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Scott Walker, Governor
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Private Onsite Wastewater Treatment Systems Technical Code Advisory Committee
Room 121C, 1400 East Washington Avenue, Madison
Contact: Bradley Johnson (608) 266-2112
May 16, 2017

9:00 A.M.

The following agenda describes the issues that the committee plans to consider at the meeting. At the time of the meeting, items may be removed from the agenda. Please consult the meeting minutes for a record of the actions of the committee.

AGENDA

OPEN SESSION – CALL TO ORDER – ROLL CALL

A. Adoption of Agenda (1-2)

B. Administrative Matters – Discussion and Consideration

1. Welcome and Introductions
2. Committee Members
   a) Aaron Ausen
   b) Frederick Hegeman
   c) Daniel Keymer
   d) Robert Roy Schmidt
   e) Daniel Vander Leest
   f) Eric Wellauer

C. Technical Advisory Matters – Discussion and Consideration

1. Geomat In-ground Component Manual (attached) **(3-36)**
2. Presby In-ground Component Manual (attached) **(37-68)**
3. Presby Mound Component Manual (attached) **(69-100)**
4. Performance monitoring under s. SPS 383.71(4)
   The department shall utilize the technical advisory committee assembled under s. SPS 384.10 (3) (c) 2. to advise the department on the performance-monitoring program. The committee shall advise the department in at least the following areas:
   (a) Development of performance monitoring protocols.
   (b) Selection of the POWTS methods and technologies to be monitored.
   (c) Identification of funding sources.
   (d) The interpretation of the results of the monitoring program

D. Board Meeting Process (Time Allocation, Agenda Items) – Discussion and Consideration

E. Committee Training – Public Records and Ethics and Lobbying – Discussion and Consideration (101-106)

F. Public Comments

G. Adjournment

Synergy Septic Systems
GeoMat In-ground Component Manual

Published by:
Synergy Systems
75D Golf Parkway
Madison, WI 53704

Synergy Septic Systems reserves the right to revise this component manual according to changes in regulations or Geomatrix products installation instructions.

Version 1

TABLE OF CONTENTS

APPENDIX

The following documents are submitted as an attachment to Synergy Septic Systems GeoMat In Ground Component Manual
Under the title: Synergy GeoMat In Ground Test Data
In compliance with: Voluntary POWTS component review in accordance with s SPS 384.10 (3) No. 4. Testing Data.

A. GeoMat NSF 40 Certification

A1. GeoMat NSF 40 Final Report

A2. Onsite Wastewater Technology Testing Report

A3. Evaluation of Water Quality Functions and Advanced Soil-Based Onsite Wastewater Treatment Systems

I. INTRODUCTION AND SPECIFICATIONS

This component manual provides design, construction, inspection, operation, and maintenance specifications for GeoMat In-ground Soil Absorption Component as provided by Synergy Septic Systems, a Wisconsin Based LLP (hereafter referred to as Synergy GeoMat In-ground).

GeoMat, through a combination of the high surface area to void space ratio and time dosing, (optional, but preferred) microbial respiration byproducts such as carbon dioxide, methane and hydrogen sulfide can be displaced with the wastewater dose; once the dose infiltrates, air is subsequently drawn into the system. Due to the high surface area to void space ratio, this gas exchange has been shown to be significantly greater than in other leach field technologies. This increased oxygen transfer rate results in increased removal of pathogens, B.O.D. and nutrients such as nitrogen and phosphorus in a shallower soil profile. Due to the high surface area to void space ratio, this also works in gravity applications

These items must accompany a properly prepared and reviewed plan acceptable to the governing unit to help provide a system that can be installed and function properly.

When designed, installed and maintained in accordance with this manual, the Synergy GeoMat In-ground provides treatment and dispersal of domestic wastewater in conformance with NSF/ANSI Standard 40 Class I Certification.

"To achieve NSF 40 Class I Certification, treatment systems must produce an acceptable quality of effluent during a six month (26-week) test. Class I systems must achieve a 30-day average effluent quality of 25 mg/L CBOD5 and 30 mg/L TSS or less, and pH 6.0 – 9.0 spanning six months of testing. System service and maintenance are prohibited during the test period."

- Detailed plans and specifications may be developed utilizing Synergy Septic Systems GeoMat In-ground Design Application
- Plans that are submitted for review and approved by the governing unit having authority over the plan for the installation.
- A Sanitary Permit must be obtained from the department or governing unit having jurisdiction. See Section XI for more details.

TABLE 1: INFLUENT FLOWS AND LOADS

Design Wastewater Flow (DWF)	≤ 5000 gal/day
Dosing of effluent required with DWF	≥ 1500 gal/day
Monthly average value of fats, oils, greases (FOG)	≤ 30 mg/L
Monthly average value of Biochemical Oxygen Demand (BOD)	≤ 220 mg/L
Monthly average value of Total Suspended Solids (TSS)	≤ 30 mg/L
Design loading rate of Geomat Component	≤ 2.0 gpd/sq.ft. Accept that when soils under component have an in situ soil application of 1.6 gpd/sq. ft, GeoMat may be loaded at ≤2.2 gpd/sq.ft
Wastewater particle size ** 2 filters required when there is a pump tank. 1 in the septic tank or 2nd chamber. One pressure filter after the pump. *** A 2nd filter is not required when the system flows by gravity ****A gravity effluent filter is not required in an existing septic tank that does not provide access for the installation of an effluent filter. In this case only 1 filter is required.	≤ 1/8 inch
Design Wastewater Flow (DWF) for flow from one or two family dwellings	Based on s SPS (5) Table 383.44-2 WI Adm. Code Maximum monthly average BOD ≤ 30 mg/L Maximum monthly average TSS ≤ 30 mg/L
Design Wastewater Flow (DWF) from public facilities	≥ 150% of estimated wastewater flow in accordance with Table 4 of this manual
GeoMat to have (Tier 3- downsizing & vertical separation credit)	Column 2 on soil test, and 2' separation to limiting factor when placed on 12" ASTM c33 sand
Linear loading rate for systems with in situ soils having a soil application rate ≤0.3 GPD/sq. receiving effluent from GeoMat	≤4.5 gal/ft/day (1- 39" GeoMat cell)
Linear loading rate for systems with in situ soils having a soil application rate > 0.3 GPD/sq. receiving effluent from GeoMat	None as long as (S) and (I) dimensions are followed
Volume of a single dose when a pressure distribution system is utilized to disperse effluent Use of pressure distribution is dictated by s. SPS 383-44 (5)	≥ 5 times the void volume of the distribution lateral(s) and ≤ 20% of the design wastewater flow
Volume of a single dose to soil absorption component when effluent is delivered to a non-pressure distribution system	≤ 20% of the design wastewater flow
Distribution cell per orifice when pressure distribution cell is used	≤ 12 ft^2

TABLE 2: SIZE AND ORIENTATION

Minimum area of infiltrative surface (basal Area) (Tier 3- downsizing & vertical separation credit)	≥ Design wastewater flow ÷ soil application rate for the in situ soil of the infiltrative surface or a lower horizon if the lower horizon adversely affects the dispersal of wastewater in accordance with s. SPS 383.44 (4) (a) and (c) WI Adm Code
Distribution component cell width GeoMat (A)	39" wide GeoMat sections placed a minimum of 12" apart. Every 39"wide GeoMat section must have an individual distribution pipe. No limit on number of cells
GeoMat Component Basal Area: (B X W) this is the sand under geoMat, S dimensions, and the I dimensions. It is always 12" thick and is sized to the extent of the basal area required.	GeoMat cell length X Infiltrative Width Total area required for basal area as per SPS 383.44-2 Column 2. NOTE: K dimension does not factor in.
GeoMat Component height	12" ASTM C 33 sand under GeoMat. + 1"GeoMat + nominal pipe size
Depth of the cover over the top of the distribution pipe	≥ 12 inches. 12 inches is optimal for gas exchange.
Depth of cover over the top of the distribution pipe measured from the in situ soil Surface	≥ 0 inches. Top of pipe must be at or below original grade.
Vertcal Separation to limiting factor	≥ 2' as measured from bottom of GeoMat Component.
Basal area	≥ Design wastewater flow rate ÷ Design loading rate of in-situ soil as specified in Table 1 Row 6
Horizontal distance of GeoMat Cell to side wall (I)	1'

TABLE 3: OTHER SPECIFICATIONS

Slope of in situ soil	≤ 25% in area of component
Max Burial Depth	6' Below finished grade to top of GeoMat. Extra sand or soil stripping may be done to achieve result. Shallow install optimal.
Vertical separation between distribution cell and seasonal saturation defined by redoximorphic features, groundwater, or bedrock	2'
Bottom of distribution cell	Level
Horizontal separation between distribution cells (S)	≥ 1 foot
Piping material in the distribution system	Meets requirements of Table s. SPS 384.30-4 or Table s. SPS 384.30-5 WI Adm Code NOTE: PSI systems shall use Table s. SPS 384.30-5. Gravity systems may use Table s. SPS 384.30-4 or Table s. SPS 384.30-5 WI Adm Code If gravity systems use Table s. SPS 384.30-5 the minimum size of ASTM 1785 pipe allowed is 2" Max is 4". Also, 1/2" orifices shall be drilled in the following manner: *The pipe shall have 2 rows, and only 2 rows, of orifices parallel to the axis of the pipe and 120° +/- 5° apart.....in other words, The perforations shall be at the nominal 4 and 8 o'clock positions when the pipe is installed. Perf0rations shall be spaced every 12". Last orifice shall be ≤ 12" from end of GeoMat. This promotes equal distribution in gravity systems. IF Table s. SPS 384.30-5 is used, lateral cleanout will be needed.*
Piping material for observation, vent, and observation/vent pipes	Meets requirements of s. SPS 384.30-2 WI Adm Code
Infiltrative Material (GeoMat)	1. GeoMat 3900 Flat Leaching System From Geomatrix: GeoMat is a patented soil-based treatment system that has earned NSF 40 Certification. It utilizes a hydroscopic membrane with a transmissive core. Physical properties consist of fused entangled plastic filaments with a geotextile fabric on the top and bottom.
Slope of the gravity flow perforated	Pipes lay level
distribution lateral piping	Pipes lay level
Location of gravity flow perforated distribution pipe in the distribution cell	Centered in the width of the cell or equally spaced in the width of the cell
Length of the distribution pipe for components using GeoMat and gravity flow distribution	≥ Equal to length of distribution cell minus 2 feet
Distance between distribution pipe end orifice and end of distribution cell for components using gravity flow distribution	≤ 1 foot
length of GeoMat	GeoMat extends to within 1' of the ends walls of the

	distribution cell. K = 1′
Number of observation pipes per distribution cell	≥ 2
Location of Observation Pipes	At very end of each cell
Design and Installation of observation pipes installed in Geo mat	1. Have an open bottom 2. Have a nominal pipe size of 4" 3. The 1" is slotted 4 Slots are ≥ 1/4" and ≤ 1/2" in width and located on opposite sides. 5. Anchored in a manner that will prevent the pipe from being pulled out 6. Extend from the infiltrative surface up to finished grade or above. 7. terminate with a removable water tight cap, or 8. Terminate with a vent cap if ≥ 12" above finished grade
Effluent application to distribution cell	1. If DWF < 1500 gpd, effluent may be applied by gravity flow, dosed to distribution cell or distribution box, then applied by gravity flow to the distribution cell, or by use of pressure distribution, unless pressure distribution is required in accordance with s. SPS 383.44 (5) (b) 2. If DWF ≥ 1500 gpd, effluent must be dosed to distribution cell or distribution box, then applied by gravity flow to the distribution cell, or by use of pressure distribution, unless pressure distribution is required in accordance with s. SPS 383.44 (5) (b)
Septic tank effluent pump system	Meets requirements of s. SPS 384.10, Wis. Adm. Code and this manual
Dose tank or compartment volume employing duplex pumps	≥ Volume of a single dose + drain back volume[a] + (6 inches x average gal/inch of tank)[b] Notes: a: Drain back volume ≥ volume of wastewater that will drain into the dose tank from the force main. b: Four inches of this dimension ≥ vertical distance from pump intake to bottom of tank. Two inches of this dimension ≥ vertical distance between pump on elevation and high water alarm activation elevation.
Siphon tank or compartment volume	≥ What is required to accommodate volumes necessary to provide dosing as specified in this manual

Distribution network for pressurized distribution systems. Note: Pressure distribution is required when soils or effluent meets parameters of s.3 83.44 (5), Wis. Adm. Code	By use of pressure distribution network conforming with the sizing methods of either Small Scale Waste Management Project publication 9.6, entitled "Design of Pressure Distribution Networks for Septic Tank – Soil Absorption Systems" or Dept. of Commerce publications SBD-10573-P or SBD-10706-P, entitled Pressure Distribution Component Manual for Private Onsite Wastewater Treatment Systems".
Vent pipes installed in GeoMat system	1. Connect to a gravity flow distribution lateral by the use of a fitting 2. Have a nominal pipe size of 4 inches 3. Extend from the distribution lateral ≥ 12 inches above finish grade 4. Terminate in a manner that will allow a free flow of air between the distribution lateral and the atmosphere 5. The vent opening port is downward
Combination observation/vent pipes installed in a GeoMat system	Meets all of the requirements of observation pipes with the following exceptions: 1. Have a minimum 4 inch pipe connection to a distribution lateral 2. Connect to the vent pipe at a point above the GeoMat 3. Extend from the infiltrative surface ≥ 12 inches above finish grade 4. Terminate in a manner that will allow a free flow of air between the distribution lateral and the atmosphere 5. The vent opening port is downward
Cover material over the geotextile fabric	Soil that will provide frost protection, prevent erosion and excess precipitation or runoff infiltration and allow air to enter the distribution cell
Installation inspection	In accordance with ch. SPS 383, Wis. Adm. Code
Management	In accordance with ch. SPS 383, Wis. Adm. Code and this manual

Table 4 Public Facility Wastewater Flows		
Source	**Unit**	**Estimated Wastewater Flow (gpd)**
Apartment or Condominium	Bedroom	100
Assembly hall (no kitchen)	Person (10 sq. ft./person)	1.3
Bar or cocktail lounge (no meals served)	Patron (10 sq. ft./patron)	4
Bar or cocktail lounge* (w/meals – all paper service)	Patron (10 sq. ft./patron)	8
Beauty salon	Station	90
Bowling alley	Bowling lane	80
Bowling alley (with bar)	Bowling lane	150
Camp, day and night	Person	25
Camp, day use only (no meals served)	Person	10
Campground or Camping Resort	Space, with sewer connection and/or service building	30
Campground sanitary dump station	Camping unit or RV served	25
Catch basin	Basin	65
Church (no kitchen)	Person	2
Church* (with kitchen)	Person	5
Dance hall	Person (10 sq. ft./person)	2
Day care facility (no meals prepared)	Child	12
Day care facility* (with meal preparation)	Child	16
Dining hall* (kitchen waste only without dishwasher and/or food waste grinder)	Meal served	2
Dining hall* (toilet and kitchen waste without dishwasher and/or food waste grinder)	Meal served	5
Dining hall* (toilet and kitchen waste with dishwasher and/or food waste grinder)	Meal served	7
Drive-in restaurant* (all paper service with inside seating)	Patron seating space	10
Drive-in restaurant* (all paper service without inside seating)	Vehicle space	10
Drive-in theater	Vehicle space	3
Employees (total all shifts)	Employee	13
Floor drain (not discharging to catch basin)	Drain	25
Gas station / convenience store	Patron (minimum 500 patrons)	3
Gas station (with service bay) Patron Service bay	 Patron Service bay	 3 50
Hospital*	Bed space	135
Hotel, motel or tourist rooming house	Room	65
Medical office building Doctors, nurses, medical staff Office personnel Patients	 Person Person Person	 50 13 6.5
Migrant labor camp (central bathhouse)	Employee	20
Mobile Home (Manufactured home) (served by its own POWTS)	Bedroom	100
Mobile home park	Mobile home site	200

Table 4 Public Facility Wastewater Flows (continued)		
Source	**Unit**	**Estimated Wastewater Flow (gpd)**
Nursing, Rest Home, Community Based Residential Facility	Bed space	65
Outdoor sport facilities (toilet waste only)	Patron	3.5
Parks (toilets waste only)	Patron (75 patrons/acre)	3.5
Parks (toilets and showers)	Patron (75 patrons/acre)	6.5
Public shower facility	Shower taken	10
Restaurant*, 24-hr. (dishwasher and/or food waste grinder only)	Patron seating space	4
Restaurant*, 24-hr. (kitchen waste only without dishwasher and/or food waste grinder)	Patron seating space	12
Restaurant, 24-hr. (toilet waste)	Patron seating space	28
Restaurant*, 24-hr. (toilet and kitchen waste without dishwasher and/or food waste grinder)	Patron seating space	40
Restaurant*, 24-hr. (toilet and kitchen waste with dishwasher and/or food waste grinder)	Patron seating space	44
Restaurant* (dishwasher and/or food waste grinder only)	Patron seating space	2
Restaurant* (kitchen waste only without dishwasher and/or food waste grinder)	Patron seating space	6
Restaurant (toilet waste)	Patron seating space	14
Restaurant* (toilet and kitchen waste without dishwasher and/or food waste grinder)	Patron seating space	20
Restaurant* (toilet and kitchen waste with dishwasher and/or food waste grinder)	Patron seating space	22
Retail store	Patron (70% of total retail area ÷ 30 sq. ft. per patron)	1
School* (with meals and showers)	Classroom (25 students/classroom)	500
School* (with meals or showers)	Classroom (25 students/classroom)	400
School (without meals or showers)	Classroom (25 students/classroom)	300
Self-service laundry (toilet waste only)	Clothes washer	33
Self-service laundry (with only residential clothes washers)	Clothes washer	200
Swimming pool bathhouse	Patron	6.5

* = May be high strength waste

II. DESCRIPTION AND PRINCIPLES OF OPERATION

Construction of Synergy GeoMat In-ground system must consist of the following components

1. In-ground soil absorption component operation is a two-stage process involving both wastewater treatment and dispersal. Treatment is accomplished predominately by physical and biochemical processes within the treatment/dispersal zone. The physical characteristics of the influent wastewater, influent application rate, temperature, and the nature of the receiving soil affect these processes.

Physical entrapment, increased retention time, and conversion of pollutants in the wastewater are important treatment objectives accomplished under unsaturated soil conditions. Pathogens contained in the wastewater are eventually deactivated through filtering, retention, and adsorption by in situ soil.

Dispersal is primarily affected by the depth of the unsaturated receiving soil, the soil's hydraulic conductivity, influent application rate, land slope, and the area available for dispersal.

The in-ground soil absorption component consists of a distribution cell. Influent is discharged to the distribution cell where it flows through the void area formed by perforated pipe, GeoMat and then passes into the underlying 12" of ASTM c33 sand and then ultimately to the in situ soil for treatment and dispersal to the environment. The soil, to the prescribed depth, beneath the distribution cell is considered part of the cell known as the treatment/dispersal zone. See Figure 1 and 2.

Cover material over the geotextile fabric is to provide frost protection, erosion protection, a conduit for to excess precipitation or runoff infiltration, and allows oxygen transfer.

The GeoMat component and in situ soil within the treatment/dispersal zone provide the physical and biochemical treatment for the influent.

Figure 1 Cross section of in-ground GeoMat system 39" wide

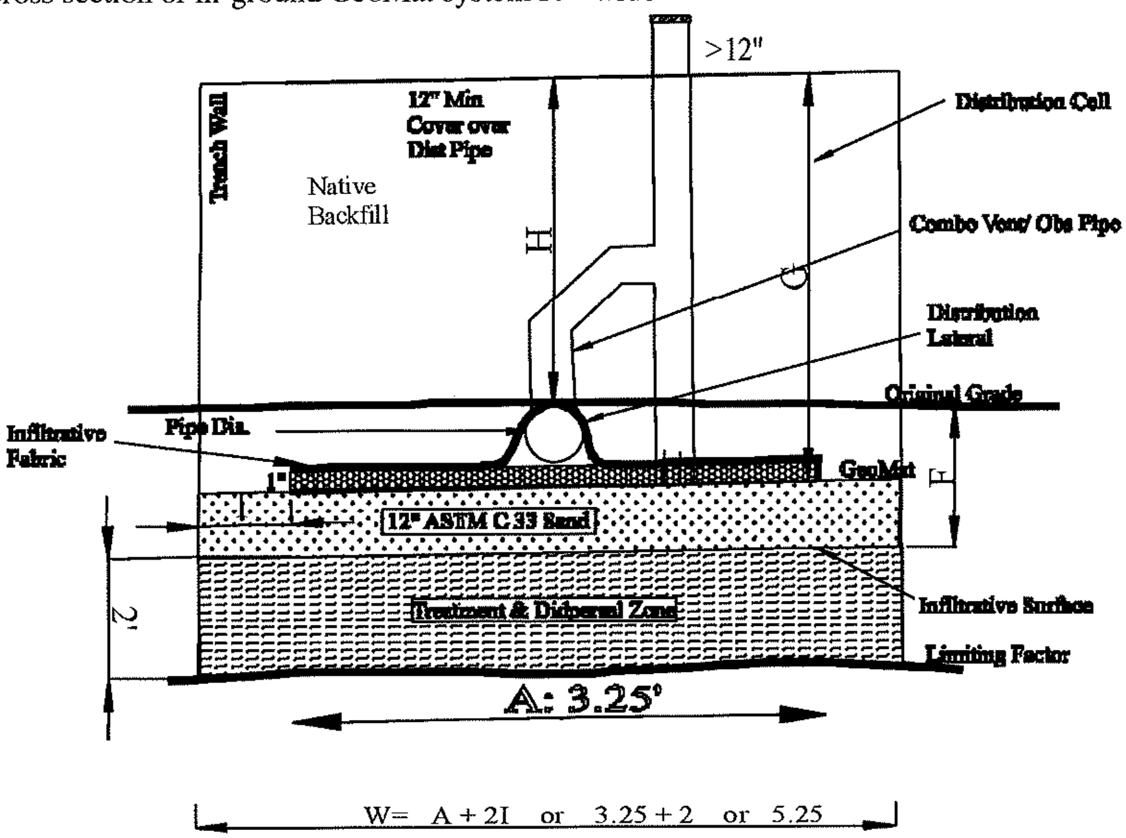
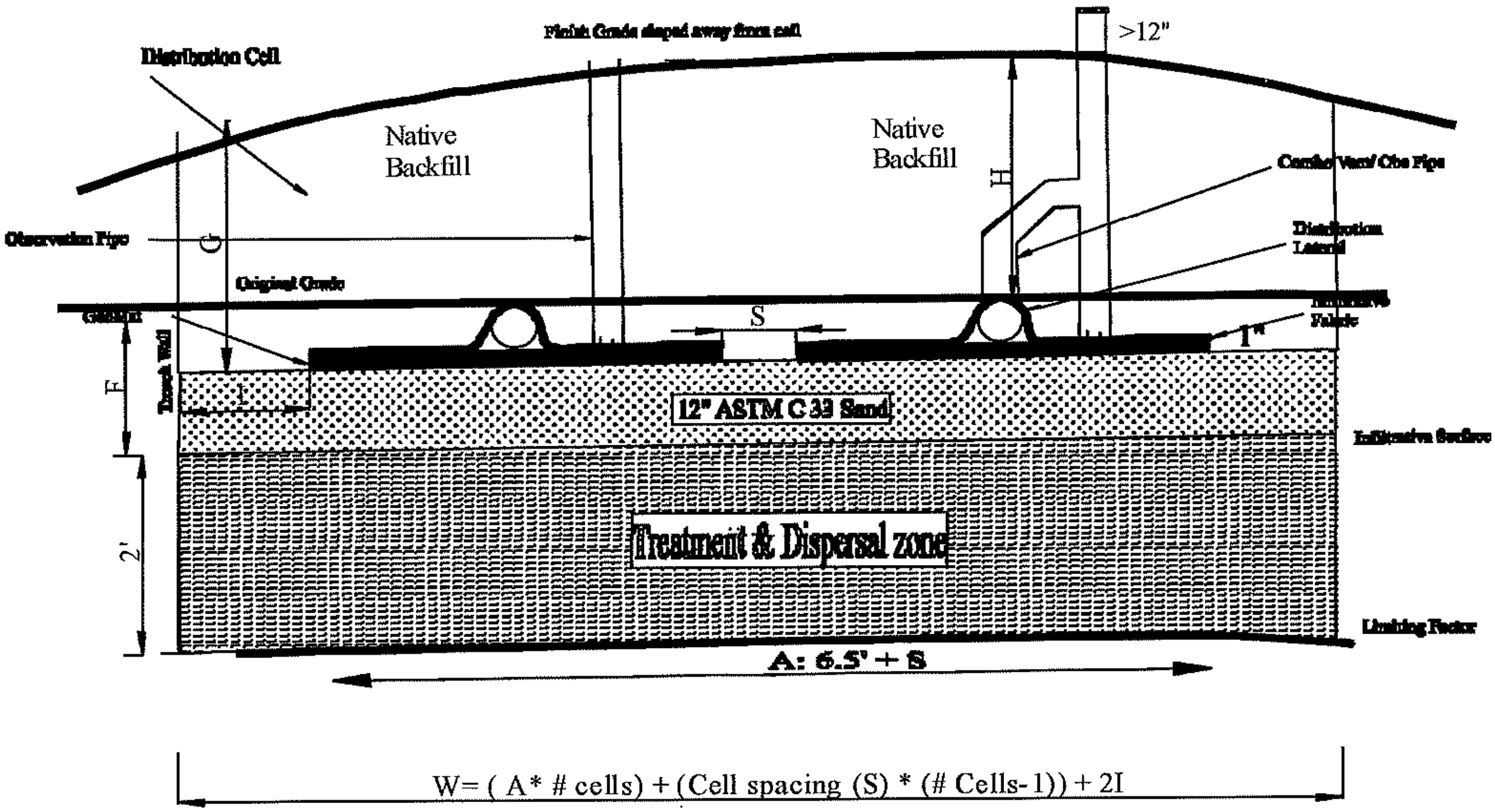


Figure 2 Cross section of in-ground GeoMat system 78" wide



2. **GeoMat 3900 Flat Leaching System From Geomatrix:** GeoMat is a patented soil-based treatment system that has earned NSF 40 Certification. It utilizes a hydroscopic membrane with a transmissive core. Physical properties consist of fused entangled plastic filaments with a geotextile fabric on the top and bottom.

   GeoMat has a thin profile (1") that maximizes contact with the soil and enhances oxygen transfer. Together, the geotextile fabric and the entangled filament pull the water across the entire surface of the mat, maximizing oxygen transfer.

   A perforated pipe is installed on top of the core and covered with another layer of geotextile fabric.

   GeoMat increases removal of BOD, TSS, pathogens, and nutrients such as nitrogen and phosphorus. When used with 12" ASTM C33 sand placed directly under the mat, GeoMat provides maximum treatment of effluent and infiltration of wastewater into soil.

3. **Filters.** 2 Required. The septic tank effluent filter provides primary protection for all distribution systems from suspended solids. The PSI filter provides secondary protection for all distribution systems from suspended solids. In some cases only 1 filter may be used. See table 1.

4. **Orifice Shields. (PSI Distribution)** This orifice shield is designed for holes that point down. Sim/Tech orifice shields are designed to protect the discharge holes in pressurized systems from the outside. The GeoMat POWTS Treatment System is designed with specific flow rates and pressure heads to obtain even distribution to the leach field. Placing the shield over the pipe is easy and no part of the shield can block the distribution hole.

III. DEFINITIONS

Definitions not found in this section are located in ch. SPS 381, WI Adm. Code or the terms use the standard dictionary definition.

A. "Cobbles" means rock fragments greater than 3 inches, but less than 10 inches in diameter.

B. "Septic tank effluent system" means a septic tank that has a pump installed in the tank that will pump the effluent from the clear zone.

C. "Site plan" means a scaled or completely dimensioned drawing, drafted by hand or computer added technology, presented in a permanent form that shows the relative locations of setback encumbrances to a regulated object. The site plan also includes a reference to north and the permanent vertical and horizontal reference point or benchmark.

D. "Stones" means rock fragments found in soil material that are greater than 10 inches in diameter, but less than 24 inches.

IV. SOIL AND SITE REQUIREMENTS

Every in-ground soil absorption component design is ultimately matched to the given soil and site.

The design approach presented in this manual is based on criteria that all applied wastewater is successfully transported away from the system, that it will not affect subsequent wastewater additions that the effluent is ultimately treated and the reaeration of the infiltrative surface will occur.

A. Minimum Soil Depth Requirements

The minimum soil factors required for successful in-ground soil absorption component performance are listed in the introduction and specification section of this manual.

Soil evaluations must be in accordance with ch. SPS 385 of the WI Adm Code. In addition, soil application rates and depth must be in accordance with ch. SPS 383 of the WI Adm Code.

B. Other Site Considerations

1. In-ground soil absorption component location – In open areas, exposure to sun and wind increases the assistance of evaporation and transportation in the dispersal of the wastewater.
2. Sites with trees and large boulders – Generally, sites with large trees, numerous smaller trees or large boulders are less desirable for installing an in-ground soil absorption component because of difficulty preparing the distribution cell area. As with rock fragments, tree roots, stumps and boulders occupy area, thus reducing the amount of soil available for proper treatment. If no other site is available, trees in the distribution cell area must be removed.
3. Setback distances – The setbacks specified in SPS 383 WI Adm Code for soil subsurface treatment/dispersal component, apply to in-ground soil absorption components. The distances are measured from the edge of the distribution cell area.

V. COVER MATERIAL

The cover material is of such quality as it is placed so that it will not damage the GeoMat. Clays are not recommended as they can restrict oxygen transfer. The cover material must not be compacted while being placed since compaction will reduce vegetative growth and oxygen transfer.

VI. DESIGN

A. Location, Size, and Shape – Placement, sizing and shaping of the GeoMat in-ground system must be in accordance with this manual.

B. Component Design – Design of the component is based upon the DWF and the soil characteristics. It must be sized such that it can accept the daily wastewater flow without causing surface seepage or groundwater pollution. Consequently, the basal area must be sufficiently large enough to absorb the effluent from the GeoMat component. The GeoMat Component must also be deigned to avoid encroachment of the water table into the treatment and dispersal zone. See Figure 3

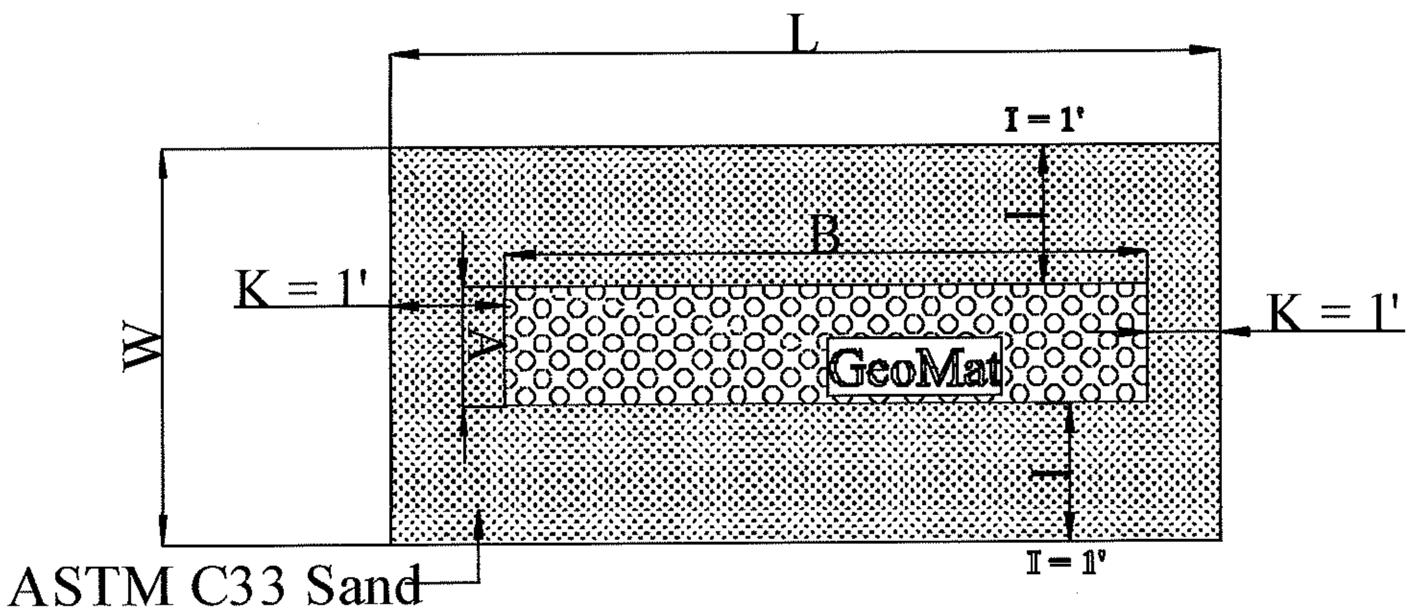


Figure 3 Level in Ground system

Design of the component includes three major steps, which are: (A) calculating DWF,
(B) calculating soil infiltration area of in situ soil, for basal area and (C) design of the distribution cell (D) Sizing the In Ground system. Each step is discussed below.

Step A: Design Wastewater Flow Calculations
One and two-family dwellings
150 gal/day/bedroom

Public Facilities
Distribution cell size for public facilities application is determined by calculating the DWF using Table 4 in this manual.

Sizing –GeoMat Systems for Public Facilities is done on an individual site basis

Step B: Sizing the in-situ soil basal Area – The required infiltrative basal area is based on the DWF and the slowest soil application rate of the in situ soil at the infiltrative surface or lower horizon if the lower horizon adversely affects the dispersal of wastewater in accordance with s. SPS 383.44 (4) (a) and (c). Wastewater application rates to the soil are found in ch. SPS 383, Tables 1 and 2, column 2, WI Adm Code.

Using the above information, the required distribution cell area can be determined using the following formula:

Basal Area = DWF ÷ Application rate of the in situ soil in accordance with s. SPS 383.44 (4) (a) and (c), WI Adm Code. Note: This area may include more than one dispersal cell.

Step C: Distribution Cell Component Configuration –GeoMat may be placed side by side with a minimum of 1' in between cells. The loading rate for GeoMat to sand is 2.0 GPD/SQFT. Accept that 2.2 GPD/SQFT is allowed on 1.6GPD/SQ TF soils, per Table 1. Length and width of the distribution cell can be almost limitless accept that linear loading rates for soils with less than 0.3 GPD/sq ft loading, setback requirements of s. SPS 383.44 Table 2, WI Adm Code and soil evaluation results may restrict options. See figure 7 for ideas.

The dimensions of the distribution cell are calculated using Formulas 1 or 2. Formula 1 is used when the in situ soil has a soil application rate of greater than 0.3-gal/sq. ft./day.

Formula 2 must be used to check for linear loading rate for the system when the in situ soil within 12" of the fill material has a soil application rate of ≤0.3 gal/sq.ft. /day the linear loading rate may not exceed 4.5 gal/sq.ft. /day.

Formula 1

Area of distribution cell = A x B

Where: A = Distribution cell width:(Individual GeoMat cell width is 3.25'

B = Distribution cell length

*Use formula 2 to confirm linear loading rate of cell is ≤4.5 gal/sq.ft. /day. If dictated by soil application rate ≤0.3 GPD/sq. ft

Formula 2

Linear Loading Rate = DWF ÷ B

Where DWF = Design wastewater flow

B = Distribution cell length

Step D:Sizing the in ground system -

1. GeoMat Component Height – GeoMat plus nominal pipe size + 12" ASTM C33 Sand

Component Height = F

Note: Sand fill depth the same across whole component

2. Cover Material – The cover material (H) provides frost protection, a suitable growth medium for vegetation, and evapotranspiration. The design uses 12" above the distribution Component (H).

3. In situ soil basal Area (B X W) – The length and width of the entire component are dependent upon the length (B) and width(A) of the distribution cell. The fill length consists of end slopes (K) and the distribution cell length (B). Where K is a constant 1'. The fill width consists of the GeoMat cell width(3.25'), # of Cells, cell spacing (S), and the(I) dimension (1') needed to obtain the adequate basal area. See Formula 1, 2 and figure 3.

NOTE: I dimension is 1'
NOTE: K does not factor into basal area calculation

Basal Area = (Cell length) *[((3.25 * # Cells) + (2I) + (cell spacing * # cells-1))]
If only 1 cell:
Basal Area = (Cell length) *[((3.25 * # Cells) + (2I)

If more than 1 cell is to be used:
In this application all numbers are known accept cell spacing. Use 3 formulas to solve for cell spacing:

$$\text{Cell Spacing} = \frac{[(\text{Basal area needed} \div \text{cell length})] - [(\text{Cell Width} * \#\ \text{Cells}) + 2I]}{(\#\ \text{cells} - 1)} \qquad \text{Formula 3}$$

Basal area is known
Cell length is known
Cell width is known
cells are known
** I dimension is 1'

Distribution cell to be centered in the infiltrative area

Distribution Cell Height (F)
The distribution cell height provides effluent storage, oxygen transfer and support of the piping within the distribution cell. The minimum height of the distribution cell, when GeoMat is used in gravity distribution components is 15-17 inches. Or Psi distribution is 13 inches plus nominal pipe size. See Figure 4.

