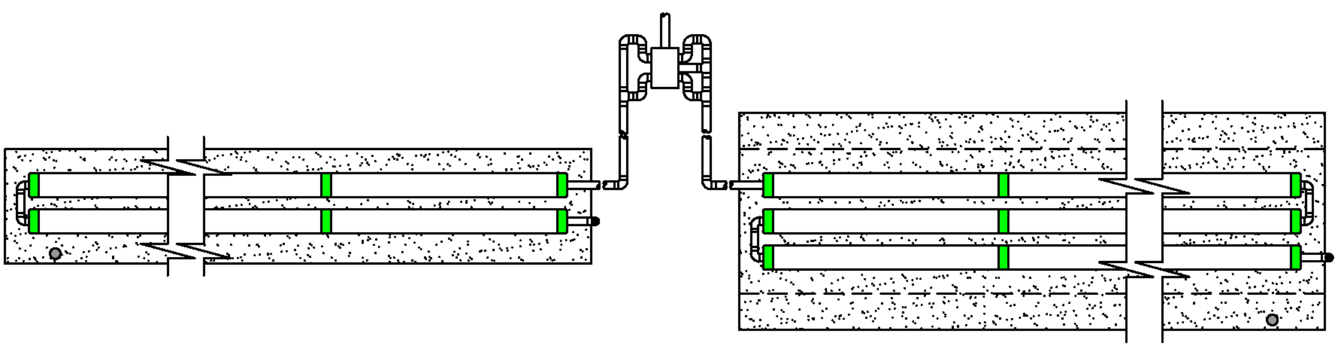
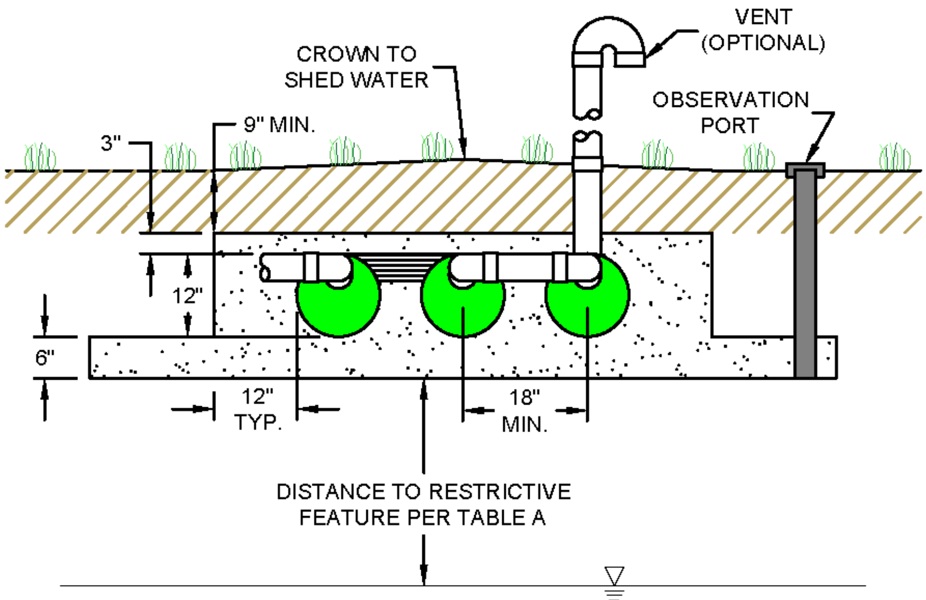


ILLUSTRATION OF EXAMPLE 5 - BOTH BEDS (NOT TO SCALE)

