

# Alternate Systems Guidance



**COMMONWEALTH OF PENNSYLVANIA**  
**Department of Environmental Protection**

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**DEPARTMENT OF ENVIRONMENTAL PROTECTION**  
**Bureau of Water Supply and Wastewater Management**

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**AUTHORITY:** Pennsylvania Sewage Facilities Act; Title 25 Pa. Code Section 73.72

**POLICY:** The Department of Environmental Protection (DEP) will develop, release for public comment and publish technical guidance for the siting, design and construction of alternate onlot sewage treatment systems.

**PURPOSE:** The purpose of this document is to provide current technical standards for alternate onlot systems and to update these standards periodically through amendments to this document.

**APPLICABILITY:** This guidance document applies to the siting, design and construction of alternate onlot sewage treatment systems proposed under the requirements of Chapter 73, Section 73.72.

**DISCLAIMER:** The policies and procedures outlined in this guidance are intended to supplement existing requirements. Nothing in the policies or procedures shall affect regulatory requirements.

The policies and procedures herein are not an adjudication or a regulation. There is no intent on the part of DEP to give the rules in these policies that weight or deference. This document establishes the framework within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.

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## 12. Drip Irrigation System

### A. Siting Requirements

1. The soils must be classified morphologically as either well drained or moderately well drained as determined by a soil scientist. Any soil scientist who is a professional member of the Pennsylvania Association of Professional Soil Scientists (PAPSS) or is a “Qualified Soil Scientist” as defined in Chapter 73, Section 73.1 is qualified to conduct the morphological evaluation necessary to site a drip irrigation system. This soil drainage classification determination and confirmation that the loading rate and horizontal linear load in Section B are met must be signed by the soil scientist and be attached to the permit application. The soil scientist who signs the soils report shall determine the number and placement of soil profile descriptions required to conduct the morphological evaluation of soils in the proposed drip zones. The profiles may be supplemented with the use of a hand auger to confirm soil conditions between profiles. Excessive disturbance of soils within the proposed drip zone must be avoided. Requirements for a minimum number of soil profiles as specified in DEP’s regulations, guidance or policy regarding other onlot systems is not applicable to drip irrigation systems.
2. The slope in each drip irrigation zone must be between 0 percent and 25 percent.
3. The depth to seasonal high water table from the surface of the ground must be greater than or equal to 20 inches. Standard tubing installation depth (see C. 2) may be used on sites with seasonal high water table limiting zones. A minimum vertical isolation distance of 20 inches must be maintained between the depth of installation of drip irrigation tubing and the shallowest indication of rock that is defined as a limiting zone.
4. The site location requirements of Chapter 73, Section 73.12 and the minimum isolation distances specified in Chapter 73, Section 73.13 apply. Isolation distances must be measured from a perimeter extending two feet beyond the outermost drip tubing in a drip irrigation zone.

### B. Design Requirements

#### **Treatment/Filtration**

1. Treatment tanks: Sewage must be treated using either a two-compartment rectangular septic tank or two rectangular septic tanks in series that meet the standards of Chapter 73, Section 73.31 (Standards for Septic Tanks) or with an aerobic tank that meets the standards of 73.32 (Standards for Aerobic Treatment Tanks).
2. Intermittent Sand Filtration, Peat Filter, or Aerobic Treatment Unit: Sewage must be further treated using one of the following methods:

- a. a septic tank followed by an intermittent sand filter designed in accordance with Chapter 73, Section 73.162; or
  - b. a septic tank followed by a peat filter designed in accordance with Part 3 of this *Alternate Systems Guidance* listing; or
  - c. an aerobic treatment unit used in place of a septic tank without a following sand or peat filter. If this option is chosen, the specific aerobic tank proposed for use must be identified, and the application must include a letter from the drip system manufacturer stating that they have evaluated this specific tank for compatibility with their system and have accepted it for this use.
3. Final filtration must be provided by a hydraulic unit fitted with in-line disk filters meeting or exceeding the filtration efficiency achieved by the American Perc Rite system disc filters manufactured by the American Manufacturing Company, Incorporated. The filters must have an automatic backwash system. The disc filters must automatically backwash before each dose and each zone must be automatically forward flushed a minimum of each 50 cycles to clean drip tubing, maintaining a scouring velocity of 2 feet per second at the distal end of each lateral connection. Backwash from the disc filters must be returned to the first compartment of the septic tank or to the inlet of an aerobic treatment tank. The system must be equipped with a dosing tank alarm to alert the property owner of problems with the system, and a flow meter. The hydraulic unit must be protected from temperatures below freezing in accordance with the manufacturer's specifications.