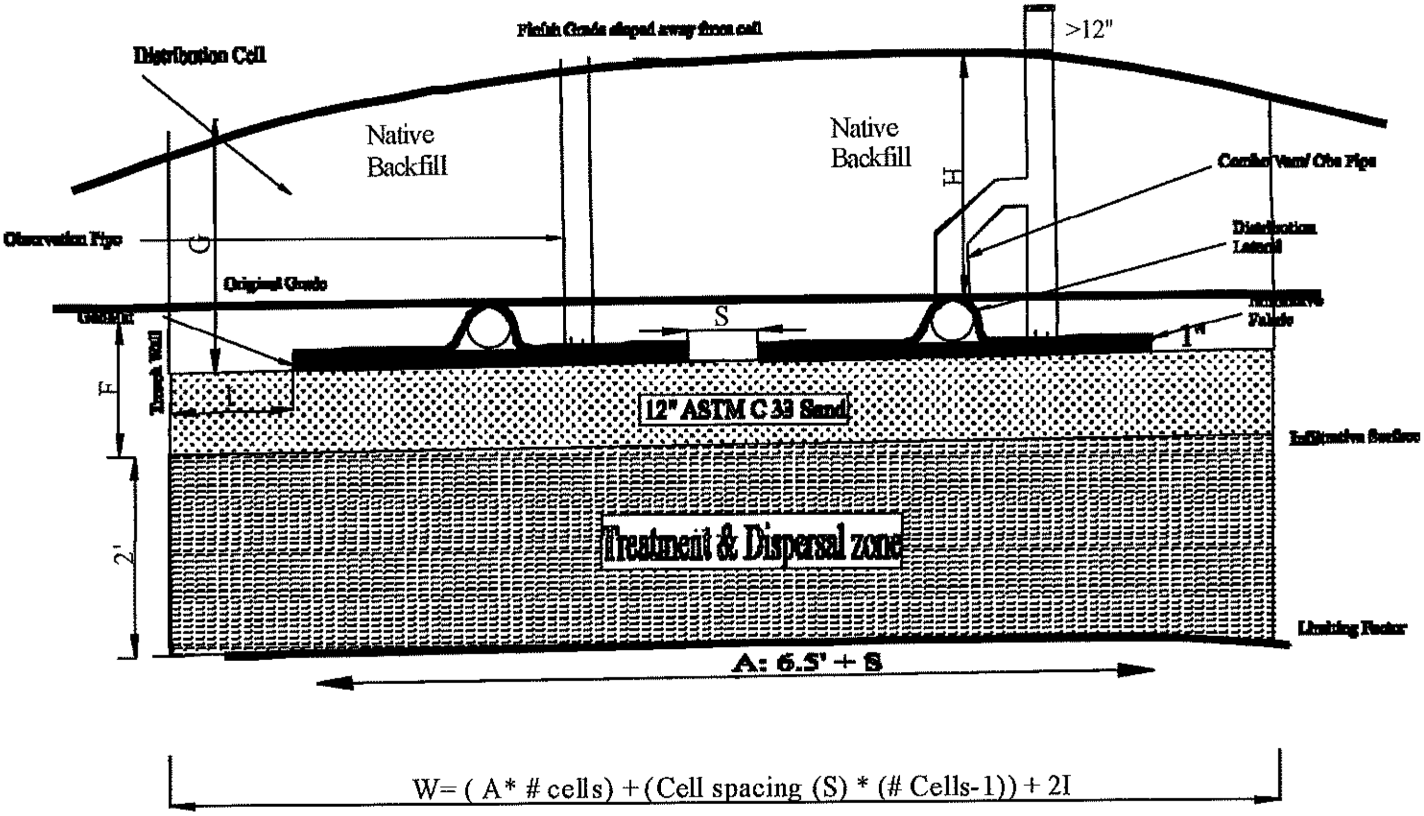


Figure 4 Height of system using GeoMat

Cover Material

A minimum of 12" of cover material must be paced over the top of pipe. Finished grade of the cover material must be at or above the surrounding land surface elevation. Depressed areas over the distribution cell that collect and retain surface water runoff must be avoided. H must be 12" across entire cell. And 12" above ASTM c 33 sand (G) where not over Cell. See figure 4.

Distribution Network and Dosing Component

The effluent application to the distribution cell may be gravity or pressure. Distribution boxes or drop boxes may be used to distribute effluent to gravity feed distribution cells. Distribution piping for gravity component has a nominal inside diameter if 4". The distribution header pipe is non perforated pipe. The slope of gravity flow perforated distribution piping is less than or equal to 4" per 100' away from distribution boxes, drop boxes or header. When a drop box design is used, the invert of the drop box overflow pipe must be at least 4" lower than the invert of the treatment tank outlet or force main connection.

The design and installation of distribution boxes must be watertight and capable of providing a means of providing equal distribution of effluent to each distribution cell. Drop boxes must be watertight and capable of distributing effluent to another distribution cell.

Components that are designed to receive a DWF greater than 1500 gal/day, dose the effluent to the distribution cell by means of a pump or siphon. The dose chamber shall contain sufficient volume to dose the distribution cell as required by its system design, retain drain back volume, contain a one day reserve zone, provide a minimum 2" separation between alarm activation and pump-on activation, and allow for protection of the pump from solids.

Drain back volumes can be calculated based on values listed in Table 5.

Table 5 VOID VOLUME FOR VARIOUS DIAMETER PIPES BASED ON NOMINAL I.D.[a]	
Nominal Pipe Size	Gallons per Foot
1-1/4	0.064
1-1/2	0.092
2	0.163
3	0.367
4	0.65
6	1.469

Note a: Table is based on - $\pi(d/2)^2$ x 12"/ft ÷ 231 cu.in./cu.ft.
Where: d = nominal pipe size in inches

A reserve capacity is required on a system with only one pump. The reserve volume must be equal to or greater than the estimated daily wastewater flow. Reserve capacity must be calculated using 100 gallons per bedroom per day for one and two family residences or the values computed by using Table 4.

The dose volume shall be included in the sizing of the dose chamber. (Volume of a septic tank effluent pump system is determined by department plumbing product approval.)

The pump alarm activation point must be at least 2" above the pump activation point.

Allow "dead" space below the pump intake to permit settling of solids in the dose chamber. This can be accomplished by placing the pump on concrete blocks or other material that can form a pedestal.

The pump manufacturer's requirement shall be followed. This may include the "pump off" switch being located high enough to allow for complete emersion of the pump in the dose chamber.

Observation pipes are installed in the distribution cells and are provided with a means of anchoring to prevent them from being lifted up. Observation pipes extend from the Bottom of GeoMat to the point at or above the finished grade. The portion of the observation pipe below the distribution pipe is slotted while the portion above the distribution pipe is solid wall. Observation piping has a nominal pipe size of 4". (See figure 5)

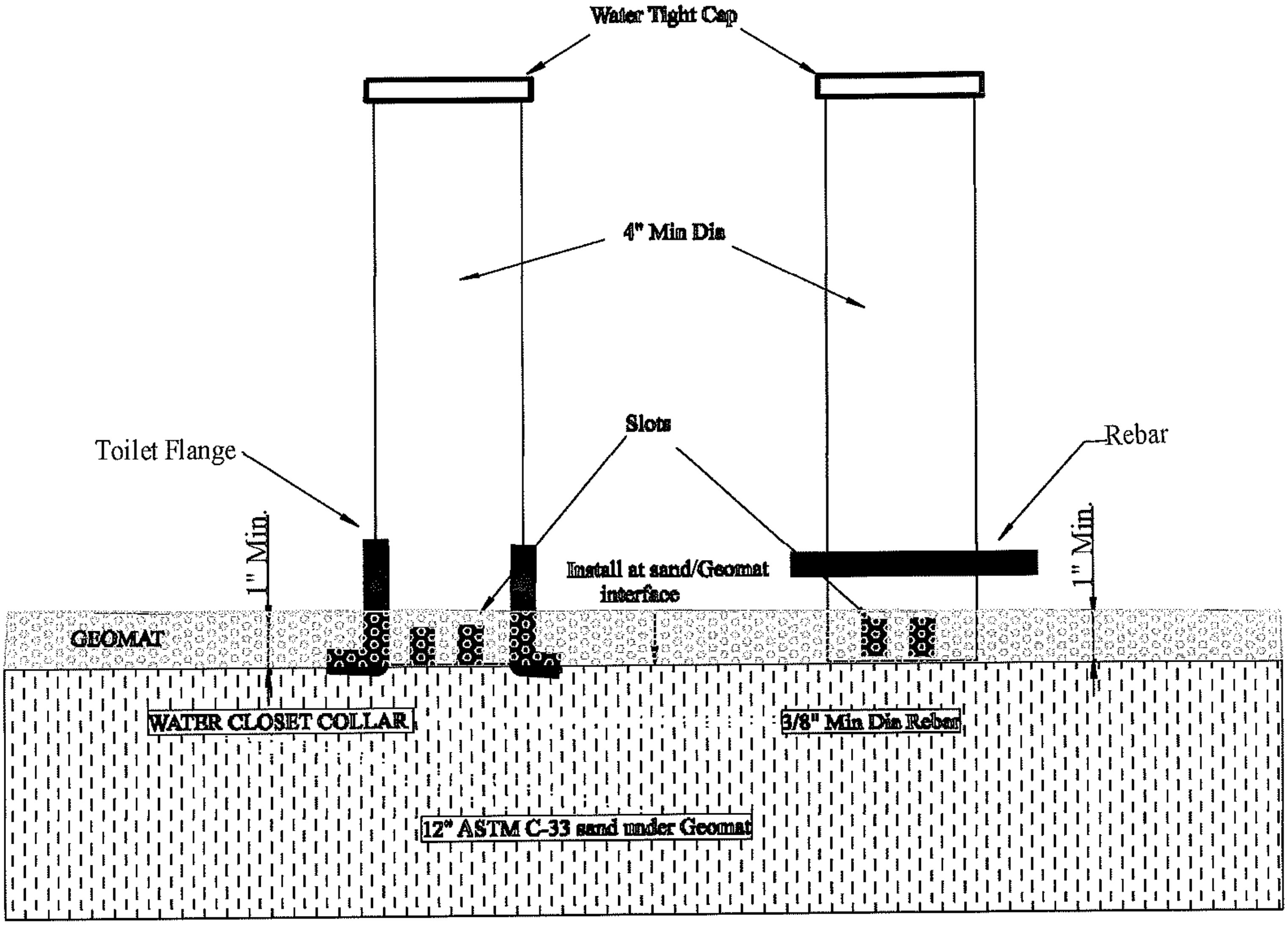


FIGURE 5

Vent pipes, if installed, connect to the upper half of the gravity flow distribution laterals and extend up to at least 12" above finish grade. Vent pipes terminate from the vent opening facing downward by means of a vent cap or fittings. Vent caps must allow a free flow of air between the distribution lateral and the atmosphere. All vent pipes has a nominal size of 4"

When a vent pipe is connected to an observation pipe, the point of connection shall be made at a point above the GeoMat and terminate as required for vent pipes.

An observation pipe may serve as a combination observation/vent pipe providing it terminates in the same manner as required for vent pipes. (See figure 6)

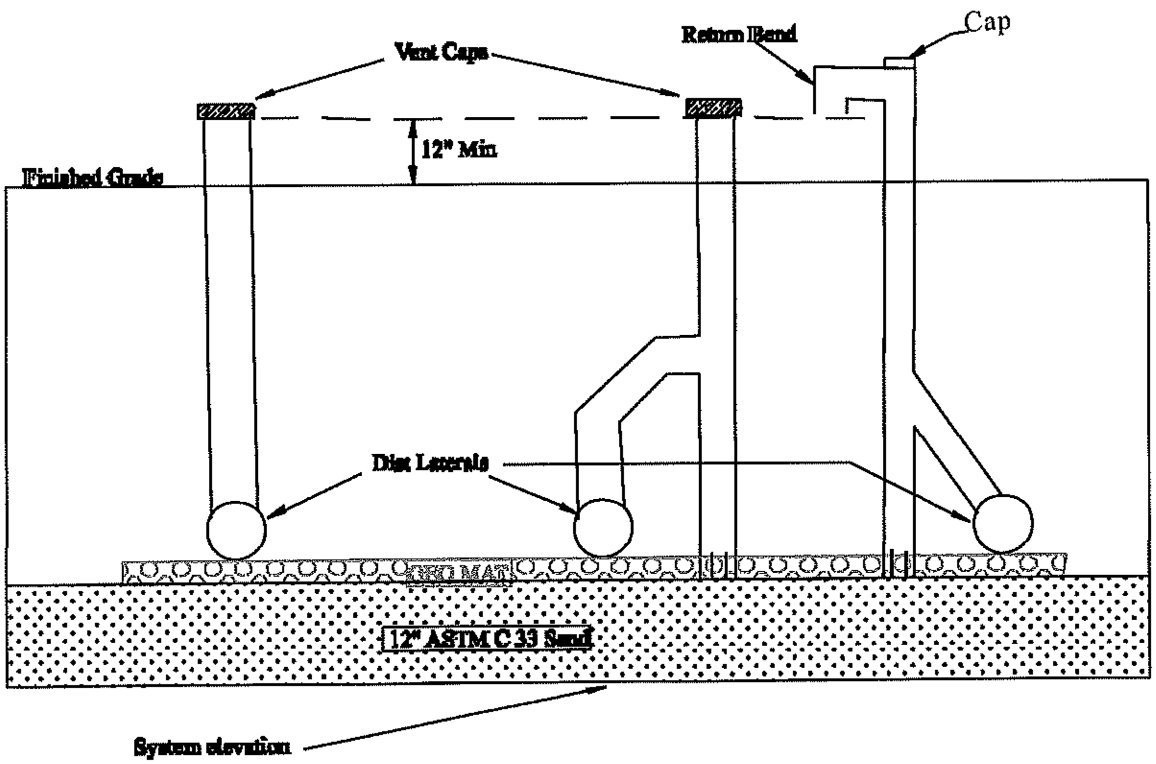


Figure 6

VII. SITE PREPERATION AND CONSTRUCTION

Procedures used in the construction of an in-ground absorption component are just as critical as design of the component. A good design with poor construction results in component failure. It is emphasized that the soil only be worked when the moisture content is low to avoid compaction and smearing. Consequently, installations are made only when the soil is dry enough to prevent compaction and smearing of the infiltrative surface. The construction plan to be followed includes:

A. Equipment – Proper equipment includes track machines or other equipment that will not compact the infiltrative surface. Minimize foot traffic on infiltrative surface and avoid equipment traffic on or over infiltrative surface.

B. Sanitary Permit – Prior to the construction of the component, a sanitary permit, obtained for the installation, must be posted in a clearly visible location on the site. Arrangements for inspection(s) must also be made with the department or governing unit issuing the sanitary permit.

C. Construction Procedures

1. Check the moisture content and condition of the soil at system elevation and several inches below as needed. If the soil at the infiltrative surface can be rolled into a ¼" wire, the site is to wet, smearing and compaction will result, thus reducing the infiltrative capacity of the soil. If the site is too wet, do not proceed until it dries out. If the soil at or below the infiltrative surface is frozen, do not proceed.

2. Set up a construction level or similar device and determine all relative elevations in relationship to the benchmark. If it is necessary to determine the bottom elevation of the distribution cell, land surface contour lines, and appropriate component elevations critical to the installation.

3. Lay out the absorption area within the tested designated area. When possible lay out the absorption area(s) on the site so that the distribution cell runs parallel with the land surface contours. Reference stakes offset from the corner stakes are recommended in case corner stakes are distributed during construction.

4. Excavate the infiltrative cell (basal area) + K dimension to the bottom elevation (system elevation) taking care not to smear the infiltrative surface. If the infiltrative surface or sidewalls are smeared, loosen it up with the use of a rake or similar device. The infiltrative surface can be left rough and should not be raked smooth.

5. Place 12" of ASTM C33 sand on scarified non-compacted insitu soil that is free of debris and rocks. This will be over the entire area required based on basal loading rate.

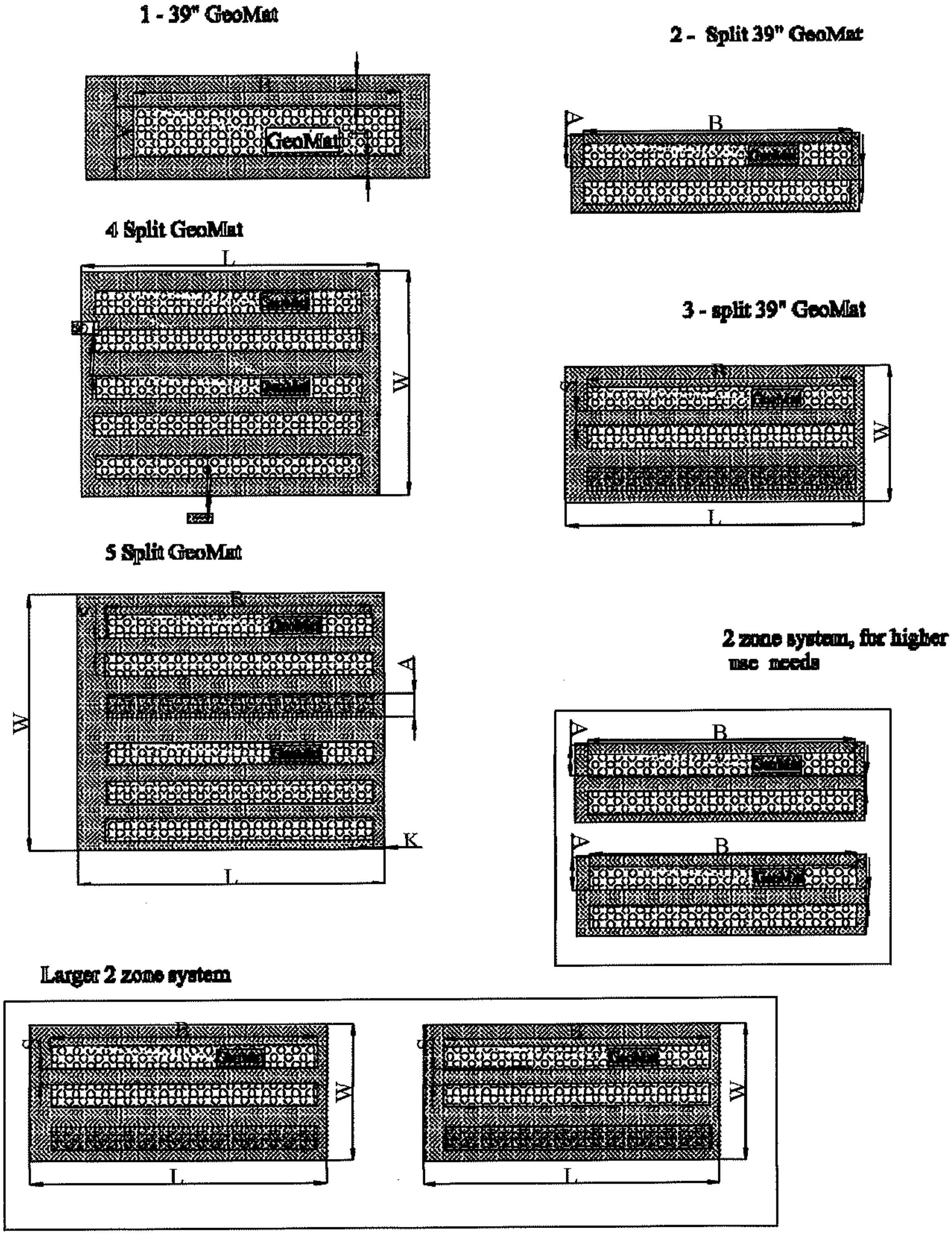
6. Place GeoMat on Sand fill. GeoMat to be 1' from end walls and equally spaced from side wall depending on I dimension. See formula 3.

7. Install observation pipes with the bottom 1" of the pipe slotted. Installation of the observation pipe includes a suitable means of anchoring so the pipes are not dislodged during inspections. Observation pipes will be installed in each distribution cell so as to be representative of a cell's hydraulic performance. Observation pipes shall be located at least 4' from the end wall and sidewall; and be installed at an elevation to view the horizontal or level infiltrative surface within the dispersal cell. Use heavy utility knife to make cut outs for obs. pipes in GeoMat.

8. Place distribution pipes as determined from design, under fabric and on top of GeoMat material. Connect the distribution box, drop box or header from the treatment or dosing tank.

9. Install vent pipe if 1 is to be used as prescribed in Figure 6

10. Place cover material over fabric. Avoid cobbles, stones or frozen material that could damage pipe, GeoMat, or fabric,



Some ideas on component configuration. Basal loading rate, # Bedrooms, and site constraints will need to be considered when designing.

Figure 7

VIII. GEOMAT IN GROUND WORKSHEET

A. SITE CONDITIONS

Evaluate the site and soils for the following:

- Surface water movement.
- Measure elevations and distances on the site so that slope, contours, and available areas can be determined.
- Determine the limiting conditions such as bedrock, high groundwater level, soil application rates, and setbacks.
- Description of several soil profiles where the system will be located.

Slope - ____%

Occupancy – One or two-family dwelling: _______ (number of bedrooms)

Public facility gallons per day ______ (Estimated water flow)

Depth to limiting factor _______ inches

Minimum depth of unsaturated soil required by table 383.44-3, Wis. Adm. Code__24__ inches

In Situ Soil application rate of in situ soil used _______ gal/sq.ft. /day

FOG value of effluent applied to component ≤ _20_ mg/L

BOD5 value of effluent applied to component ≤ _180_mg/L

TSS value of effluent tied to component ≤__50__ mg/L

Fecal coliform monthly geometric mean value of effluent tied to component ≥ 10^4 CFU /100mg

__X__Yes ________ No

Type of Dist. Cell---GeoMat

B. DESIGN WASTEWATER FLOW

One and two-family dwelling

Combined wastewater flow:

DWF = 150 gal/day/ bedroom x number of bedrooms

= 150 gal/day/bedroom x # of bedrooms

= 150 gal/day/bedroom x _________bedrooms

= ______ gal/day

Clearwater and greywater only:

DWF = 90 gal/day/bedroom x # of bedrooms
= 90 gal/day/bedroom x ________ # of bedrooms

= gal/day

Blackwater only:

DWF = 60 gal/day/bedroom x # of bedrooms

= 60 gal/day/bedroom x ________ # of bedrooms

= gal/day

<u>Public Facilities</u>

DWF = Estimated wastewater flow x 1.5

= ________ gal/day x 1.5

= ________ gal/day

C. WIDTH AND LENGTH OF THE DISTRIBUTION CELL

1. Determine the Design Loading Rate (DLR) for the site.

From Table 383.44-2, WI Adm Code, select the soil application rate for the most restrictive soil horizon at the infiltrative surface or a lower horizon of the the lower horixz=zon adversely affects the dispersal of wastewater in accordance with SPS 383.44 (4) (a) and (c).
The Design Loading Rate (DLR) is the soil application rate taken form Table 383.44-2 WI adm Code.

DLR = ________ gpd/ ft^2

2. Determine the Infiltrative basal area.

Calculate the distribution cell area by dividing the daily Design Wastewater Flow (DWF) by the Design Loading Rate (DLR).

Infiltrative basal area = DWF ÷ DLR

Infiltrative basal area = ________ gpd ÷ __________ gpd/ft^2

Infiltrative basal area = __________ ft^2

3. Determine size of distribution cell

Loading rate of fill material = ______ ≤ 1.0 gal/sq.ft./day if BOD_5 or TSS ≥ 30 mg/L

or = _____ ≤ 2.0 gal/sq.ft./day if BOD5 or TSS ≤30 mg

= _____ ≤ 2.2 gal/sq.ft./day if BOD5 or TSS ≤30 mg/L **<u>&</u>** 1.6 gal/sq ft/ day soil application rate

b. Bottom area of distribution cell = Design wastewater flow ÷loading rate of fill material as determined in C.1 a.

Distribution cell area = _____ gal/day÷_____ gal/ft^2./day

Distribution cell area =_____ ft^2

4. Distribution Cell Configuration
   OPTIONS—3.25'

a. Distribution cell width(s) (A) = 3.25 feet and the number of distribution

cells = _____cells.

b. Distribution cell length (B) = Bottom area of distribution cell ÷ width of distribution cell.

B = _____ ft^2. ÷ (Distribution cell area required) ÷ _____ft. (A)

B = _____or _____ft

c. Check distribution cell length (B)

5. Basal Area calculation

Basal Area required = (Cell length) *[((3.25 * # Cells) + (2I) + (cell spacing * # cells-1))]
If only 1 cell:
Basal Area = (Cell length) *[((3.25 * # Cells) + (2I)

If more than 1 cell is to be used:
In this application all numbers are known accept cell spacing. Use 3 formula to solve for cell spacing:

Cell Spacing = [(Basal area needed ÷ cell length)] - [(Cell Width * # Cells) +2I] / (# cells -1) Formula 3

Basal area is known
Cell length is known
Cell width is known
cells is known
** I dimension is 1'

Cell spacing(S) = _____' minimum S dimension is 1'

Now that S is known:

Basal Area required = (Cell length) *[((3.25 * # Cells) + (2I) + (cell spacing * # cells-1))]
If only 1 cell:
Basal Area = (Cell length) *[((3.25 * # Cells) + (2I)

Basal Area = _____ Sq. FT Check basal area _____ proposed, _____ required

6. Total Length and Width (L X W)
   L = Cell length + 2K   K is always 1
   L = _____'

   W = (Cell width * # Cells) + 2I + (Cell spacing * (# Cells -1))
   W = ______'

7. Linear loading rate

   Linear loading rate ≤ Design wastewater flow ÷ Cell length (B) or effective cell length for a concave mound.

   Linear loading rate ≤ ______ gal/day ÷ ______feet

   Linear loading rate ≤ _______ gal/ft/day

   Linear loading rate for systems with in situ soils having a soil application rate of ≤ 0.3 gal/ ft^2/day within 12 inches of original grade must be less than or equal to 4.5 gal/ft/day.

   Is the linear loading rate ≤ what is allowed? _____ Yes ___ No -----If no, then the length and width of the distribution cell must be changed so it does.

   Distribution cell length B = Design Wastewater Flow ÷ Maximum Linear Loading Rate

   Distribution cell length B = ____ gal/day ÷ ____ gal/ft/day

   Distribution cell length B = ________ ft.

IX. GEOMAT MOUND WORKSHEET EXAMPLE

A. SITE CONDITIONS

Evaluate the site and soils for the following:

- Surface water movement.
- Measure elevations and distances on the site so that slope, contours, and available areas can be determined.
- Determine the limiting conditions such as bedrock, high groundwater level, soil application rates, and setbacks.
- Description of several soil profiles where the system will be located.

Slope - ____%

Occupancy – One or two-family dwelling: ___5___ (number of bedrooms)

Public facility gallons per day ___0___ (Estimated water flow)

Depth to limiting factor ___70___ inches

Minimum depth of unsaturated soil required by table 383.44-3, Wis. Adm. Code___24___ inches

In Situ Soil application rate of in situ soil used ___1.6___ gal/sq.ft. /day

FOG value of effluent applied to component ≤ ___20___ mg/L

BOD5 value of effluent applied to component ≤ ___180___ mg/L

TSS value of effluent tied to component ≤___50___ mg/L

Fecal coliform monthly geometric mean value of effluent tied to component ≥ 10^4 CFU /100mg

___X___ Yes ________ No

Type of Dist. Cell---GeoMat

B. DESIGN WASTEWATER FLOW

One and two-family dwelling

Combined wastewater flow:

DWF = 150 gal/day/ bedroom x number of bedrooms

= 150 gal/day/bedroom x # of bedrooms

= 150 gal/day/bedroom x ___5___ bedrooms

= 750 gal/day

Clearwater and greywater only:

DWF = 90 gal/day/bedroom x # of bedrooms
= 90 gal/day/bedroom x ________ # of bedrooms

= gal/day

Blackwater only:

DWF = 60 gal/day/bedroom x # of bedrooms

= 60 gal/day/bedroom x ________ # of bedrooms

= gal/day

Public Facilities

DWF = Estimated wastewater flow x 1.5

= ________ gal/day x 1.5

= ________ gal/day

C. WIDTH AND LENGTH OF THE DISTRIBUTION CELL

8. Determine the Design Loading Rate (DLR) for the site.

From Table 383.44-2, WI Adm Code, select the soil application rate for the most restrictive soil horizon at the infiltrative surface or a lower horizon of the the lower horixz=zon adversely affects the dispersal of wastewater in accordance with SPS 383.44 (4) (a) and (c).
The Design Loading Rate (DLR) is the soil application rate taken form Table 383.44-2 WI adm Code.

DLR = ____1.6____ gpd/ ft^2

9. Determine the Infiltrative basal area.

Calculate the distribution cell area by dividing the daily Design Wastewater Flow (DWF) by the Design Loading Rate (DLR).

Infiltrative basal area = DWF ÷ DLR

Infiltrative basal area = __750______ gpd ÷ ____1.6______ gpd/ft^2

Infiltrative basal area = ____469______ ft^2

10. Determine size of distribution cell

Loading rate of fill material = ______≤ 1.0 gal/sq.ft./day if BOD5 or TSS ≥ 30 mg/L
or = ______≤ 2.0 gal/sq.ft./day if BOD5 or TSS ≤30 mg
= __X__ ≤ 2.2 gal/sq.ft./day if BOD5 or TSS ≤30 mg/L <u>&</u> 1.6 gal/sq ft/ day soil application rate

b. Bottom area of distribution cell = Design wastewater flow ÷loading rate of fill material as determined in C.1 a.

Distribution cell area = 750 gal/day÷ 2.2 gal/ft^2./day

Distribution cell area = 341 ft^2

11. Distribution Cell Configuration

OPTIONS—3.25'

a. Distribution cell width(s) (A) = 3.25 feet and the number of distribution

cells = 2 cells.

b. Distribution cell length (B) = Bottom area of distribution cell ÷ width of distribution cell.

B = 341 ft^2. ÷ (Distribution cell area required) ÷ 6.50 ft. (A)

B = 52.44 or 53 ft

c. Check distribution cell length (B)

12. Basal Area calculation

Basal Area required = (Cell length) *[((3.25 * # Cells) + (2I) + (cell spacing * # cells-1))]

If only 1 cell:

Basal Area = (Cell length) *[((3.25 * # Cells) + (2I)

If more than 1 cell is to be used:

In this application all numbers are known accept cell spacing. Use 3 formula to solve for cell spacing:

Cell Spacing = [(Basal area needed ÷ cell length)] - [(Cell Width * # Cells) +2I] / (# cells -1) Formula 3

Basal area is known

Cell length is known

Cell width is known

cells is known

** I dimension is 1'

Cell Spacing (S) = [(469÷53)] - [(3.25 * #2) +2] / (2 -1)

Cell Spacing (S) = [(8.85)] - [(6.5) +2] / (1)

Cell Spacing(S) = [(8.85)] - [(6.5) +2] / (1)

Cell spacing(S) = .35' minimum S dimension is 1'

Now that S is known:

Basal Area required = (Cell length) *[((3.25 * # Cells) + (2I) + (cell spacing * # cells-1))]
If only 1 cell:
Basal Area = (Cell length) *[((3.25 * # Cells) + (2I)

Basal Area = (53) * [((3.25 * # 2) + (2I) + (1* # 2-1))]
= (53) * (6.5) + (2) +(1)
= (53) * (9.5)
= 503.5 Sq. FT   Check basal area 503.5 proposed, 469 required

13. Total Length and Width (L X W)

L = Cell length + 2K   K is always 1
L = 53 + 2
L = 55'

W = (Cell width * # Cells) + 2I + (Cell spacing * (# Cells -1))
W = 3.25 * 2 + (2*1) +(1* (2-1))
W = 6.5' + 2 + 1
W = 9.5'

14. Linear loading rate

Linear loading rate ≤ Design wastewater flow ÷ Cell length (B) or effective cell length for a concave mound.

Linear loading rate ≤ _750_ gal/day ÷ _53_ feet

Linear loading rate ≤ _14_ gal/ft/day

Linear loading rate for systems with in situ soils having a soil application rate of ≤ 0.3 gal/ ft^2/day within 12 inches of original grade must be less than or equal to 4.5 gal/ft/day.

Is the linear loading rate ≤ what is allowed? __X__ Yes ____ No -----If no, then the length and width of the distribution cell must be changed so it does.

Distribution cell length B = Design Wastewater Flow ÷ Maximum Linear Loading Rate

Distribution cell length B = ____ gal/day ÷ ____ gal/ft/day

Distribution cell length B = ________ ft.

X. SYNERGY GEOMAT PLAN SUBMITTAL

A. Plan Submittal

BEST Septic Systems requires every plan is prepared for review utilizing the GeoMat-SoilAir Mound System Crew File.

In addition to the Crew File, the following information is required to be submitted for review:

- Photocopies of soil report forms along with other documents required by the reviewing agent.
- Plans or documents must be originals or permanent copies.

B. Forms and Fees

- Application form for submittal provided by the reviewing agent, along with proper fees required by the reviewing agent.

C. Soils Information

- Complete soil and site evaluation report (Form # SBD-8330) for each soil boring described; signed and dated by Certified Soil Tester, with License Number.
- Separate sheet showing the location of all borings. The location of all boring and backhoe pits must be able to be identified on the plot plan.

D. Documentation

- Architects, engineers, or designers must sign, seal, and date each page of the submittal or provide an index page, which is signed, sealed, and dated.
- Mater Plumbers must sign, date, and include their license number on each page of the submittal or provide an index page, which is signed, sealed, and dated.
- Three complete sets of plans and specifications (clear, permanent, and legible); submittals must be on paper measuring at least 8.5 x 11 inches.
- Designs

E. Plot Plan

- Document plans or plans drawn to scale (scale indicated on plans) with parcel size or all property boundaries. Clearly marked.
- Slope directions and percent in system area.
- Benchmark and north arrow.
- Setbacks indicated as per appropriate code.
- Two-foot contours or other appropriate contour interval within the system area.
- Location information, legal description of parcel must be noted.
- Location of any nearby system or well.

F. Plan View

- Dimensions for distribution cells

- Location of observation pipes.

- Dimensions of mound.

- Pipe lateral layout, which must include the number of laterals, pipe material, diameter and length; and number, location and size of orifices.

- Manifold and force main locations, with materials, length and diameter of each.

G. Cross Section of System

- Include tilling requirement, distribution cell details, percent slope, side slope, and cover material.

- Lateral elevation, position of observation pipes, dimensions of distribution cell, and type of cover material such as geotextile fabric, if applicable.

H. System Sizing

- For one and two-family dwellings, the number of bedrooms must be included.

- For public buildings, the sizing calculations must be included.

I. Tank and Pump or Siphon Information

- All construction details for site-construction tanks.

- Size and manufacturer information for prefabricated tanks.

- Notation of pump or siphon model, pump performance curve, friction loss for force main and calculation for total dynamic head.

- Notation of highwater alarm manufacturer and model number.

- Cross section of dose tank / chamber to include storage volumes; connections for piping, vents, and power; pump "off" setting; dosing cycle and volume, highwater alarm setting; and storage volume above the highwater alarm; and location of vent and manhole.

- Cross section of two compartment tanks or tanks installed in a series must include information listed above.

Private Onsite Wastewater Treatment Systems (POWTS) Inspection Report
(Attach to Permit)

Industry Services Division

General Information

Personal information you provide may be used for secondary purposes [Privacy Law, s. 15.04 (1)(m)]

County		
Sanitary Permit No:		
State Plan Transaction ID#:		
Parcel Tax No:		

Permit Holder's Name:		☐ City ☐ Village ☐ Town of:	
CST BM Elev:	Insp BM Elev:	BM Description:	

Tank Information

TYPE	MANUFACTURER	CAPACITY
Septic		
Dosing		
Aeration		
Holding		

Tank Setback Information

TANK TO	P/L	WELL	BLDG	VENT TO AIR INTAKE	ROAD
Septic					NA
Dosing					NA
Aeration					NA
Holding					

Pump / Siphon Information

Manufacturer				Demand
Model Number				GPM
TDH Lift	Friction Loss	System Head		TDH Ft
Forcemain	Length	Dia	Dist. To Well	

Elevation Data

STATION	BS	HI	FS	ELEV
Benchmark				
Bldg. Sewer				
St / Ht Inlet				
St / Ht Outlet				
Dt Inlet				
Dt Bottom				
Installation Contour				
Header / Man.				
Dist. Pipe				
Infiltrative Surface				
Final Grade				

Dispersal Cell Information

DIMENSIONS	Width	Length	No of Cells	
SETBACK INFORMATION	P / L	Bldg	Well	OHWM of Nav Waters
CELL TO				

Type of System	LEACHING CHAMBER	Manufacturer:
		Model Number:

Distribution System

X Pressure Systems Only

Header / Manifold Length ____ Dia ____	Distribution Pipe(s) Length ____ Dia ____ Spac ____	X Hole Size	X Hole Spacing	Observation Pipes ☐ Yes ☐ No

Soil Cover

Depth Over Cell Center	Depth Over Cell Edges	Depth of Topsoil	Seeded / Sodded ☐ Yes ☐ No	Mulched ☐ Yes ☐ No

COMMENTS: (Include code discrepancies, persons present, etc.)

Plan revision required?☐ Yes ☐ No

Use other side for additional information — Date — POWTS Inspector's Signature — Cert No

The Presby Wastewater Treatment System

Wisconsin

Advanced Enviro-Septic®

In-Ground Component Manual

- Minimizes the Expense
- Protects the Environment
- Preserves the Site

Presby Environmental, Inc.

The Next Generation of Wastewater Treatment Technology

143 Airport Rd., Whitefield, NH 03598
Tel: 800-473-5298 Fax: 603-837-9864
info@presbyeco.com
www.PresbyEnvironmental.com

The information in this manual is subject to change without notice. We recommend that you check your State's page on our website on a regular basis for updated information. Your suggestions and comments are welcome. Please contact us at: 800-473-5298

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

The products and methods depicted in this manual are protected by one or more patents. For more information: Pat. www.presbyeco.com/patents.

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

IMPORTANT NOTICE: This Manual is intended ONLY for use in designing and installing Presby Environmental's Advanced Enviro-Septic® Wastewater Treatment Systems. The 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.

Date of Issue: February 15, 2017

TABLE OF CONTENTS

1.0 Background

Liquid that exits from a septic tank ("effluent") contains suspended solids that can cause traditional systems to fail prematurely. Solids can overload bacteria, cut off air required for aerobic bacterial activity, and/or seal the underlying soil, interfering with its ability to absorb liquid.

1.1 What Our System Does

By utilizing simple yet effective natural processes, the Presby 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 treatment area ("biomat") than traditional systems.

1.2 Why Our System Excels

The Presby Treatment System retains solids in its pipe and provides multiple bacterial surfaces to treat effluent prior to its contact with the soil. The continual cycling of effluent (the rising and falling of liquid inside the pipe) enhances bacterial growth. This all combines to create a unique eco-system that no other passive wastewater treatment system is designed to offer. The result is a system that excels by being more efficient, lasting longer, and has a minimal environmental impact.

1.3 System Advantages

a) costs less than traditional systems
b) eliminates the need for washed stone
c) often requires a smaller area
d) installs more easily and quickly than traditional systems
e) adapts easily to residential and commercial sites of virtually any size
f) adapts well to difficult sites
g) develops a protected receiving surface preventing sealing of the underlying soil
h) blends "septic mounds" into sloping terrain
i) increases system performance and longevity
j) tests environmentally safer than traditional systems
k) recharges groundwater more safely than traditional systems
l) made from recycled plastic

1.4 Patented Presby Technology

At the heart of Advanced Enviro-Septic® is a patented corrugated, perforated plastic pipe with interior skimmer tabs and cooling ridges. All Presby Pipe is surrounded by one or more filtering, treatment and dispersal layers. Presby Systems are completely passive, requiring no electricity, motors, alarms, computers, etc. Presby Pipes are assembled and installed in a bed of specified System Sand which can either be below the ground or above.