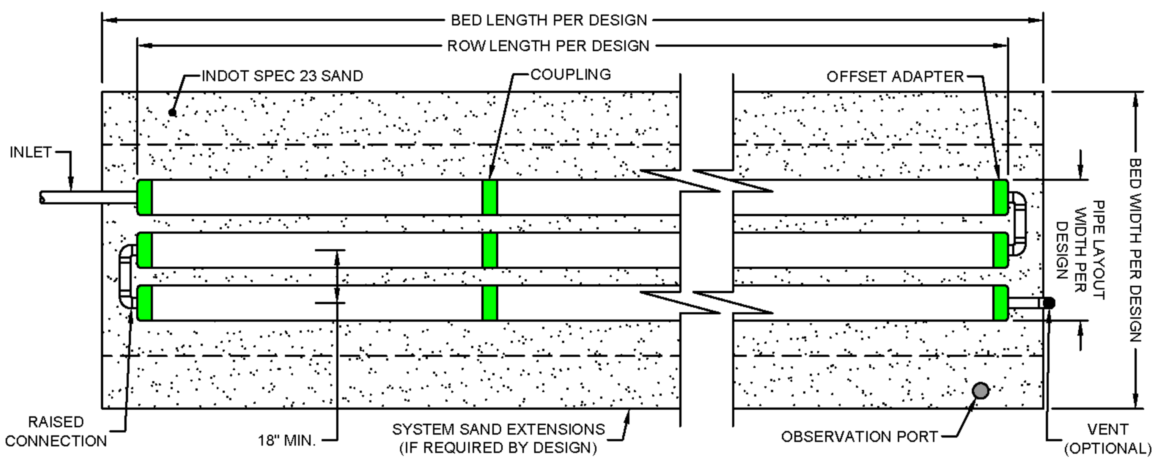


Level Subsurface System

CROSS SECTION VIEW



PLAN VIEW



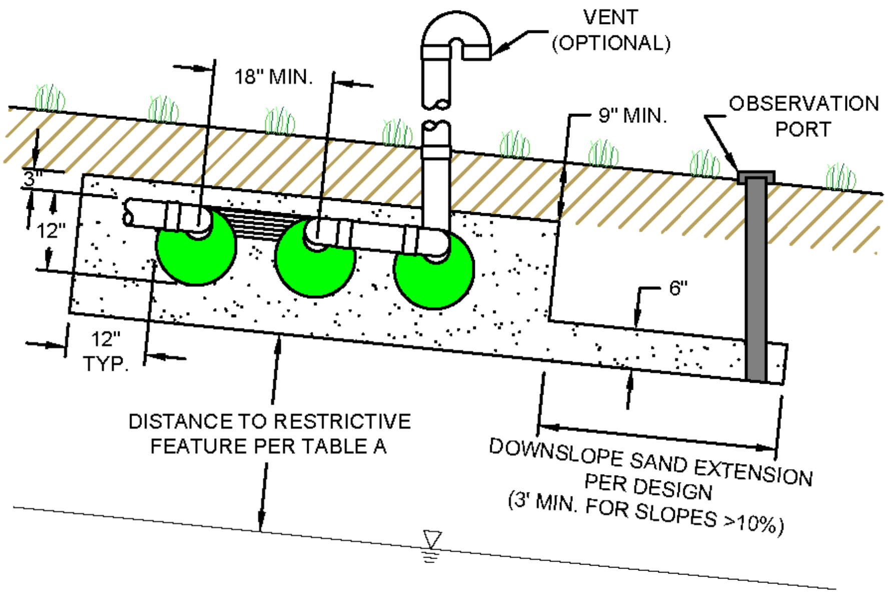
NOTES:

1. Number and length of conduits per design.
2. In systems with less than 18 inches of total cover after settling (measured from the top of the AES pipe) venting is not required but is optional at the discretion of the designer.
3. Pumping is not required unless gravity flow cannot be achieved.
4. In subsurface systems, the infiltrative surface must be a minimum of 4 inches below the original grade.
5. Subsurface systems must have at least 6 inches of system sand (IN DOT 23 sand) below all AES pipes.
6. Subsurface systems are allowed on slopes up to 15%.
7. Subsurface systems are designed along the contour while adhering to minimum separation distances to restrictive features.
8. When the system sand (IN DOT 23 sand) or the cover material extends above original grade, the IN DOT 23 sand and the soil material covering the system must have side slopes tapering at a maximum of 3:1.

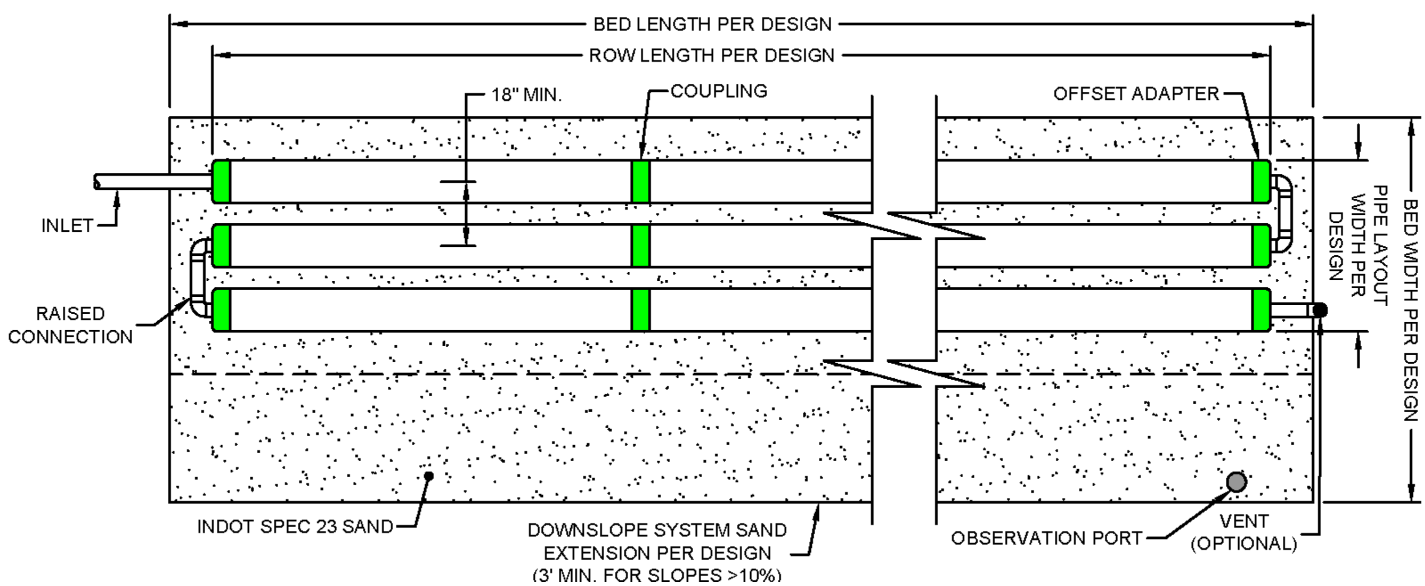
SYSTEM CONFIGURATIONS

Sloped Subsurface System

CROSS SECTION VIEW



PLAN VIEW

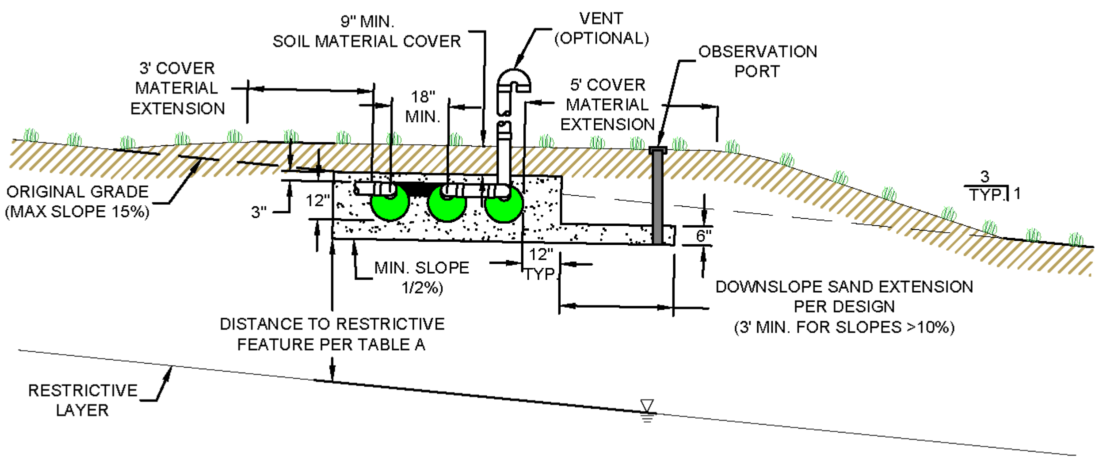


NOTES:

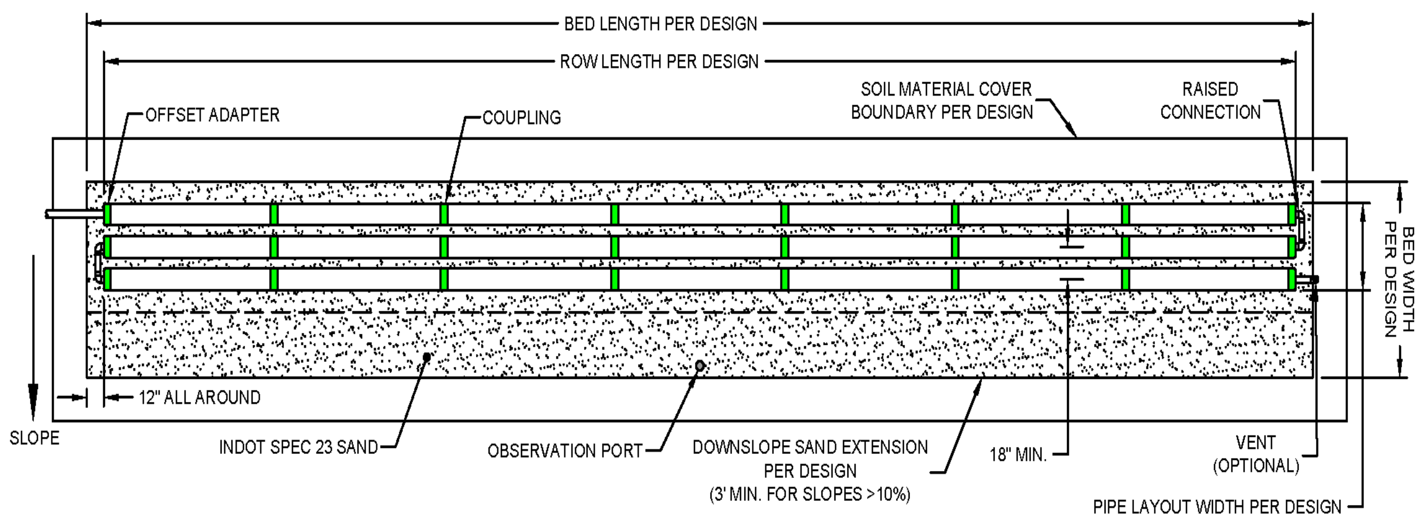
1. Number and length of conduits per design.
2. In systems with less than 18 inches of total cover after settling (measured from the top of the AES pipe) venting is not required but is optional at the discretion of the designer.
3. Pumping is not required unless gravity flow cannot be achieved.
4. In subsurface systems, the infiltrative surface must be a minimum of 4 inches below the original grade.
5. Subsurface systems must have at least 6 inches of system sand (IN DOT 23 sand) below all AES pipes.
6. Subsurface systems are allowed on slopes up to 15%.
7. Subsurface systems are designed along the contour while adhering to minimum separation distances to restrictive features.
8. When the system sand (IN DOT 23 sand) or the cover material extends above original grade, the IN DOT 23 sand and the soil material covering the system must have side slopes tapering at a maximum of 3:1

Sloped Subsurface System with Modified Bed Slope

CROSS SECTION VIEW



PLAN VIEW



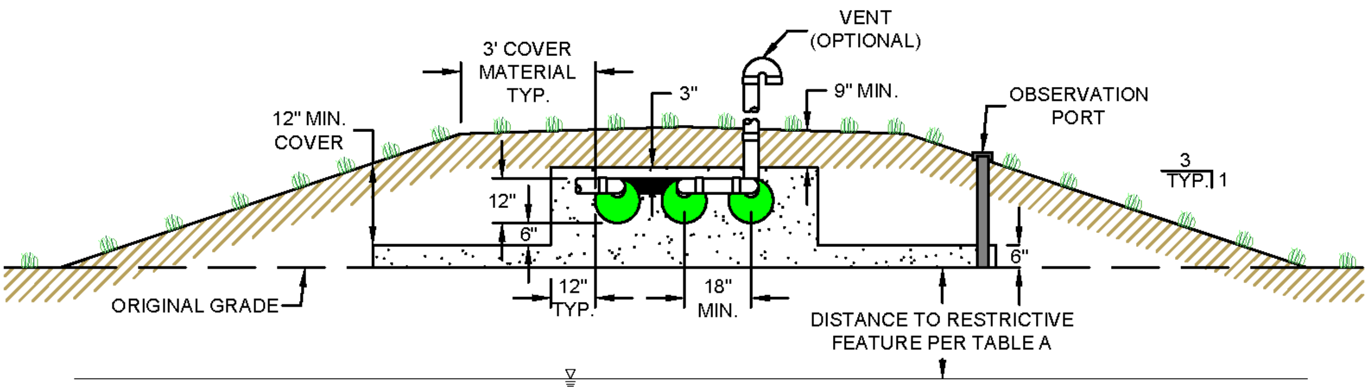
NOTES:

1. Number and length of conduits rows per design.
2. In system with less than 18 inches of total cover after settling (measured from the top of the AES pipe) venting is not required but is optional at the discretion of the designer.
3. In subsurface systems, the infiltrative surface must be a minimum of 4 inches below the original grade.
4. Subsurface systems are allowed on slopes up to 15%. Minimum slope for the modified bed bottom is ½%.
5. Subsurface systems must have at least 6 inches of system sand (IN DOT 23 sand) below all AES pipes.
6. Subsurface systems are designed along the contour while adhering to minimum separation distances to restrictive features throughout the system.
7. When the system sand (IN DOT 23 sand) or the cover material extends above original grade, the IN DOT 23 sand and the soil material covering the system must have side slopes tapering at a maximum of 3:1.