### **Drip Irrigation Zone**

1. A minimum of two zones are required for each system, with adequate flow equalization provided to accommodate time dosing of the zones.
2. The drip tubing must follow the contour of the land.
3. The loading rate must be no more than 0.34 gallons per day per lineal foot of tubing (example: sewage flow is 400 gallons per day,  $400 \text{ gpd} / 0.34 \text{ gallons per lineal ft.} = 1,176 \text{ lineal ft. of tubing} / 2 \text{ zones} = 588 \text{ lineal ft. of tubing per zone}$ ). Sewage flows must be calculated using Chapter 73, Section 73.17.
4. The tubing must have pressure-compensating emitters every 2 feet with spacing between tubing ranging between 1 and 3 feet unless justification for different spacing is provided (such as trees, irregular topography, etc.). All emitters within the zone shall provide equal distribution between plus or minus 10 percent. This standard has been met by the American Perc Rite System only. No substitution of other drip tubing is permitted.
5. The horizontal linear load (the gallons per foot along the topographic contour) must not exceed 4.6 gallons per day as calculated on the average daily flow of the

onlot system. The average daily flow is 50 percent of the peak design flow as listed in Chapter 73, Section 73.17(a) & (b).

The horizontal linear load equals the average daily gallons per day divided by the length of the system (example: 400 gallons per day peak flow x .5 = 200 gallons per day average daily flow; horizontal linear load equals 200 gpd /43.5 ft = 4.6).

The minimum horizontal length required is the average daily flow divided by 4.6 (example: 400 gallons per day peak flow x .5 = 200 gallons per day average daily flow, topographical length required is 200 gpd /4.6 = 43.5).

Where the soils exceed the minimum criteria in 12A. above, the horizontal linear load may be increased based on the evaluation of a combination of factors including, but not limited to, increased depth over limiting zone, permeability and slope.

6. The SEO, at his discretion, may require the site plan for the drip irrigation zones to be developed by or in consultation with the manufacturer or a representative of the manufacturer of the drip irrigation system being installed.
7. On slopes greater than 5 percent, top-feed supply and return manifolds are recommended.

#### C. Construction

1. Soil moisture conditions must be at or below field capacity during construction. These conditions must be determined in the same way that soil moisture conditions are determined prior to beginning the construction of an elevated sand mound.
2. Drip lines must be installed below the soil surface using a vibratory plow, a standard trencher or by manual or hand installation to a maximum depth of 12 inches from the soil surface, with 6 inches being the optimum installation depth. Cable pullers must not be used. Where installation depths less than 6 inches from the soil surface are necessary due to stoniness, additional cover shall be required to provide 6 to 12 inches of cover. The addition of native on-site or imported mulch is permissible in wooded areas of passive activity with established forest litter.
3. The manufacturer's representative must be present to oversee the installation of the system. The current list of representatives is available from the manufacturer. As an alternative, contractors may attend a training course provided by the manufacturer before installing drip tubing independent of oversight by the manufacturer.
4. Installation of the drip irrigation system shall meet the specifications provided by the manufacturer.

5. Drip tubing is susceptible to freezing when sufficient turf cover is not established in non-wooded areas prior to winter operation. When turf cover will not be established prior to winter operation, other measures, such as a temporary cover of mulch or straw, should be used to insulate the tubing.

D. Operation and Maintenance

The following operation and maintenance conditions must be attached to the permit issued by the local agency:

1. The manufacturer's representative must meet with the property owner within 1 month of system start-up and/or occupancy of the dwelling and with the local agency's SEO upon request, to explain the operation and maintenance of the system and provide written instructions to the property owner that includes:
  - a. Instructions on the operation and maintenance of the system.
  - b. The locations of all parts of the system.
  - c. A caution notice regarding disturbance of the drip zones that may cause system damage (i.e., excavation for trees, fencing, etc.).
  - d. An explanation of the automatic alarm system.
  - e. A statement requiring that the manufacturer's representative be contacted if the alarm system is activated.
2. The manufacturer of the drip irrigation system must provide a minimum 2-year warranty on all defects due to materials or workmanship.

The only drip irrigation system that has met the requirements for this alternate system listing to date is the American Perc Rite System, manufactured by the American Manufacturing Company, Incorporated (5517 Wellington Road, Gainesville, Virginia 20155).

All proposals for the application of drip irrigation systems that fall outside the standards established by this alternate system listing must be proposed and reviewed as experimental systems under the provisions of Chapter 73, Section 73.71.

Until the local agency's SEO has received training on drip irrigation siting, design and construction or has received review delegation in writing from DEP, all proposals for drip irrigation must be forwarded to the appropriate regional office of DEP for review and comment prior to permit issuance.