1.5 Advanced Enviro-Septic® (AES)

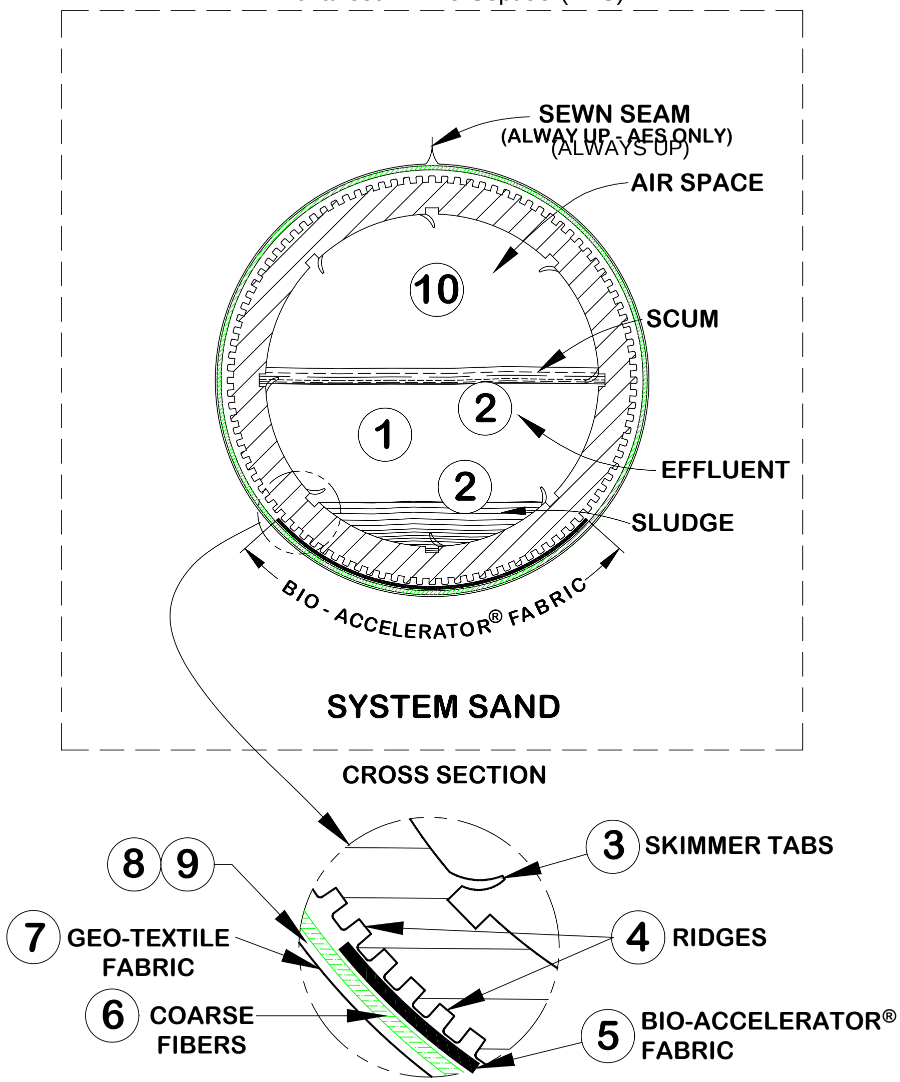
The Advanced Enviro-Septic® pipe is assembled into an onsite wastewater treatment system that has been successfully tested and certified to NSF 40, Class I (a certification typically given to mechanical aeration devices), BNQ of Quebec, Class I, II, III and Cebedeau, Belgium standards. Advanced Enviro-Septic® is comprised of corrugated, perforated plastic pipe, Bio-Accelerator® fabric along its bottom which is surrounded by a layer of randomized plastic fibers and a sewn geo-textile fabric. Advanced Enviro-Septic® creates an eco-system designed to simultaneously purify and disperse effluent after primary treatment by a septic tank. Advanced Enviro-Septic® is the "next generation" of our Enviro-Septic® technology. The AES product incorporates Bio-Accelerator®, a proprietary enhancement that screens additional solids from effluent, accelerates treatment processes, assures even distribution and provides additional surface area. Each foot of Advanced Enviro-Septic® pipe provides over 40 sq ft of total surface area for bacterial activity.

2.0 Ten Stages of Wastewater Treatment

The Presby Wastewater Treatment System's

10 STAGES OF TREATMENT

Advanced Enviro-Septic® (AES)



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® fabric screens 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, randomly-oriented fibers separates more suspended solids from the effluent.

Stage 7: Effluent passes into the geo-textile fabrics and grows a protected bacterial surface.

Stage 8: Sand wicks liquid from the geo-textile fabrics and enables air to transfer to the bacterial surface.

Stage 9: The fabrics and fibers provide a large bacterial surface to break down solids.

Stage 10: An ample air supply and fluctuating liquid levels increase bacterial efficiency.

3.0 Presby System Components

3.1 Advanced Enviro-Septic® Pipe

a) Presby pipe required is calculated at 3 GPD/ft for both residential and commercial applications. This assumes residential strength effluent.
b) Plastic pipe made with a significant percentage of recycled material
c) 10 ft sections (can be cut to any length)
d) Ridged and perforated, with skimmer tabs on interior
e) Bio-Accelerator® along bottom of pipe (sewn seam always placed up).
f) Surrounded by a mat of randomly-oriented plastic fibers
g) Wrapped in a non-woven geo-textile fabric stitched in place
h) Exterior diameter of 12 in.
i) Each 10 ft section has a liquid holding capacity of approx. 58 gallons
j) A 10 ft length of AES pipe is flexible enough to bend up to 90°

3.2 Offset Adapter

An offset adapter is a plastic fitting 12 in. in diameter with an inlet hole designed to accept a 4-inch sewer line, raised connection or vent pipe. The hole is to be installed in the 12 o'clock position. The distance from the bottom of the Offset Adapter to the bottom of its inlet hole is 7 in. When assembling pipes into rows, note that the geo-textile fabrics are placed over the edges of the Offset Adapter and Couplings.

Double Offset Adapter

A double offset adapter is a plastic fitting 12 in. in diameter with two 4 in. holes designed to accept a 4-inch inlet pipe, raised connection, vent or vent manifold, and/or bottom drain, depending upon the particular requirements of the design configuration. The 4 in. 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 in. from each other.

3.3 Coupling

A coupling is a plastic fitting used to create a connection between two pieces of Presby Pipe. Note that the couplings are wide enough to cover 1 or 2 pipe corrugations on each of the two pipe ends being joined. The couplings feature a snap-lock feature that requires no tools. When assembling pipes into rows, note that the geo-textile fabric does not go under couplings. Pull fabric back, install coupling, and then pull fabric over coupling. Also, note, during installation in cold weather, couplings are easier to work with if stored in a heated location (such as a truck cab) before use.

3.4 Distribution Box

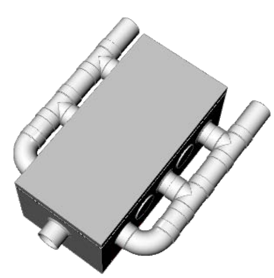
A Distribution Box, also called a "D-box," is a device used to distribute effluent coming from the septic tank in a system that contains more than one section or more than one bed. D-boxes are also sometimes used for velocity reduction. D-boxes come in various sizes and with a varying number of outlets. 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. A distribution box is only required when dividing flow to more than one section of the Presby bed.

3.5 Flow Equalizers

All Presby Systems with Combination Serial distribution or Multiple Bed distribution must use Flow Equalizers in each distribution box outlet. A flow equalizer is an adjustable plastic insert installed in the outlet holes of a distribution box to equalize effluent distribution to each outlet whenever flow is divided. Each Bed or section of Combination Serial distribution is limited to a maximum of 15 gallons per minute, due to the flow constraints of the equalizers. Example: pumping to a combination system with 3 sections (using 3 D-Box outlets). The maximum delivery rate is (3 x 15) = 45 GPM. Always provide a means of velocity reduction when needed.

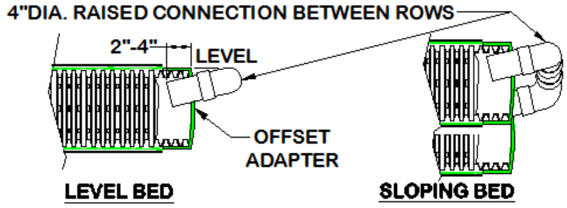
3.6 Manifolded Splitter Box

A manifolded splitter box joins several outlets of a D-box to help divide flow more accurately. Dividing flow to multiple beds is a common use of splitter boxes. All outlets delivering effluent to the Presby field must have a flow equalizer. Do not place an equalizer on vent outlets.



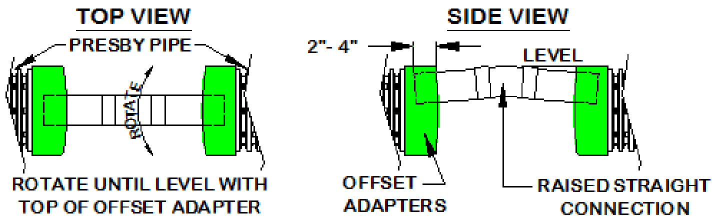
3.7 Raised Connection

A raised connection is a PVC Sewer & Drain pipe configuration which is used to connect Presby Rows. Raised connections extend 2 in. to 4 in. into pipe and are installed on an angle (as shown below). All PVC joints should be glued or mechanically fastened.



3.8 Raised Straight Connection

A raised straight connection is a PVC Sewer & Drain pipe configuration which is used to connect Presby Rows that are placed end to end along the same contour. Raised straight connections extend 2 in. to 4 in. into pipe and are installed on an angle (as shown below). All PVC joints should be glued or mechanically fastened. Offset Adapters will accept 4 inch schedule 40 PVC if the edge to be inserted into the adapter is rounded.



3.9 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 is determined by state and/or local rules. Septic tanks must be fitted with inlet and outlet baffles in order to retain solids in the septic tank and to prevent them from entering the Presby pipes. Effluent filters are not recommended by Presby Environmental, Inc. due to their tendency to clog, which cuts off the oxygen supply that is essential to the functioning of the Presby System. If you are required to use an effluent filter in a gravity fed system due to State or local requirements, the effluent filter selected must allow the free passage of air to ensure the proper functioning of the system.

3.10 System Sand

The System Sand that surrounds the Presby pipes is an **essential** component of the system. It is **critical** that the correct type and amount of System Sand is used during construction. System Sand must be coarse to very coarse, clean, granular sand, free of organic matter. System Sand is placed a minimum of 12 inches below, 6 inches between and around the perimeter and 3 inches above from the Presby pipes. It must adhere to **all** of the following percentage and quality restrictions:

Presby System Sand Specification

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

3.11 System Sand Acceptable Alternative

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

4.0 **Table A – Soil Application Rate by Soil Characteristics** (from Wisconsin Table SPS 383.44-1)

Soil Characteristics			Soil Application Rate (GPD/sq ft)
Texture	**Structure** – **Shape**	**Structure** – **Grade**	
Coarse Sand, Sand, Loamy Coarse Sand, Loamy Sand	-	Structureless	1.6[a] / 0.5[b]
Fine Sand, Loamy Fine Sand	-	Structureless	1.0
Very Fine Sand, Loamy Very Fine Sand	-	Structureless	0.6
Coarse Sandy Loam, Sandy Loam	-	Structureless, Massive	0.6
	Platy	Weak	0.6
		Moderate, Strong	0.2
	Prismatic, Blocky, Granular	Weak	0.7
		Moderate, Strong	1.0
Fine Sandy Loam, Very Fine Sandy Loam	-	Structureless, Massive	0.5
	Platy	Moderate, Strong	0.2
	Platy, Prismatic, Blocky, Granular	Weak	0.6
	Prismatic, Blocky, Granular	Moderate, Strong	0.8
Loam	-	Structureless, Massive	0.5
	Platy	Moderate, Strong	0.2
	Platy, Prismatic, Blocky, Granular	Weak	0.6
	Prismatic, Blocky, Granular	Moderate, Strong	0.8
Silt Loam	-	Structureless, Massive	0.2
	Platy	Moderate, Strong	0.2
	Platy, Prismatic, Blocky, Granular	Weak	0.6
	Prismatic, Blocky, Granular	Moderate, Strong	0.8
Silt	-	-	0.0
Sandy Clay Loam, Clay Loam, Silty Clay Loam	-	Structureless, Massive	0.0
	Platy	Weak, Moderate, Strong	0.2
	Prismatic, Blocky, Granular	Weak	0.3
		Moderate, Strong	0.6
Sandy Clay, Clay, Silty Clay	-	Structureless, Massive	0.0
	Platy	Weak, Moderate, Strong	0.0
	Prismatic, Blocky, Granular	Weak	0.0
		Moderate, Strong	0.3

a = with ≤60% rock fragments and b = with >60% to <90% rock fragments

Note: Soil application rates shown above and below assume residential strength effluent (see para. 11.7, page 12 for definition of residential strength). Contact Presby Environmental for technical assistance with high strength wastewater.

5.0 Table B – Soil Application Rate using Percolation Rate (from Wisconsin Table SPS 383.44-2)

Percolation Rate Minutes per Inch (MPI)	Soil Application Rate Gallons per Day per Sq Ft (GPD/sq ft)
0 to less than 10	1.2
10 to less than 30	0.9
30 to less than 45	0.7
45 to less than 60	0.5
60 to 120	0.3

6.0 Table C: Slope Requirements

Soil Application Rate (GPD/sq ft)	Maximum System Slope (%)	Maximum Site Slope (%)
1.6 – 0.6	25	33
0.5	15	20
0.3 – 0.2	5	5

7.0 Table D: Row Length and Pipe Layout Width (Single Level)

		Total Linear Feet of Presby Pipe													
Row Length (ft)	**20**	40	60	80	100	120	140	160	180	200	220	240	260	280	300
	25	50	75	100	125	150	175	200	225	250	275	300	325	350	375
	30	60	90	120	150	180	210	240	270	300	330	360	390	420	450
	35	70	105	140	175	210	245	280	315	350	385	420	455	490	525
	40	80	120	160	200	240	280	320	360	400	440	480	520	560	600
	45	90	135	180	225	270	315	360	405	450	495	540	585	630	675
	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750
	55	110	165	220	275	330	385	440	495	550	605	660	715	770	825
	60	120	180	240	300	360	420	480	540	600	660	720	780	840	900
	65	130	195	260	325	390	455	520	585	650	715	780	845	910	975
	70	140	210	280	350	420	490	560	630	700	770	840	910	980	1,050
	75	150	225	300	375	450	525	600	675	750	825	900	975	1,050	1,125
	80	160	240	320	400	480	560	640	720	800	880	960	1,040	1,120	1,200
	85	170	255	340	425	510	595	680	765	850	935	1,020	1,105	1,190	1,275
	90	180	270	360	450	540	630	720	810	900	990	1,080	1,170	1,260	1,350
	95	190	285	380	475	570	665	760	855	950	1,045	1,140	1,235	1,330	1,425
	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500
# of Rows		**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1.50' C/L		2.50	4.00	5.50	7.00	8.50	10.00	11.50	13.00	14.50	16.00	17.50	19.00	20.50	22.00
1.75' C/L		2.75	4.50	6.25	8.00	9.75	11.50	13.25	15.00	16.75	18.50	20.25	22.00	23.75	25.50
2.00 C/L		3.00	5.00	7.00	9.00	11.00	13.00	15.00	17.00	19.00	21.00	23.00	25.00	27.00	29.00
2.25 C/L		3.25	5.50	7.75	10.00	12.25	14.50	16.75	19.00	21.25	23.50	25.75	28.00	30.25	32.50
2.50 C/L		3.50	6.00	8.50	11.00	13.50	16.00	18.50	21.00	23.50	26.00	28.50	31.00	33.50	36.00
		*Pipe Layout Width (ft) = Outermost edge of first row to outermost edge of last row													

*Formula for single level Pipe Layout Width = [Row Spacing x (# of Rows - 1)] + 1. Row spacing is 1.5 ft minimum; larger row spacing is allowed and at the discretion of the designer. To use Table D: select a row length and move right until the minimum amount of pipe is found (more is allowed). Then move down to find the number of rows required. Continue downward in the same column until adjacent to the row spacing and find the pipe layout width.

8.0 Design Worksheet (Single Level Systems)

Step #1: ___________ GPD ÷ ________ GPD/sq ft Application Rate (Table A) = _________ sq ft sand bed area min.

Step #2: ___________ GPD ÷ 3 GPD/ft = _________ ft of Presby pipe minimum (assumes residential strength)

Step #3: ___________ GPD ÷ 750 GPD/section = _______ sections required. Notes: round fractions up to whole number. This step does not apply to parallel distribution systems.

Step #4: ___________ ft Presby pipe (Step #2) ÷ _________ ft row length = ________ number of rows. Notes: number of rows must be evenly divided by number of serial sections from Step #3, add rows if necessary (does not apply to parallel distribution systems). Longer rows preferred to shorter length rows.

Step #5: ___________ ft PLW from Table D (or calculated manually for larger row spacing)

Step #6: ___________% system slope (cannot exceed Table C allowances)

Step #7: Calculate System Sand bed width –
Beds sloping 10% or less, use the larger of (a) or (b) below:

a) ___________ sq ft sand bed area (Step #1) ÷ (______ ft row length + 1 ft) = ________ ft sand bed width minimum
Note: 1 ft is added to row length to allow 6 inches of sand beyond the ends of each row.

b) ___________ ft PLW (Step #5) + 1 ft = _____________ ft sand bed width minimum

Beds sloping over 10%, use the larger of (c) or (d) below:

c) ___________ sq ft sand bed area (Step #1) ÷ (______ ft row length + 1 ft) = ________ ft sand bed width minimum

d) ___________ ft PLW (Step #5) + 4.5 ft = _______ ft sand bed width minimum Note: 4.5 ft is added to the PLW to allow 6 inches of sand above the first row and 3.5 ft beyond the edge of the lower row.

Step #8: Calculate System Sand Extension(s) choose (a) or (b) below:
Level beds (System Sand Extensions (SSE) are placed on each side of Presby Pipes):

a) (__________ ft SSBW (Step #7) – ________ ft PLW Step #5 + 1) ÷ 2 = ________ ft

Sloping beds: SSE placed entirely on the down slope side of the bed

b) __________ ft SSBW (Step #7) – ________ ft PLW (Step #5) + 1 = ________ ft

8.1 Design Example (single level)

Single family residence, (3) bedrooms (300 GPD), Application Rate for LFS (Loamy Fine Sandy), 10% sloping site, serial distribution layout, single level.

Step #1: **300** GPD ÷ **1.0** GPD/sq ft Application Rate (Table A) = **300** sq ft sand bed area min.

Step #2: **300** GPD ÷ 3 GPD/ft = **100** ft of Presby pipe minimum

Step #3: **300** GPD ÷ 750 GPD/section = **0.4→1** sections required.

Step #4: **100** ft Presby pipe (Step #2) ÷ **50** ft row length = 2 rows required

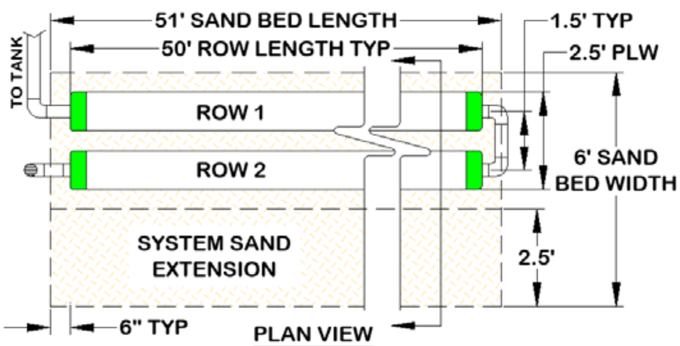
Step #5: **2.5** ft PLW from Table D (or calculated manually for larger row spacing)

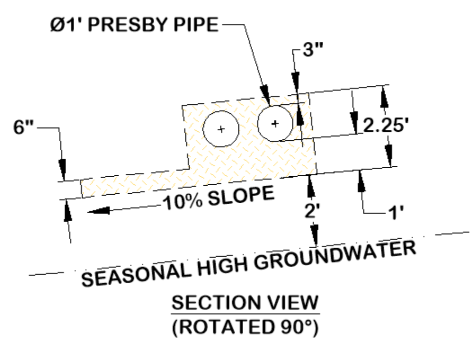
Step #6: **10**% system slope (Table C allows up to 25%)

Step #7: Calculate System Sand bed width –
Beds sloping 10% or less, use the larger of (a) or (b) below:
a) **300** sq ft sand bed area (Step #1) ÷ (**50** ft row length + 1 ft) = 5.9 ft sand bed width min.
b) **2.5** ft PLW (Step #5) + 1 ft = **3.5** ft sand bed width minimum **(use 5.9 ft from 7a above)**

Step #8: Calculate System Sand Extension(s) choose (a) or (b) below:
Sloping beds: SSE placed entirely on the down slope side of the bed
b) 5.9 ft SSBW (Step #7) – (**5.5** ft PLW Step #5 + 1) = less than zero (no System Sand extension required)

Illustration of Example #1, Basic Serial Distribution:





Notes: A distribution box could have been used (parallel layout) with the distribution box being placed in-line with the highest row and then connecting to all the rows individually. Whenever possible eliminate the need for a distribution box and use a serial layout. This will insure air passes equally through every foot of Presby pipe.

8.2 Design Example #2 (Single Level):

Single family residence, (4) bedrooms (400 GPD), Application Rate of 0.5 GPD/sq ft for 60 MPI soils, level site, serial distribution layout, single level.

Step #1: **400** GPD ÷ **0.5** GPD/sq ft Application Rate (Table A) = **800** sq ft sand bed area min.

Step #2: **400** GPD ÷ 3 GPD/ft = **134** ft of Presby pipe minimum

Step #3: **400** GPD ÷ 750 GPD/section = **0.54→1** sections required.

Step #4: **134** ft Presby pipe (Step #2) ÷ **70** ft row length = 1.9→**2** rows required

Step #5: **2.5** ft PLW from Table D (or calculated manually for larger row spacing)

Step #6: **0**% system slope (Table C allows up to 15%)

Step #7: Calculate System Sand bed width –

Beds sloping 10% or less, use the larger of (a) or (b) below:

a) **800** sq ft sand bed area (Step #1) ÷ (**70** ft row length + 1 ft) = 11.3 ft sand bed width **(<u>use this value</u>)**

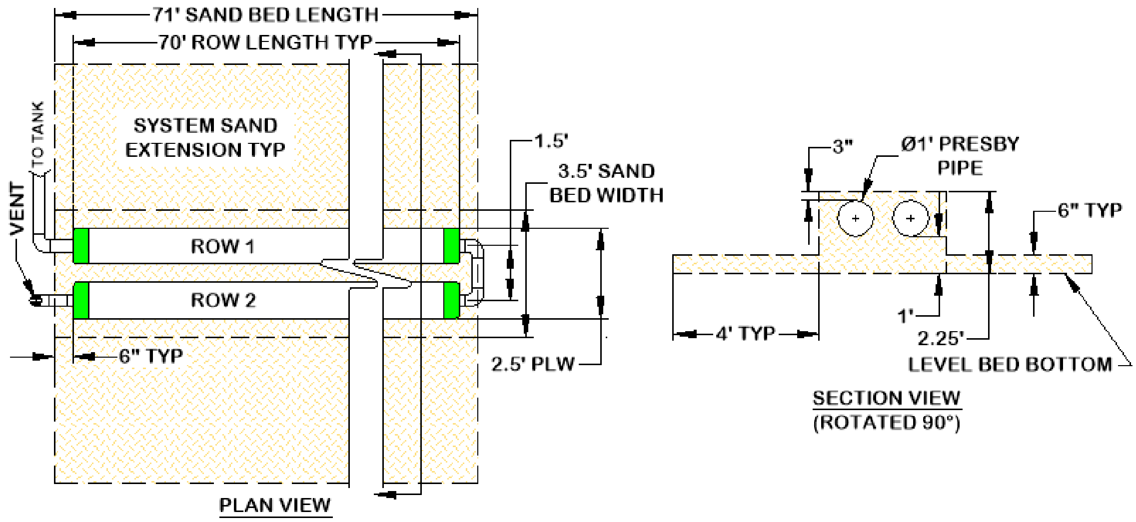
b) **2.5** ft PLW (Step #5) + 1 ft = **3.5** ft sand bed width minimum

Step #8: Calculate System Sand Extension(s) choose (a) or (b) below:

Sloping beds: SSE placed entirely on the down slope side of the bed

a) **11.3** ft SSBW (Step #7) – (**2.5** ft PLW Step #5 + 1) ÷ 2 = 3.9 ft round up to **4** ft for ease of construction.

Illustration of Example #2, Basic Serial Distribution:



8.3 Design Example #3 (Single Level):

Commercial system, 770 GPD, Application Rate of 0.8 GPD/sq ft for Very Fine Sandy Loam soils, 12% sloping terrain and system, serial distribution layout.

Step #1: **770** GPD ÷ **0.8** GPD/sq ft Application Rate (Table A) = **962.5** sq ft sand bed area min.

Step #2: **770** GPD ÷ 3 GPD/ft = **257** ft of Presby pipe minimum

Step #3: **770** GPD ÷ 750 GPD/section = **1.1→2** sections required.

Step #4: **257** ft Presby pipe (Step #2) ÷ **65** ft row length = 3.9→**4** rows required

Step #5: **5.5** ft PLW from Table D (or calculated manually for larger row spacing)

Step #6: **12**% system slope (Table C allows up to 25%)

Step #7: Calculate System Sand bed width –

Beds sloping over 10%, use the larger of (c) or (d) below:

c) **962.5** sq ft sand bed area (Step #1) ÷ (**65** ft row length + 1 ft) = **14.6** ft sand bed width **(use this value)**

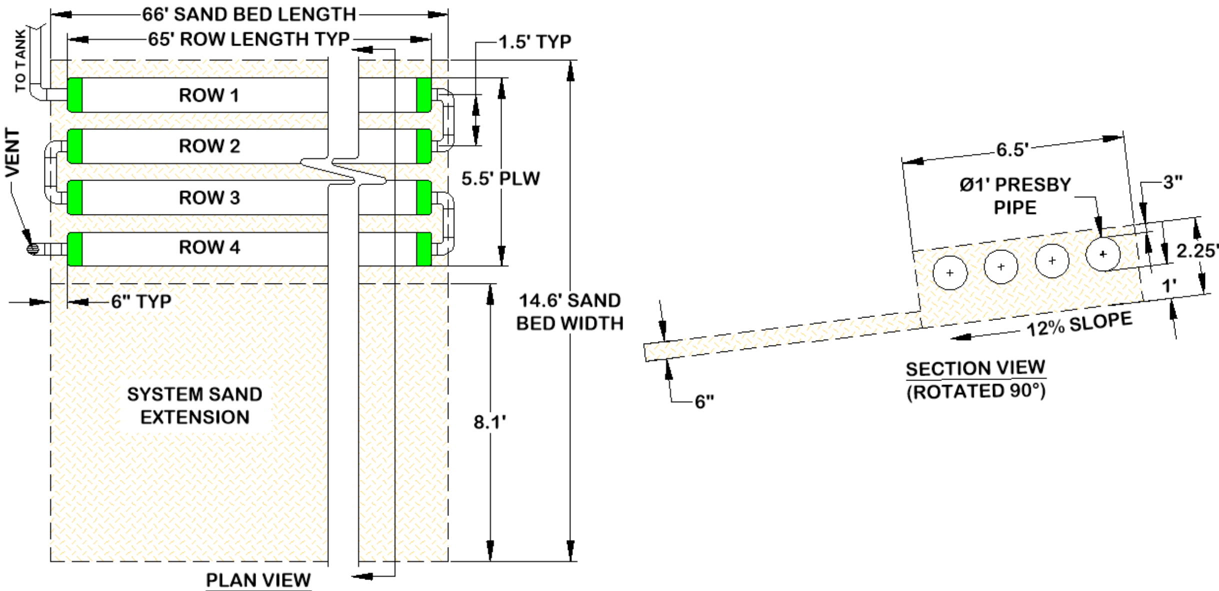
d) **5.5** ft PLW (Step #5) + 4.5 ft = **10** ft sand bed width minimum

Step #8: Calculate System Sand Extension(s) choose (a) or (b) below:

Sloping beds: SSE placed entirely on the down slope side of the bed

a) **14.6** ft SSBW (Step #7) – (**5.5** ft PLW Step #5 + 1 ft) = **8.1** ft

Illustration of Example #3, Commercial, Combination Serial Distribution:



9.0 Table E: Row Length and Pipe Layout Width (Multi-Level™)

Row Length (ft)	Total Linear Feet of Presby Pipe													
20	40	60	80	100	120	140	160	180	200	220	240	260	280	300
25	50	75	100	125	150	175	200	225	250	275	300	325	350	375
30	60	90	120	150	180	210	240	270	300	330	360	390	420	450
35	70	105	140	175	210	245	280	315	350	385	420	455	490	525
40	80	120	160	200	240	280	320	360	400	440	480	520	560	600
45	90	135	180	225	270	315	360	405	450	495	540	585	630	675
50	100	150	200	250	300	350	400	450	500	550	600	650	700	750
55	110	165	220	275	330	385	440	495	550	605	660	715	770	825
60	120	180	240	300	360	420	480	540	600	660	720	780	840	900
65	130	195	260	325	390	455	520	585	650	715	780	845	910	975
70	140	210	280	350	420	490	560	630	700	770	840	910	980	1,050
75	150	225	300	375	450	525	600	675	750	825	900	975	1,050	1,125
80	160	240	320	400	480	560	640	720	800	880	960	1,040	1,120	1,200
85	170	255	340	425	510	595	680	765	850	935	1,020	1,105	1,190	1,275
90	180	270	360	450	540	630	720	810	900	990	1,080	1,170	1,260	1,350
95	190	285	380	475	570	665	760	855	950	1,045	1,140	1,235	1,330	1,425
100	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500
# of Rows	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1.5' C/L	1.75	2.50	3.25	4.00	4.75	5.50	6.25	7.00	7.75	8.50	9.25	10.00	10.75	11.50
2.0' C/L	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00
2.50' C/L	2.25	3.50	4.75	6.00	7.25	8.50	9.75	11.00	12.25	13.50	14.75	16.00	17.25	18.50
2.75' C/L	2.38	3.75	5.13	6.50	7.88	9.25	10.63	12.00	13.38	14.75	16.13	17.50	18.88	20.25
	*Pipe Layout Width (ft) = Outermost edge of Upper Level to Outermost edge of Lower Level													

Formula for Multi-Level™ Pipe Layout Width (3 rows or more) = { [Row Spacing x (# of Rows - 1)] / 2 } + 1. Row spacing is 1.5 ft minimum; larger row spacing is allowed and at the discretion of the designer.

10.0 Design Worksheet for Multi-Level™ Systems

Step #1: ___________ GPD ÷ ________ GPD/sq ft Application Rate (Table A) = _________ sq ft sand bed area min.

Step #2: ___________ GPD ÷ 3 GPD/ft = _________ ft of Presby pipe minimum (assumes residential strength)

Step #3: ___________ GPD ÷ 750 GPD/section = _______ sections required. Notes: round fractions up to whole number. This step does not apply to parallel distribution systems.

Step #4: ___________ ft Presby pipe (Step #2) ÷ _________ ft row length = ________ number of rows. Notes: number of rows must be evenly divided by number of serial sections from Step #3, add rows if necessary (does not apply to parallel distribution systems). Longer rows preferred to shorter length rows.

Step #5: ___________ ft PLW from Table E (or calculated manually for larger row spacing)

Step #6: ___________% system slope (cannot exceed Table C allowances)

Step #7: Calculate System Sand bed width –
Beds sloping 10% or less, use the larger of (a) or (b) below:

a) ___________ sq ft sand bed area (Step #1) ÷ (______ ft row length + 1 ft) = ________ ft sand bed width minimum
Note: 1 ft is added to row length to allow 6 inches of sand beyond the ends of each row.

b) ___________ ft PLW (Step #5) + 1 ft = _____________ ft sand bed width minimum

Beds sloping over 10%, use the larger of (c) or (d) below:

c) ___________ sq ft sand bed area (Step #1) ÷ (______ ft row length + 1 ft) = ________ ft sand bed width minimum

d) ___________ ft PLW (Step #5) + 4.5 ft = _______ ft sand bed width minimum Note: 4.5 ft is added to the PLW to allow 6 inches of sand above the first row and 3.5 ft beyond the edge of the lower row.

Step #8: Calculate System Sand Extension(s) choose (a) or (b) below:
Level beds (System Sand Extensions (SSE) are placed on each side of Presby Pipes):

a) (__________ ft SSBW (Step #7) – ________ ft PLW Step #5 + 1) ÷ 2 = ________ ft

Sloping beds: SSE placed entirely on the down slope side of the bed

b) __________ ft SSBW (Step #7) – ________ ft PLW (Step #5) + 1 = ________ ft

10.1 Design Example #4 (Multi-Level™)

Single family residence, (6) bedrooms (600 GPD), Application Rate for LFS (Loamy Fine Sandy), level site, serial distribution layout.

Step #1: **600** GPD ÷ **1.0** GPD/sq ft Application Rate (Table A) = **600** sq ft sand bed area min.

Step #2: 6**00** GPD ÷ 3 GPD/ft = **200** ft of Presby pipe minimum

Step #3: 6**00** GPD ÷ 750 GPD/section = **0.8→1** sections required.

Step #4: **200** ft Presby pipe (Step #2) ÷ **50** ft row length = 4 rows required

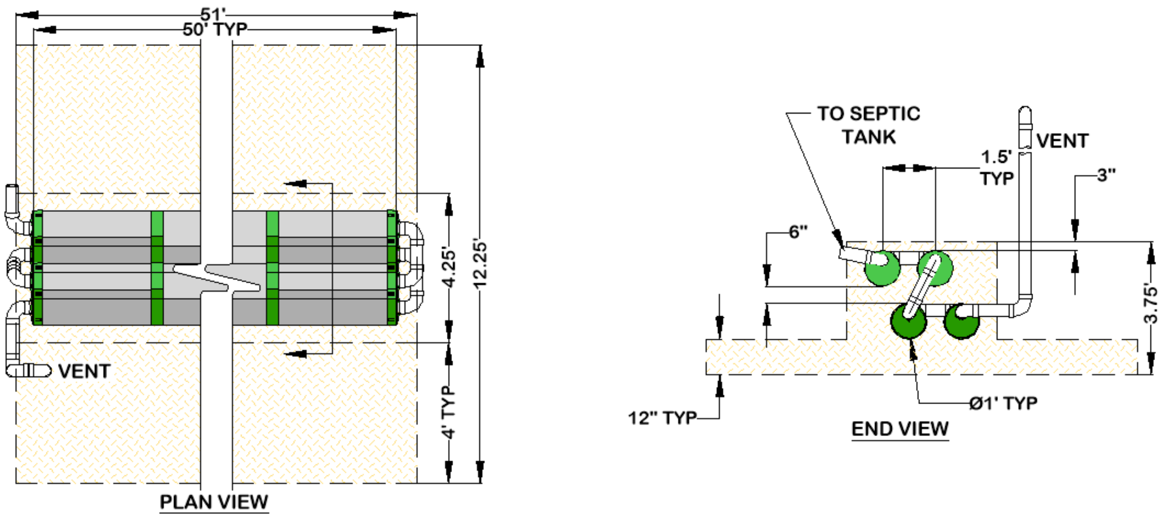
Step #5: **3.25** ft PLW from Table D (at 1.5 ft spacing)

Step #6: **0**% system slope (Table C allows up to 25%)

Step #7: Calculate System Sand bed width –
Beds sloping 10% or less, use the larger of (a) or (b) below:
a) **600** sq ft sand bed area (Step #1) ÷ (**50** ft row length + 1 ft) = 11.8 ft sand bed width min. **(<u>use this value</u>)**
b) **3.25** ft PLW (Step #5) + 1 ft = **4.25** ft sand bed width minimum

Step #8: Calculate System Sand Extension(s) choose (a) or (b) below:
Level beds (System Sand Extensions (SSE) are placed on each side of Presby Pipes):
b) [**11.8** ft SSBW (Step #7) – (**3.25** ft PLW Step #5 + 1)] ÷ 2= 3.775 ft (round up to 4 ft for ease of construction).

Illustration of Example #4, Basic Serial Distribution, Multi-Level™



11.0 Design Criteria

11.1 Advanced Enviro-Septic® Pipe Requirements

a) Sewn seam must be oriented in the 12 o'clock position. This correctly orients the Bio-Accelerator® fabric in the 6 o'clock position.
b) Venting is always required regardless of vertical separation to restrictive features.

11.2 Barrier Materials over System Sand

No barrier materials (hay, straw, tarps, etc.) are to be placed between the System Sand and cover material; such materials may cut off necessary oxygen supply to the system. The only exception is the placement of the specified fabric to achieve H-20 loading requirements. See section 22.0, page 19.

11.3 Certification Requirements

Any designers and installers who have not previously attended a Presby Environmental, Inc. Certification Course are required to obtain Presby Certification. Certification is obtained by attending a Certification Course presented by Presby Environmental, Inc. or its sanctioned representative. Certification can also be obtained by viewing tutorial videos on our website (high speed connection required) and then successfully passing a short assessment test, which is also available through regular mail. All professionals involved in the inspection, review or certification of AES systems should also become Presby Certified. Professionals involved in the design or installation of Multi-Level™ systems must be Presby Certified.

11.4 Converging Flows Restriction

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

11.5 Daily Design Flow

Residential daily design flow for Presby Systems is calculated in accordance with State rules. The minimum daily design flow for any single-family residential system is two bedrooms and 200 GPD for any commercial system.

a) Certain fixtures, such as jetted tubs, may require an increase in the size of the septic tank.
b) Daily design flow for a single bedroom apartment with a kitchen connected to a residence (also sometimes referred to as a “studio” or “in-law apartment”) shall be calculated by adding two additional bedrooms.
c) When daily design flow is determined by water meter for commercial systems, refer to the State Rules.

d) PEI recommends taking the average daily use from a peak month and multiply it by a peaking factor of 2 to 3 times.
e) Note that "daily design flows" are calculated to assume occasional "peak" usage and a factor of safety; Systems are not expected to receive continuous dosing at full daily design load.

11.6 End-to-End Preferred Over Side-to-Side
If site conditions permit, End-to-End multiple bed configurations are preferable to Side-to-Side configurations (see para. 18.0, page 18).

11.7 Effluent (Wastewater) Strength
The Presby pipe requirement for Bed or Trench systems is based on residential strength effluent, which has received primary treatment in a septic tank. Residential strength effluent (measured after the septic tank) cannot exceed a concentration of 240 mg/L, when adding together the values for the 5-day biochemical oxygen demand (BOD5) and the total suspended solids (TSS). Typically, this corresponds to an influent strength of 300 mg/L BOD5 and 350 mg/L TSS prior to the septic tank. Designing a system that will treat higher strength wastes requires additional Presby pipe. In these situations, consult our Technical Advisors at (800) 473-5298 for recommendations.

11.8 Filters, Alarms & Baffles
a) Effluent Filters are **not** recommended for use with Presby Systems.
b) If used, effluent filters must be maintained on at least an annual basis. Follow manufacturer's instructions regarding required inspections, cleaning and maintenance of the effluent filter. Please consult PEI for the most compatible filter recommendations.
c) Effluent Filters must allow the free passage of air to ensure the proper functioning of the system. A blocked filter in any on-site septic system could interfere with venting, causing the system to convert to an anaerobic state and result in a shortened life.
d) All pump systems to have a high-water alarm float or sensor installed inside the pump chamber.
e) All septic tanks must be equipped with baffles to prevent excess solids from entering the Presby System.
f) Charcoal filters in vent stacks (for odor control) are not recommended by PEI. They can block air flow and potentially shorten system life. Contact PEI for recommendations to correct odor problems.