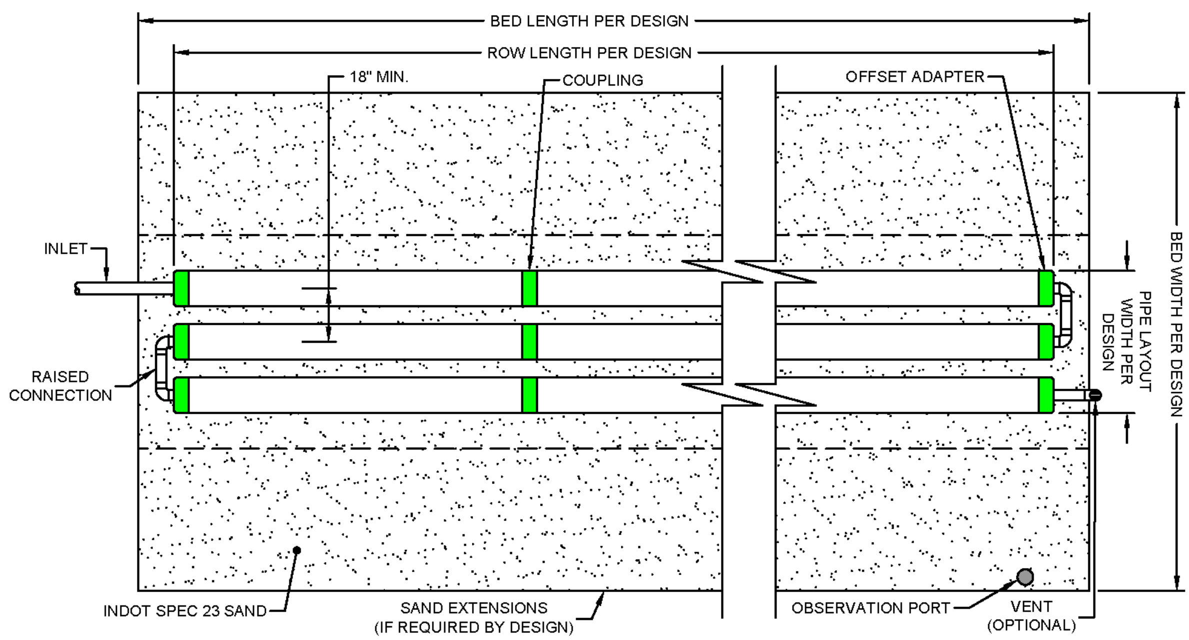
SYSTEM CONFIGURATIONS

Level Elevated System

CROSS SECTION VIEW



PLAN VIEW

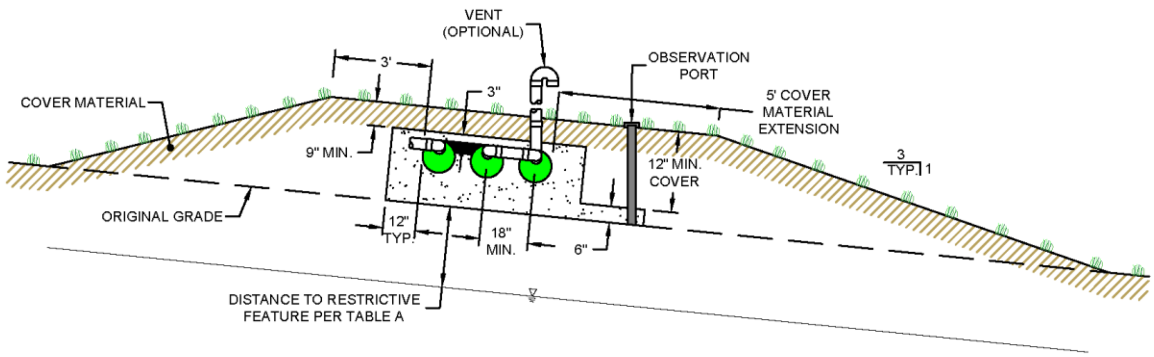


NOTES:

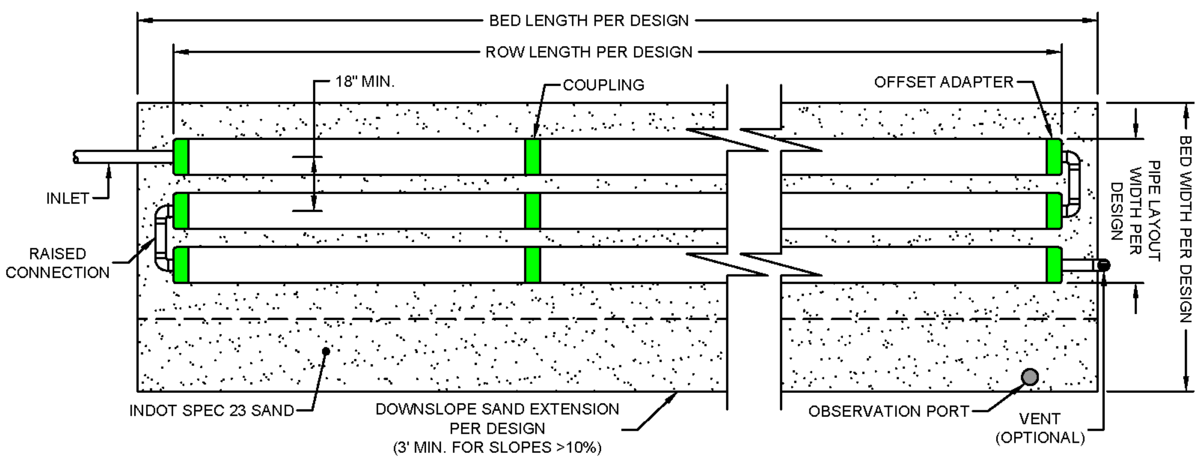
1. To qualify as an elevated bed, the infiltrative surface must be less than 4 inches below the original grade.
2. Elevated systems must have at least 12 inches of system sand (IN DOT 23 sand) below all AES pipes.
3. Elevated systems are allowed on slopes up to 6%.
4. The system sand and cover soils must have side slope tapers no steeper than 3:1 (steeper slope requires IDOH approval). The side slope taper begins 3 feet from the AES pipe, measured parallel to the system slope - if any.
5. Cover material extensions (materials extending beyond the edges of the AES pipe perimeter) are required before beginning the slope tapers.
6. While elevated systems are required to follow the contours of the original grade, the spacing and slope of the pipes shall remain consistent from end to end.
7. In systems with less than 18 inches of total cover after settling (measured from the top of the AES pipe) venting is not required but is optional at the discretion of the designer.
8. Pumping is not required unless gravity flow cannot be achieved.