## APPENDIX 1

### System Summary Alternate Systems\*

SYSTEM	SITING CRITERIA	
<b>Peat Based Systems</b>		
<b>Peat Based System Limiting Zone ≥ 20 Inches Option 1</b>	<b>Depth to Rock</b>	≥ 20 inches
	<b>Depth to Water Table</b>	≥ 20 inches
	<b>Slope</b>	0 - 12 percent
	<b>Percolation Rates</b>	3 - 180 min/in.
	<b>Other</b>	May reduce size of absorption area by up to 40 percent with perc rate up to 60 min/in.
<b>Peat Based System Limiting Zone &lt; 20 Inches Option 1</b>	<b>Depth to Rock</b>	≥ 16 inches
	<b>Depth to Water Table</b>	≥ 10 inches
	<b>Slope</b>	0 - 12 percent
	<b>Percolation Rates</b>	None - Soil morphological testing.
	<b>Other</b>	Need soil scientist to evaluate soils and provide design criteria.
	<b>Disinfection</b>	UV Disinfection Required.
<b>Peat Based System Option 2 (IRSIS)</b>	<b>Depth to Rock</b>	≥ 16 inches
	<b>Depth to Water Table</b>	≥ 10 inches
	<b>Slope</b>	0 - 25 percent
	<b>Percolation Rates</b>	None
	<b>Other</b>	Use in place of sand filter in IRSIS.
<b>Peat Based System Limiting Zone ≥ 72 Inches Option 3</b>	<b>Depth to Rock</b>	≥ 72 inches
	<b>Depth to Water Table</b>	≥ 72 inches
	<b>Slope</b>	0 - 12 percent
	<b>Percolation Rates</b>	> 90 min/in. @ 12 - 36 inches 3 - 90 min/in. @ 36 - 60 inches
	<b>Other</b>	For use in place of 12 inches of sand in a subsurface sand filter.
<b>Free Access Gravity Sand Filter (with options other than IRSIS)</b>	<b>Depth to Rock</b>	≥ 20 inches
	<b>Depth to Water Table</b>	≥ 20 inches
	<b>Slope</b>	0 - 25 percent
	<b>Percolation Rates</b>	3 - 180 min/in.
<b>Free Access Gravity Sand filter (with IRSIS)</b>	<b>Depth to Rock</b>	≥ 16 inches
	<b>Depth to Water Table</b>	≥ 10 inches
	<b>Slope</b>	0 - 25 percent
	<b>Percolation Rates</b>	none
<b>CO-OP RFS III Limiting Zone ≥ 20 Inches</b>	<b>Depth to Rock</b>	≥ 20 inches
	<b>Depth to Water Table</b>	≥ 20 inches
	<b>Slope</b>	0 - 25 percent
	<b>Percolation Rates</b>	3 - 180 min/in.
	<b>Disinfection</b>	UV Disinfection required.

\*Refer to complete listing for specific conditions related to each system.

**System Summary  
Alternate Systems\***

(Continued)

SYSTEM	SITING CRITERIA	
<b>CO-OP RFS III Limiting Zone &lt; 20 Inches</b>	<b>Depth to Rock</b>	≥ 16 inches
	<b>Depth to Water Table</b>	≥ 10 inches
	<b>Slope</b>	0 - 12 percent
	<b>Percolation Rates</b>	None - Soil morphological testing.
	<b>Other</b>	Need soil scientist to evaluate soils and provide design criteria.
	<b>Disinfection</b>	UV Disinfection required.
<b>CO-OP RFS III System (with IRSIS)</b>	<b>Depth to Rock</b>	≥ 16 inches
	<b>Depth to Water Table</b>	≥ 10 inches
	<b>Slope</b>	0 - 25 percent
	<b>Percolation Rates</b>	none
<b>At-grade Bed System</b>	<b>Depth to Rock</b>	≥ 48 inches
	<b>Depth to Water Table</b>	≥ 48 inches
	<b>Slope</b>	0 - 12 percent
	<b>Percolation Rates</b>	3 - 180 min/in.
	<b>Other</b>	Design may be modified based on application (see specific listings).
<b>Modified Subsurface Sand Filter for Fast Percolation Shallow Bedrock Sites with No Water Table Present</b>	<b>Soil Depth</b>	≥ 72 inches and additional criteria
	<b>Slope</b>	≤ 8 percent
	<b>Percolation Rates</b>	< 3 min/in. at 12 - 36 inches 3 - 180 min/in. at 36 - 60 inches
<b>Shallow Placement Pressure Dosed Systems</b>	<b>Depth to Rock</b>	≥ 58 inches
	<b>Depth to Water Table</b>	≥ 58 inches
	<b>Slope</b>	0 - 25 percent
	<b>Percolation Rates</b>	3 - 180 min/in.
<b>Drip Irrigation System</b>	<b>Depth to Rock</b>	≥ 20 inches
	<b>Depth to Water Table</b>	≥ 20 inches
	<b>Slope</b>	0 - 25 percent
	<b>Percolation Rates</b>	None unless soil scientist requests
	<b>Other</b>	Need soil scientist to evaluate soils and provide design criteria.
<b>Steep Slope ESM (Slope 12 - 15%, Perc Rate 3 - 30 min/in.)</b>	<b>Depth to Rock</b>	≥ 20 inches
	<b>Depth to Water Table</b>	≥ 20 inches
	<b>Slope</b>	≥ 12 percent and ≤ 15 percent
	<b>Percolation Rates</b>	3 - 30 min/in.
	<b>Other</b>	≤ 600 gpd

\*Refer to complete listing for specific conditions related to each system.