11.9 Flow Equalizers Required
All distribution boxes used to divide effluent flow require flow equalizers in their outlets. Flow equalizers are limited to a maximum of 15 GPM per equalizer.

11.10 Garbage Disposals (a.k.a. Garbage Grinders)
No additional Presby Pipe is required when using a garbage disposal (grinder). If a garbage disposal is utilized, follow the State's requirements regarding septic tank sizing. Multiple compartment septic tanks or multiple tanks are preferred and should be pumped as needed.

11.11 Presby Pipe Requirement (Single & Multi-Level™)
See Section 11.1, on page 11 for additional Advanced Enviro-Septic® requirements. Presby Pipe requirements are as follows and require a 1.5 ft minimum row spacing:
a) Residential systems: 3 GPD/ft assuming effluent strength of 300 mg/L BOD5 and 350 mg/L TSS
b) Commercial systems: 3 GPD/ft assuming effluent strength of 300 mg/L BOD5 and 350 mg/L TSS
c) Contact Presby Environmental, Inc. when treating high strength effluent.

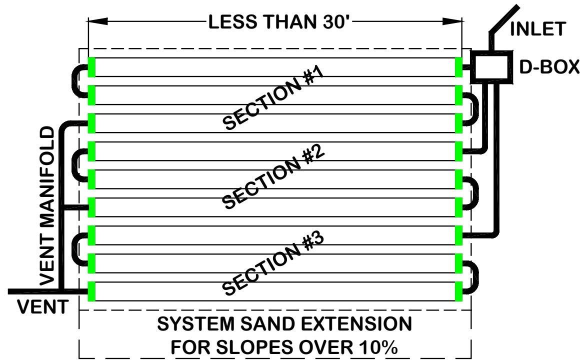
11.12 Presby Environmental Standards and Technical Support
All Presby Systems must be designed and installed in compliance with the procedures and specifications described in this Manual and in the product's State approval. This Manual is to be used in conjunction with the State Department of Safety and Professional Services Administrative Rules. In the event of contradictions between this Manual and State regulations, Presby Environmental, Inc. should be contacted for technical assistance at (800) 473-5298. Exceptions to any State rules other than those specifically discussed in this Manual require a State waiver.

11.13 Pressure Distribution
The use of pressure distribution lines in Presby Systems is **prohibited**. Pumps may be utilized when necessary only to gain elevation and to feed a distribution box which then distributes effluent by gravity to the Presby Field.

11.14 Row Requirements
a) All beds must have at least 2 rows.
b) Maximum row length for any system is 100 ft.
c) Recommended minimum row length is 30 ft.
d) A combination (or D-Box) distribution system must be used if any row length is less than 30 ft. The D-Box must feed at least 30 ft of Presby Pipe, a minimum of two D-Box outlets must be used and the field must be vented.

e) Row Center-to-Center Spacing is 1.5 ft min. for all systems. Row spacing may be increased to accommodate greater basal area spacing requirements if desired.
f) For level beds: the Presby Rows are centered in the middle of the System Sand bed area and any System Sand extensions divided evenly on both sides.
g) For Sloping Beds: the elevations for each Presby Row must be provided on the drawing. All rows to be grouped at the high side of the System Sand bed area with any System Sand extensions placed entirely on the downslope side.
h) All rows must be laid level to within +/- ½ in. (total of 1 in.) of the specified elevation and preferably should be parallel to the contour of the site.
i) It is easier if row lengths are designed in exact 10 ft increments since Presby Pipe comes in 10 ft sections. However, if necessary, the pipe is easily cut to any length to meet site constraints.

Illustration of row lengths less than 30ft:



11.15 Separation Distances (Horizontal and Vertical)

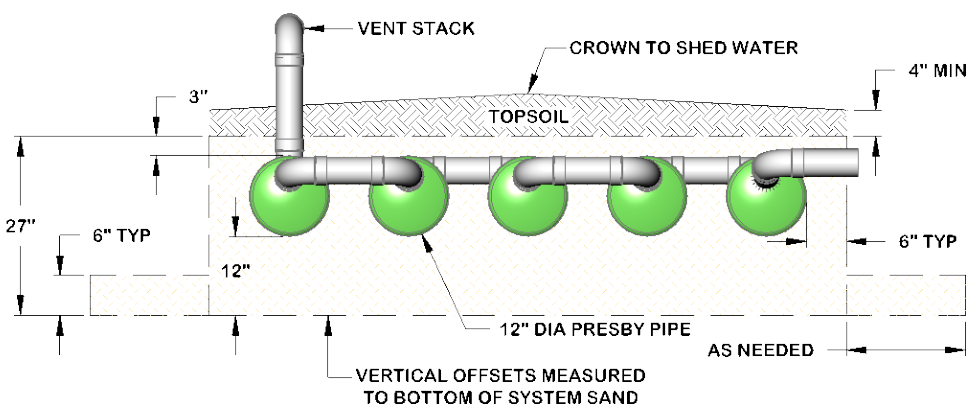
Separation distances to the seasonal high water table (SHWT) or other restrictive features are measured from the outermost edge of the System Sand.

11.16 Sloping Sites and Sloping Systems

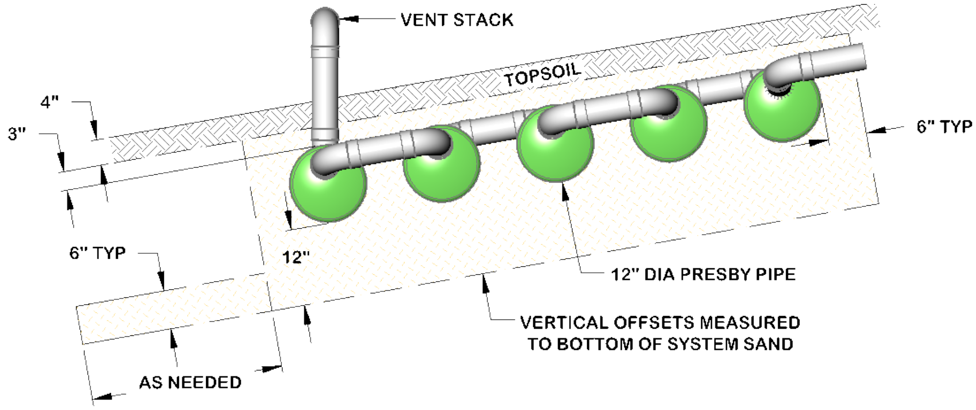
a) The percentage of slope in all system drawings refers to the slope of the Presby System, not the existing terrain ("site slope") and refers to the slope of the bed itself ("system slope").
b) The system slope and the site slope do not have to be the same (see illustration in para.18.2, page 19).
c) Maximum site slope is 33% and maximum system slope is 25% (without a State waiver).

11.17 System Sand Bed Height Dimensions

The height of a Presby Sand Bed measures 27 in. minimum (not including cover material):
a) 12 in. minimum of System Sand below the Presby Pipe;
b) 12 in. diameter of the pipe; and
c) 3 inches minimum of System Sand above the Presby Pipe; also
d) When System Sand Extensions are required, they must be a minimum of 6 inches thick.

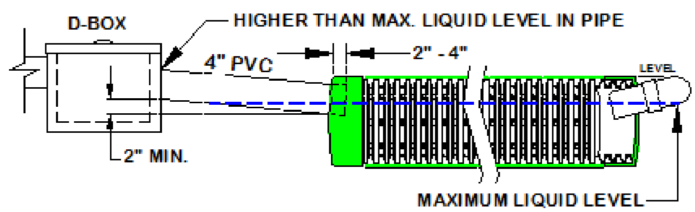


e) Sloping systems require any System Sand extension to be placed on the down slope side of the field. If the system slope is over 10% the sand extension must be at least 2.5 ft.



11.18 Two Inch Rule

The outlet of a septic tank or distribution box (if used) must be set at least 2 inches above the highest inlet of the Presby Row, with the connecting pipe slope not less than 1% (approximately 1/8 in. per foot.) See illustration of 2 in. rule below:



11.19 Topographic Position Requirement

The system location must be located in an area that does not concentrate water, both surface and subsurface. If allowed by State and local authorities, altering the terrain upslope of a system may alleviate this requirement if the waters are sufficiently altered to redirect flows away from the field.

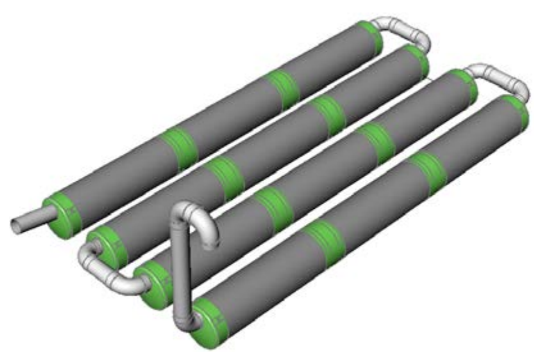
11.20 Water Purification Systems

a) Water purification systems and water softeners should **not** discharge into any Presby System. This "backwash" does not require treatment and the additional flow may overload the system.
b) If there is no alternative means of disposing of this backwash other than in the Presby System, then the system will need to be "oversized." Calculate the total amount of backwash in GPD, multiply by 3, and add this amount to the daily design flow when determining the field and septic tank sizing.
c) Water purification systems and water softeners require regular routine maintenance; consult and follow the manufacturer's maintenance recommendations.

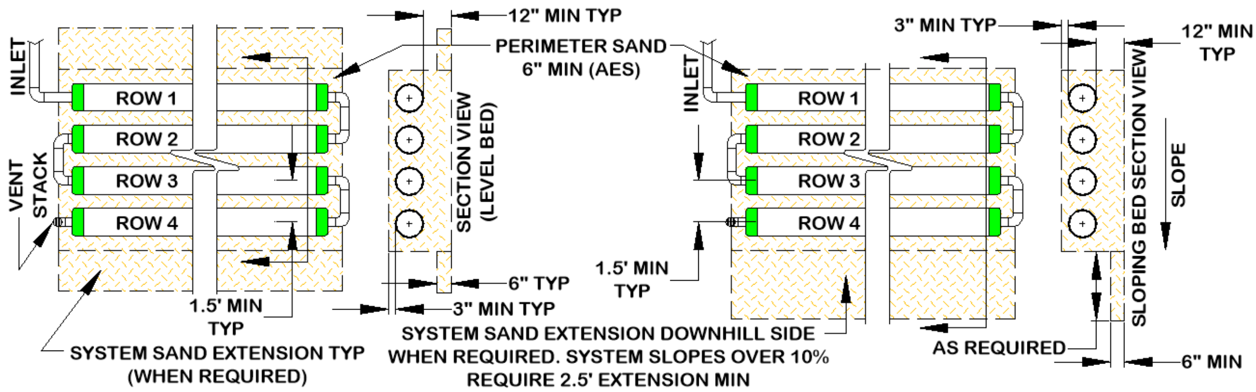
12.0 Basic Serial Distribution (Single Level)

AES rows are connected in series at the ends with raised connections, using offset adapters. Basic Serial distribution systems are quick to develop a strong biomat in the first row, provide a longer flow route, improved effluent treatment and ensure air will pass through all the Presby Rows. Other criteria:

a) May be used for single beds of 750 GPD or less.
b) Incorporates rows in serial distribution in a single bed.
c) Maximum length of any row is 100 ft.
d) Flow Equalizers are not required for Basic Serial systems.
e) For level beds: any required System Sand extension is to be evenly divided and placed on both sides of the Presby pipes.
f) For sloping beds, any required System Sand extension is placed entirely on the downhill (low) side of the field. If the bed slopes over 10%, the System Sand extension must be at least 2.5 ft.
g) Gravity fed Basic Serial systems do not require the use of a D-Box (fed directly from the septic tank).
h) Illustrations of Basic Serial Systems:



Level Beds   Sloping Beds

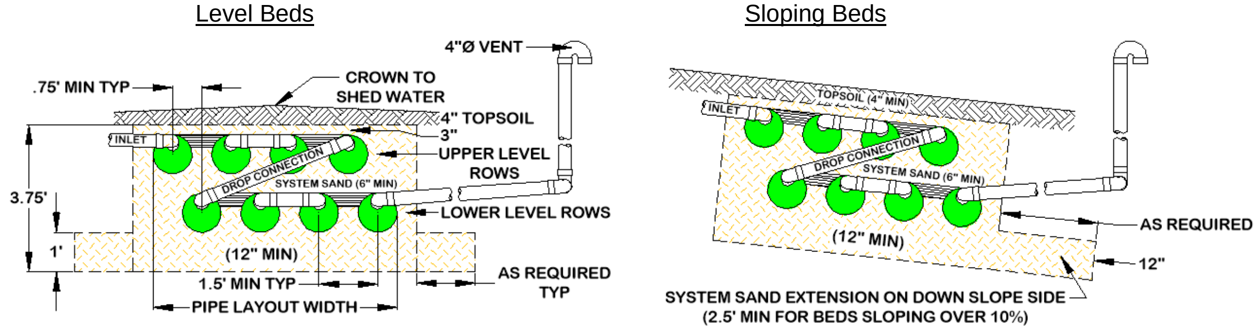


13.0 Basic Serial Distribution (Multi-Level™)

Basic Serial Multi-Level™ systems must conform to the requirements for single level basic serial systems except:

a) Row spacing 1.5 ft minimum.
b) The vent must be connected to the last row in the series on the Lower Level.
c) When a System Sand Extension is required, it must be 12 inches thick.
d) A minimum of 6 inches of System Sand separates the Upper and Lower Level Rows.
e) Effluent is delivered first to the Upper Rows, which then connects to the Lower Level Rows by way of a Drop Connection.
f) The Drop Connection must pitch downward toward the Lower Level at least 2 inches.
g) Multi-Level™ systems are not allowed in H-20 applications.
h) For level beds: any required System Sand extension is to be evenly divided and placed on both sides of the Presby pipes.
i) For sloping beds, any required System Sand extension is placed entirely on the downhill (low) side of the field. If the bed slopes over 10%, the System Sand extension must be at least 2.5 ft.
j) System Sand extensions for Multi-Level™ systems must be 12 inches thick.
k) Illustrations of Multi-Level™ Basic Serial Systems:

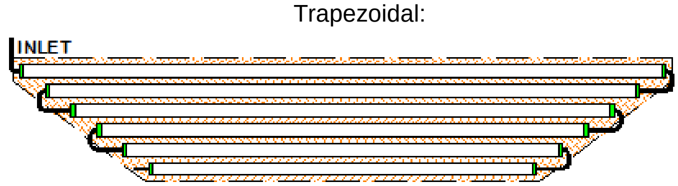
Level Beds   Sloping Beds



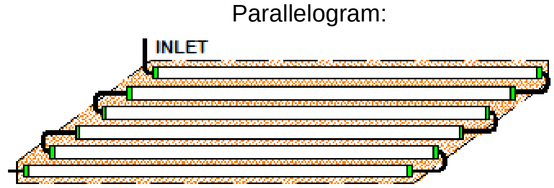
13.1 Basic Serial Configuration with Unusual Shapes:

Bed may be constructed with unusual shapes to avoid site obstacles or meet setback requirements.

Trapezoidal:

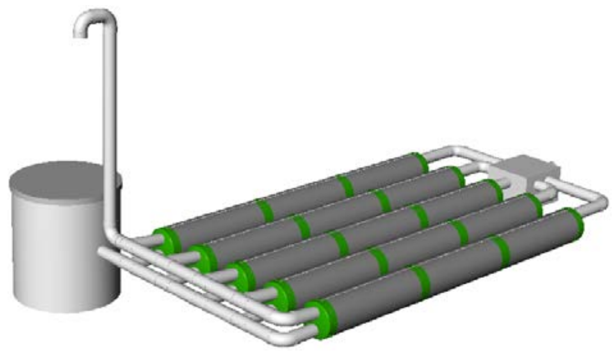


Parallelogram:



14.0 Bottom Drain

A bottom drain is a line connected to the hole in the 6 o'clock position of a double offset adapter at the end of each serial section or each row in a D-box Distribution or Combination Configuration which drains to a sump and is utilized to lower the water level in a saturated system or to facilitate system rejuvenation. There must be 18 inches from the bottom of the sump to the bottom of the drain. The sump should be brought above the final grade and have a locking or mechanically fastened cover.



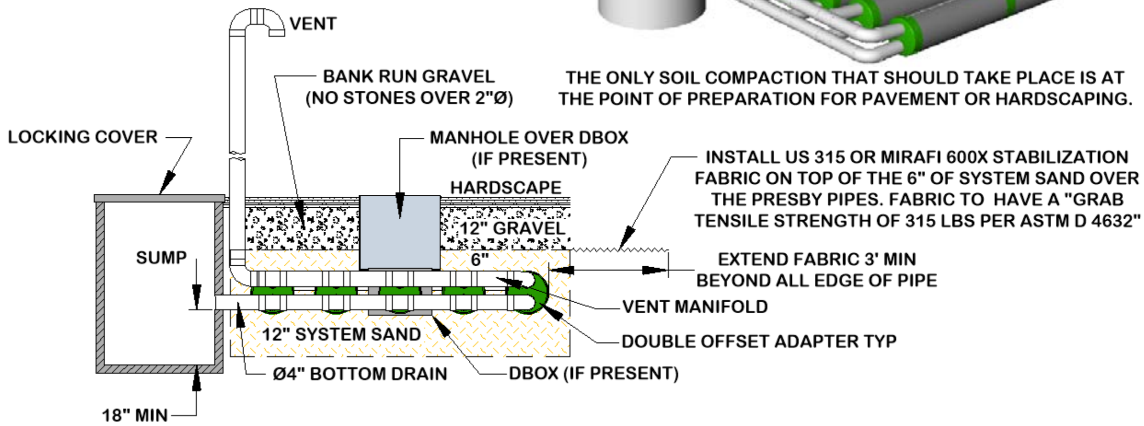
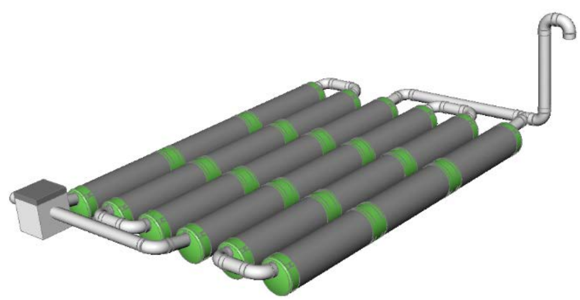


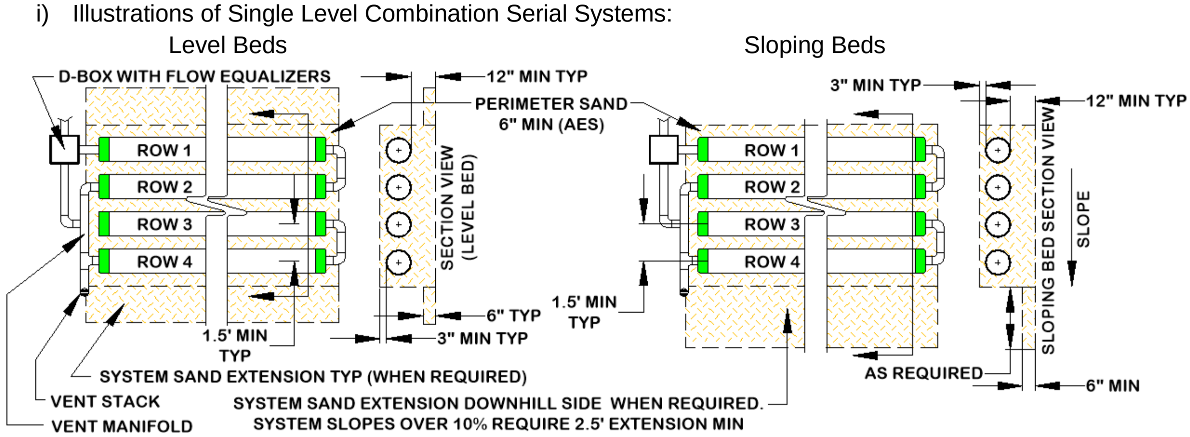
Illustration of a bottom drain used for H-20 system (End View):

15.0 Combination Serial Distribution (Single Level)



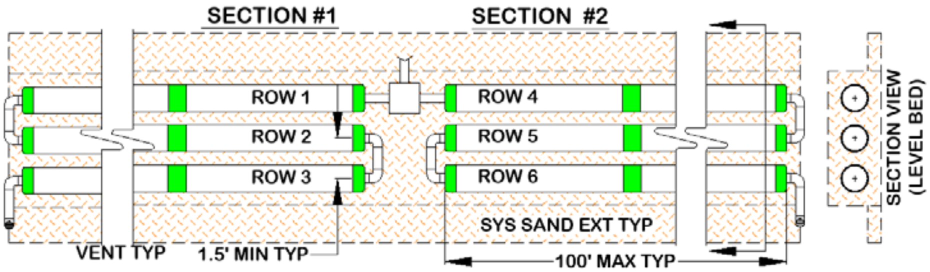
Combination Serial distribution within one bed, or multiple beds, is required for systems with daily design flows greater than 750 GPD. Combination Serial distribution is quick to develop a strong biomat in the first row of each section, providing improved effluent treatment. Each Combination Serial section is limited to a maximum loading of 750 gallons/day.

a) Combination Serial distribution consists of two or more serial sections installed in a single bed.
b) Each section in a Combination Serial system consists of a series of Presby Rows connected at the ends with raised connections, using offset adapters and PVC sewer and drain pipe.
c) Maximum length of any row is 100 ft.
d) There is no limit on the number of Combination Serial Sections within a bed.
e) For level beds: any required System Sand extension is to be evenly divided and placed on both sides of the Presby pipes.
f) For sloping beds, any required System Sand extension is placed entirely on the downhill (low) side of the field. If the bed slopes over 10%, the System Sand extension must be at least 2.5 ft.
g) When the vent manifold is on the same side as the serial section inlets, the manifold runs over the top of these inlets (as shown below).
h) Combination systems require the use of an adequately sized D-Box.
i) Illustrations of Single Level Combination Serial Systems:



15.1 Butterfly Configuration

a) A "butterfly configuration," is considered a single bed system with two or more sections (can also be D-Box or Combination configurations).
b) Maximum length of any row is 100 ft.
c) Serial Section loading limit is 750 GPD.
d) Beds can contain any number of serial sections.
e) For level beds: any required System Sand extension is to be evenly divided and placed on both sides of the Presby pipes.
f) For sloping beds: any required System Sand extension is placed entirely on the downhill (low) side of the field. If the bed slopes over 10%, the System Sand extension must be at least 2.5 ft.
g) Illustration of a level bed Butterfly configuration (plan view):



15.2 Section Loading

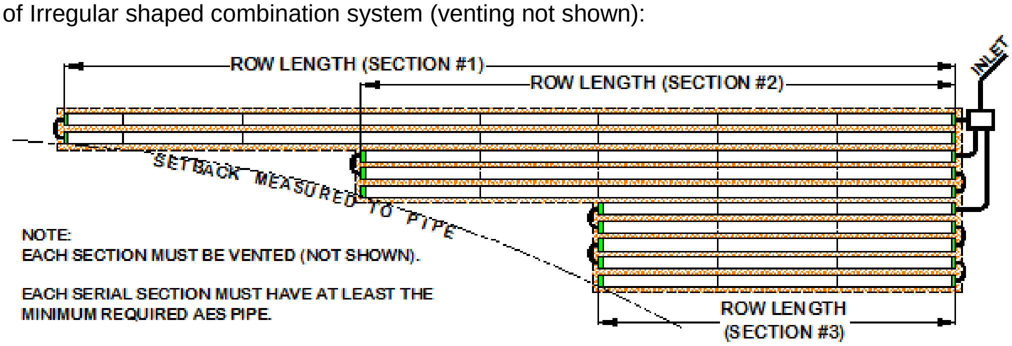
Each section in a Combination Serial system has a maximum daily design flow of 750 GPD. More than the minimum number of sections may be used. Ex: Daily design flow = 1,000 GPD requires (1,000 ÷ 750) = 1.4, use 2 sections minimum. Combination systems are only required if the daily design flow exceeds 750 GPD.

15.3 Section Length Requirement

a) Each section must have the same minimum linear feet of pipe.
b) The minimum linear feet of pipe per section is determined by dividing the total linear feet required in the Presby System by the number of sections required.
c) A section may exceed the minimum linear feet required.
d) Rows within a section may vary in length to accommodate site constraints.

15.4 Irregular Shaped Combination Serial Configuration

Illustration of Irregular shaped combination system (venting not shown):



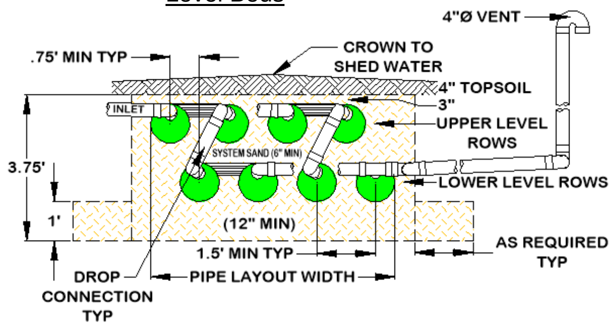
16.0 Combination Serial Distribution (Multi-Level™)

Combination Multi-Level™ systems must conform to the requirements for single level combination systems except:

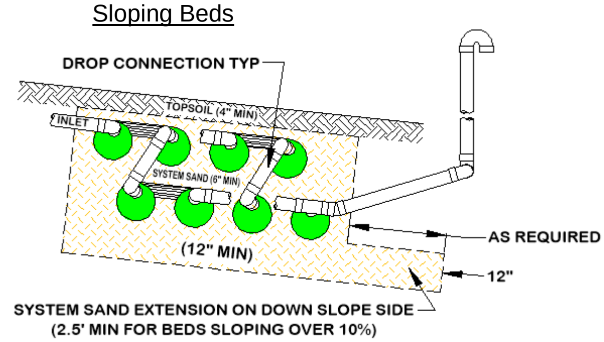
a) Row spacing 1.5 ft minimum.
b) The vent must be connected to the last row in the series on the Lower Level.
c) If a System Sand Extension is required, it must be 12 in. thick
d) Effluent must be delivered to the Upper Level Rows from the D-Box. A Drop Connection delivers effluent from the Upper Level rows to the Lower Level rows.
e) The Drop Connection must pitch downward toward the Lower Level at least 2 inches.
f) Multi-Level™ systems are not allowed in H-20 applications.
g) The ends of all serial sections on the Lower Level are manifolded and taken to a vent stack. Each serial section may be vented separately.
h) A minimum of 6 in. of System Sand separates the Upper Level Rows from the Lower Level Rows.
i) For level beds: any required System Sand extension is to be evenly divided and placed on both sides of the Presby pipes.
j) For sloping beds, any required System Sand extension is placed entirely on the downhill (low) side of the field. If the bed slopes over 10%, the System Sand extension must be at least 2.5 ft.
k) System Sand extensions for Multi-Level™ systems must be 12 inches thick.

l) Illustrations of Multi-Level™ Combination Serial Systems:

Level Beds

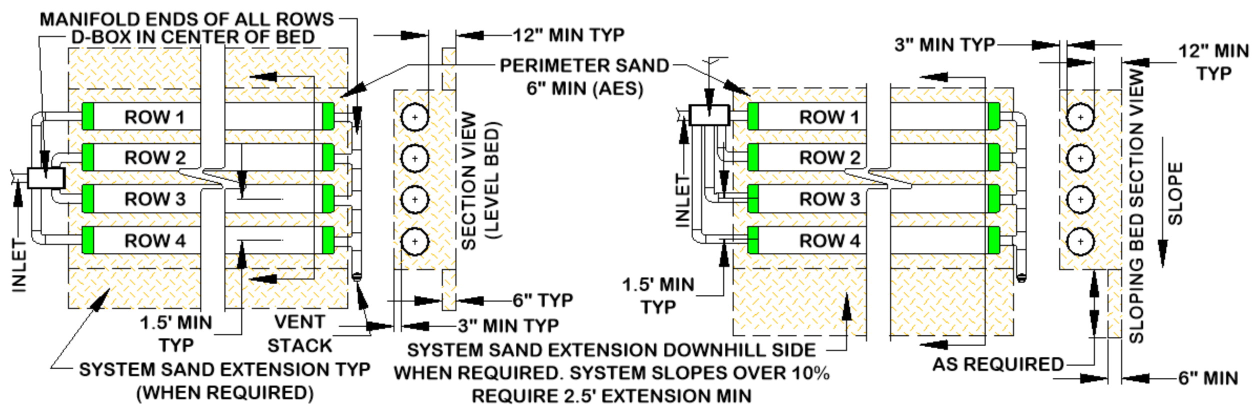


Sloping Beds



17.0 D-Box Distribution (Single Level)

a) All rows in this configuration must be the same length.
b) Flow equalizers must be used in the D-Box.
c) Use a Manifold to connect the ends of all rows. Manifold to be sloped toward Presby Pipes.
d) Maximum row length is 100 ft.
e) Place the D-Box on level, firmly compacted soil.
f) All rows must be laid level end-to-end.
g) A 2-inch min. drop is required between the D-box outlets and the Presby Pipe inlets.
i) D-Box systems are not recommended for use in Multi-Level™ beds.
j) For level beds: any required System Sand extension is to be evenly divided and placed on both sides of the Presby pipes.
k) For sloping beds: any required System Sand extension is placed entirely on the downhill (low) side of the field. If the bed slopes over 10%, the System Sand extension must be at least 2.5 ft.
h) Illustrations for D-Box (Parallel) Distribution:



18.0 Multiple Bed Distribution

Multiple Bed distribution incorporates two or more beds (Single Level or Multi-Level™), each bed with Basic Serial, Combination Serial, or D-Box distribution, and each receiving an equal amount of effluent from a D-Box. Multiple beds may be oriented along the contour of the site or along the slope of the site.

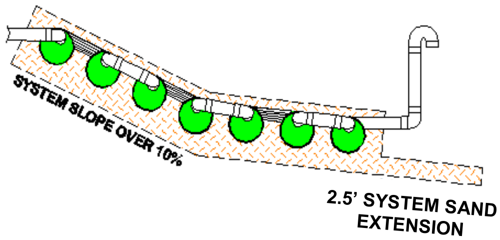
a) Each bed must have the same minimum linear feet of pipe. The minimum linear feet of pipe per bed is determined by dividing the total linear feet required in the Presby System by the number of beds.
b) Rows within a bed may vary in length to accommodate site constraints, except with D-Box configuration which requires all rows to be the same length.
c) End-to-End configurations are preferred to Side-to-Side configurations.
d) In Side-to-Side configuration, one bed is placed beside another or one bed is placed down slope of another. Bed separation distance is measured from pipe-to-pipe and is dependent on soil hydrology and State requirements.
e) Multi-Level™ may be used in multiple bed systems.

18.1 System Sand Extension

In systems where SSBA is greater the PLW + 1' (see para. 8.0, page 9, step #9). In systems sloping more than 10%, a 3 ft minimum System Sand extension is required. The System Sand extension area is placed on the down slope side of all sloping systems. For level systems, the System Sand Extension is divided equally and placed on both sides. The System Sand extension area is a minimum of 6 inches deep (12 inches for Multi-Level™ beds). For beds with multiple slopes, if any portion of the bed has a system slope greater than 10% a system sand extension is required. Illustration of bed with multiple slopes below.

18.2 Total Linear Feet Requirement

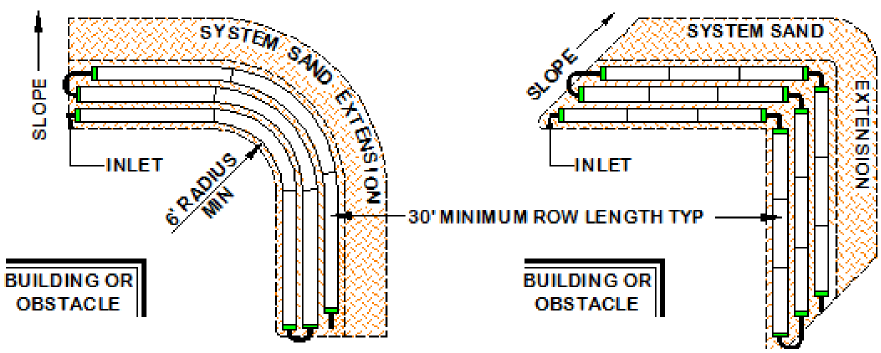
a) Maximum row length is 100 ft.
b) Each section or bed must have at least the minimum linear feet of pipe (total feet of pipe required divided by number of sections equals the minimum number of feet required for each section or bed).
c) A section or bed may exceed the minimum linear length.
d) Rows within a section or bed may vary in length (except D-Box configurations) to accommodate site constraints.



19.0 Angled and Curving Beds

Angled configurations are used to avoid obstacles.

a) Rows should follow the contour of the site as much as possible
b) Rows are angled by bending pipes up to 90 degrees or through the use of offset adapters
c) Row lengths are required to be a minimum of 30 ft
d) Multi-Level™ systems may take advantage of angled bed configurations.
e) Illustrations of Angled Beds:

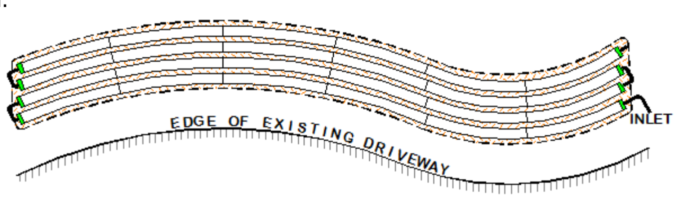


19.1 Trench Systems

Presby pipe may be installed in trench configurations on level or sloping terrain and may utilize serial, combination or parallel distribution. Trench systems may incorporate one or two rows of Presby pipe. A minimum of 12 inches below, 6 inches between and around the perimeter and 3 inches above of System Sand are required for all Presby pipes. Consult regulatory rules for required trench separation.

20.0 Curved Beds

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



21.0 Non-Conventional System Configurations

Non-conventional system configurations may have irregular shapes to accommodate site constraints. A site-specific waiver from the state may be required for non-conventional configurations.

22.0 H-20 Loading

If a system is to be installed below an area that will be subjected to vehicular traffic, it must be designed and constructed as depicted below in order to protect the system from compaction and/or damage. Note that a layer of stabilization fabric is added between the System Sand and the cover material. All H-20 systems require venting. See para. 14.0 on page 16 for illustration of H-20 loading requirements.

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

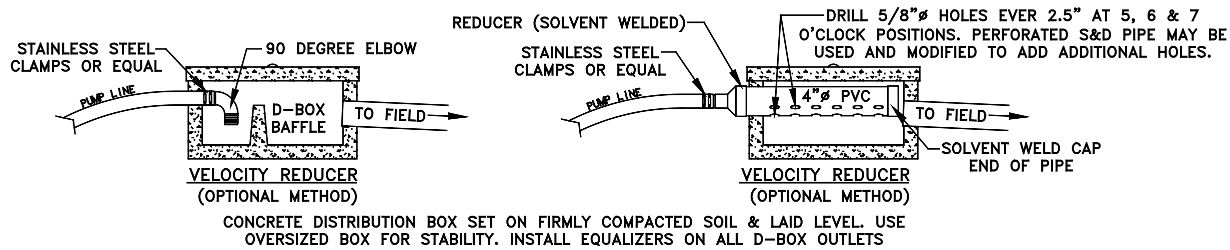
23.1 Alarm
States require all pump systems to have a high-water alarm float or sensor installed inside the pump chamber.

23.2 Differential Venting
All pump systems must use differential venting (see illustration, para.25.2, page 21).

23.3 Distribution Box
All pump systems require a distribution box with some means of velocity reduction for the effluent entering the D-Box.

23.4 Velocity Reduction
The rate at which effluent enters the Presby Pipe must be controlled. Excessive effluent velocity can disrupt solids that settle in the pipes.

a) Effluent must never be pumped directly into Presby Pipe.
b) A distribution box or tank must be installed between the pumping chamber and the Presby Pipe to reduce effluent velocity.
c) Force mains must discharge into a distribution box (or equivalent) with velocity reducer and a baffle, 90° bend, tee or equivalent (see illustrations on next page).
   Two methods of velocity reduction:



23.5 Dose Volume
a) Pump volume per dose must be no greater than 1 gallon times the total linear feet of Presby Pipe.
b) Pump dosing should be designed for a minimum of 6 cycles per day.
c) If possible, the dosing cycle should provide one hour of drying time between doses.

23.6 Basic Serial Distribution Limit
Pumped systems with Basic Serial distribution are limited to a maximum dose rate of 40 gallons per minute and do not require the use of a flow equalizer on the D-Box outlet. Never pump directly into Presby Pipe.

23.7 Combination and Multiple-Bed Distribution Limit
All Presby Systems with Combination Serial distribution or Multiple Bed distribution must use Flow Equalizers in each distribution box outlet. Each Bed or section of Combination Serial distribution is limited to a maximum of 15 gallons per minute, due to the flow constraints of the equalizers. Example: pumping to a combination system with 3 sections (using 3 D-Box outlets). The maximum delivery rate is (3 x 15) = 45 GPM. Always provide a means of velocity reduction.

24.0 System Sand and Sand Fill Requirements for All Beds
It is critical to the proper functioning of Presby Systems that the proper amount and type of System Sand be installed.

24.1 Quantity of System Sand
System Sand is placed a minimum of 12 in. below, 3 in. above and 6 in. between the Presby Rows and a minimum of 6 in. horizontally around the perimeter of the Advanced Enviro-Septic® rows.

24.2 Sand Fill
Sand fill meeting state and local requirements is used to raise the elevation of the system in order to meet the required separation distance from the SHWT or other restrictive feature. No organic material or stones larger than 6 in. are allowed in the Sand Fill. System Sand may be used in place of sand fill; however, this may increase material costs.

25.0 Venting Requirements
An adequate air supply is essential to the proper functioning of Presby Systems. Venting is always required. Including the following requirements:

a) Pump systems must utilize Differential Venting.

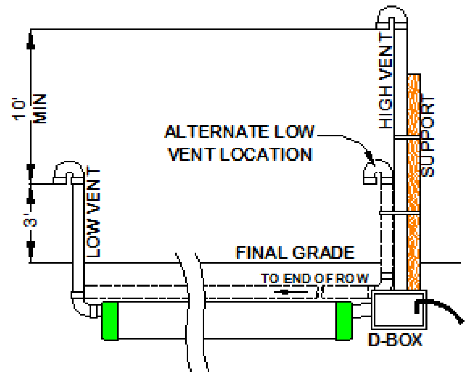
b) Vents for Multi-Level™ beds must connect to the lower level rows.