Sloped Elevated System

CROSS SECTION VIEW



PLAN VIEW



NOTES:

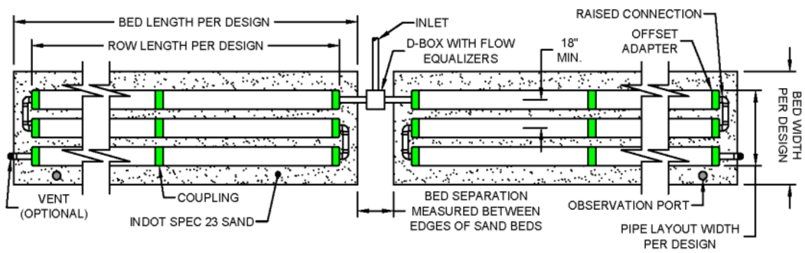
1. To qualify as an elevated bed, the infiltrative surface must be less than 4 inches below the original grade.
2. Elevated systems must have at least 12 inches of system sand (IN DOT 23 sand) below all AES pipes.
3. Elevated systems are allowed on slopes up to 6%.
4. The system sand and cover soils must have side slope tapers no steeper than 3:1 (steeper slope requires IDOH approval). The side slope taper begins 3 feet from the AES pipe, measured parallel to the system slope - if any.
5. Cover material extensions (materials extending beyond the edges of the AES pipe perimeter) are required before beginning the slope tapers.
6. While elevated systems are required to follow the contours of the original grade, the spacing and slope of the pipes shall remain consistent from end to end.
7. In systems with less than 18 inches of total cover after settling (measured from the top of the AES pipe) venting is not required but is optional at the discretion of the designer.
8. Pumping is not required unless gravity flow cannot be achieved.

SYSTEM CONFIGURATIONS

Multiple Bed Systems

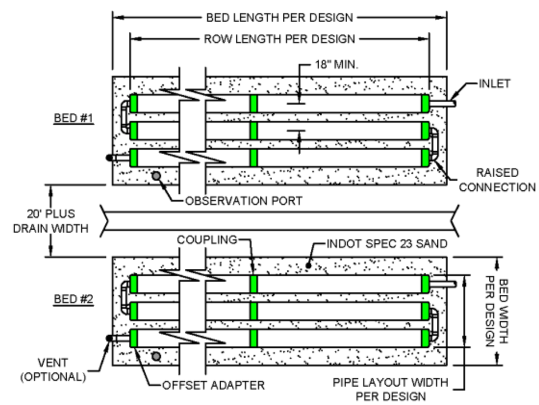
Multiple Bed distribution incorporates two or more beds, each bed proportionately sized for the effluent flow into it. Multiple beds must be oriented along the contour of the site or along the slope of the site. When using multiple beds, the pipe requirement (from Table A) and the required system sand bed area (from Table B) must be divided proportionally. End-to-end configurations are preferred over side-to-side configurations. Bed separation for end-to-end bed systems is 2 feet minimum measured from the edge of each sand bed, If system is designed to receive ≥ 450 gpd of flow, splitting the system into multiple beds of < 450 gpd per bed allows for the minimum 24-inch vertical separation to a restrictive feature per Table A.

END-TO-END CONFIGURAITON PLAN VIEW -



SIDE-TO-SIDE CONFIGURAITON PLAN VIEW

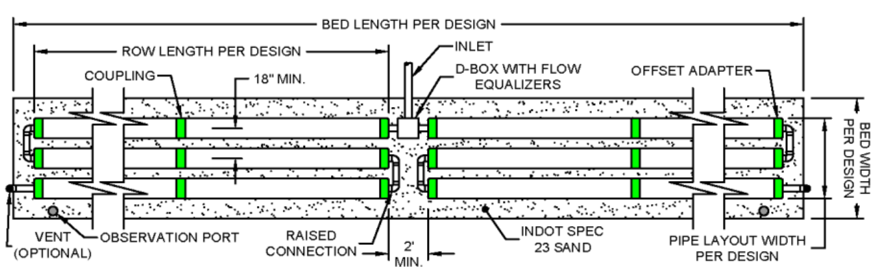
In side-to-side configurations one bed is placed beside another or one bed is placed down slope of another. When subsurface drainage is required, a segment drain placed between the beds is required. When subsurface drainage is not required or used, the beds shall be provided with a dispersal area (outside the system sand bed area) as required in 410 IAC 6-8.3-58 or 410 IAC 6-10.1-62, whichever is applicable. Separation distances between beds placed side-to-side is measured from the outermost edge of the system sand or system sand extension if present.



Butterfly Configuration

Butterfly configurations are considered a single bed and as such may only be designed with 24-inch vertical separation to a restrictive feature when the design daily flow is less than 450 gpd.