**System Summary  
Alternate Systems\***

(Continued)

SYSTEM	SITING CRITERIA	
<b>A/B Soil System Limiting Zone <math>\geq</math> 20 Inches</b>	<b>Depth to Rock</b>	$\geq$ 20 inches
	<b>Depth to Water Table</b>	$\geq$ 20 inches
	<b>Slope</b>	$\leq$ 12 percent
	<b>Percolation Rates</b>	3 - 180 min/in.
	<b>Other</b>	Conditions dependent on final treatment option chosen.
<b>A/B Soil System Limiting Zone <math>&lt;</math> 20 Inches</b>	<b>Depth to Rock</b>	$\geq$ 16 inches
	<b>Depth to Water Table</b>	$\geq$ 10 inches
	<b>Slope</b>	0 - 12 percent
	<b>Percolation Rates</b>	None - Soil morphological testing.
	<b>Other</b>	Need soil scientist to evaluate soils and provide design criteria.
	<b>Disinfection</b>	UV Disinfection required.
<b>Non-Infiltration, Evapotranspiration Bed Contained Within a Greenhouse</b>	<b>Depth to Rock</b>	Any - Non-soil-based System
	<b>Depth to Water Table</b>	Any - Non-soil-based System
	<b>Slope</b>	Any - Non-soil-based System
	<b>Percolation Rate</b>	Any - Non-soil-based System

\*Refer to complete listing for specific conditions related to each system.

## APPENDIX 5

### Hydraulic Linear Loading Rate Table

			Hydraulic Liner Loading Rate, gal/ft/d							
			Slope							
Soil Characteristics		Infiltration Loading Rate, gal/ft <sup>2</sup> /d	0-4%		5-9%		>10%			
Texture	Structure		Infiltration Distance, Inch	Infiltration Distance, Inch		Infiltration Distance, Inch		Infiltration Distance, Inch		
	Shape	Grade		10-12	12-20	10-12	12-20	10-12	12-20	
COS, S, LCOS, LS		--	0SG	1.6	4.0	5.0	5.0	6.0	6.0	7.0
FS, VFS, LFS, LVFS		--	0SG	1.0	3.5	4.5	4.0	5.0	5.0	6.0
CSL, SL	--	0M	0.6	3.0	3.5	3.6	4.1	5.0	6.0	
	PL	1	0.5	3.0	3.5	3.6	4.1	4.0	5.0	
		2, 3								
	PR/BK /GR	1	0.7	3.5	4.5	4.0	5.0	5.0	6.0	
2, 3		1.0	3.5	4.5	4.0	5.0	5.0	6.0		
FSL, VFSL	--	0M	0.5	2.0	2.3	2.4	2.7	2.7	3.2	
	PL	1, 2, 3								
	PR/BK /GR	1	0.6	3.0	3.5	3.3	3.8	3.6	4.1	
		2, 3	0.8	3.3	3.8	3.6	4.1	3.9	4.4	
L	--	0M	0.5	2.0	2.3	2.4	2.7	2.7	3.2	
	PL	1, 2, 3								
	PR/BK /GR	1	0.6	3.0	3.5	3.3	3.8	3.6	4.1	
		2, 3	0.8	3.3	3.8	3.6	4.1	3.9	4.4	
SIL	--	0M	0.2	2.0	2.5	2.2	2.7	2.4	2.9	
	PL	1, 2, 3								
	PR/BK /GR	1	0.6	2.4	2.7	2.7	3.0	3.0	3.5	
		2, 3	0.8	2.7	3.0	3.0	3.5	3.3	3.8	
SCL, CL, SICL	--	0M								
	PL	1, 2, 3								
	PR/BK /GR	1	0.3	2.0	2.5	2.2	2.7	2.4	2.9	
		2, 3	0.6	2.4	2.9	2.7	3.0	3.0	3.5	
SC, C, SIC	--	0M								
	PL	1, 2, 3								
	PR/BK /GR	1								
		2, 3	0.3	2.0	2.5	2.2	2.7	2.4	2.9	

Adapted from Tyler, 2000.

Width of Infiltration Field = Hydraulic Linear Loading Rate divided by Infiltration Hydraulic Loading Rate

Length of Infiltration Field = Wastewater Volume divided by Hydraulic Linear Loading Rate