25.1 General Rules

a) Vent openings must be located to ensure the unobstructed flow of air through the entire Presby System.
b) The low vent inlet must be a minimum of 1 ft above final grade or anticipated snow level.
c) One 4 in. vent is required for every 1,000 ft of Presby Pipe.
d) A single 6 in. vent may be installed in place of up to three 4 in. vents.
e) If a vent manifold is used, it must be at least the same diameter as the vent(s).
f) When venting multiple beds, it is preferred that each bed be vented separately rather than manifolding bed vents together.
g) Sch. 40 PVC or equivalent should be used for all vent stacks.
h) Remote Venting may be utilized to minimize the visibility of vent stacks.

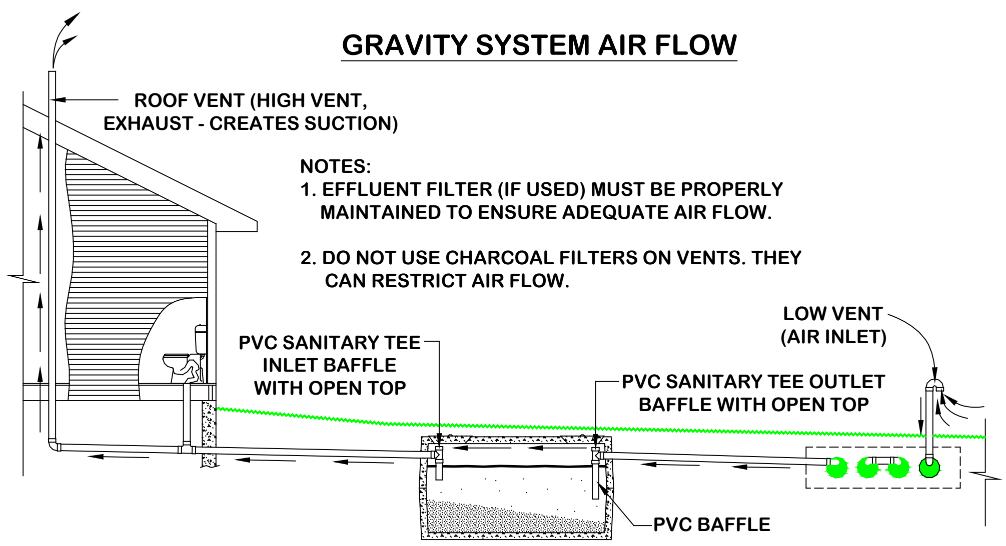
25.2 Differential Venting

a) Differential venting is the use of high and low vents in a system.
b) In a gravity system, the roof stack acts as the high vent.
c) High and low vent openings must be separated by a minimum of 10 vertical feet.
d) If possible, the high and low vents should be of the same capacity.



25.3 Vent Locations for Gravity Systems

a) A low vent is installed at the end of the last row of each section or the end of the last row in a Basic Serial bed, or at the end of each row in a D-Box Distribution Configuration system. A vent manifold may be used to connect the ends of multiple sections or rows.
b) 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.
c) When the house (roof) vent functions as the high vent, there must be a minimum of a 10 ft vertical differential between the low and high (roof) vent openings.
d) Illustration of gravity system air flow:



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

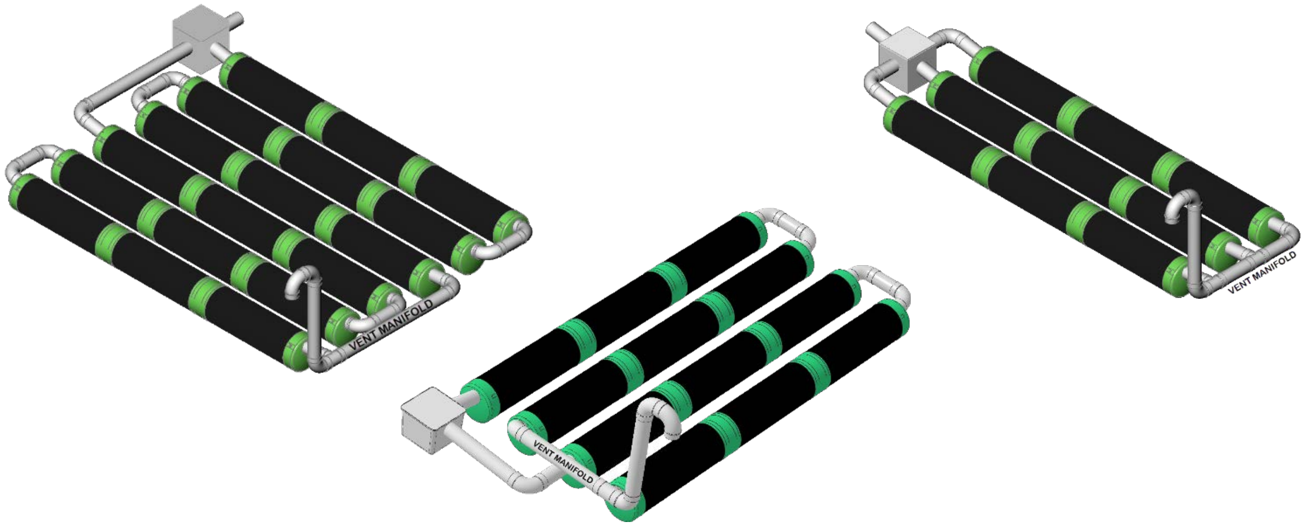
25.4 Pump System Vent Locations

a) A low vent is installed through an offset adapter at the end of each section, Basic Serial bed or attached to a vent manifold.
b) A high vent is attached to an unused distribution box outlet.
c) A 10 ft minimum vertical differential is required between high and low vent openings.
d) When venting multiple beds, it is preferred that each bed be vented separately (have their own high and low vents) rather than manifolding bed vents together.

e) The Low and High vents may be swapped proved the distribution box is insulated against freezing in cold climates.
f) See Remote Venting (para. 25.7, page 22) and Bypass Venting (para. 25.8, page 23) for options to relocate or eliminate the High Vent.

25.5 Vent Manifolds

A vent manifold may be incorporated to connect the ends of a number of sections or rows of Presby Pipe to a single vent opening. Slope the lines connecting the manifold to the Presby pipes to drain condensation. See diagrams below:



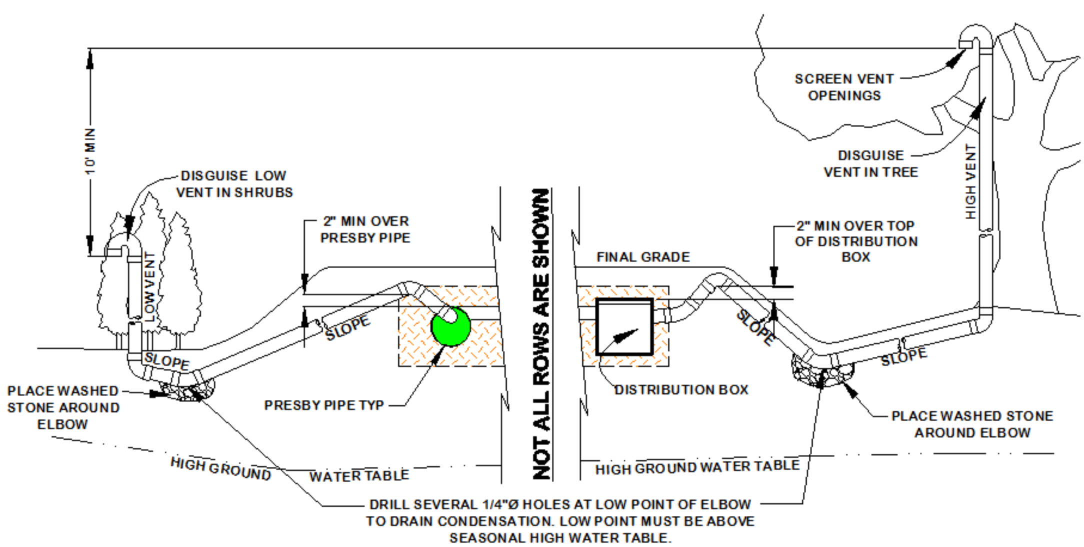
25.6 Vent Piping Slope

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

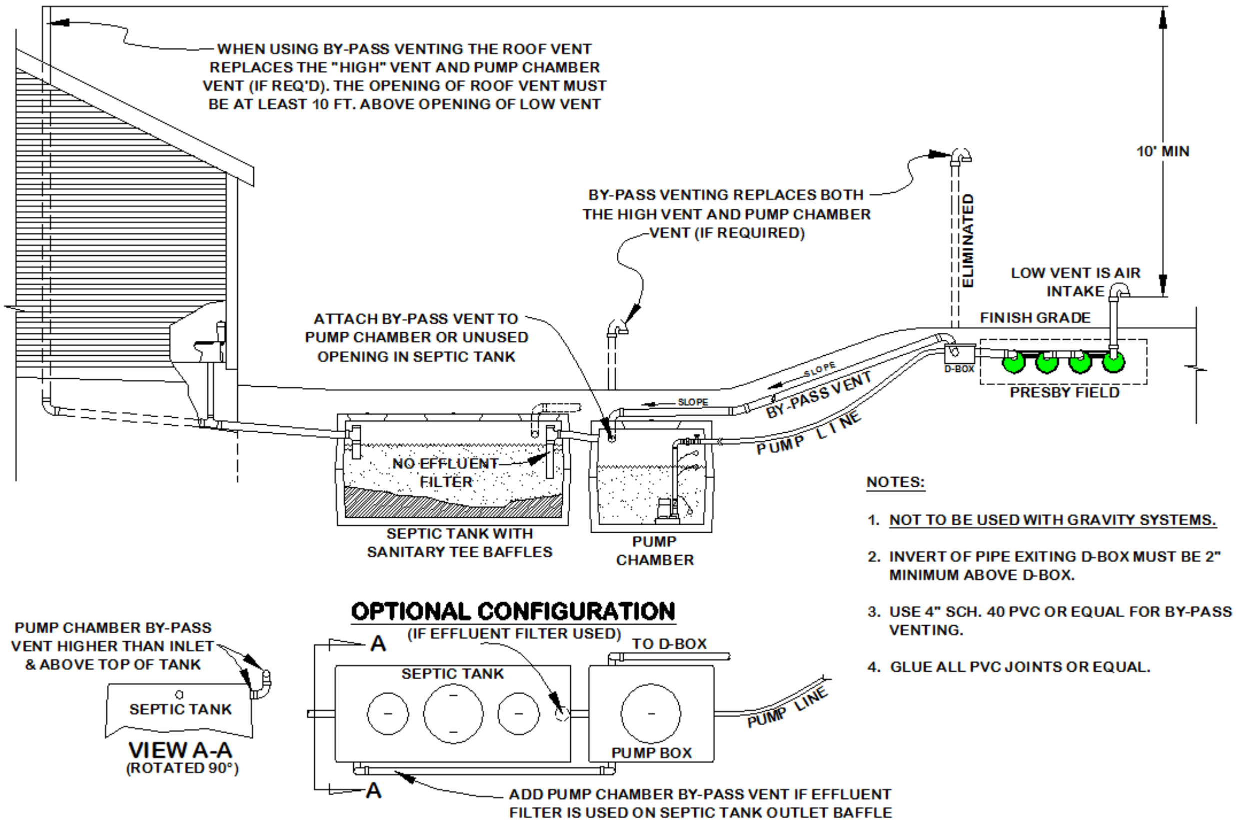
25.7 Remote Venting

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

a) A **high point** that is above the highest point of all Presby Pipes or the Distribution Box; and,
b) A **low point** opened for drainage which is above the SHWT. (See diagram below.)



25.8 By-Pass Venting



26.0 Site Selection

26.1 Determining Site Suitability
Refer to State or local rules regarding site suitability requirements.

26.2 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.

26.3 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.

26.4 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.

26.5 Hydraulic loading
Systems should not be located where lawn irrigation, roof drains, or natural flows increase water loading to the soils around the system.

26.6 Access
Systems should be located to allow access for septic tank maintenance and to at least one end of all Presby Rows. Planning for future access will facilitate rejuvenation in the unlikely event the system malfunctions.

26.7 Rocky or Wooded Areas
Avoid locating systems in rocky or wooded areas that require additional site work, since this 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.

26.8 Replacement System
In the event of system malfunction, contact PEI for technical assistance prior to attempting Rejuvenation procedures. In the unlikely event that a Presby System needs to be replaced …

a) It can be reinstalled in the same location, eliminating the need for a replacement field reserve area.

b) All unsuitable material must be removed prior to replacement system construction.
c) Disposal of hazardous materials to be in accordance with State and local requirements.
d) Permits may be required for system replacement; contact the appropriate local or state agency.

27.0 Installation Requirements, Component Handling and Site Preparation

27.1 Component Handling

a) Keep mud, grease, oil, etc. away from all components.
b) Avoid dragging pipe through wet or muddy areas.
c) Store pipe on high and dry areas to prevent surface water and soil from entering the pipes or contaminating the fabric prior to installation.
d) The outer fabric of the Presby 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.

27.2 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.

27.3 Site Preparation Prior to Excavation

a) Locate and stake out the System Sand bed, extension areas and soil material cover extensions on the site according to the approved plan.
b) Install sediment/erosion control barriers prior to beginning excavation to protect the system from surface water flows during construction.
c) Do not travel across or locate excavation equipment within the portion of the site receiving System Sand.
d) Do not stockpile materials or equipment within the portion of the site receiving System Sand.
e) It is especially important to avoid using construction equipment down slope of the system to prevent soil compaction.

27.4 When to Excavate

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

27.5 Tree Stumps

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.

a) Do not locate equipment within the limits of the System Sand bed.
b) Avoid soil disturbance, relocation, or compaction.
c) Avoid mechanical leveling or tamping of dislodged soil.
d) Fill all voids created by stump or root removal with System Sand.

27.6 Organic Material Removal

Before tilling, remove all grass, leaves, sticks, brush and other organic matter or debris from the excavated system site. It is not necessary for the soil of the system site to be smooth when the site is prepared.

27.7 Raking and Tilling Procedures

All areas receiving System Sand, sand fill and fill extensions **must** be raked or tilled. If a backhoe/excavator is used to till the site, fit it with chisel teeth and till the site. The backhoe/excavator must remain outside of the proposed System Sand area and extensions. For in-ground bed systems, excavate the system bed as necessary below original grade. Using an excavator or backhoe, tilt the bucket teeth perpendicular to the bed and use the teeth to rake furrows 2 in.- 6 in. deep into the bottom of the entire area receiving System Sand or sand fill (“receiving area”).

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

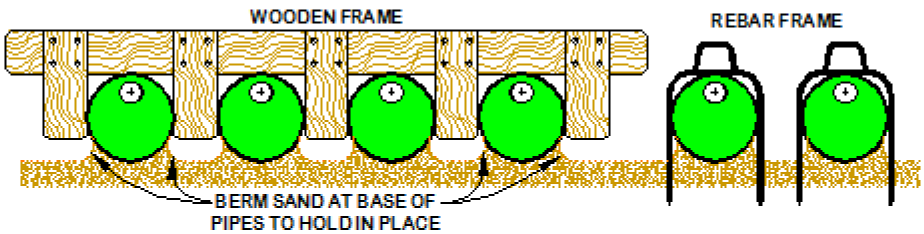
a) To protect the tilled area (System Sand bed area and System Sand extension area) from damage by precipitation, System Sand should be installed immediately after tilling.
b) Work off either end or the uphill side of the system to avoid compacting soil.
c) Keep at least 6 in. of sand between the vehicle tracks and the tilled soil of the site if equipment must work on receiving soil.
d) Track construction equipment should not travel over the installed system area until at least 12 in. of cover material is placed over the Presby Pipes.
e) Heavy equipment with tires must never enter the receiving area due to likely wheel compaction of underlying soil structures.

27.9 Distribution Box Installation
To prevent movement, be sure D-boxes are placed level on compacted soil, sand, pea gravel base, or concrete pad.

27.10 Level Row Tolerances
Use a laser level or transit to install rows level. Variations beyond 1 in. (±1/2") may affect system performance and are not acceptable.

27.11 Correct Alignment of Advanced Enviro-Septic® Bio-Accelerator® Fabric
The Bio-Accelerator® (white geo-textile fabric) is to be positioned centered along the bottom of the pipe rows (sewn seam up).

27.12 Row Spacers
System Sand may be used to keep pipe in place while covering, but simple tools may also be constructed for this purpose. Two examples are shown. One is made from rebar, the other from wood. Center-to-center row spacing may be larger than specified by this manual. Caution: Remove all tools used as row spacers before final covering.



27.13 Connect Rows Using Raised Connections
Raised connections consist of offset adapters, 4 in. 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 Presby System (see para. 3.7 page 4). Glue or mechanically fasten all pipe connections.

27.14 Backfilling Rows

a) Spread System Sand between the rows.
b) Confirm pipe rows are positioned with Bio-Accelerator® along the bottom (sewn seam up).
c) Straddle each row of pipe and walk heel-to-toe its entire length, ensuring that System Sand fills all void spaces beneath the Presby Pipe.
d) Finish spreading System Sand to the top of the rows and leave them exposed for inspection purposes.

27.15 Backfilling and Final Grading
Spread System Sand to a minimum of 3 inches over the pipe and a minimum of 6 inches beyond Presby Pipes on all four sides beyond the Presby Pipes. Spread soil material free of organics, stones over 4 inches and building debris, having a texture similar to the soil at the site, without causing compaction. Construction equipment should not travel over the installed system area until at least 12 inches of cover material is placed over the Presby Pipes (H-10 Loading). 18 inches of cover material over the Presby System is required for H-20 loading (see para. 22.0, page 19).

27.16 System Soil Cover Material
A minimum of 4 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.

27.17 Erosion Control
To prevent erosion, soil cover above the system shall be planted with native, shallow-rooted vegetation such as grass, wildflowers and certain perennials or ground covers.

27.18 Trees and Shrubs
It is recommended that no trees or shrubs be located within 10 ft of the system perimeter to prevent roots from growing into and damaging the system.

28.0 System Bacteria Rejuvenation and Expansion
This section covers procedures for bacteria rejuvenation and explains how to expand existing systems.
Note: Presby Environmental, Inc. must be contacted for technical assistance prior to attempting rejuvenation procedures.

28.1 Why would System Bacteria Rejuvenation be needed?
Bacteria rejuvenation is the return of bacteria to an aerobic state. Flooding, improper venting, alteration or improper depth of soil material cover, use of incorrect sand, sudden use changes, introduction of chemicals or medicines, and a variety of other conditions can contribute to converting bacteria in any system from an aerobic to an anaerobic

state. This conversion severely limits the bacteria's ability to effectively treat effluent, as well as limiting liquids from passing through. A unique feature of the Presby System is its ability to be rejuvenated in place.

28.2 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 Presby Systems without costly removal and replacement.

1. Contact Presby Environmental before attempting Rejuvenation for technical assistance.
2. Determine and rectify the problem(s) causing the bacteria conversion.
3. Drain the system by excavating one end of all the rows and removing the offset adapters.
4. If foreign matter has entered the system, flush the pipes.
5. Safeguard the open excavation.
6. Guarantee a passage of air through the system.
7. Allow all rows to dry for 72 hours minimum. The System Sand should return to its natural color.
8. Re-assemble the system to its original design configuration. As long as there is no physical damage to the Presby components, the original components may be reused.

29.0 System Expansion

Presby Systems are easily expanded by adding equal lengths of pipe to each row of the original design or by adding additional equal sections. All system expansions must comply with State and local regulations. Permits may be required prior to system expansion.

29.1 Reusable Components

Presby Pipe and components are not biodegradable and may be reused. In cases of improper installation, it may be possible to excavate, clean, and reinstall all system components.

30.0 Operation & Maintenance

30.1 Proper Use

Presby Systems require minimal maintenance, provided the system is not subjected to abuse. An awareness of proper use and routine maintenance will guarantee system longevity. We encourage all system owners and service providers to obtain and review a copy of our Owner's Manual, available from our website www.PresbyEnvironmental.com or via mail upon request to (800) 473-5298 or info@presbyeco.com.

30.2 System Abuse Conditions

The following conditions constitute system abuse:

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

Note: PEI and most regulatory agencies do not recommend the use of septic system additives.

30.3 System Maintenance/Pumping of the Septic Tank

a) Inspect the septic tank at least once every two years under normal usage.
b) Pump the tank when surface scum and bottom sludge occupy one-fourth or more of the liquid depth of the tank.
c) If a garbage disposal is used, the septic tank will likely require more frequent pumping.
d) 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.
e) Inspect the system to ensure that vents are in place and free of obstructions.
f) 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.

30.4 Site Maintenance

It is important that the system site remain free of shrubs, trees, and other woody vegetation, 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.

31.0 Glossary

This Manual contains terminology which is common to the industry and terms that are unique to Presby Systems. While alternative definitions may exist, this section defines how these terms are used in this Manual.

31.1 Advanced Enviro-Septic® (AES) Pipe

A single unit comprised of corrugated plastic pipe, Bio-Accelerator® fabric along its bottom which is surrounded by a layer of randomized plastic fibers and a sewn geo-textile fabric. Each unit is 10 ft in length, with an outside diameter of 12 in. and a storage capacity of approximately 58 gallons. Each foot of Advanced Enviro-Septic® provides over 40 sq ft of total surface area for bacterial activity. The sewn seam is always oriented up (12 o'clock position) within the bed. A white tag is sewn into the seam indicating the product is Advanced Enviro-Septic® pipe. Pipes are joined together with couplings to form rows. Advanced Enviro-Septic® is a combined wastewater treatment and dispersal system.

31.2 Basic Serial Distribution

Basic Serial distribution incorporates Presby Rows in serial distribution in a single bed (see Basic Serial Distribution in para. 12.0, page 14).

31.3 Bio-Accelerator®

Bio-Accelerator® fabric screens 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. Bio-Accelerator® is only available with Advanced Enviro-Septic®.

31.4 Bottom Drain

A bottom drain is a line connected to the hole in the 6 o'clock position of a double offset adapter at the end of each serial section or each row in a D-Box Distribution Configuration which drains to a sump and is utilized to lower the water level in a saturated system or to facilitate system rejuvenation (see illustration in para. 14.0, page 16).

31.5 Butterfly Configuration

A variation of a standard, single bed system with the D-box located in the center, with rows oriented symmetrically on either side, and with each side or section receiving an equal volume of flow from the D-Box. See Butterfly Configuration (see para. 15.1, page 17).

31.6 Center-to-Center Row Spacing

The distance from the center of one Presby Row to the center of the adjacent row.

31.7 Coarse Randomized Fiber

A mat of coarse, randomly-oriented fibers which separates more suspended solids from the effluent protecting the bacterial surface in the geo-textile fabric (see illustration in para. 2.0, page 2).

31.8 Combination Serial Distribution

Incorporates two or more sections of Presby Pipe in a single bed, with each section receiving a maximum of 750 GPD of effluent from a distribution box. Combination Distribution is not required for daily flows of 750 GPD or less. See Combination Serial Distribution, para. 15.0, on page 16.

31.9 Cooling Ridges

Pipe ridges that allow the effluent to flow uninterrupted around the circumference of the pipe and aid in cooling (see illustration in para. 2.0, page 2).

31.10 Coupling

A plastic fitting that joins two Presby Pipe pieces in order to form rows (see para.3.3, page 3).

31.11 Daily Design Flow

The peak daily flow of wastewater to a system, expressed in gallons per day (GPD); systems are typically sized based on the daily design flow. Design flow calculations are set forth in the State Rules. In general, actual daily use is expected to be one-half to two-thirds less than "daily design flow."

31.12 Differential Venting

A method of venting a Presby System utilizing high and low vents (see para. 25.2, page 21).

31.13 Distribution Box or "D-Box"
A device designed to divide and distribute effluent from the septic tank equally to each of the outlet pipes that carry effluent into the Presby System. D-Boxes are also used for velocity reduction, see Velocity Reduction, para. 23.4, page 20.

31.14 Drop Connection (Multi-Level™ Systems)
A drop connection is a PVC Sewer & Drain pipe configuration which is used to connect upper level rows to lower level rows in a Multi-Level™ bed. Drop connections extend 2 in. to 4 in. into the pipe and are installed with at least 2 in. of drop from the upper level row to the lower level row. All PVC joints should be glued or mechanically fastened.

31.15 D-Box Distribution Configuration
A design in which each Presby Row receives effluent from a distribution box outlet. Such a system is also called a "parallel system" or a "finger system." See D-Box (Parallel) Distribution, para. 17.0, page 18.

31.16 End-to-End Configuration
Consists of two or more beds constructed in a line (i.e., aligned along the width of the beds). See para. 18.0, page 18 and illustration on page 16.

31.17 Flow Equalizer
An adjustable plastic insert installed in the outlet pipes of a D-Box to equalize effluent distribution to each outlet.

31.18 GPD and GPM
An acronym for Gallons per Day and Gallons per Minute respectively.

31.19 High and Low Vents
Pipes used in differential venting. Detailed information about venting requirements can be found in Venting Requirements, para. 25.0, page 20.

31.20 High Strength Effluent
High strength wastewater is septic tank effluent quality with combined 30-day average carbonaceous biochemical oxygen demand (BOD5) and total suspended solids (TSS) in excess of two-hundred and forty (240) mg/L.

31.21 Manifolded Splitter Box
A PVC configuration which connects several distribution box outlets together in order to equalize effluent flow. Refer to drawing in para. 3.6, on page 3.

31.22 Multi-Level™
A Multi-Level™ System is a patented process using Presby Pipe; it consists of essentially two Presby Systems installed in the same bed with one system on top of another with 6 in. of System Sand between the two levels. Multi-Level Systems are limited to soils with a Soil Application rate of 0.6 GDP/ft^2 and greater.

31.23 Multiple Bed Distribution
Incorporates two or more beds, each bed with Basic Serial, Combination Serial, or D-Box distribution and receiving effluent from a distribution box (see para. 18.0, page 18).

31.24 Non-Conventional Configurations
Have irregular shapes or row lengths shorter than 30 ft to accommodate site constraints (see para. 13.1, page 15).

31.25 Offset Adapter
A plastic fitting with a 4-inch hole installed at the 12 o'clock position which allows for connections from one row to another and for installation of venting (see para. 3.2, page 3).

31.26 Pressure Distribution
A pressurized, small-diameter pipe system used to deliver effluent to an absorption field. Pressure Distribution is not permitted to be used with the Presby System. Presby Systems are designed to promote even distribution without the need for pressure distribution.

31.27 Pump Systems
Utilize a pump to gain elevation in order to deliver effluent to a D-Box (see para. 23.0, page 20).

31.28 Raised Connection
A U-shaped, 4" diameter, PVC pipe configuration which is used to connect rows oriented in a serial configuration and to maintain the proper liquid level inside each row. See drawing in para.3.8, page 4.

31.29 Raking and Tilling
Refers to methods of preparing the native soil that will be covered with System Sand or Sand Fill, creating a transitional layer between the sand and the soil. See Installation Requirements para. 27.7, page 24.

31.30 Row
Consists of a number of Presby Pipe sections connected by couplings with an Offset Adapter on the inlet end and an Offset Adapter or End Cap on the opposite end. Rows are typically between 30 ft and 100 ft long (see Row Requirements in para. 11.14, page 12).

31.31 Sand Fill
Clean sand, free of organic materials and meeting the specifications set forth in Sand Fill, para. 24.2, page 20. Sand fill is used to raise the elevation of the system to meet required separation distance or in side slope tapers. System Sand may be used in place of Sand Fill.

31.32 Section / Serial Section
A group of interconnected rows receiving effluent from one distribution box outlet. Sections are limited to 750 GPD daily design flow maximum.

31.33 Serial Distribution
Two or more Presby Rows connected by a Raised Connection. Basic Serial distribution is described in detail in sections 12.0 on page 14. Combination Serial distribution is described in detail in paragraphs 15.0 and 16.0, pages 16 and 17.

31.34 Skimmer Tabs
Projections into the AES pipe that help to capture grease and suspended solids from the existing effluent (see illustration in para. 2.0, page 2).

31.35 Side-to-Side Configuration
Consist of two or more beds arranged so that the rows are parallel to one another.

31.36 Slope (3:1)
In this Manual's illustrations, slope is expressed as a ratio of run to rise. Example: A slope with a grade of (3:1) is the difference in horizontal distance of two (3) horizontal feet (run) over an elevation difference of one (1) ft (rise).

31.37 Slope (%)
Expressed as a **percent**, is the difference in elevation divided by the difference in horizontal distance between two points on the surface of a landform. Example: A site slope of one (1) percent is the difference in elevation of one (1) foot (rise) over a horizontal distance of one hundred (100) feet (run).

31.38 Smearing
The mechanical sealing of soil air spaces along an excavated, tilled or compressed surface. This is also referred to as "compacting." In all installations, it is critical to avoid smearing or compacting the soils under and around the field.

31.39 Surface Diversion
A natural or manmade barrier that changes the course of water flow around an onsite system's soil absorption field.

31.40 System Sand Bed
System Sand area required/used in Presby Systems. The System Sand bed extends a minimum of 12 in. below, 3 in. above and 6 in. horizontally from the outside edges of the Presby Pipes.

31.41 System Sand
System Sand must be clean, granular sand free of organic matter and must adhere to the Presby System Specification with no more than 3% passing the #200 sieve (see complete details in para. 3.10, page 4).

31.42 System Sand Extension Area
The System Sand extension area is a minimum of 6 in. deep for Single Level systems and 12 in. deep for Multi-Level systems. The System Sand extension is placed on the down slope side of sloping systems. System sloping more than 10% require a 3 ft minimum extension. The System Sand extension is measured from the tall portion of the System Sand bed (see illustration in para. 18.1, page 19).

31.43 Topsoil (a.k.a. Loam or Soil Cover Material)
Topsoil, also known as Loam, is soil material cover capable of sustaining plant growth which forms the topmost layer of cover material above the system.

31.44 Velocity Reducer
Velocity reducer refers to any of the various components whose purpose is to reduce the velocity of effluent flow into the Presby Pipes. A distribution box with a baffle or inlet tee is sufficient for velocity reduction in most systems (see illustration in para. 23.4, page 20).

The Presby Wastewater Treatment System

Wisconsin

Advanced Enviro-Septic®

Mound Component Manual

Minimizes the Expense **Protects the Environment** **Preserves the Site**

Presby Environmental, Inc.

The Next Generation of Wastewater Treatment Technology

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The information in this manual is subject to change without notice. We recommend that you check your State's page on our website on a regular basis for updated information. Your suggestions and comments are welcome. Please contact us at: 800-473-5298

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The products and methods depicted in this manual are protected by one or more patents. For more information: Pat. www.presbyeco.com/patents.

IMPORTANT NOTICE: This Manual is intended ONLY for use in designing and installing Presby Environmental's Advanced Enviro-Septic® Wastewater Treatment Systems. 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.

Date of Issue: February 15, 2017

TABLE OF CONTENTS

1.0 Background

Liquid that exits from a septic tank ("effluent") contains suspended solids that can cause traditional systems to fail prematurely. Solids can overload bacteria, cut off air required for aerobic bacterial activity, and/or seal the underlying soil, interfering with its ability to absorb liquid.

1.1 What Our System Does

By utilizing simple yet effective natural processes, the Presby 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 treatment area ("biomat") than traditional systems.

1.2 Why Our System Excels

The Presby Treatment System retains solids in its pipe and provides multiple bacterial surfaces to treat effluent prior to its contact with the soil. The continual cycling of effluent (the rising and falling of liquid inside the pipe) enhances bacterial growth. This all combines to create a unique eco-system that no other passive wastewater treatment system is designed to offer. The result is a system that excels by being more efficient, lasting longer, and has a minimal environmental impact.

1.3 System Advantages

a) costs less than traditional systems
b) eliminates the need for washed stone
c) often requires a smaller area
d) installs more easily and quickly than traditional systems
e) adapts easily to residential and commercial sites of virtually any size
f) adapts well to difficult sites
g) develops a protected receiving surface preventing sealing of the underlying soil
h) blends "septic mounds" into sloping terrain
i) increases system performance and longevity
j) tests environmentally safer than traditional systems
k) recharges groundwater more safely than traditional systems
l) made from recycled plastic

1.4 Patented Presby Technology

At the heart of Advanced Enviro-Septic® is a patented corrugated, perforated plastic pipe with interior skimmer tabs and cooling ridges. All Presby Pipe is surrounded by one or more filtering, treatment and dispersal layers. Presby Systems are completely passive, requiring no electricity, motors, alarms, computers, etc. Presby Pipes are assembled and installed in a bed of specified System Sand which can either be below the ground or above.

1.5 Advanced Enviro-Septic® (AES)

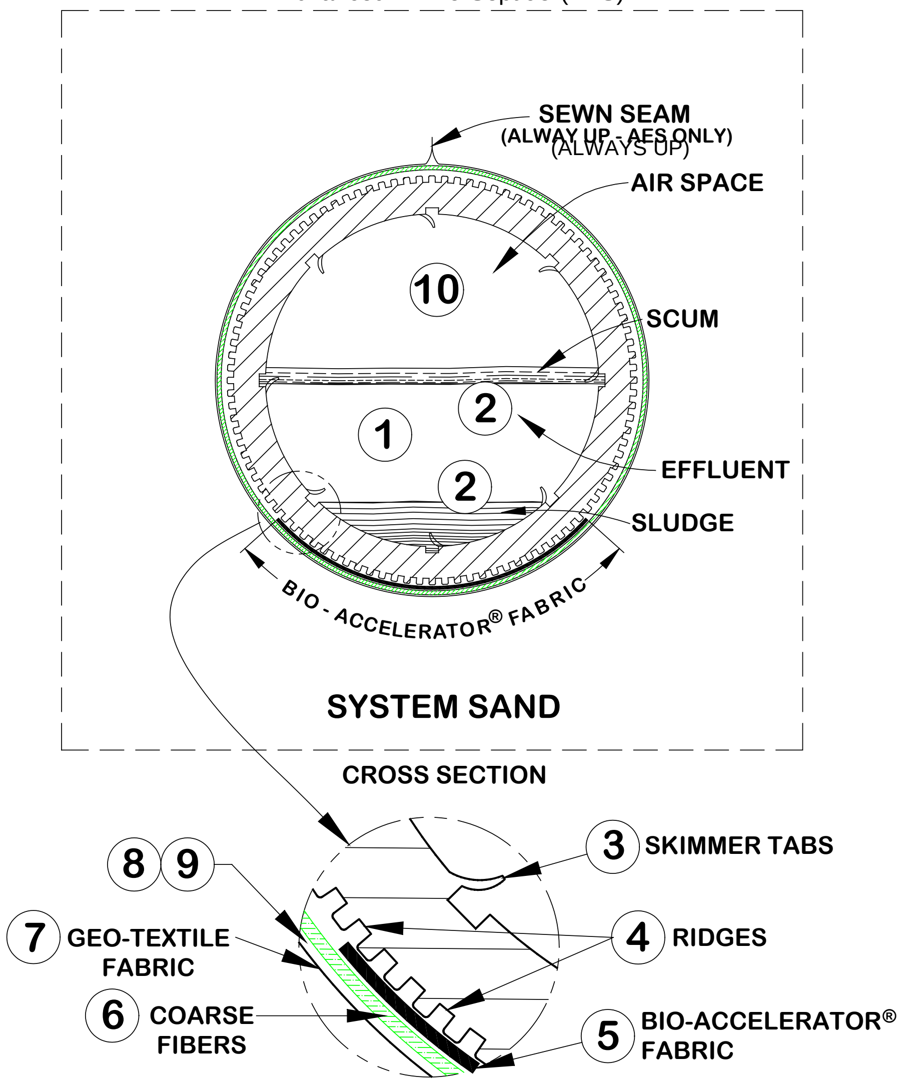
The Advanced Enviro-Septic® pipe is assembled into an onsite wastewater treatment system that has been successfully tested and certified to NSF 40, Class I (a certification typically given to mechanical aeration devices), BNQ of Quebec, Class I, II, III and Cebedeau, Belgium standards. Advanced Enviro-Septic® is comprised of corrugated, perforated plastic pipe, Bio-Accelerator® fabric along its bottom which is surrounded by a layer of randomized plastic fibers and a sewn geo-textile fabric. Advanced Enviro-Septic® creates an eco-system designed to simultaneously purify and disperse effluent after primary treatment by a septic tank. Advanced Enviro-Septic® is the "next generation" of our Enviro-Septic® technology. The AES product incorporates Bio-Accelerator®, a proprietary enhancement that screens additional solids from effluent, accelerates treatment processes, assures even distribution and provides additional surface area. Each foot of Advanced Enviro-Septic® pipe provides over 40 sq ft of total surface area for bacterial activity.

2.0 Ten Stages of Wastewater Treatment

The Presby Wastewater Treatment System's

10 STAGES OF TREATMENT

Advanced Enviro-Septic® (AES)



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® fabric screens 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, randomly-oriented fibers separates more suspended solids from the effluent.

Stage 7: Effluent passes into the geo-textile fabrics and grows a protected bacterial surface.

Stage 8: Sand wicks liquid from the geo-textile fabrics and enables air to transfer to the bacterial surface.

Stage 9: The fabrics and fibers provide a large bacterial surface to break down solids.

Stage 10: An ample air supply and fluctuating liquid levels increase bacterial efficiency.

3.0 Presby System Components

3.1 Advanced Enviro-Septic® Pipe

a) Presby pipe required is calculated at 3 GPD/ft for both residential and commercial applications. This assumes residential strength effluent.
b) Plastic pipe made with a significant percentage of recycled material
c) 10 ft sections (can be cut to any length)
d) Ridged and perforated, with skimmer tabs on interior
e) Bio-Accelerator® along bottom of pipe (sewn seam always placed up).
f) Surrounded by a mat of randomly-oriented plastic fibers
g) Wrapped in a non-woven geo-textile fabric stitched in place
h) Exterior diameter of 12 in.
i) Each 10 ft section has a liquid holding capacity of approx. 58 gallons
j) A 10 ft length of AES pipe is flexible enough to bend up to 90°

3.2 Offset Adapter

An offset adapter is a plastic fitting 12 in. in diameter with an inlet hole designed to accept a 4-inch sewer line, raised connection or vent pipe. The hole is to be installed in the 12 o'clock position. The distance from the bottom of the Offset Adapter to the bottom of its inlet hole is 7 in. When assembling pipes into rows, note that the geo-textile fabrics are placed over the edges of the Offset Adapter and Couplings.

Double Offset Adapter

A double offset adapter is a plastic fitting 12 in. in diameter with two 4 in. holes designed to accept a 4 inch inlet pipe, raised connection, vent or vent manifold, and/or bottom drain, depending upon the particular requirements of the design configuration. The 4 in. 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 in. from each other.

3.3 Coupling

A coupling is a plastic fitting used to create a connection between two pieces of Presby Pipe. Note that the couplings are wide enough to cover 1 or 2 pipe corrugations on each of the two pipe ends being joined. The couplings feature a snap-lock feature that requires no tools. When assembling pipes into rows, note that the geo-textile fabric does not go under couplings. Pull fabric back, install coupling, and then pull fabric over coupling. Also, note during installation in cold weather, couplings are easier to work with if stored in a heated location (such as a truck cab) before use.