PLAN VIEW



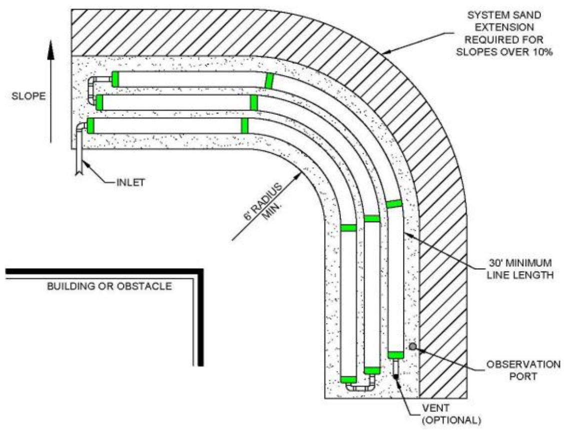
NOTES:

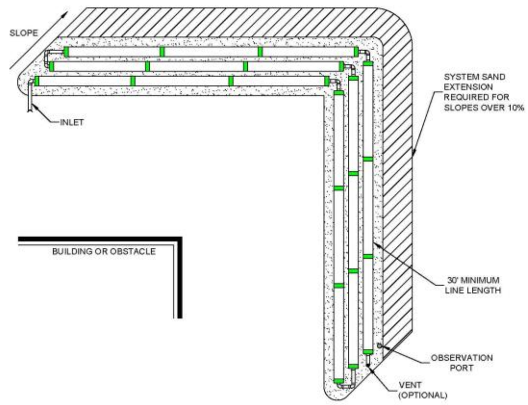
1. Number and length of conduits per design.
2. In system with less than 18 inches of total cover after settling (measured from the top of the AES pipe) venting is not required but is optional at the discretion of the designer.
3. Pumping is not required unless gravity flow cannot be achieved.
4. Systems exceeding 102 linear feet are required to be equally split as a multiple bed or butterfly system.
5. Butterfly systems are considered a single bed with center fed rows of 100 ft or less (maximum bed length over 200 ft).
6. Systems may require the use of system sand extensions

Angled or Curving Systems

Angled configurations generally have one or more specific bends, but the rows and bed are to be oriented along the contours of the site as illustrated below. Rows are angled by bending pipes (first drawing, below) or through the use of offset adapters (second drawing, to right).

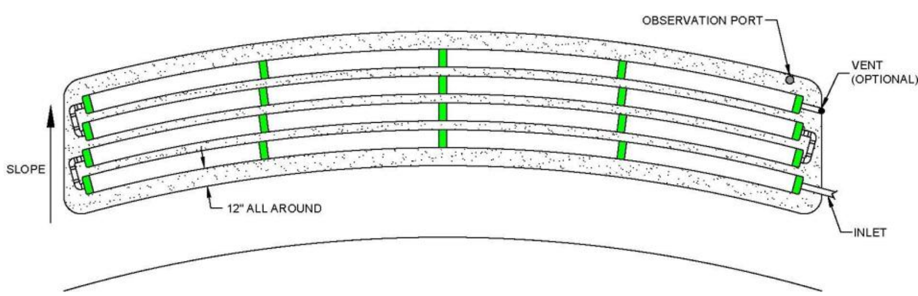
LEVEL 90 PLAN VIEW





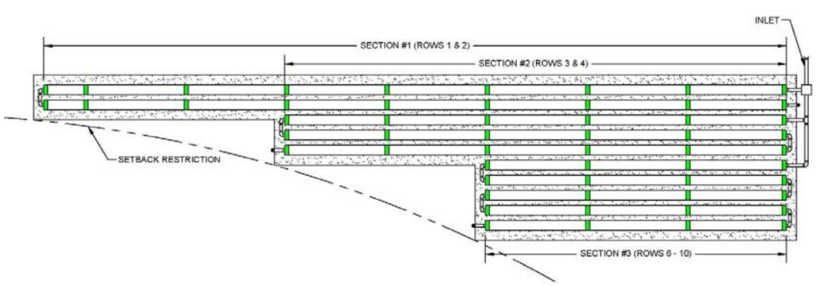
Curved configurations work well around structures, setbacks, and slopes. Multiple curves can be used within a system to accommodate various contours of the site.

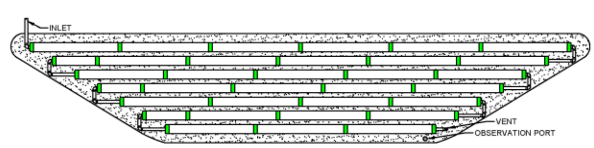
LEVEL CURVED PLAN VIEW



Non-Conventional

Non-Conventional system configurations may have irregular shapes to accommodate site constraints. If the site will accommodate a conventional AES configuration, a non-conventional AES system may not be used. Non-conventional configurations are limited to soils with an IN-SLR of 0.6 GPD/square foot or faster. Below are illustrations of beds with varying row lengths. The first row of a trapezoidal systems must be the longest row. For multi-section beds, each serial section must contain the minimum amount of AES pipe required per section.





NOTES:

1. Number and length of conduits per design.
2. In system with less than 18 inches of total cover after settling (measured from the top of the AES pipe) venting is not required but is optional at the discretion of the designer.
3. Pumping is not required unless gravity flow cannot be achieved.
4. Observation ports are required (Inspection port not shown in above picture).
5. AES pipe may be bent up to 90.

Before You Begin

AES may only be installed according to these instructions, as well as all applicable state and local health permitting authority requirements.

If unsure of the installation requirements for a site, contact your permitting authority. If unsure of the applicability of AES for a given site, contact Infiltrator Water Technologies' Technical Services Department. The soil and site evaluation and the design of the onsite system must be reviewed, approved and a construction permit obtained from the local permitting authority before installation.

Materials and Equipment Needed

- ☐ AES pipe
- ☐ Couplings
- ☐ Offset adapters/Endcaps
- ☐ System sand
- ☐ PVC pipe and couplings
- ☐ Backhoe / Excavator
- ☐ Observation Port
- ☐ Laser, Transit, or Level
- ☐ Shovel and Rake
- ☐ Tape Measure

These guidelines for construction machinery must be followed during installation:

- ☐ Avoid direct contact with AES pipe when using construction equipment. AES pipes require a 12-inch minimum of consolidated cover to support a wheel load rating of 16,000 lbs/axle or equivalent to an H-10 AASHTO load rating.
- ☐ Only drive across the system when necessary.
- ☐ Never drive down the length of the system.
- ☐ To avoid additional soil compaction, never drive heavy vehicles over the completed system.

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

Before preparing a site, remove all grass, leaves, sticks, brush, and other organic matter or debris from the system site.

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 and erosion control measures per plan.
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 installing system sand, keep at least 6" of system sand between the vehicle tracks and the tilled soil of the site. Equipment with tires should be avoided due to likely wheel compaction of underlying soil structures.

When to Excavate

Do not work wet or frozen soils (see Indiana 410 IAC 6-8.3-74(e) for residential systems or 410 IAC 6-10.1-82(e) for commercial systems for complete instructions and testing criteria). Do not excavate the system area immediately before, during, or after precipitation.

Tilling Procedures

Subsurface Systems:
For subsurface bed systems, excavate the system bed area to a depth of at least 4 in. and as specified in the plan below original grade. Using an excavator or backhoe, tilt the bucket teeth perpendicular to the bed (parallel to contour) and use the teeth to rake furrows 2 in.- 6 in. deep into the bottom of the entire area receiving System Sand ("receiving area") being sure to stay off of the area downslope of the bed. After excavating the site, cut off all roots that protrude above the excavated surface (without compacting the soil material). Remove all stumps, organic material, stones larger than 6", and construction debris and add 6 in. of system sand (measured from the bottom of the excavation) to the excavated site on the same day the system is excavated and before any precipitation without causing compaction of the soil or sand.

Elevated Systems:
The site for elevated systems shall be prepared in accordance with Indiana 410 IAC 6-8.3-86 and -87 for residential systems, or 410 IAC 6-10.1-94 and -95 for commercial systems, or the most current version of the rules that control this practice. All areas receiving system sand, sand fill, and cover material extensions must be tilled to a depth of 7" to 14". The tillage equipment should remain outside of the proposed system sand area and extensions and should not enter the area downslope of the bed. If a plow pan exists, till the soil to at least 2" below the bottom of the plow pan. The state or local department of health may require field supervision of tilling operations.

After tilling the site, cut off all roots that protrude above the tilled surface (without compaction of the soil material) and place at least 12 inches of System Sand on the prepared surface before placing the AES pipes. When installing system sand, keep at least 6" of system sand between the vehicle tracks and the tilled soil of the site. Equipment with tires should be avoided due to likely wheel compaction of underlying soil structures.

If an elevated system is being installed 1-3" deep, the soil to be excavated should be removed very carefully, ensuring that no more than the allowed amount of soil is removed from the site, prior to tilling. Tilling of the site should then occur as outlined above.

Installing Observation Ports

AES bed systems in Indiana require at least one observation port be installed.

1. Cut a 4-inch pvc pipe to the desired length, ensuring the pipe will extend to final grade.
2. Drill a minimum of ten ¼" to ½" holes within 1/2 to 6 inches from the bottom of the pipe, wrap the bottom end of the pipe in filter fabric.
3. Install the observation pipe at the appropriate location, based on site conditions, and ensure the bottom of the pipe is at the bottom of the system (at the native soil interface).
4. Install a removable, water-tight, secure cover cap.

Install System Sand Immediately After Excavation

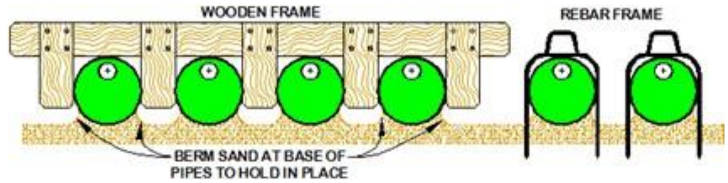
- To protect the tilled area from damage by precipitation, system sand should be installed immediately after tilling.
- Work off either end or the uphill side of the system to avoid compacting soil or disturbing the prepared dispersal area.
- Install system sand (minimum of 6 inches deep for subsurface systems and 12 inches deep for elevated systems) 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.
- Heavy equipment with tires shall never enter the receiving area due to likely wheel compaction of underlying soil structures.

Row Installation Sequence

1. 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 with the Bio-Accelerator (white geo-textile fabric) positioned in the center along the bottom of the pipe rows (sewn seam up).
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 inch end-to-end. Variations beyond 1 inch (±½ inch) are not acceptable.
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).

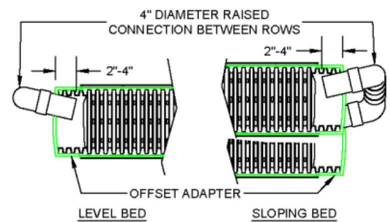
Row Spacers

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 wood, the other from rebar. CAUTION: Remove all tools used as row spacers before final covering.



Connect Rows Using Raised Connections

Raised connections consist of offset adapters, 4-inch. PVC sewer and drain pipe, and 90° elbows. They enable greater liquid storage capacity and increase the bacterial surfaces being developed. Use raised connections to connect the rows of the AES system.



Backfilling Rows

1. Confirm pipe rows are positioned with Bio-Accelerator along the bottom (sewn seam up).
2. Spread system sand between the rows.
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 inch 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 inches over the AES pipe and a minimum of 12 inches on all four sides of the bed beyond the AES pipes.
2. Spread a minimum of 9 inches of suitable earth cover (topsoil or loam free of organics, stones over 4 inches, and building debris) having a texture similar to the soil at the site, without causing compaction. It is best to crown several extra inches of soil over the finished grade to allow for settling after installation.
3. To prevent erosion, soil cover above the system shall be seeded or sodded with shallow-rooted vegetation.

Cover Material Extension Requirements

All systems with any portion of the system sand bed above original grade require cover material extensions on each side beyond the outside edge of all AES pipes and then tapering to meet existing grade at a maximum slope of 3:1 See Cover Material Extensions and Side Slope Tapers on page 4 for more detail.

Information for System Owners

Proper Use

The AES 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.

System Use and Abuse

The following conditions constitute some examples of 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, or additional water discharging fixtures).
- Solids in high volume (excessive number of occupants, paper products, personal hygiene products, garbage disposals, etc).
- 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, unapproved barrier materials, etc.)
- Special Note: Infiltrator and most regulatory agencies do not recommend the use of septic system additives.