3.4 Distribution Box

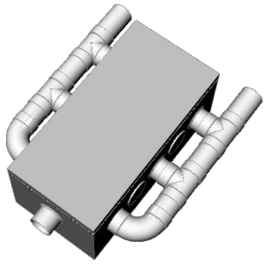
A Distribution Box, also called a "D-box," is a device used to distribute effluent coming from the septic tank in a system that contains more than one section or more than one bed. D-boxes are also sometimes used for velocity reduction. D-boxes come in various sizes and with a varying number of outlets. 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. A distribution box is only required when dividing flow to more than one section of the Presby bed.

3.5 Flow Equalizers

All Presby Systems with Combination Serial distribution or Multiple Bed distribution must use Flow Equalizers in each distribution box outlet. A flow equalizer is an adjustable plastic insert installed in the outlet holes of a distribution box to equalize effluent distribution to each outlet whenever flow is divided. Each Bed or section of Combination Serial distribution is limited to a maximum of 15 gallons per minute, due to the flow constraints of the equalizers. Example: pumping to a combination system with 3 sections (using 3 D-Box outlets). The maximum delivery rate is (3 x 15) = 45 GPM. Always provide a means of velocity reduction when needed.

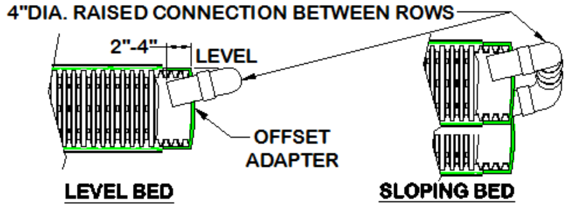
3.6 Manifolded Splitter Box

A manifolded splitter box joins several outlets of a D-box to help divide flow more accurately. Dividing flow to multiple beds is a common use of splitter boxes. All outlets delivering effluent to the Presby field must have a flow equalizer. Do not place an equalizer on vent outlets.



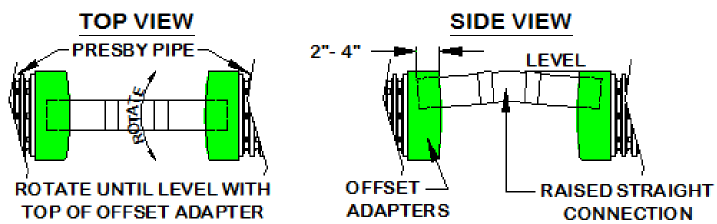
3.7 Raised Connection

A raised connection is a PVC Sewer & Drain pipe configuration which is used to connect Presby Rows. Raised connections extend 2 in. to 4 in. into pipe and are installed on an angle (as shown below). All PVC joints should be glued or mechanically fastened.



3.8 Raised Straight Connection

A raised straight connection is a PVC Sewer & Drain pipe configuration which is used to connect Presby Rows that are placed end to end along the same contour. Raised straight connections extend 2 inches to 4 inches into pipe and are installed on an angle (as shown below). All PVC joints should be glued or mechanically fastened. Offset Adapters will accept 4 inch schedule 40 PVC if the edge to be inserted into the adapter is rounded.



3.9 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 is determined by state and/or local rules. Septic tanks must be fitted with inlet and outlet baffles in order to retain solids in the septic tank and to prevent them from entering the Presby pipes. Effluent filters are not recommended by Presby Environmental, Inc. due to their tendency to clog, which cuts off the oxygen supply that is essential to the functioning of the Presby System. If you are required to use an effluent filter in a gravity fed system due to State or local requirements, the effluent filter selected must allow the free passage of air to ensure the proper functioning of the system.

3.10 System Sand

The System Sand that surrounds the Presby pipes is an **essential** component of the system. It is **critical** that the correct type and amount of System Sand is used during construction. System Sand must be coarse to very coarse, clean, granular sand, free of organic matter. System Sand is placed a minimum of 12 inches below, 6 inches between and around the perimeter and 3 inches above from the Presby pipes. It must adhere to **all** of the following percentage and quality restrictions:

Presby System Sand Specification

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

3.11 System Sand Acceptable Alternative

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

4.0 **Table A – Soil Application Rate by Soil Characteristics** (from Wisconsin Table SPS 383.44-1)

Soil Characteristics			Soil Application Rate (GPD/sq ft)	
Texture	Structure: Shape	Structure: Grade		
Coarse Sand, Sand, Loamy Coarse Sand, Loamy Sand	-	Structureless	1.6[a]	0.5[b]
Fine Sand, Loamy Fine Sand	-	Structureless	1.0	
Very Fine Sand, Loamy Very Fine Sand	-	Structureless	0.6	
Coarse Sandy Loam, Sandy Loam	-	Structureless, Massive	0.6	
	Platy	Weak	0.6	
		Moderate, Strong	0.2	
	Prismatic, Blocky, Granular	Weak	0.7	
		Moderate, Strong	1.0	
Fine Sandy Loam, Very Fine Sandy Loam	-	Structureless, Massive	0.5	
	Platy	Moderate, Strong	0.2	
	Platy, Prismatic, Blocky, Granular	Weak	0.6	
	Prismatic, Blocky, Granular	Moderate, Strong	0.8	
Loam	-	Structureless, Massive	0.5	
	Platy	Moderate, Strong	0.2	
	Platy, Prismatic, Blocky, Granular	Weak	0.6	
	Prismatic, Blocky, Granular	Moderate, Strong	0.8	
Silt Loam	-	Structureless, Massive	0.2	
	Platy	Moderate, Strong	0.2	
	Platy, Prismatic, Blocky, Granular	Weak	0.6	
	Prismatic, Blocky, Granular	Moderate, Strong	0.8	
Silt	-	-	0.0	
Sandy Clay Loam, Clay Loam, Silty Clay Loam	-	Structureless, Massive	0.0	
	Platy	Weak, Moderate, Strong	0.2	
	Prismatic, Blocky, Granular	Weak	0.3	
		Moderate, Strong	0.6	
Sandy Clay, Clay, Silty Clay	-	Structureless, Massive	0.0	
	Platy	Weak, Moderate, Strong	0.0	
	Prismatic, Blocky, Granular	Weak	0.0	
		Moderate, Strong	0.3	

a = with ≤60% rock fragments and b = with >60% to <90% rock fragments

Note: Soil application rates shown above and below assume residential strength effluent (see para. 11.7, page 12 for definition of residential strength). Contact Presby Environmental for technical assistance with high strength wastewater.

5.0 Table B – Soil Application Rate using Percolation Rate (from Wisconsin Table SPS 383.44-2)

Percolation Rate Minutes per Inch (MPI)	Soil Application Rate Gallons per Day per Sq Ft (GPD/sq ft)
0 to less than 10	1.2
10 to less than 30	0.9
30 to less than 45	0.7
45 to less than 60	0.5
60 to 120	0.3

6.0 Table C: Slope Requirements

Soil Application Rate (GPD/sq ft)	Maximum System Slope (%)	Maximum Site Slope (%)
1.6 – 0.6	25	33
0.5	15	20
0.3 – 0.2	5	5

7.0 Table D: Row Length and Pipe Layout Width (Single Level)

Row Length (ft)	Total Linear Feet of Presby Pipe													
20	40	60	80	100	120	140	160	180	200	220	240	260	280	300
25	50	75	100	125	150	175	200	225	250	275	300	325	350	375
30	60	90	120	150	180	210	240	270	300	330	360	390	420	450
35	70	105	140	175	210	245	280	315	350	385	420	455	490	525
40	80	120	160	200	240	280	320	360	400	440	480	520	560	600
45	90	135	180	225	270	315	360	405	450	495	540	585	630	675
50	100	150	200	250	300	350	400	450	500	550	600	650	700	750
55	110	165	220	275	330	385	440	495	550	605	660	715	770	825
60	120	180	240	300	360	420	480	540	600	660	720	780	840	900
65	130	195	260	325	390	455	520	585	650	715	780	845	910	975
70	140	210	280	350	420	490	560	630	700	770	840	910	980	1,050
75	150	225	300	375	450	525	600	675	750	825	900	975	1,050	1,125
80	160	240	320	400	480	560	640	720	800	880	960	1,040	1,120	1,200
85	170	255	340	425	510	595	680	765	850	935	1,020	1,105	1,190	1,275
90	180	270	360	450	540	630	720	810	900	990	1,080	1,170	1,260	1,350
95	190	285	380	475	570	665	760	855	950	1,045	1,140	1,235	1,330	1,425
100	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500
# of Rows	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1.50' C/L	2.50	4.00	5.50	7.00	8.50	10.00	11.50	13.00	14.50	16.00	17.50	19.00	20.50	22.00
1.75' C/L	2.75	4.50	6.25	8.00	9.75	11.50	13.25	15.00	16.75	18.50	20.25	22.00	23.75	25.50
2.00 C/L	3.00	5.00	7.00	9.00	11.00	13.00	15.00	17.00	19.00	21.00	23.00	25.00	27.00	29.00
2.25 C/L	3.25	5.50	7.75	10.00	12.25	14.50	16.75	19.00	21.25	23.50	25.75	28.00	30.25	32.50
2.50 C/L	3.50	6.00	8.50	11.00	13.50	16.00	18.50	21.00	23.50	26.00	28.50	31.00	33.50	36.00
	*Pipe Layout Width (ft) = Outermost edge of first row to outermost edge of last row													

*Formula for single level Pipe Layout Width = [Row Spacing x (# of Rows - 1)] + 1. Row spacing is 1.5 ft minimum; larger row spacing is allowed and at the discretion of the designer. To use Table D: select a row length and move right until the minimum amount of pipe is found (more is allowed). Then move down to find the number of rows required. Continue downward in the same column until adjacent to the row spacing and find the pipe layout width.

8.0 Design Worksheet (Single Level Systems)

Step #1: ___________ GPD ÷ ________ GPD/sq ft Application Rate (Table A) = _________ sq ft sand bed area min.

Step #2: ___________ GPD ÷ 3 GPD/ft = _________ ft of Presby pipe minimum (assumes residential strength)

Step #3: ___________ GPD ÷ 750 GPD/section = _______ sections required. Notes: round fractions up to whole number. This step does not apply to parallel distribution systems.

Step #4: ___________ ft Presby pipe (Step #2) ÷ _________ ft row length = ________ number of rows. Notes: number of rows must be evenly divided by number of serial sections from Step #3, add rows if necessary (does not apply to parallel distribution systems). Longer rows preferred to shorter length rows.

Step #5: ___________ ft PLW from Table D (or calculated manually for larger row spacing)

Step #6: ___________% system slope (cannot exceed Table C allowances)

Step #7: Calculate System Sand bed width –
Beds sloping 10% or less, use the larger of (a) or (b) below:

a) ___________ sq ft sand bed area (Step #1) ÷ (______ ft row length + 1 ft) = ________ ft sand bed width minimum
Note: 1 ft is added to row length to allow 6 inches of sand beyond the ends of each row.

b) ___________ ft PLW (Step #5) + 1 ft = _____________ ft sand bed width minimum

Beds sloping over 10%, use the larger of (c) or (d) below:

c) ___________ sq ft sand bed area (Step #1) ÷ (______ ft row length + 1 ft) = ________ ft sand bed width minimum

d) ___________ ft PLW (Step #5) + 4.5 ft = _______ ft sand bed width minimum Note: 4.5 ft is added to the PLW to allow 6 inches of sand above the first row and 3.5 ft beyond the edge of the lower row.

Step #8: Calculate System Sand Extension(s) choose (a) or (b) below:
Level beds (System Sand Extensions (SSE) are placed on each side of Presby Pipes):

a) (__________ ft SSBW (Step #7) – ________ ft PLW Step #5 + 1) ÷ 2 = ________ ft

Sloping beds: SSE placed entirely on the down slope side of the bed

b) __________ ft SSBW (Step #7) – ________ ft PLW (Step #5) + 1 = ________ ft

8.1 Design Example (single level)

Single family residence, (3) bedrooms (300 GPD), Application Rate for LFS (Loamy Fine Sandy), 10% sloping site, serial distribution layout, seasonal high groundwater at 30 inches.

Step #1: **300** GPD ÷ **1.0** GPD/sq ft Application Rate (Table A) = **300** sq ft sand bed area min.

Step #2: **300** GPD ÷ 3 GPD/ft = **100** ft of Presby pipe minimum

Step #3: **300** GPD ÷ 750 GPD/section = **0.4→1** sections required.

Step #4: **100** ft Presby pipe (Step #2) ÷ **50** ft row length = **2** rows required

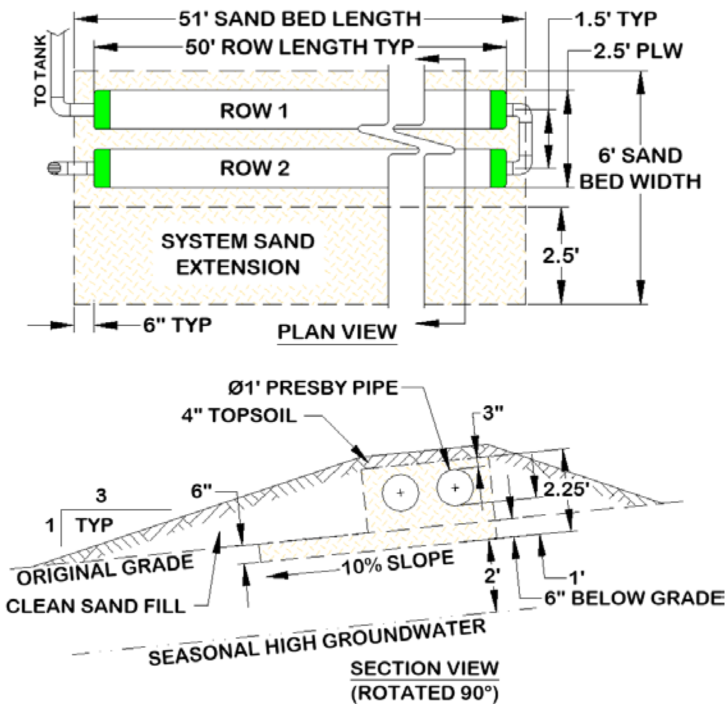
Step #5: **2.5** ft PLW from Table D (or calculated manually for larger row spacing)

Step #6: **10**% system slope (Table C allows up to 25%)

Step #7: Calculate System Sand bed width –
Beds sloping 10% or less, use the larger of (a) or (b) below:
a) **300** sq ft sand bed area (Step #1) ÷ (**50** ft row length + 1 ft) = 5.9 ft sand bed width min.
b) **2.5** ft PLW (Step #5) + 1 ft = **3.5** ft sand bed width minimum **(use 5.9 ft from 7a above)**

Step #8: Calculate System Sand Extension(s) choose (a) or (b) below:
Sloping beds: SSE placed entirely on the down slope side of the bed when present
b) 5.9 ft SSBW (Step #7) – (**2.5** ft PLW Step #5 + 1) = 2.4 (use 2.5 ft System Sand extension for ease of construction)

Illustration of Example #1, Basic Serial Distribution:



Notes: A distribution box could have been used (parallel layout) with the distribution box being placed in-line with the highest row and then connecting to all the rows individually. Whenever possible eliminate the need for a distribution box and use a serial layout. This will insure air passes equally through every foot of Presby pipe.

8.2 Design Example #2 (Single Level):

Single family residence, (4) bedrooms (400 GPD), Application Rate of 0.5 GPD/sq ft for 60 MPI soils, level site, serial distribution layout, seasonal high groundwater at 18 inches.

Step #1: **400** GPD ÷ **0.5** GPD/sq ft Application Rate (Table A) = **800** sq ft sand bed area min.

Step #2: **400** GPD ÷ 3 GPD/ft = **134** ft of Presby pipe minimum

Step #3: **400** GPD ÷ 750 GPD/section = **0.54→1** sections required.

Step #4: **134** ft Presby pipe (Step #2) ÷ **70** ft row length = 1.9**→2** rows required

Step #5: **2.5** ft PLW from Table D (or calculated manually for larger row spacing)

Step #6: **0**% system slope (Table C allows up to 15%)

Step #7: Calculate System Sand bed width –

Beds sloping 10% or less, use the larger of (a) or (b) below:

a) **800** sq ft sand bed area (Step #1) ÷ (**70** ft row length + 1 ft) = 11.3 ft sand bed width **(<u>use this value</u>)**

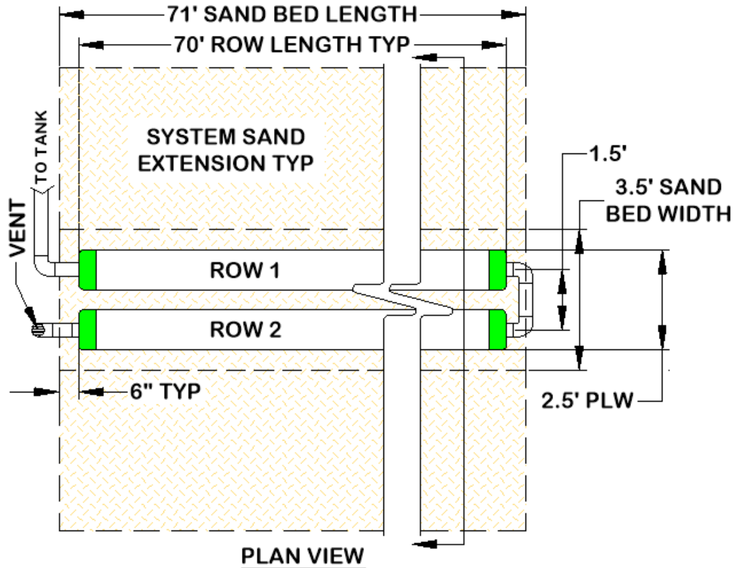
b) **2.5** ft PLW (Step #5) + 1 ft = **3.5** ft sand bed width minimum

Step #8: Calculate System Sand Extension(s) choose (a) or (b) below:

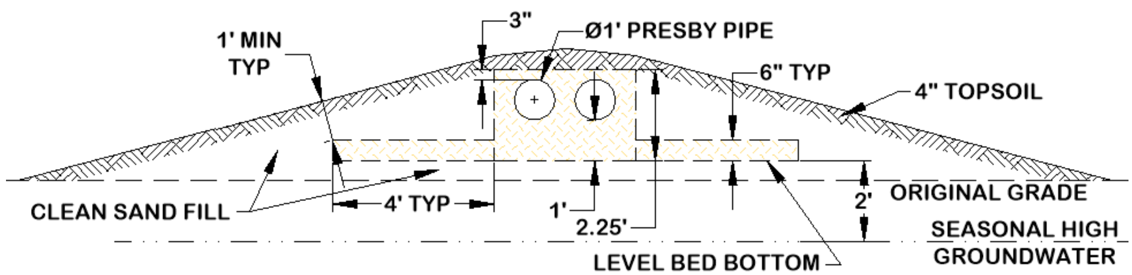
Sloping beds: SSE placed entirely on the down slope side of the bed

a) **11.3** ft SSBW (Step #7) – (**2.5** ft PLW Step #5 + 1) ÷ 2 = 3.9 ft round up to **4** ft for ease of construction.

Illustration of Example #2, Basic Serial Distribution:



PLAN VIEW



SECTION VIEW
(ROTATED 90°)

8.3 Design Example #3 (Single Level):

Commercial system, 770 GPD, Application Rate of 0.8 GPD/sq ft for Very Fine Sandy Loam soils, 12% sloping terrain and system, serial distribution layout, season high ground water at 24 inches.

Step #1: **770** GPD ÷ **0.8** GPD/sq ft Application Rate (Table A) = **962.5** sq ft sand bed area min.

Step #2: **770** GPD ÷ 3 GPD/ft = **257** ft of Presby pipe minimum

Step #3: **770** GPD ÷ 750 GPD/section = **1.1→2** sections required.

Step #4: **257** ft Presby pipe (Step #2) ÷ **65** ft row length = 3.9**→4** rows required

Step #5: **5.5** ft PLW from Table D (or calculated manually for larger row spacing)

Step #6: **12**% system slope (Table C allows up to 25%)

Step #7: Calculate System Sand bed width –

Beds sloping over 10%, use the larger of (c) or (d) below:

c) **962.5** sq ft sand bed area (Step #1) ÷ (**65** ft row length + 1 ft) = **14.6** ft sand bed width **(use this value)**

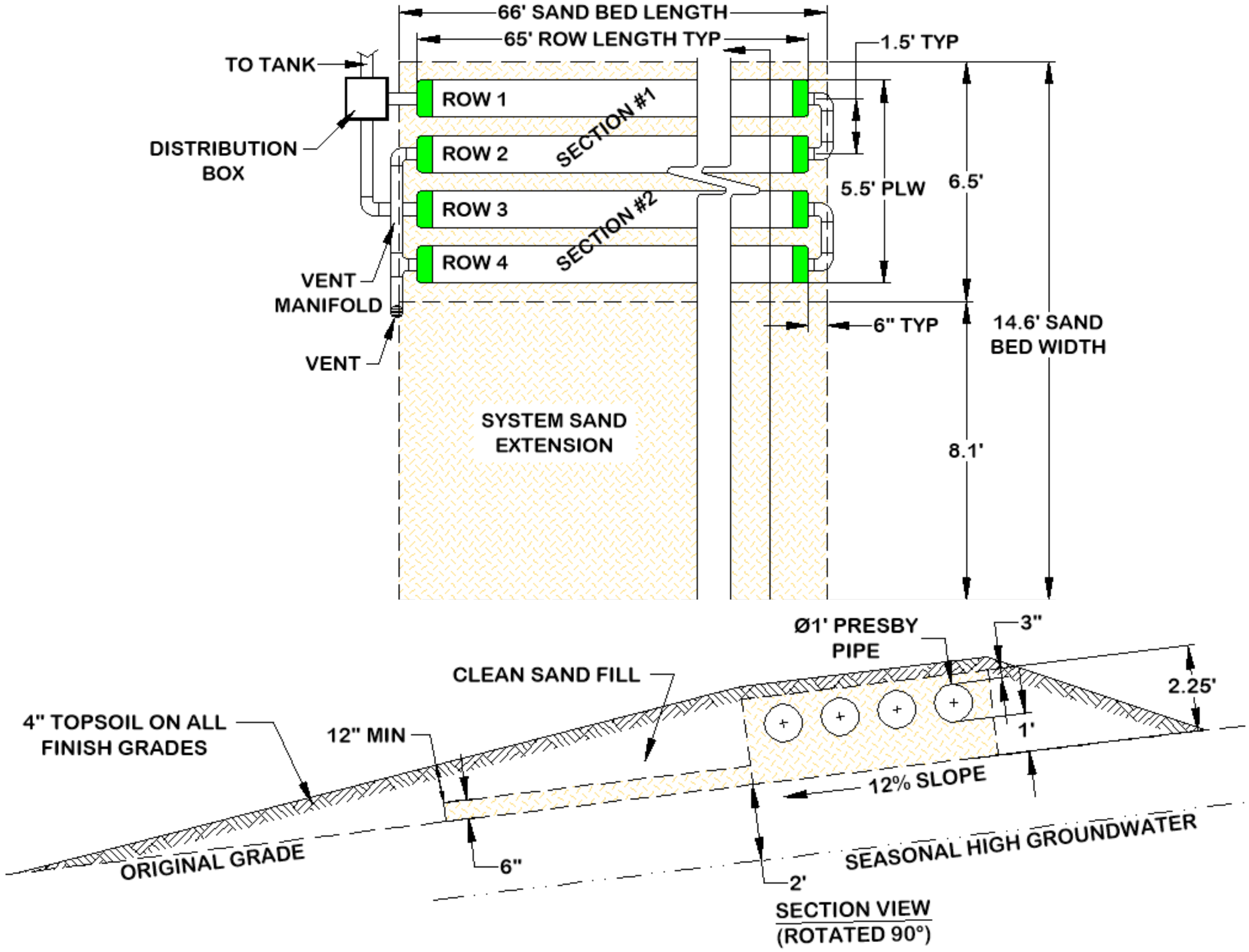
d) **5.5** ft PLW (Step #5) + 4.5 ft = **10** ft sand bed width minimum

Step #8: Calculate System Sand Extension(s) choose (a) or (b) below:

Sloping beds: SSE placed entirely on the down slope side of the bed

a) **14.6** ft SSBW (Step #7) – (**5.5** ft PLW Step #5 + 1 ft) = **8.1** ft

Illustration of Example #3, Commercial, Combination Serial Distribution:



9.0 Table E: Row Length and Pipe Layout Width (Multi-Level™)

Row Length (ft)	Total Linear Feet of Presby Pipe													
20	40	60	80	100	120	140	160	180	200	220	240	260	280	300
25	50	75	100	125	150	175	200	225	250	275	300	325	350	375
30	60	90	120	150	180	210	240	270	300	330	360	390	420	450
35	70	105	140	175	210	245	280	315	350	385	420	455	490	525
40	80	120	160	200	240	280	320	360	400	440	480	520	560	600
45	90	135	180	225	270	315	360	405	450	495	540	585	630	675
50	100	150	200	250	300	350	400	450	500	550	600	650	700	750
55	110	165	220	275	330	385	440	495	550	605	660	715	770	825
60	120	180	240	300	360	420	480	540	600	660	720	780	840	900
65	130	195	260	325	390	455	520	585	650	715	780	845	910	975
70	140	210	280	350	420	490	560	630	700	770	840	910	980	1,050
75	150	225	300	375	450	525	600	675	750	825	900	975	1,050	1,125
80	160	240	320	400	480	560	640	720	800	880	960	1,040	1,120	1,200
85	170	255	340	425	510	595	680	765	850	935	1,020	1,105	1,190	1,275
90	180	270	360	450	540	630	720	810	900	990	1,080	1,170	1,260	1,350
95	190	285	380	475	570	665	760	855	950	1,045	1,140	1,235	1,330	1,425
100	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500
# of Rows	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1.5' C/L	1.75	2.50	3.25	4.00	4.75	5.50	6.25	7.00	7.75	8.50	9.25	10.00	10.75	11.50
2.0' C/L	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00
2.50' C/L	2.25	3.50	4.75	6.00	7.25	8.50	9.75	11.00	12.25	13.50	14.75	16.00	17.25	18.50
2.75' C/L	2.38	3.75	5.13	6.50	7.88	9.25	10.63	12.00	13.38	14.75	16.13	17.50	18.88	20.25
	*Pipe Layout Width (ft) = Outermost edge of Upper Level to Outermost edge of Lower Level													

Formula for Multi-Level™ Pipe Layout Width (3 rows or more) = { [Row Spacing x (# of Rows - 1)] / 2 } + 1. Row spacing is 1.5 ft minimum; larger row spacing is allowed and at the discretion of the designer.

10.0 Design Worksheet for Multi-Level™ Systems

Step #1: ___________ GPD ÷ ________ GPD/sq ft Application Rate (Table A) = _________ sq ft sand bed area min.

Step #2: ___________ GPD ÷ 3 GPD/ft = _________ ft of Presby pipe minimum (assumes residential strength)

Step #3: ___________ GPD ÷ 750 GPD/section = _______ sections required. Notes: round fractions up to whole number. This step does not apply to parallel distribution systems.

Step #4: ___________ ft Presby pipe (Step #2) ÷ _________ ft row length = ________ number of rows. Notes: number of rows must be evenly divided by number of serial sections from Step #3, add rows if necessary (does not apply to parallel distribution systems). Longer rows preferred to shorter length rows.

Step #5: ___________ ft PLW from Table E (or calculated manually for larger row spacing)

Step #6: ___________% system slope (cannot exceed Table C allowances)

Step #7: Calculate System Sand bed width –
Beds sloping 10% or less, use the larger of (a) or (b) below:

a) ___________ sq ft sand bed area (Step #1) ÷ (______ ft row length + 1 ft) = ________ ft sand bed width minimum
Note: 1 ft is added to row length to allow 6 inches of sand beyond the ends of each row.

b) ___________ ft PLW (Step #5) + 1 ft = _____________ ft sand bed width minimum

Beds sloping over 10%, use the larger of (c) or (d) below:

c) ___________ sq ft sand bed area (Step #1) ÷ (______ ft row length + 1 ft) = ________ ft sand bed width minimum

d) ___________ ft PLW (Step #5) + 4.5 ft = _______ ft sand bed width minimum Note: 4.5 ft is added to the PLW to allow 6 inches of sand above the first row and 3.5 ft beyond the edge of the lower row.

Step #8: Calculate System Sand Extension(s) choose (a) or (b) below:
Level beds (System Sand Extensions (SSE) are placed on each side of Presby Pipes):

a) (__________ ft SSBW (Step #7) – ________ ft PLW Step #5 + 1) ÷ 2 = ________ ft

Sloping beds: SSE placed entirely on the down slope side of the bed

b) __________ ft SSBW (Step #7) – ________ ft PLW (Step #5) + 1 = ________ ft

10.1 Design Example #4 (Multi-Level™)

Single family residence, (6) bedrooms (600 GPD), Application Rate for LFS (Loamy Fine Sandy), level site, serial distribution layout, seasonal high ground water 36 inches.

Step #1: **600** GPD ÷ **1.0** GPD/sq ft Application Rate (Table A) = 6**00** sq ft sand bed area min.

Step #2: **600** GPD ÷ 3 GPD/ft = 2**00** ft of Presby pipe minimum

Step #3: **600** GPD ÷ 750 GPD/section = **0.8→1** sections required.

Step #4: **200** ft Presby pipe (Step #2) ÷ **50** ft row length = **4** rows required

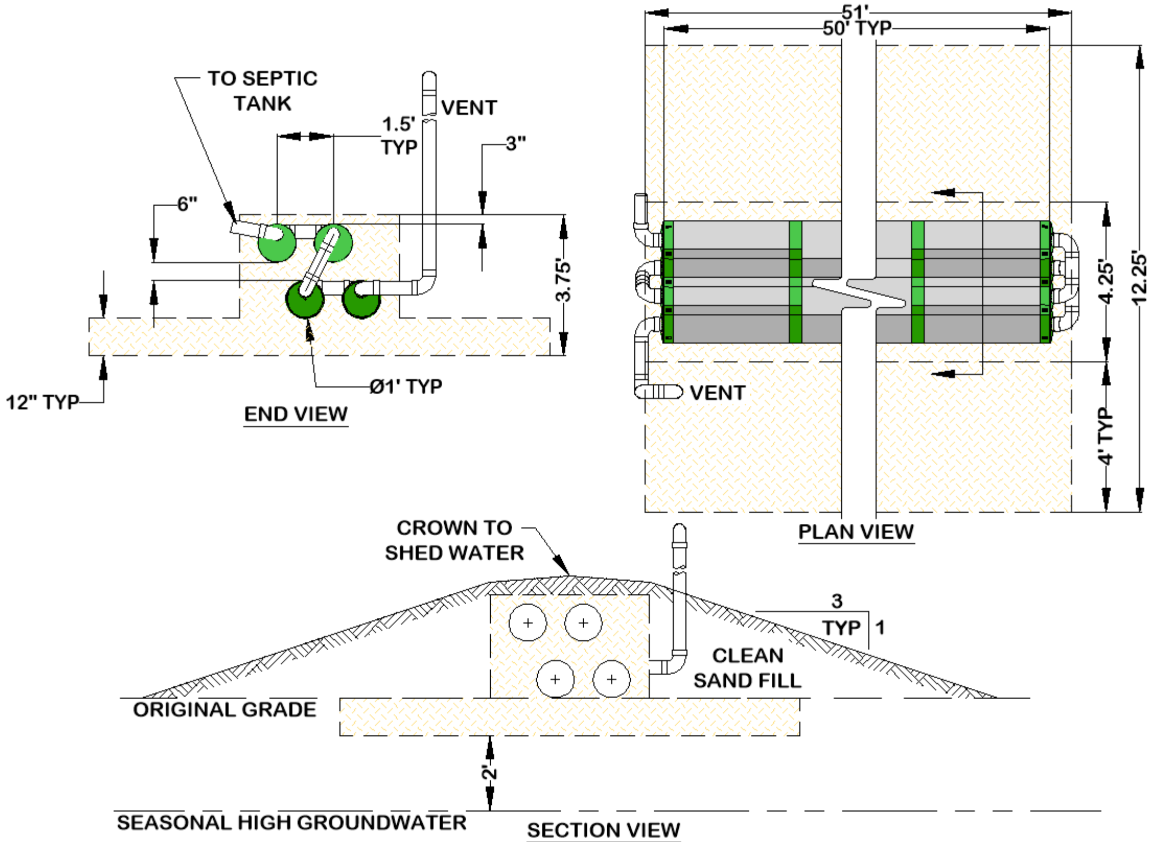
Step #5: **3.25** ft PLW from Table D (at 1.5 ft spacing)

Step #6: **0**% system slope (Table C allows up to 25%)

Step #7: Calculate System Sand bed width –
Beds sloping 10% or less, use the larger of (a) or (b) below:
a) **300** sq ft sand bed area (Step #1) ÷ (**50** ft row length + 1 ft) = 11.8 ft sand bed width min.**(<u>use this value</u>)**
b) **3.25** ft PLW (Step #5) + 1 ft = **4.25** ft sand bed width minimum

Step #8: Calculate System Sand Extension(s) choose (a) or (b) below:
Level beds (System Sand Extensions (SSE) are placed on each side of Presby Pipes):
b) [11.8 ft SSBW (Step #7) – (**3.25** ft PLW Step #5 + 1)] ÷ 2= 3.775 ft (round up to 4 ft for ease of construction).

Illustration of Example #4, Basic Serial Distribution, Multi-Level™



11.0 Design Criteria

11.1 Advanced Enviro-Septic® Pipe Requirements

a) Sewn seam must be oriented in the 12 o'clock position. This correctly orients the Bio-Accelerator® fabric in the 6 o'clock position.
b) Venting is always required regardless of vertical separation to restrictive features.

11.2 Barrier Materials over System Sand

No barrier materials (hay, straw, tarps, etc.) are to be placed between the System Sand and cover material; such materials may cut off necessary oxygen supply to the system. The only exception is the placement of the specified fabric to achieve H-20 loading requirements. See section 22.0, page 19.

11.3 Certification Requirements

Any designers and installers who have not previously attended a Presby Environmental, Inc. Certification Course are required to obtain Presby Certification. Certification is obtained by attending a Certification Course presented by Presby Environmental, Inc. or its sanctioned representative. Certification can also be obtained by viewing tutorial videos on our website (high speed connection required) and then successfully passing a short assessment test, which is also available through regular mail. All professionals involved in the inspection, review or certification of AES systems should also become Presby Certified. Professionals involved in the design or installation of Multi-Level™ systems must be Presby Certified.

11.4 Converging Flows Restriction

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

11.5 Daily Design Flow

Residential daily design flow for Presby Systems is calculated in accordance with State rules. The minimum daily design flow for any single-family residential system is two bedrooms and 200 GPD for any commercial system.

a) Certain fixtures, such as jetted tubs, may require an increase in the size of the septic tank.
b) Daily design flow for a single bedroom apartment with a kitchen connected to a residence (also sometimes referred to as a "studio" or "in-law apartment") shall be calculated by adding two additional bedrooms.
c) When daily design flow is determined by water meter for commercial systems, refer to the State Rules.

d) PEI recommends taking the average daily use from a peak month and multiply it by a peaking factor of 2 to 3 times.
e) Note that "daily design flows" are calculated to assume occasional "peak" usage and a factor of safety; Systems are not expected to receive continuous dosing at full daily design load.

11.6 End-to-End Preferred Over Side-to-Side

If site conditions permit, End-to-End multiple bed configurations are preferable to Side-to-Side configurations (see para. 18.0, page 18).

11.7 Effluent (Wastewater) Strength

The Presby pipe requirement for Bed or Trench systems is based on residential strength effluent, which has received primary treatment in a septic tank. Residential strength effluent (measured after the septic tank) cannot exceed a concentration of 240 mg/L, when adding together the values for the 5-day biochemical oxygen demand (BOD5) and the total suspended solids (TSS). Typically, this corresponds to an influent strength of 300 mg/L BOD5 and 350 mg/L TSS prior to the septic tank. Designing a system that will treat higher strength wastes requires additional Presby pipe. In these situations, consult our Technical Advisors at (800) 473-5298 for recommendations.

11.8 Filters, Alarms & Baffles

a) Effluent Filters are **not** recommended for use with Presby Systems.
b) If used, effluent filters must be maintained on at least an annual basis. Follow manufacturer's instructions regarding required inspections, cleaning and maintenance of the effluent filter. Please consult PEI for the most compatible filter recommendations.
c) Effluent Filters must allow the free passage of air to ensure the proper functioning of the system. A blocked filter in any on-site septic system could interfere with venting, causing the system to convert to an anaerobic state and result in a shortened life.
d) All pump systems to have a high-water alarm float or sensor installed inside the pump chamber.
e) All septic tanks must be equipped with baffles to prevent excess solids from entering the Presby System.
f) Charcoal filters in vent stacks (for odor control) are not recommended by PEI. They can block air flow and potentially shorten system life. Contact PEI for recommendations to correct odor problems.

11.9 Flow Equalizers Required

All distribution boxes used to divide effluent flow require flow equalizers in their outlets. Flow equalizers are limited to a maximum of 15 GPM per equalizer.

11.10 Garbage Disposals (a.k.a. Garbage Grinders)

No additional Presby Pipe is required when using a garbage disposal (grinder). If a garbage disposal is utilized, follow the State's requirements regarding septic tank sizing. Multiple compartment septic tanks or multiple tanks are preferred and should be pumped as needed.

11.11 Presby Pipe Requirement (Single & Multi-Level™)

See Section 11.1, on page 11 for additional Advanced Enviro-Septic® requirements. Presby Pipe requirements are as follows and require a 1.5 ft minimum row spacing:

a) Residential systems: 3 GPD/ft assuming effluent strength of 300 mg/L BOD5 and 350 mg/L TSS
b) Commercial systems: 3 GPD/ft assuming effluent strength of 300 mg/L BOD5 and 350 mg/L TSS
c) Contact Presby Environmental, Inc. when treating high strength effluent.

11.12 Presby Environmental Standards and Technical Support

All Presby Systems must be designed and installed in compliance with the procedures and specifications described in this Manual and in the product's State approval. This Manual is to be used in conjunction with the State Department of Safety and Professional Services Administrative Rules. In the event of contradictions between this Manual and State regulations, Presby Environmental, Inc. should be contacted for technical assistance at (800) 473-5298. Exceptions to any State rules other than those specifically discussed in this Manual require a State waiver.

11.13 Pressure Distribution

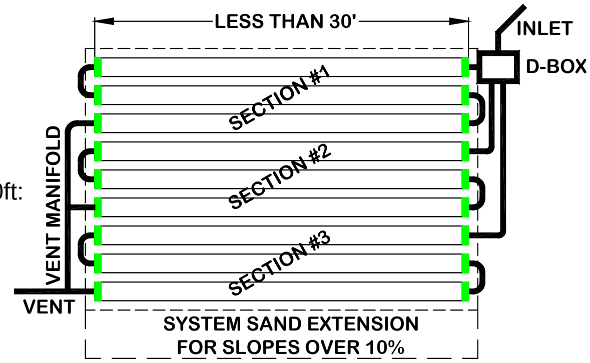
The use of pressure distribution lines in Presby Systems is **prohibited**. Pumps may be utilized when necessary only to gain elevation and to feed a distribution box which then distributes effluent by gravity to the Presby Field.

11.14 Row Requirements

a) All beds must have at least 2 rows.
b) Maximum row length for any system is 100 ft.
c) Recommended minimum row length is 30 ft.
d) A combination (or D-Box) distribution system must be used if any row length is less than 30 ft. The D-Box must feed at least 30 ft of Presby Pipe, a minimum of two D-Box outlets must be used and the field must be vented.

e) Row Center-to-Center Spacing is 1.5 ft min. for all systems. Row spacing may be increased to accommodate greater basal area spacing requirements if desired.
f) For level beds: the Presby Rows are centered in the middle of the System Sand bed area and any System Sand extensions divided evenly on both sides.
g) For Sloping Beds: the elevations for each Presby Row must be provided on the drawing. All rows to be grouped at the high side of the System Sand bed area with any System Sand extensions placed entirely on the downslope side.
h) All rows must be laid level to within +/- ½ in. (total of 1 in.) of the specified elevation and preferably should be parallel to the contour of the site.
i) It is easier if row lengths are designed in exact 10 ft increments since Presby Pipe comes in 10 ft sections. However, if necessary, the pipe is easily cut to any length to meet site constraints.

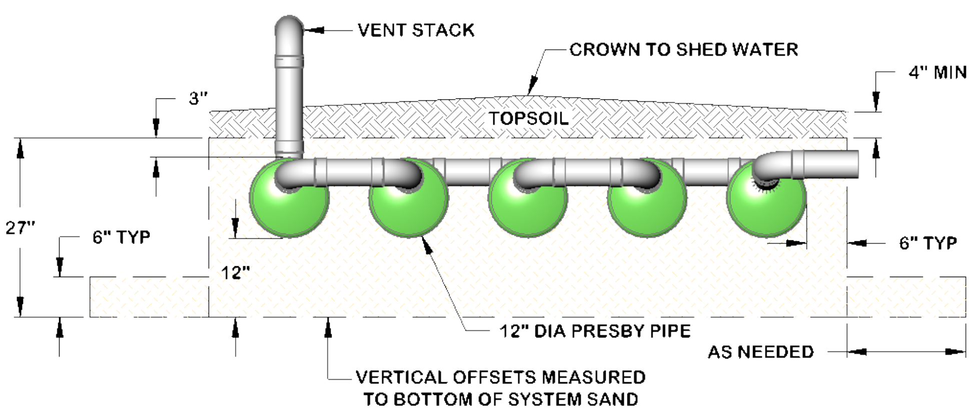
Illustration of row lengths less than 30ft:



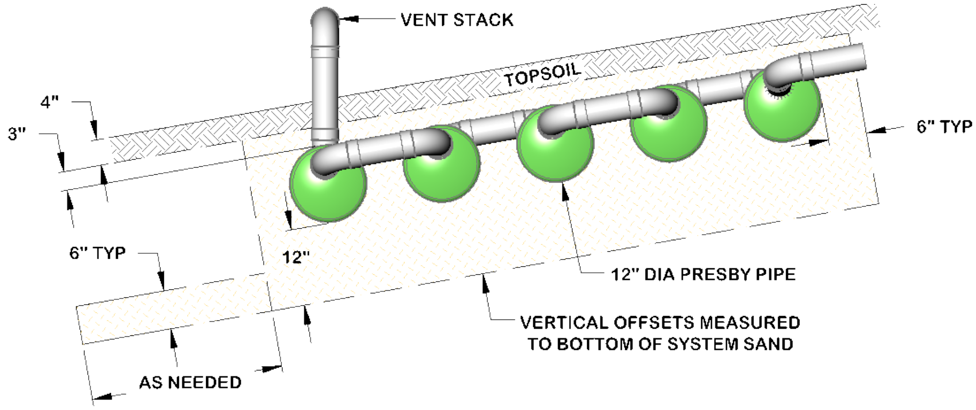
11.15 Separation Distances (Horizontal and Vertical)
Separation distances to the seasonal high water table (SHWT) or other restrictive features are measured from the outermost edge of the System Sand.

11.16 Sloping Sites and Sloping Systems
a) The percentage of slope in all system drawings refers to the slope of the Presby System, not the existing terrain ("site slope") and refers to the slope of the bed itself ("system slope").
b) The system slope and the site slope do not have to be the same (see illustration in para. 18.218.1 , page 19).
c) Maximum site slope is 33% and maximum system slope is 25% (without a State waiver).

11.17 System Sand Bed Height Dimensions
The height of a Presby Sand Bed measures 27 in. minimum (not including cover material):
a) 12 in. minimum of System Sand below the Presby Pipe;
b) 12 in. diameter of the pipe; and
c) 3 inches minimum of System Sand above the Presby Pipe; also
d) When System Sand Extensions are required, they must be a minimum of 6 inches thick.

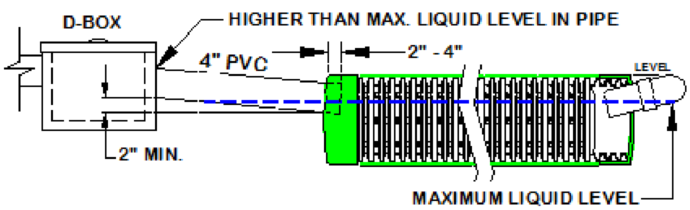


e) Sloping systems require any System Sand extension to be placed on the down slope side of the field. If the system slope is over 10% the sand extension must be at least 2.5 ft.



11.18 Two Inch Rule

The outlet of a septic tank or distribution box (if used) must be set at least 2 inches above the highest inlet of the Presby Row, with the connecting pipe slope not less than 1% (approximately 1/8 in. per foot.) See illustration of 2 in. rule below:



11.19 Topographic Position Requirement

The system location must be located in an area that does not concentrate water, both surface and subsurface. If allowed by State and local authorities, altering the terrain upslope of a system may alleviate this requirement if the waters are sufficiently altered to redirect flows away from the field.

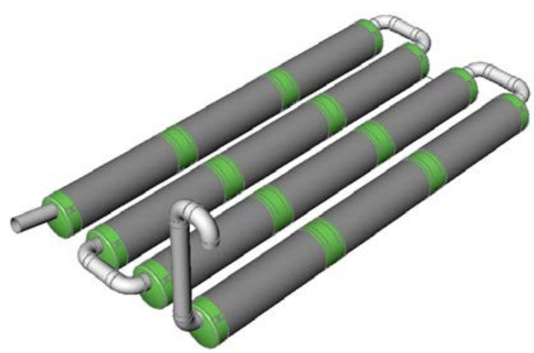
11.20 Water Purification Systems

a) Water purification systems and water softeners should **not** discharge into any Presby System. This “backwash” does not require treatment and the additional flow may overload the system.
b) If there is no alternative means of disposing of this backwash other than in the Presby System, then the system will need to be “oversized.” Calculate the total amount of backwash in GPD, multiply by 3, and add this amount to the daily design flow when determining the field and septic tank sizing.
c) Water purification systems and water softeners require regular routine maintenance; consult and follow the manufacturer’s maintenance recommendations.

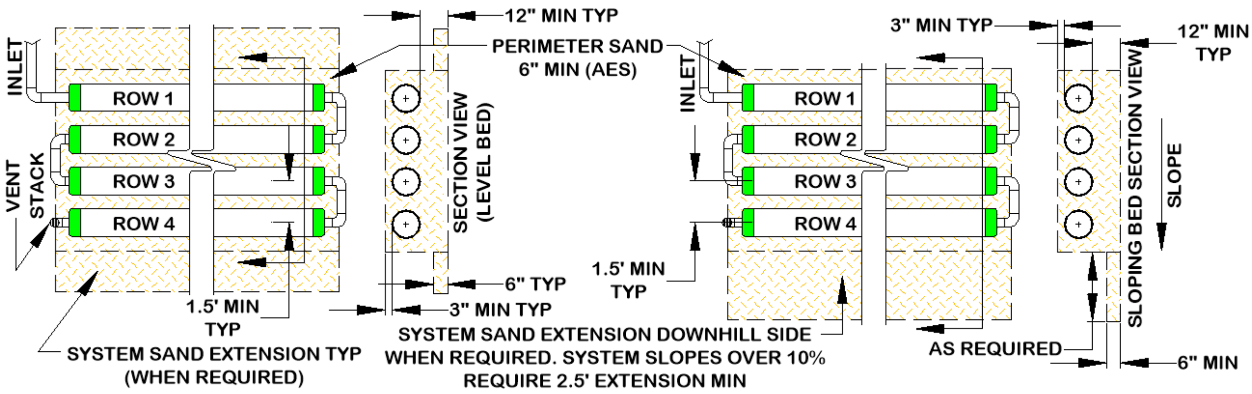
12.0 Basic Serial Distribution (Single Level)

AES rows are connected in series at the ends with raised connections, using offset adapters. Basic Serial distribution systems are quick to develop a strong biomat in the first row, provide a longer flow route, improved effluent treatment and ensure air will pass through all the Presby Rows. Other criteria:

a) May be used for single beds of 750 GPD or less.
b) Incorporates rows in serial distribution in a single bed.
c) Maximum length of any row is 100 ft.
d) Flow Equalizers are not required for Basic Serial systems.
e) For level beds: any required System Sand extension is to be evenly divided and placed on both sides of the Presby pipes.
f) For sloping beds, any required System Sand extension is placed entirely on the downhill (low) side of the field. If the bed slopes over 10%, the System Sand extension must be at least 2.5 ft.
g) Gravity fed Basic Serial systems do not require the use of a D-Box (fed directly from the septic tank).
h) Illustrations of Basic Serial Systems:



Level Beds   Sloping Beds

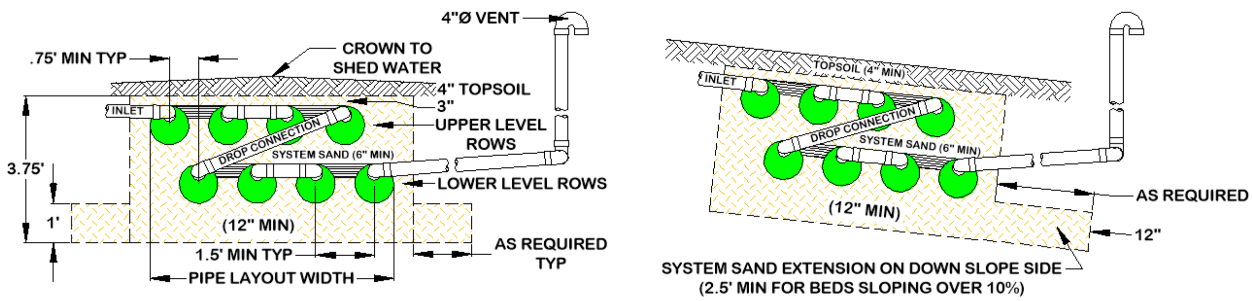


13.0 Basic Serial Distribution (Multi-Level™)

Basic Serial Multi-Level™ systems must conform to the requirements for single level basic serial systems except:

a) Row spacing 1.5 ft minimum.
b) The vent must be connected to the last row in the series on the Lower Level.
c) When a System Sand Extension is required, it must be 12 inches thick.
d) A minimum of 6 inches of System Sand separates the Upper and Lower Level Rows.
e) Effluent is delivered first to the Upper Rows, which then connects to the Lower Level Rows by way of a Drop Connection.
f) The Drop Connection must pitch downward toward the Lower Level at least 2 inches.
g) Multi-Level™ systems are not allowed in H-20 applications.
h) For level beds: any required System Sand extension is to be evenly divided and placed on both sides of the Presby pipes.
i) For sloping beds, any required System Sand extension is placed entirely on the downhill (low) side of the field. If the bed slopes over 10%, the System Sand extension must be at least 2.5 ft.
j) System Sand extensions for Multi-Level™ systems must be 12 inches thick.
k) Illustrations of Multi-Level™ Basic Serial Systems:

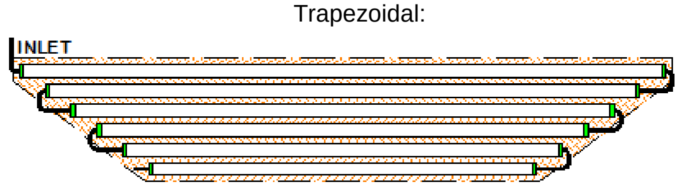
Level Beds   Sloping Beds



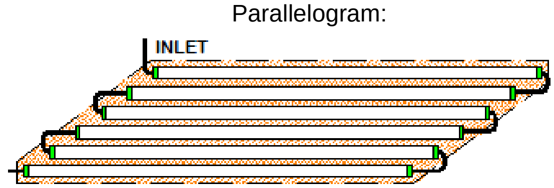
13.1 Basic Serial Configuration with Unusual Shapes:

Bed may be constructed with unusual shapes to avoid site obstacles or meet setback requirements.

Trapezoidal:

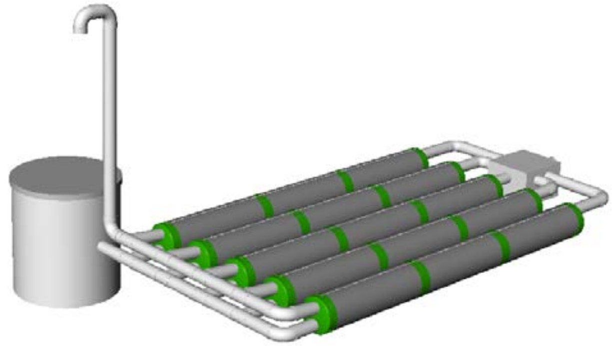


Parallelogram:



14.0 Bottom Drain

A bottom drain is a line connected to the hole in the 6 o'clock position of a double offset adapter at the end of each serial section or each row in a D-box Distribution or Combination Configuration which drains to a sump and is utilized to lower the water level in a saturated system or to facilitate system rejuvenation. There must be 18 inches from the bottom of the sump to the bottom of the drain. The sump should be brought above the final grade and have a locking or mechanically fastened cover.



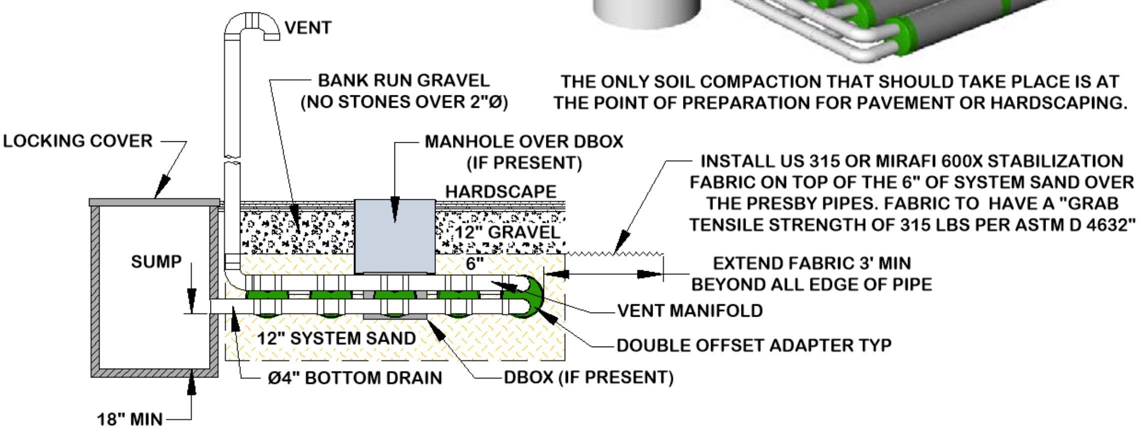
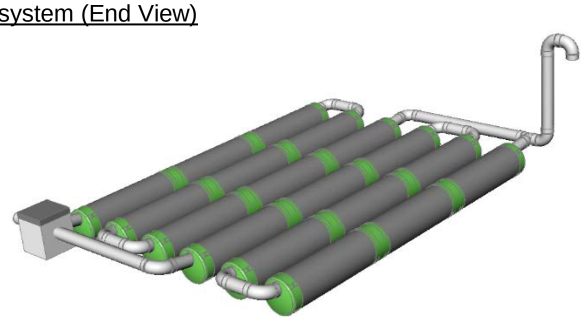


Illustration of a bottom drain used for H-20 system (End View)

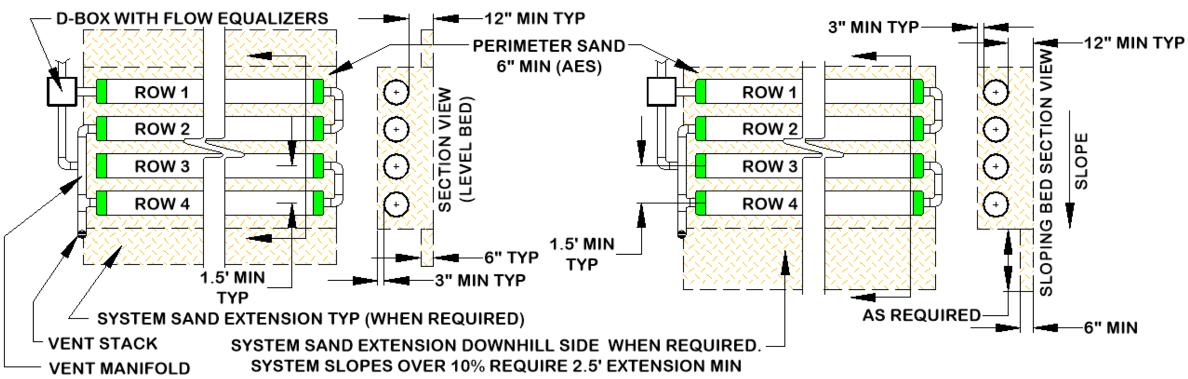
15.0 Combination Serial Distribution (Single Level)

Combination Serial distribution within one bed, or multiple beds, is required for systems with daily design flows greater than 750 GPD. Combination Serial distribution is quick to develop a strong biomat in the first row of each section, providing improved effluent treatment. Each Combination Serial section is limited to a maximum loading of 750 gallons/day.



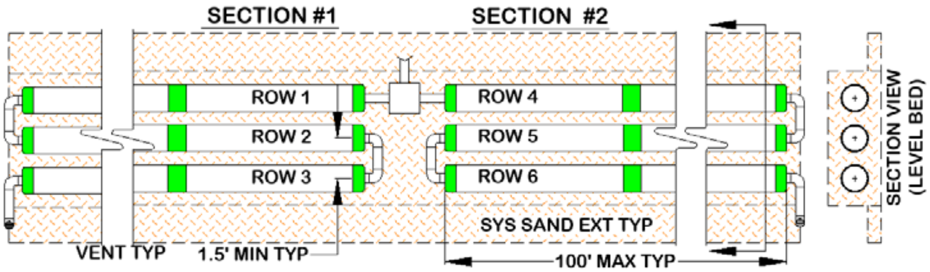
a) Combination Serial distribution consists of two or more serial sections installed in a single bed.
b) Each section in a Combination Serial system consists of a series of Presby Rows connected at the ends with raised connections, using offset adapters and PVC sewer and drain pipe.
c) Maximum length of any row is 100 ft.
d) There is no limit on the number of Combination Serial Sections within a bed.
e) For level beds: any required System Sand extension is to be evenly divided and placed on both sides of the Presby pipes.
f) For sloping beds, any required System Sand extension is placed entirely on the downhill (low) side of the field. If the bed slopes over 10%, the System Sand extension must be at least 2.5 ft.
g) When the vent manifold is on the same side as the serial section inlets, the manifold runs over the top of these inlets (as shown below).
h) Combination systems require the use of an adequately sized D-Box.
i) Illustrations of Single Level Combination Serial Systems:

Level Beds | Sloping Beds



15.1 Butterfly Configuration

a) A "butterfly configuration," is considered a single bed system with two or more sections (can also be D-Box or Combination configurations).
b) Maximum length of any row is 100 ft.
c) Serial Section loading limit is 750 GPD.
d) Beds can contain any number of serial sections.
e) For level beds: any required System Sand extension is to be evenly divided and placed on both sides of the Presby pipes.
f) For sloping beds: any required System Sand extension is placed entirely on the downhill (low) side of the field. If the bed slopes over 10%, the System Sand extension must be at least 2.5 ft.
g) Illustration of a level bed Butterfly configuration (plan view):



15.2 Section Loading

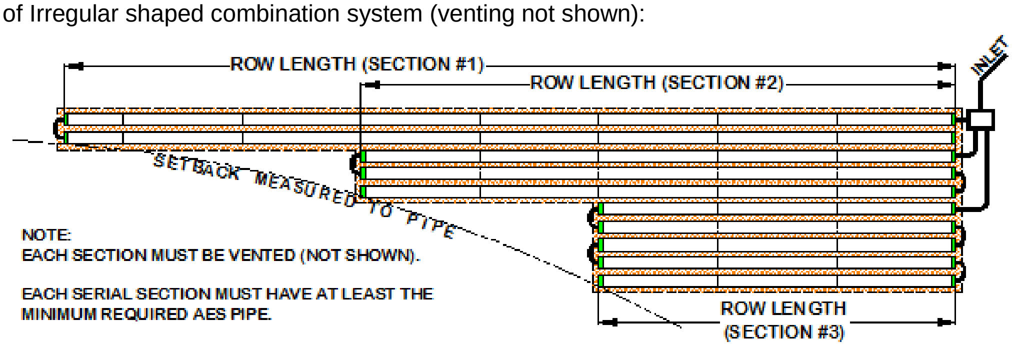
Each section in a Combination Serial system has a maximum daily design flow of 750 GPD. More than the minimum number of sections may be used. Ex: Daily design flow = 1,000 GPD requires (1,000 ÷ 750) = 1.4, use 2 sections minimum. Combination systems are only required if the daily design flow exceeds 750 GPD.

15.3 Section Length Requirement

a) Each section must have the same minimum linear feet of pipe.
b) The minimum linear feet of pipe per section is determined by dividing the total linear feet required in the Presby System by the number of sections required.
c) A section may exceed the minimum linear feet required.
d) Rows within a section may vary in length to accommodate site constraints.

15.4 Irregular Shaped Combination Serial Configuration

Illustration of Irregular shaped combination system (venting not shown):



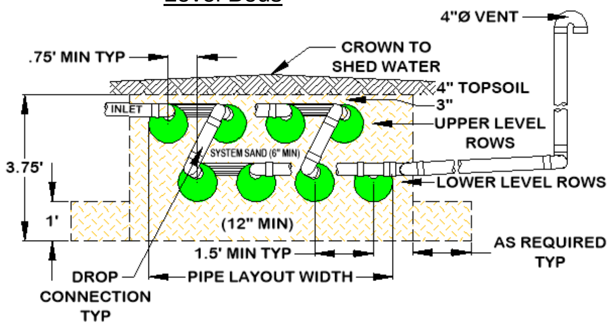
16.0 Combination Serial Distribution (Multi-Level™)

Combination Multi-Level™ systems must conform to the requirements for single level combination systems except:

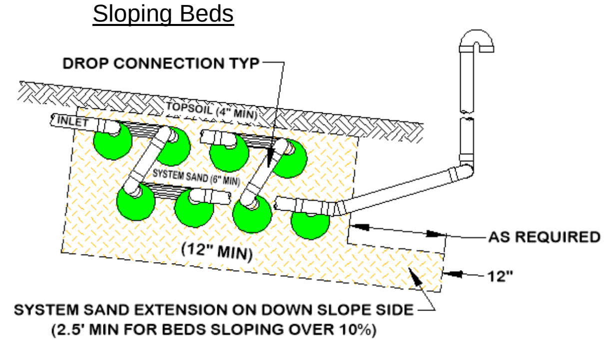
a) Row spacing 1.5 ft minimum.
b) The vent must be connected to the last row in the series on the Lower Level.
c) If a System Sand Extension is required, it must be 12 in. thick
d) Effluent must be delivered to the Upper Level Rows from the D-Box. A Drop Connection delivers effluent from the Upper Level rows to the Lower Level rows.
e) The Drop Connection must pitch downward toward the Lower Level at least 2 inches.
f) Multi-Level™ systems are not allowed in H-20 applications.
g) The ends of all serial sections on the Lower Level are manifolded and taken to a vent stack. Each serial section may be vented separately.
h) A minimum of 6 in. of System Sand separates the Upper Level Rows from the Lower Level Rows.
i) For level beds: any required System Sand extension is to be evenly divided and placed on both sides of the Presby pipes.
j) For sloping beds, any required System Sand extension is placed entirely on the downhill (low) side of the field. If the bed slopes over 10%, the System Sand extension must be at least 2.5 ft.
k) System Sand extensions for Multi-Level™ systems must be 12 inches thick.

l) Illustrations of Multi-Level™ Combination Serial Systems:

Level Beds

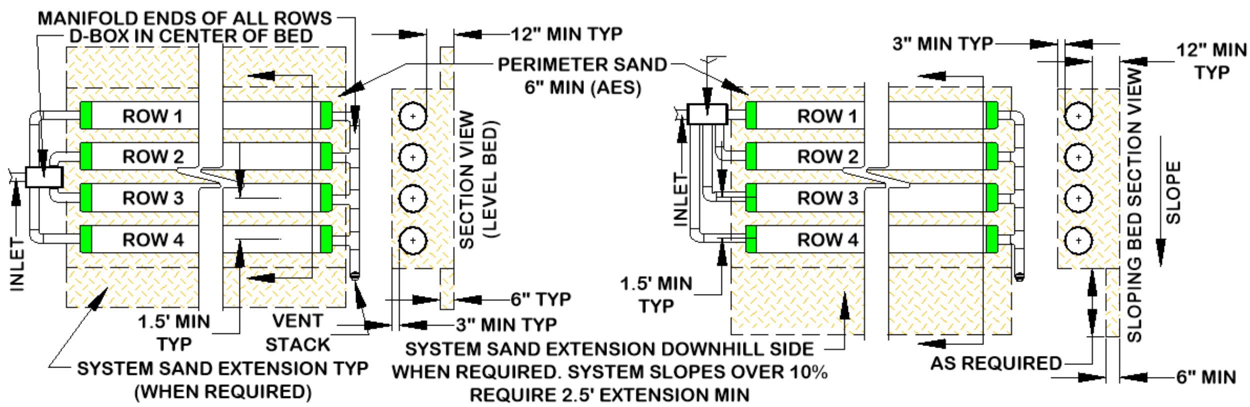


Sloping Beds



17.0 D-Box Distribution (Single Level)

a) All rows in this configuration must be the same length.
b) Flow equalizers must be used in the D-Box.
c) Use a Manifold to connect the ends of all rows. Manifold to be sloped toward Presby Pipes.
d) Maximum row length is 100 ft.
e) Place the D-Box on level, firmly compacted soil.
f) All rows must be laid level end-to-end.
g) A 2-inch minimum drop is required between the D-box outlets and the Presby Pipe inlets.
i) D-Box systems are not recommended for use in Multi-Level™ beds.
j) For level beds: any required System Sand extension is to be evenly divided and placed on both sides of the Presby pipes.
k) For sloping beds: any required System Sand extension is placed entirely on the downhill (low) side of the field. If the bed slopes over 10%, the System Sand extension must be at least 2.5 ft.
h) Illustrations for D-Box (Parallel) Distribution:



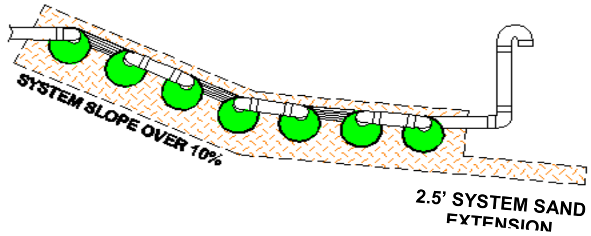
18.0 Multiple Bed Distribution

Multiple Bed distribution incorporates two or more beds (Single Level or Multi-Level™), each bed with Basic Serial, Combination Serial, or D-Box distribution, and each receiving an equal amount of effluent from a D-Box. Multiple beds may be oriented along the contour of the site or along the slope of the site.

a) Each bed must have the same minimum linear feet of pipe. The minimum linear feet of pipe per bed is determined by dividing the total linear feet required in the Presby System by the number of beds.
b) Rows within a bed may vary in length to accommodate site constraints, except with D-Box configuration which requires all rows to be the same length.
c) End-to-End configurations are preferred to Side-to-Side configurations.
d) In Side-to-Side configuration, one bed is placed beside another or one bed is placed down slope of another. Bed separation distance is measured from pipe-to-pipe and is dependent on soil hydrology and State requirements.
e) Multi-Level™ may be used in multiple bed systems.

18.1 System Sand Extension

In systems where SSBA is greater the PLW + 1' (see para. 8.0, page 6, step #9). In systems sloping more than 10%, a 2.5 ft minimum System Sand extension is required. The System Sand extension area is placed on the down slope side of all sloping systems. For level systems, the System Sand Extension is divided equally and placed on both sides. The System Sand extension area is a minimum of 6 inches deep (12 inches for Multi-Level™ beds). For beds with multiple slopes, if any portion of the bed has a system slope greater than 10% a system sand extension is required. Illustration of bed with multiple slopes below.



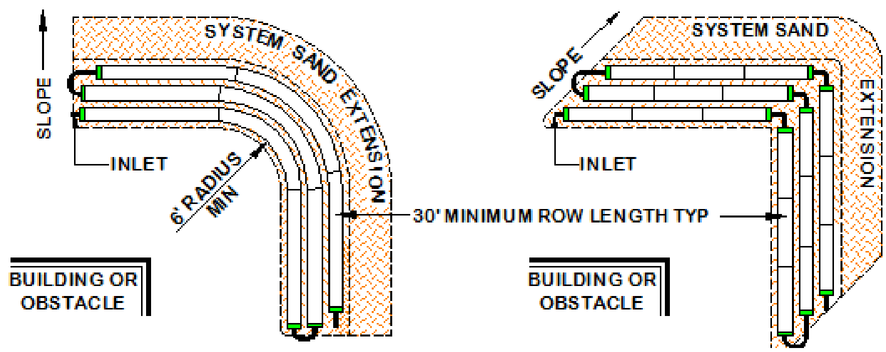
18.2 Total Linear Feet Requirement

a) Maximum row length is 100 ft.
b) Each section or bed must have at least the minimum linear feet of pipe (total feet of pipe required divided by number of sections equals the minimum number of feet required for each section or bed).
c) A section or bed may exceed the minimum linear length.
d) Rows within a section or bed may vary in length (except D-Box configurations) to accommodate site constraints.

19.0 Angled and Curving Beds

Angled configurations are used to avoid obstacles.

a) Rows should follow the contour of the site as much as possible
b) Rows are angled by bending pipes up to 90 degrees or through the use of offset adapters
c) Row lengths are required to be a minimum of 30 ft
d) Multi-Level™ systems may take advantage of angled bed configurations.
e) Illustrations of Angled Beds:

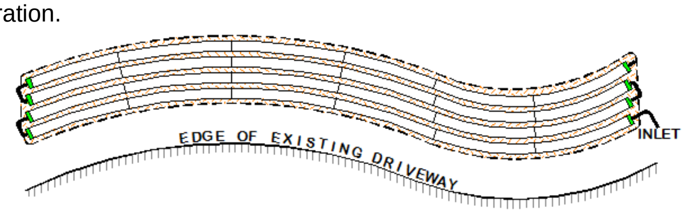


19.1 Trench Systems

Presby pipe may be installed in trench configurations on level or sloping terrain and may utilize serial, combination or parallel distribution. Trench systems may incorporate one or two rows of Presby pipe. A minimum of 12 inches below, 6 inches between and around the perimeter and 3 inches above of System Sand are required for all Presby pipes. Consult regulatory rules for required trench separation.

20.0 Curved Beds

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



21.0 Non-Conventional System Configurations

Non-conventional system configurations may have irregular shapes to accommodate site constraints. A site-specific waiver from the state may be required for non-conventional configurations.

22.0 H-20 Loading

If a system is to be installed below an area that will be subjected to vehicular traffic, it must be designed and constructed as depicted below in order to protect the system from compaction and/or damage. Note that a layer of stabilization fabric is added between the System Sand and the cover material. All H-20 systems require venting. See para. 14.0 on page 16 for illustration of H-20 loading requirements.

23.0 Pumped System Requirements

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

23.1 Alarm

States require all pump systems to have a high-water alarm float or sensor installed inside the pump chamber.

23.2 Differential Venting

All pump systems must use differential venting (see illustration, para. 25.2, page 21).

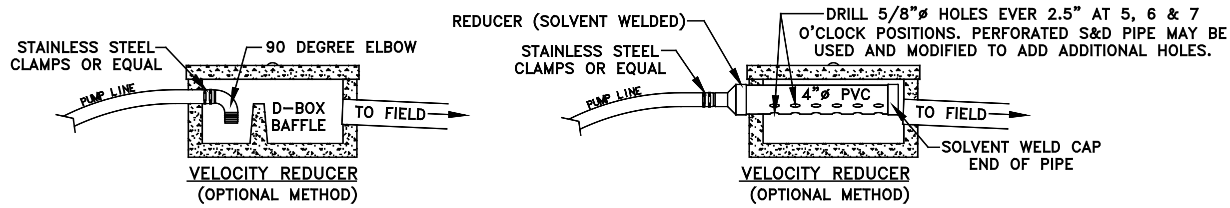
23.3 Distribution Box

All pump systems require a distribution box with some means of velocity reduction for the effluent entering the D-Box.

23.4 Velocity Reduction

The rate at which effluent enters the Presby Pipe must be controlled. Excessive effluent velocity can disrupt solids that settle in the pipes.

a) Effluent must never be pumped directly into Presby Pipe.
b) A distribution box or tank must be installed between the pumping chamber and the Presby Pipe to reduce effluent velocity.
c) Force mains must discharge into a distribution box (or equivalent) with velocity reducer and a baffle, 90° bend, tee or equivalent (see illustrations on next page).
   Two methods of velocity reduction:



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

23.5 Dose Volume

a) Pump volume per dose must be no greater than 1 gallon times the total linear feet of Presby Pipe.
b) Pump dosing should be designed for a minimum of 6 cycles per day.
c) If possible, the dosing cycle should provide one hour of drying time between doses.

23.6 Basic Serial Distribution Limit

Pumped systems with Basic Serial distribution are limited to a maximum dose rate of 40 gallons per minute and do not require the use of a flow equalizer on the D-Box outlet. Never pump directly into Presby Pipe.

23.7 Combination and Multiple-Bed Distribution Limit

All Presby Systems with Combination Serial distribution or Multiple Bed distribution must use Flow Equalizers in each distribution box outlet. Each Bed or section of Combination Serial distribution is limited to a maximum of 15 gallons per minute, due to the flow constraints of the equalizers. Example: pumping to a combination system with 3 sections (using 3 D-Box outlets). The maximum delivery rate is (3 x 15) = 45 GPM. Always provide a means of velocity reduction.

24.0 System Sand and Sand Fill Requirements for All Beds

It is critical to the proper functioning of Presby Systems that the proper amount and type of System Sand be installed.

24.1 Quantity of System Sand

System Sand is placed a minimum of 12 in. below, 3 in. above and 6 in. between the Presby Rows and a minimum of 6 in. horizontally around the perimeter of the Advanced Enviro-Septic® rows.

24.2 Sand Fill

Sand fill meeting state and local requirements is used to raise the elevation of the system in order to meet the required separation distance from the SHWT or other restrictive feature. No organic material or stones larger than 6 in. are allowed in the Sand Fill. System Sand may be used in place of sand fill; however, this may increase material costs.

25.0 Venting Requirements

An adequate air supply is essential to the proper functioning of Presby Systems. Venting is always required. Including the following requirements:

a) Pump systems must utilize Differential Venting.

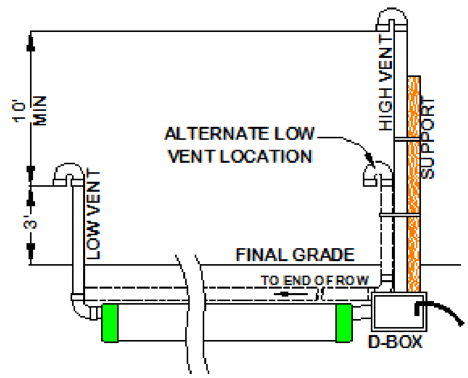
b) Vents for Multi-Level™ beds must connect to the lower level rows.

25.1 General Rules

a) Vent openings must be located to ensure the unobstructed flow of air through the entire Presby System.
b) The low vent inlet must be a minimum of 1 ft above final grade or anticipated snow level.
c) One 4 in. vent is required for every 1,000 ft of Presby Pipe.
d) A single 6 in. vent may be installed in place of up to three 4 in. vents.
e) If a vent manifold is used, it must be at least the same diameter as the vent(s).
f) When venting multiple beds, it is preferred that each bed be vented separately rather than manifolding bed vents together.
g) Sch. 40 PVC or equivalent should be used for all vent stacks.
h) Remote Venting may be utilized to minimize the visibility of vent stacks.

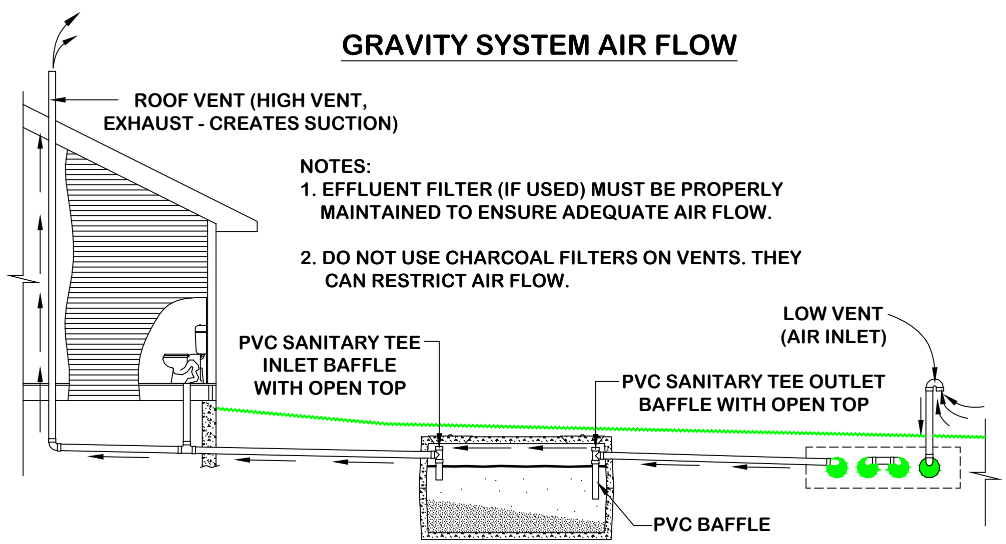
25.2 Differential Venting

a) Differential venting is the use of high and low vents in a system.
b) In a gravity system, the roof stack acts as the high vent.
c) High and low vent openings must be separated by a minimum of 10 vertical feet.
d) If possible, the high and low vents should be of the same capacity.