Site Maintenance

It is important that the system site remains free of shrubs, trees, and other woody vegetation, including the entire SSBA, and areas impacted by side slope tapering and subsurface drainage (if used). Roots can infiltrate and cause damage or clogging of system components. If subsurface drainage 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.

Trouble Shooting

In the event that any of the following indicators arise, contact a qualified onsite wastewater system professional.

- Wastewater back-up into the dwelling
- Persistent septic odor
- Unusually wet area atop and/or around the system
- “Ponding” of effluent on the lawn
- “Breakout” of effluent along the side of a slope or other landscape features

If at any time you have concerns about the use, operation, or maintenance of your Infiltrator AES System, **contact the Infiltrator Water Technologies Technical Department at 1-800-221-4436.**

Information for Service Providers

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 (only use a licensed Septic Tank Cleaner for sewage removal).
- 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.

System Failure/Repair

A qualified onsite wastewater system professional shall be contacted when there are indications of malfunction with the AES System. When visiting the site, the qualified onsite wastewater system professional should, at a minimum, do the following:

- Assess the present condition of the AES System and the surrounding area
- Research the history of use, including:
  - water volume use
  - contaminants
- Evaluate the site for groundwater intrusion
- Inspect the septic tank
- Inspect the AES System conduit lines
- Check faucet and toilet function

Upon completion of the site inspection, the onsite wastewater system professional shall contact Infiltrator Water Technologies Technical Services Department or an authorized Infiltrator representative with his or her report. In addition, the local health department should be notified of the system failure.

If the AES system requires replacement or repair, follow the procedure outlined below. **Caution:** This procedure must be followed in such a way as to not create a public health hazard. Please note that IDOH prefers that replacement systems be installed in an undisturbed area rather than in the same location unless there is no available area to do so.

1. An onsite soil evaluation must confirm that the soils at the site are suitable for the replacement system and a probable reason for system failure must be determined before securing the required state and local permits/approvals prior to beginning any work.
2. Use an Indiana licensed septic tank cleaner to remove any sewage, contaminated components (not being reused) or contaminated soils from the site.
3. Replace damaged components with new AES products. If components are not damaged, they may be flushed and reused.
4. Replace in the same excavated location with new system sand (IN DOT 23 sand).
5. When site conditions do not allow for a system to be designed as full-sized replacement system based upon current specifications, “in-kind” replacement using AES pipe is permitted.
6. All system replacements or repairs must comply with state and local regulations.

Bacteria Rejuvenation and Expansion

Why Would System Bacteria Rejuvenation Be Needed?

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

How to Rejuvenate System Bacteria

System bacteria are "rejuvenated" when they return to an aerobic state. By using the following procedure, this can be accomplished in most AES systems without costly removal and replacement. Caution: This procedure must be followed in such a way as to not create a public health hazard.

1. Contact IDOH for the appropriate permit.
2. Contact Infiltrator's Technical Services Department before attempting rejuvenation for technical assistance.
3. Determine and rectify the problem(s) causing the bacteria conversion.
4. Drain the system by excavating at least one end of all the rows and removing the offset adapters or endcaps. Sewage from the system must be removed by an Indiana licensed septic tank cleaner.
5. If foreign matter has entered the system, flush the pipes.
6. Safeguard the open excavation.
7. Guarantee a passage of air through the system.
8. Allow all rows to dry for 72 hours minimum. The system sand should return to its natural color.
9. Re-assemble the system to its original design configuration. If there is no physical damage to the AES components, the original components may be reused.

System Expansion

AES systems are easily expanded by adding equal lengths of pipe to each row of the original design or by adding additional equal sections. AES pipe may be used for expanding systems originally constructed with Enviro-Septic or Simple Septic pipe. All system expansions must comply with State and local regulations. Permits will be required prior to system expansion.

Field Renovation

In the unlikely event that an AES system needs to be replaced

- The system can be repaired and left in the same location if an alternate site is not available and if allowed by state and local authorities.
- Prior to initiating the repair system construction, the failed system components and any unsuitable system sand must be removed, except that the original infiltrative surface shall not be disturbed other than by hand raking.
- Disposal of hazardous materials to be in accordance with state and local requirements.
- Contact the appropriate local or state department for necessary permits.

INDIANA AES SYSTEM INSTALLATION FORM

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

System Information (check all that apply):

☐ New Construction	☐ Replacement System	☐ System Repair
☐ Elevated System	☐ Subsurface System	
☐ Gravity Fed	☐ Pump to D-box	
☐ Single Serial Section System	☐ Parallel Distribution	☐ Multiple Serial Section System
☐ Effluent Filter Used	☐ Venting included	

Number of Beds:	Design Flow (bedrooms or GPD):	IN-SLR	AES-SLR
Installation Date:	System Startup Date:		
State Permit Number:	Local Construction Permit Number:		
Comments:			

WARRANTY

(a) The structural integrity of each unit, endcap and other accessory manufactured by Infiltrator (collectively referred to as “Units”), when installed and operated in an onsite wastewater system in accordance with Infiltrator’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 Infiltrator in writing at its corporate headquarters in Old Saybrook, Connecticut within fifteen (15) days of the alleged defect. Infiltrator will supply replacement Units for those Units determined by Infiltrator to be defective and covered by this Limited Warranty. Infiltrator’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 AES System components (unit, endcap or other accessory) is manufactured by anyone other than Infiltrator. The Limited Warranty does not extend to incidental, consequential, special or indirect damages. Infiltrator 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 Infiltrator. 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 Infiltrator 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 Infiltrator’s installation instructions.

(d) No representative of Infiltrator 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 Infiltrator. A limited number of states and counties have different warranty requirements. Any purchaser of Units should contact Infiltrator’s corporate headquarters in Old Saybrook, Connecticut, prior to such purchase, to obtain a copy of the applicable warranty, and should carefully read that warranty prior to the purchase of Units.

Contact Infiltrator’s Technical Services Department
for assistance at 1-800-221-4436 or info@infiltratorwater.com