25.3 Vent Locations for Gravity Systems

a) A low vent is installed at the end of the last row of each section or the end of the last row in a Basic Serial bed, or at the end of each row in a D-Box Distribution Configuration system. A vent manifold may be used to connect the ends of multiple sections or rows.
b) 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.
c) When the house (roof) vent functions as the high vent, there must be a minimum of a 10 ft vertical differential between the low and high (roof) vent openings.
d) Illustration of gravity system air flow:



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

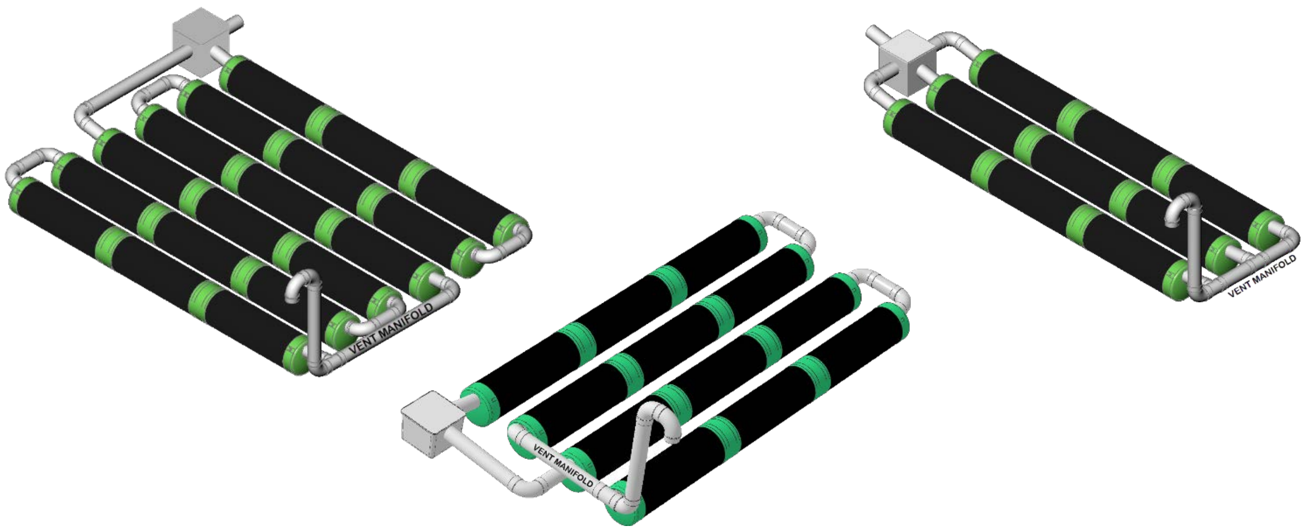
25.4 Pump System Vent Locations

a) A low vent is installed through an offset adapter at the end of each section, Basic Serial bed or attached to a vent manifold.
b) A high vent is attached to an unused distribution box outlet.
c) A 10 ft minimum vertical differential is required between high and low vent openings.
d) When venting multiple beds, it is preferred that each bed be vented separately (have their own high and low vents) rather than manifolding bed vents together.

e) The Low and High vents may be swapped proved the distribution box is insulated against freezing in cold climates.
f) See Remote Venting (para. 25.7, page 22) and Bypass Venting (para. 25.8, page 23) for options to relocate or eliminate the High Vent.

25.5 Vent Manifolds

A vent manifold may be incorporated to connect the ends of a number of sections or rows of Presby Pipe to a single vent opening. Slope the lines connecting the manifold to the Presby pipes to drain condensation. See diagrams below:



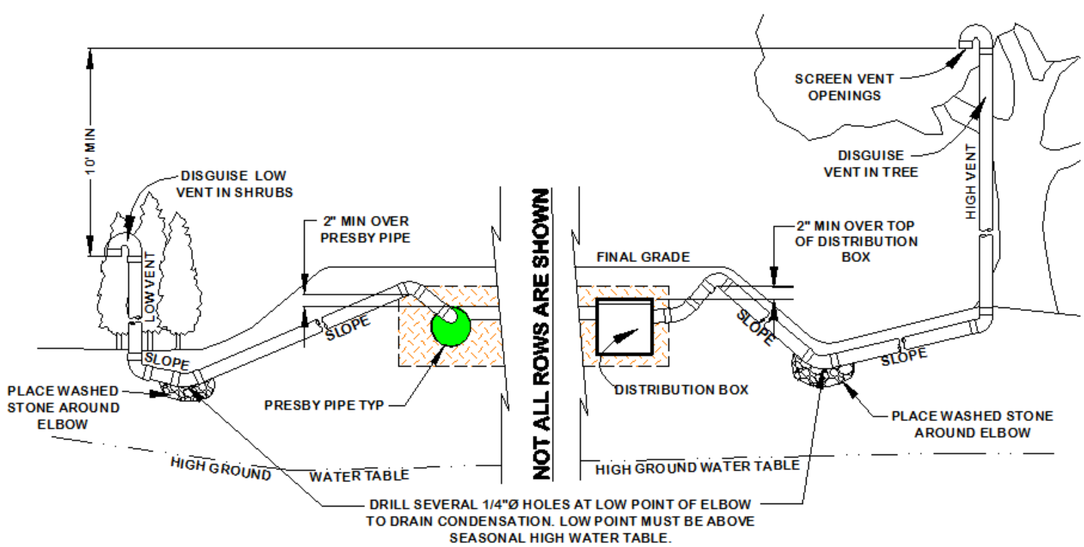
25.6 Vent Piping Slope

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

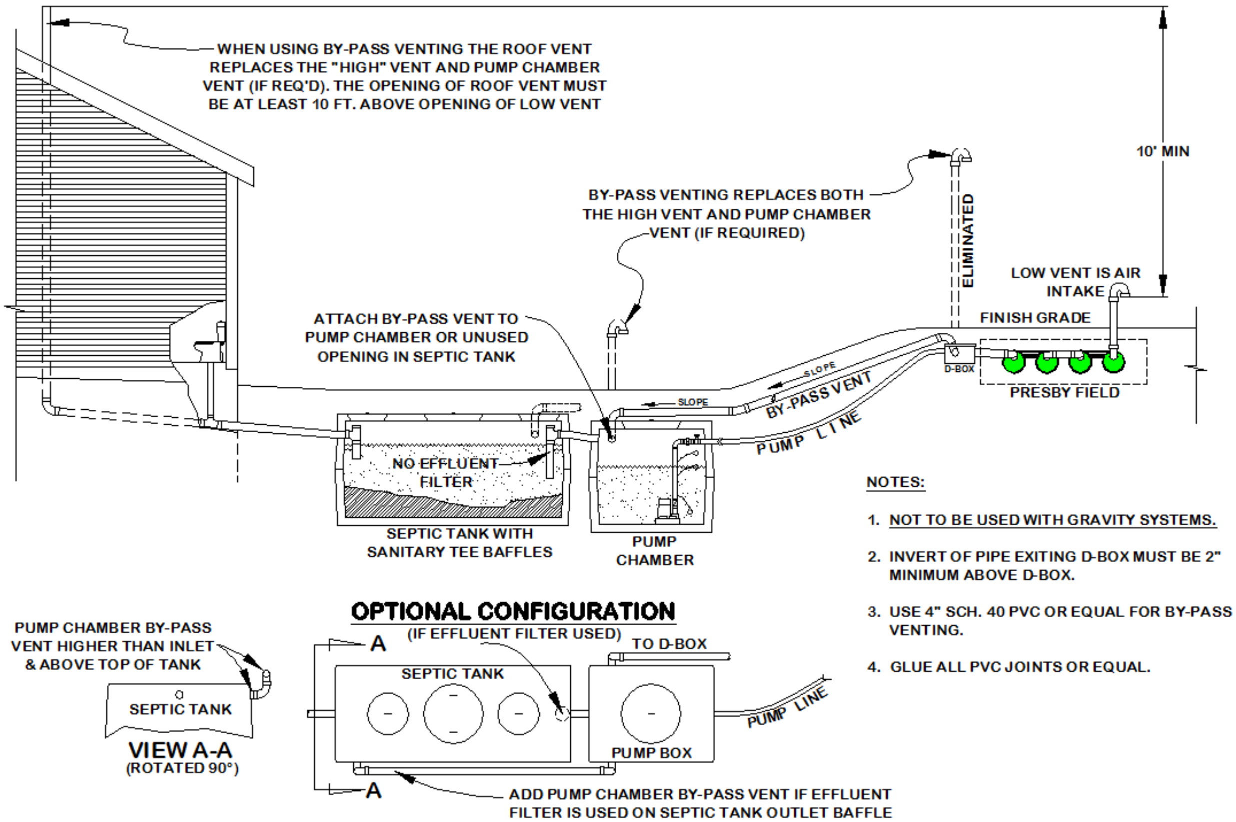
25.7 Remote Venting

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

a) A **high point** that is above the highest point of all Presby Pipes or the Distribution Box; and,
b) A **low point** opened for drainage which is above the SHWT. (See diagram below.)



25.8 By-Pass Venting



26.0 Site Selection

26.1 Determining Site Suitability
Refer to State or local rules regarding site suitability requirements.

26.2 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.

26.3 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.

26.4 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.

26.5 Hydraulic loading
Systems should not be located where lawn irrigation, roof drains, or natural flows increase water loading to the soils around the system.

26.6 Access
Systems should be located to allow access for septic tank maintenance and to at least one end of all Presby Rows. Planning for future access will facilitate rejuvenation in the unlikely event the system malfunctions.

26.7 Rocky or Wooded Areas
Avoid locating systems in rocky or wooded areas that require additional site work, since this 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.

26.8 Replacement System
In the event of system malfunction, contact PEI for technical assistance prior to attempting Rejuvenation procedures. In the unlikely event that a Presby System needs to be replaced …

a) It can be reinstalled in the same location, eliminating the need for a replacement field reserve area.

b) All unsuitable material must be removed prior to replacement system construction.
c) Disposal of hazardous materials to be in accordance with State and local requirements.
d) Permits may be required for system replacement; contact the appropriate local or state agency.

27.0 Installation Requirements, Component Handling and Site Preparation

27.1 Component Handling

a) Keep mud, grease, oil, etc. away from all components.
b) Avoid dragging pipe through wet or muddy areas.
c) Store pipe on high and dry areas to prevent surface water and soil from entering the pipes or contaminating the fabric prior to installation.
d) The outer fabric of the Presby 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.

27.2 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.

27.3 Site Preparation Prior to Excavation

a) Locate and stake out the System Sand bed, extension areas and soil material cover extensions on the site according to the approved plan.
b) Install sediment/erosion control barriers prior to beginning excavation to protect the system from surface water flows during construction.
c) Do not travel across or locate excavation equipment within the portion of the site receiving System Sand.
d) Do not stockpile materials or equipment within the portion of the site receiving System Sand.
e) It is especially important to avoid using construction equipment down slope of the system to prevent soil compaction.

27.4 When to Excavate

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

27.5 Tree Stumps

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.

a) Do not locate equipment within the limits of the System Sand bed.
b) Avoid soil disturbance, relocation, or compaction.
c) Avoid mechanical leveling or tamping of dislodged soil.
d) Fill all voids created by stump or root removal with System Sand.

27.6 Organic Material Removal

Before tilling, remove all grass, leaves, sticks, brush and other organic matter or debris from the excavated system site. It is not necessary for the soil of the system site to be smooth when the site is prepared.

27.7 Raking and Tilling Procedures

All areas receiving System Sand, sand fill and fill extensions **must** be raked or tilled. If a backhoe/excavator is used to till the site, fit it with chisel teeth and till the site. The backhoe/excavator must remain outside of the proposed System Sand area and extensions. For elevated bed systems remove the “A” horizon (topsoil), then use an excavator or backhoe to rake furrows 2 inches – 6 inches deep into the receiving area.

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

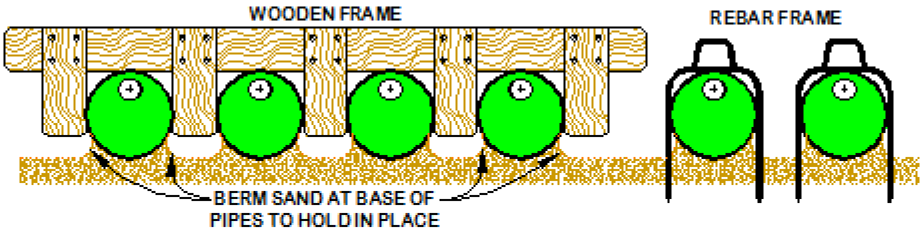
a) To protect the tilled area (System Sand bed area and System Sand extension area) from damage by precipitation, System Sand should be installed immediately after tilling.
b) Work off either end or the uphill side of the system to avoid compacting soil.
c) Keep at least 6 in. of sand between the vehicle tracks and the tilled soil of the site if equipment must work on receiving soil.
d) Track construction equipment should not travel over the installed system area until at least 12 inches of cover material is placed over the Presby Pipes.
e) Heavy equipment with tires must never enter the receiving area due to likely wheel compaction of underlying soil structures.

27.9 Distribution Box Installation
To prevent movement, be sure D-boxes are placed level on compacted soil, sand, pea gravel base, or concrete pad.

27.10 Level Row Tolerances
Use a laser level or transit to install rows level. Variations beyond 1 in. (±1/2") may affect system performance and are not acceptable.

27.11 Correct Alignment of Advanced Enviro-Septic® Bio-Accelerator® Fabric
The Bio-Accelerator® (white geo-textile fabric) is to be positioned centered along the bottom of the pipe rows (sewn seam up).

27.12 Row Spacers
System Sand may be used to keep pipe in place while covering, but simple tools may also be constructed for this purpose. Two examples are shown. One is made from rebar, the other from wood. Center-to-center row spacing may be larger than specified by this manual. Caution: Remove all tools used as row spacers before final covering.



27.13 Connect Rows Using Raised Connections
Raised connections consist of offset adapters, 4 in. 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 Presby System (see para. 3.7 page 4). Glue or mechanically fasten all pipe connections.

27.14 Backfilling Rows

a) Spread System Sand between the rows.
b) Confirm pipe rows are positioned with Bio-Accelerator® along the bottom (sewn seam up).
c) Straddle each row of pipe and walk heel-to-toe its entire length, ensuring that System Sand fills all void spaces beneath the Presby Pipe.
d) Finish spreading System Sand to the top of the rows and leave them exposed for inspection purposes.

27.15 Backfilling and Final Grading
Spread System Sand to a minimum of 3 inches over the pipe and a minimum of 6 inches beyond Presby Pipes on all four sides beyond the Presby Pipes. Spread soil material free of organics, stones over 4 inches and building debris, having a texture similar to the soil at the site, without causing compaction. Construction equipment should not travel over the installed system area until at least 12 inches of cover material is placed over the Presby Pipes (H-10 Loading). 18 inches of cover material over the Presby System is required for H-20 loading (see para. 22.0, page 19).

27.16 System Soil Cover Material
A minimum of 4 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.

27.17 Erosion Control
To prevent erosion, soil cover above the system shall be planted with native, shallow-rooted vegetation such as grass, wildflowers and certain perennials or ground covers.

27.18 Trees and Shrubs
It is recommended that no trees or shrubs be located within 10 ft of the system perimeter to prevent roots from growing into and damaging the system.

28.0 System Bacteria Rejuvenation and Expansion
This section covers procedures for bacteria rejuvenation and explains how to expand existing systems.
Note: Presby Environmental, Inc. must be contacted for technical assistance prior to attempting rejuvenation procedures.

28.1 Why would System Bacteria Rejuvenation be needed?
Bacteria rejuvenation is the return of bacteria to an aerobic state. Flooding, improper venting, alteration or improper depth of soil material cover, use of incorrect sand, sudden use changes, introduction of chemicals or medicines, and a variety of other conditions can contribute to converting bacteria in any system from an aerobic to an anaerobic

state. This conversion severely limits the bacteria's ability to effectively treat effluent, as well as limiting liquids from passing through. A unique feature of the Presby System is its ability to be rejuvenated in place.

28.2 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 Presby Systems without costly removal and replacement.

1. Contact Presby Environmental before attempting Rejuvenation for technical assistance.
2. Determine and rectify the problem(s) causing the bacteria conversion.
3. Drain the system by excavating one end of all the rows and removing the offset adapters.
4. If foreign matter has entered the system, flush the pipes.
5. Safeguard the open excavation.
6. Guarantee a passage of air through the system.
7. Allow all rows to dry for 72 hours minimum. The System Sand should return to its natural color.
8. Re-assemble the system to its original design configuration. As long as there is no physical damage to the Presby components, the original components may be reused.

29.0 System Expansion

Presby Systems are easily expanded by adding equal lengths of pipe to each row of the original design or by adding additional equal sections. All system expansions must comply with State and local regulations. Permits may be required prior to system expansion.

29.1 Reusable Components

Presby Pipe and components are not biodegradable and may be reused. In cases of improper installation, it may be possible to excavate, clean, and reinstall all system components.

30.0 Operation & Maintenance

30.1 Proper Use

Presby Systems require minimal maintenance, provided the system is not subjected to abuse. An awareness of proper use and routine maintenance will guarantee system longevity. We encourage all system owners and service providers to obtain and review a copy of our Owner's Manual, available from our website www.PresbyEnvironmental.com or via mail upon request to (800) 473-5298 or info@presbyeco.com.

30.2 System Abuse Conditions

The following conditions constitute system abuse:

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

Note: PEI and most regulatory agencies do not recommend the use of septic system additives.

30.3 System Maintenance/Pumping of the Septic Tank

a) Inspect the septic tank at least once every two years under normal usage.
b) Pump the tank when surface scum and bottom sludge occupy one-fourth or more of the liquid depth of the tank.
c) If a garbage disposal is used, the septic tank will likely require more frequent pumping.
d) 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.
e) Inspect the system to ensure that vents are in place and free of obstructions.
f) 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.

30.4 Site Maintenance

It is important that the system site remain free of shrubs, trees, and other woody vegetation, 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.

31.0 Glossary

This Manual contains terminology which is common to the industry and terms that are unique to Presby Systems. While alternative definitions may exist, this section defines how these terms are used in this Manual.

31.1 Advanced Enviro-Septic® (AES) Pipe

A single unit comprised of corrugated plastic pipe, Bio-Accelerator® fabric along its bottom which is surrounded by a layer of randomized plastic fibers and a sewn geo-textile fabric. Each unit is 10 ft in length, with an outside diameter of 12 in. and a storage capacity of approximately 58 gallons. Each foot of Advanced Enviro-Septic® provides over 40 sq ft of total surface area for bacterial activity. The sewn seam is always oriented up (12 o'clock position) within the bed. A white tag is sewn into the seam indicating the product is Advanced Enviro-Septic® pipe. Pipes are joined together with couplings to form rows. Advanced Enviro-Septic® is a combined wastewater treatment and dispersal system.

31.2 Basic Serial Distribution

Basic Serial distribution incorporates Presby Rows in serial distribution in a single bed (see Basic Serial Distribution in para. 12.0, page 14).

31.3 Bio-Accelerator®

Bio-Accelerator® fabric screens 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. Bio-Accelerator® is only available with Advanced Enviro-Septic®.

31.4 Bottom Drain

A bottom drain is a line connected to the hole in the 6 o'clock position of a double offset adapter at the end of each serial section or each row in a D-Box Distribution Configuration which drains to a sump and is utilized to lower the water level in a saturated system or to facilitate system rejuvenation (see illustration in para. 14.0, page 16).

31.5 Butterfly Configuration

A variation of a standard, single bed system with the D-box located in the center, with rows oriented symmetrically on either side, and with each side or section receiving an equal volume of flow from the D-Box. See Butterfly Configuration (see para. 15.1, page 17).

31.6 Center-to-Center Row Spacing

The distance from the center of one Presby Row to the center of the adjacent row.

31.7 Coarse Randomized Fiber

A mat of coarse, randomly-oriented fibers which separates more suspended solids from the effluent protecting the bacterial surface in the geo-textile fabric (see illustration in para. 2.0, page 2).

31.8 Combination Serial Distribution

Incorporates two or more sections of Presby Pipe in a single bed, with each section receiving a maximum of 750 GPD of effluent from a distribution box. Combination Distribution is not required for daily flows of 750 GPD or less. See Combination Serial Distribution, para. 15.0, on page 16.

31.9 Cooling Ridges

Pipe ridges that allow the effluent to flow uninterrupted around the circumference of the pipe and aid in cooling (see illustration in para. 2.0, page 2).

31.10 Coupling

A plastic fitting that joins two Presby Pipe pieces in order to form rows (see para.3.3, page 3).

31.11 Daily Design Flow

The peak daily flow of wastewater to a system, expressed in gallons per day (GPD); systems are typically sized based on the daily design flow. Design flow calculations are set forth in the State Rules. In general, actual daily use is expected to be one-half to two-thirds less than "daily design flow."

31.12 Differential Venting

A method of venting a Presby System utilizing high and low vents (see para. 25.2, page 21).

31.13 Distribution Box or "D-Box"
A device designed to divide and distribute effluent from the septic tank equally to each of the outlet pipes that carry effluent into the Presby System. D-Boxes are also used for velocity reduction, see Velocity Reduction, para. 23.4, page 20.

31.14 Drop Connection (Multi-Level™ Systems)
A drop connection is a PVC Sewer & Drain pipe configuration which is used to connect upper level rows to lower level rows in a Multi-Level™ bed. Drop connections extend 2 in. to 4 in. into the pipe and are installed with at least 2 in. of drop from the upper level row to the lower level row. All PVC joints should be glued or mechanically fastened.

31.15 D-Box Distribution Configuration
A design in which each Presby Row receives effluent from a distribution box outlet. Such a system is also called a "parallel system" or a "finger system." See D-Box (Parallel) Distribution, para. 17.0, page 18.

31.16 End-to-End Configuration
Consists of two or more beds constructed in a line (i.e., aligned along the width of the beds).

31.17 Flow Equalizer
An adjustable plastic insert installed in the outlet pipes of a D-Box to equalize effluent distribution to each outlet.

31.18 GPD and GPM
An acronym for <u>G</u>allons <u>p</u>er <u>D</u>ay and <u>G</u>allons <u>p</u>er <u>M</u>inute respectively.

31.19 High and Low Vents
Pipes used in differential venting. Detailed information about venting requirements can be found in Venting Requirements, para. 25.0, page 20.

31.20 High Strength Effluent
High strength wastewater is septic tank effluent quality with combined 30-day average carbonaceous biochemical oxygen demand (BOD5) and total suspended solids (TSS) in excess of two-hundred and forty (240) mg/L.

31.21 Manifolded Splitter Box
A PVC configuration which connects several distribution box outlets together in order to equalize effluent flow. Refer to drawing in para. 3.6, on page 3.

31.22 Multi-Level™
A Multi-Level™ System is a patented process using Presby Pipe; it consists of essentially two Presby Systems installed in the same bed with one system on top of another with 6 in. of System Sand between the two levels. Multi-Level Systems are limited to soils with a Soil Application rate of 0.6 GDP/ft^2 and greater.

31.23 Multiple Bed Distribution
Incorporates two or more beds, each bed with Basic Serial, Combination Serial, or D-Box distribution and receiving effluent from a distribution box (see para. 18.0, page 18).

31.24 Non-Conventional Configurations
Have irregular shapes or row lengths shorter than 30 ft to accommodate site constraints (see para. 13.1, page 15).

31.25 Offset Adapter
A plastic fitting with a 4-inch hole installed at the 12 o'clock position which allows for connections from one row to another and for installation of venting (see para. 3.2, page 3).

31.26 Pressure Distribution
A pressurized, small-diameter pipe system used to deliver effluent to an absorption field. Pressure Distribution is not permitted to be used with the Presby System. Presby Systems are designed to promote even distribution without the need for pressure distribution.

31.27 Pump Systems
Utilize a pump to gain elevation in order to deliver effluent to a D-Box (see para. 23.0, page 20).

31.28 Raised Connection
A U-shaped, 4" diameter, PVC pipe configuration which is used to connect rows oriented in a serial configuration and to maintain the proper liquid level inside each row. See drawing in para. 3.8, page 4.

31.29 Raking and Tilling
Refers to methods of preparing the native soil that will be covered with System Sand or Sand Fill, creating a transitional layer between the sand and the soil. See Installation Requirements para. 27.7, page 24.

31.30 Row
Consists of a number of Presby Pipe sections connected by couplings with an Offset Adapter on the inlet end and an Offset Adapter or End Cap on the opposite end. Rows are typically between 30 ft and 100 ft long (see Row Requirements in para. 11.14, page 12).

31.31 Sand Fill
Clean sand, free of organic materials and meeting the specifications set forth in Sand Fill, para. 24.2, page 20. Sand fill is used to raise the elevation of the system to meet required separation distance or in side slope tapers. System Sand may be used in place of Sand Fill.

31.32 Section / Serial Section
A group of interconnected rows receiving effluent from one distribution box outlet. Sections are limited to 750 GPD daily design flow maximum.

31.33 Serial Distribution
Two or more Presby Rows connected by a Raised Connection. Basic Serial distribution is described in detail in sections 12.0 on page 14. Combination Serial distribution is described in detail in paragraphs 15.0 and 16.0, pages 16 and 17.

31.34 Skimmer Tabs
Projections into the AES pipe that help to capture grease and suspended solids from the existing effluent (see illustration in para. 2.0, page 2).

31.35 Side-to-Side Configuration
Consist of two or more beds arranged so that the rows are parallel to one another.

31.36 Slope (3:1)
In this Manual's illustrations, slope is expressed as a ratio of run to rise. Example: A slope with a grade of (3:1) is the difference in horizontal distance of two (3) horizontal feet (run) over an elevation difference of one (1) ft (rise).

31.37 Slope (%)
Expressed as a **percent**, is the difference in elevation divided by the difference in horizontal distance between two points on the surface of a landform. Example: A site slope of one (1) percent is the difference in elevation of one (1) foot (rise) over a horizontal distance of one hundred (100) feet (run).

31.38 Smearing
The mechanical sealing of soil air spaces along an excavated, tilled or compressed surface. This is also referred to as “compacting.” In all installations, it is critical to avoid smearing or compacting the soils under and around the field.

31.39 Surface Diversion
A natural or manmade barrier that changes the course of water flow around an onsite system’s soil absorption field.

31.40 System Sand Bed
System Sand area required/used in Presby Systems. The System Sand bed extends a minimum of 12-inches below, 3-inches above and 6-inches horizontally from the outside edges of the Presby Pipes.

31.41 System Sand
System Sand must be clean, granular sand free of organic matter and must adhere to the Presby System Sand Specification with no more than 3% passing the #200 sieve (see complete details in para. 3.10 on page 4).

31.42 System Sand Extension Area
The System Sand extension area is a minimum of 6 in. deep for Single Level systems and 12 in. deep for Multi-Level systems. The System Sand extension is placed on the down slope side of sloping systems. System sloping more than 10% require a 2.5 ft minimum extension. The System Sand extension is measured from the tall portion of the System Sand bed (see illustration in para. 18.1, page 19).

31.43 Topsoil (a.k.a. Loam or Soil Cover Material)
Topsoil, also known as Loam, is soil material cover capable of sustaining plant growth which forms the topmost layer of cover material above the system.

31.44 Velocity Reducer
Velocity reducer refers to any of the various components whose purpose is to reduce the velocity of effluent flow into the Presby Pipes. A distribution box with a baffle or inlet tee is sufficient for velocity reduction in most systems (see illustration in para. 23.4, page 20).

State of Wisconsin
Department of Safety & Professional Services

AGENDA REQUEST FORM

1) Name and Title of Person Submitting the Request: Laura Smith, on behalf of Brittany Lewin	2) Date When Request Submitted: 03/01/17 Items will be considered late if submitted after 12:00 p.m. on the deadline date which is 8 business days before the meeting

3) Name of Board, Committee, Council, Sections:

All Boards, Committees, Councils and Sections

4) Meeting Date:	5) Attachments:	6) How should the item be titled on the agenda page?
05/16/17	☒ Yes ☐ No	Board Training Review – Public Records and Ethics and Lobbying – Discussion and Consideration

7) Place Item in:	8) Is an appearance before the Board being scheduled?	9) Name of Case Advisor(s), if required:
☒ Open Session ☐ Closed Session	☐ Yes ☒ No	N/A

10) Describe the issue and action that should be addressed:

Please review the materials previously emailed, and included herein, in preparation for discussion at the meeting.

1) Public Records and Ethics and Lobbying Training
   i. Email from 3/1/17
   ii. Wisconsin Public Records Law Basics
   iii. DSPS Public Records Information
   iv. Ethics and Lobbying Law One Pager

11) Authorization

Signature of person making this request　　　　Date

Supervisor (if required)　　　　Date

Executive Director signature (indicates approval to add post agenda deadline item to agenda)　　Date

Directions for including supporting documents:
1. This form should be attached to any documents submitted to the agenda.
2. Post Agenda Deadline items must be authorized by a Supervisor and the Policy Development Executive Director.
3. If necessary, provide original documents needing Board Chairperson signature to the Bureau Assistant prior to the start of a meeting.

Wood, Kimberly - DSPS

From:	Wood, Kimberly - DSPS
Sent:	Wednesday, March 01, 2017 3:27 PM
To:	Boullion, James - DSPS
Cc:	Lewin, Brittany - DSPS; Ryan, Thomas - DSPS; Williams, Dan - DSPS; Zadrazil, Chad J - DSPS
Subject:	Completion Reminder: Public Records and Ethics and Lobbying Training
Attachments:	WisconsinPublicRecordsLawBasics_PPT.pdf; Ethics and Lobbying Law One Pager.pdf; DSPS Public Records Information.pdf

DSPS Board, Council or Committee member,

For those of you that have not already done so, this is a reminder to review the training materials we sent you a few weeks ago regarding what you need to know about Wisconsin's ethics and lobbying laws and how to handle public records. You will have a chance to raise any questions and discuss these topics at your next board, council or committee meeting.

We have also included an additional document called "DSPS Public Records Information.pdf" that identifies who you should talk to at DSPS about public records questions. ***Some people had difficulty opening the public records training file, therefore we have also attached a PDF version of the training called "WisconsinPublicRecordsLawBasics_PPT.pdf".***

Hello,

Below you will find information about two requirements recently communicated to state agencies.

All Board, Council, Section and Committee members are required to receive training in two separate areas: 1) Public Records, and; 2) Ethics and Lobbying. **These required trainings must be completed at your earliest opportunity. Please complete the web-based public records training and review the attached ethics and lobbying guidance document by March 1st.** At your next meeting, you will have the opportunity to discuss the public records training and we will review the ethics and lobby law training.

Background information and instructions for both trainings is included below.

1) **Public Records**

On March 11, 2016, the Governor issued Executive Order #189 reaffirming the importance of transparency in state government. Specifically, the Governor asked agencies to implement best practices to promote the public's access to the records of their government under Wisconsin's Public Records Law. The Governor also directed each state agency to provide public records resources and training for all employees and members of all boards, councils, commissions and committees attached to the agency.

This training has been developed and is available online at the following web link:
http://dsps.wi.gov/Documents/Board%20Services/Other%20Resources/RecordsTraining/Wisconsin_Public_Records_Law_Basics.pdf
*Please note that this link will require Adobe Flash Player which may not be available for your hand held device. *If you are unable to open the training, you may view the attached PDF titled "WisconsinPublicRecordsLawBasics_PPT" instead.*

If you have difficulty in accessing this information please contact Kimberly Wood at Kimberly.Wood@wisconsin.gov and she will assist you.

2) Ethics and Lobbying

Recently the Wisconsin Ethics Commission withdrew a formal opinion that had created a pathway for agency officials to remove themselves from the prohibitions of the lobbying law. A number of questions were received in response to the action by the Ethics Commission.

A guidance document is attached in an effort to clarify the current status of the law. The attachment is a one-page overview of specific provisions in the state ethics and lobbying laws that apply to persons appointed by Governor Walker throughout state government.

While the ethics law provisions apply to all appointees of the Governor, the lobbying law only applies to members of boards, councils, or commissions and committees that are involved with rule writing.

If you have any questions, please feel free to reach out to your Executive Director or the Wisconsin Ethics Commission at any time.

Thank you,

Jim Boullion
Administrator, Division of Policy Development
Department of Safety and Professional Services
james.boullion@wisconsin.gov
Phone: (608) 266-8419

What Is a Public Record?

Anything paper or electronic with information about government business, with a few exceptions

Public records can be paper or electronic.

Examples of electronic public records:
- Emails
- Videos
- Audio files
- Database content
- Instant messages

Record Location

The location of the record does not matter!

Emails, text messages, or files about government business on your personal device are public records. You must keep them and turn them over upon request.

Public Records Responsibility 3

When you have a public record, understand how to properly retain it.

- If it **is** a public record, follow your agency's record retention schedule.
- Check with your agency's records officer(s) or records coordinator(s) to learn:
  - How long to keep records.
  - Where to send records when time expires.
- Before you get rid of a record, make sure there are no pending records requests, audits, or lawsuits that require you to hold on to it.

Key Points

Key points to remember:
- Don't delete emails or any other records unless you know that you don't need to keep them.
- Organize hard copy documents so you know where to find them if a member of the public requests them.
- Know how long you are required to keep your records and what to do with them when that time is up.

Key Points, Continued

- Keep all your emails in a place where someone can search them when requests come in.
- Manage your own emails. Don't rely on disaster recovery backup systems. If you run out of storage in your mailbox, ask your agency's help desk for assistance with .pst files or similar solutions.
- Text messages on your personal cell phone are public records if they pertain to government business.
- Emails in your personal email are public records if they pertain to government business.

Public Records Responsibility 4

Recognize a public records request and handle the request appropriately.

A public records request:
- Is any request for government records.
- Does not require magic words or precise format.
- Can be submitted by email, by letter, by phone, in person, or by any other method.
- Can be written or verbal.
- Does not need to identify the requestor or the purpose of the request.

Department of Safety and Professional Services

Agency Specific Public Records Information

February 24, 2017

The purpose of this memo is to provide information on public records requests that is specific to the Department of Safety and Professional Services (DSPS).

DSPS receives public record requests in a number of ways. Most public record requests are received via US mail or by email. DSPS has a public records mailbox accessible from the DSPS website. In addition, the DSPS website contains a public records notice which sets out the procedure for making a request and information about fees. Here is the link to the public records notice: http://dsps.wi.gov/other-services/open-records-notice-and-requests

Records requests should always be considered a priority. If you are an employee of DSPS and you receive a request you should immediately notify your supervisor or a record custodian. Any records that may be covered by the request should be preserved. If you are a member of a board or council and you receive a request you should immediately notify your primary contact at DSPS, normally the executive director of your board or council. Again, any records that may be covered by the request should be preserved. The record request should be forwarded to the supervisor, custodian or executive director within one business day.

Deputy record custodians process the requests. The custodians will work in conjunction with the DSPS public information officer on requests involving media or legislative issues. The custodians will also work with the employees or board/council members if there is a need to search emails or other records in possession of the employee or board/council member. The goal is for the custodian to provide a response as soon as practicable. For this reason, cooperation with the custodians is essential.

The agency record custodian is Michael Berndt.
The following lists reflect deputy record custodians for each agency division:

DLSC
Meena Balasubramanian
Beth Cramton
Zach Hendrickson
Terri Rees

DPCP
Kris Hendrickson

DMS/Office of Sec.
Michael Berndt
Alicia Bork

DPD
Shawn Leatherwood

DIS/Field Offices
Peggy Thran

Public records are retained for periods of time set out in Record Destruction Authorizations, commonly called RDAs, or as required by the General Record Schedules. If you have questions about how long some record is supposed to be retained, please talk with you supervisor. Record officers update the agency RDAs and are familiar with the General Record Schedules. The agency record officers are Michael Berndt and Peggy Thran.

The guidance below provides a summary of the prohibitions on solicitation and acceptance of items of value under Wisconsin law. This guidance does not provide a comprehensive overview of the regulations that apply to state officials. For further information, please consult the Wisconsin Ethics Commission (http://ethics.wi.gov/content/resources) and Chapters 13 and 19 of the Wisconsin Statutes.

Lobbying law. Chapter 13, Wisconsin Statutes.

General Rule: Members of state agencies, boards, commissions, or councils that have rulemaking authority cannot **solicit** or **accept** anything of pecuniary value from a lobbyist or lobbying principal, even if they offer to pay for it. (§13.62, §13.625, 80 OAG 205). [Involvement in rulemaking is defined very broadly; you are likely considered to be involved in rulemaking just by virtue of the fact that you are appointed to a board, commission or council with rulemaking authority. §13.62(3)]. *Note that the Wisconsin Ethics Commission recently withdrew a formal opinion that allowed agency officials to remove themselves from the prohibitions of the lobbying law by refraining from engaging in rulemaking activities.*

Applies to members of boards with rule-making authority ("agency officials"). [Defined in §13.62(3)].

Exceptions:

- If the thing provided by a principal (not an individual lobbyist) is available to the general public on the same terms and conditions and is available to anyone who wants it and who meets the criteria for eligibility. [§13.625(2); 80 OAG 205]. For example, a member of the State Bar could attend a generally advertised continuing legal education conference put on by the State Bar (a lobbying principal) so long as it was available to anyone who wished to attend and met the criteria for eligibility, such as membership in the State Bar.
  - The criteria for eligibility must be:
    - Established and readily identifiable; and
    - Drawn without the purpose or effect of giving a preference to or conferring an advantage upon you.
  - There must be no offer or notice of availability directed to you that gives you an advantage.
- The lobbyist or principal is your employer and the thing provided does not exceed what the employer customarily provides to all employees (e.g., a paycheck). [§13.625(6r)]. *(Note that one's status as a lobbyist does not prevent service as an agency official.)*
- The expense is provided as a benefit to the state, such as meals, transportation or lodging in connection with an event related to your state duties, which the state would otherwise pay. [§13.625(7); §19.56(3)(a)].
- Informational or educational materials. [§13.625(6t)].
- The lobbyist is a relative or resides in the same household [§13.625(6)].

*All lobbyists and lobbying principals are required to register here: https://lobbying.wi.gov/Home/Welcome.

Ethics Law. Chapter 19, Wisconsin Statutes.

General Rule: No state public official may use his or her public position or office to obtain financial gain or anything of substantial value for the private benefit of himself or herself or his or her immediate family, or for an organization with which he or she is associated. [§19.45(2); §19.42(2)].

Applies to individuals appointed by the governor, and other positions defined in Wis. Stat. 19.42(13).

Exceptions: (*Note that these exceptions are to the ethics code only. They are not exceptions to prohibitions under the lobbying code*.)

- The thing offered is unrelated to your state position (e.g. a family member or long-time friend).
- The expense is provided as a benefit to the state, such as meals, transportation or lodging in connection with an event related to your state duties which the state would otherwise pay. [§19.56(3)(a)].

IF YOU HAVE ANY DOUBT IF SOMETHING IS PERMITTED,
ASK YOUR LEGAL OFFICE OR THE ETHICS COMMISSION