

**567—69.5(455B) Secondary treatment—soil absorption systems.** When a PSDS uses secondary treatment prior to the discharge, land application, or other disposal of effluent, it shall comply with all applicable provisions of this rule or 567—69.6(455B).

**69.5(1) Provisions.** The following provisions apply to all soil absorption systems. Soil absorption systems are the best available treatment technology and shall always be used where possible.

*a. Prohibited drainage.*

(1) Nothing shall enter a soil absorption system that does not first pass through a septic tank.

(2) Roof, foundation, area, and storm drains shall not discharge into or upon a soil absorption system.

*b. Prohibited construction.* There shall be no construction of any kind, including driveways, covering the septic tank, distribution box, or absorption field of a soil absorption system. Vehicle access should be infrequent, primarily limited to vegetation maintenance.

*c. Soil evaluation.* Either a percolation test or a professional soil analysis, including a confining layer determination, is required before any soil absorption system is installed.

(1) Percolation test. If a percolation test is performed, it shall comply with the procedure in Appendix B of this chapter.

(2) Professional soil analysis. If a professional soil analysis is performed, soil characteristics including but not limited to soil content, color, texture, and structure shall be used to determine the confining layer and the soil loading rate.

(3) Acceptable percolation rate. An area is deemed suitable if:

1. For conventional systems, soil absorption bed systems, and at-grade systems, the average percolation rate is less than 60 minutes per inch and greater than one minute per inch.

2. For mound systems, an average percolation rate of less than 120 minutes per inch is achieved.

(4) Confining layer determination. At least one additional test hole six feet in depth, or to water or rock, whichever occurs first, shall be provided in the center of the proposed absorption area to determine the location of any confining layer. This six-foot test hole shall be drilled prior to determining the percolation test hole depths and may be augered the same size as the percolation test holes or may be made with a soil probe.

*d. Groundwater.* If the seasonal high groundwater level is present within three feet of the trench bottom final grade and cannot be successfully lowered by subsurface tile drainage, the area shall be classified as unsuitable for a soil absorption system. The administrative authority shall be consulted to determine an acceptable alternative method of wastewater treatment.

*e. Location.*

(1) Soil absorption systems shall be located in accordance with the SDs in Table I in 567—paragraph 60.2(2)“c.”

(2) All soil absorption systems shall be located to maximize the vertical SD from the bottom of the absorption trench to the confining layer, but under no circumstances shall this vertical separation be less than three feet.

(3) In situations where specific location or site characteristics would appear to prohibit installation of a conventional soil absorption system, design modifications to overcome such limitations may be approved by the administrative authority. Such design modifications could include but are not limited to the installation of subsurface drainage; the use of shallow or at-grade systems or mound systems; or the use of pretreated effluent.

*f. Driveway crossings.* Connecting lines under driveways shall be constructed of SCH 40 PVC pipe (SDR 26 or stronger) or equivalent and shall be protected from freezing.

*g. Loading rates and trench size.*

(1) Percolation and soil loading tables. All soil absorption systems installed under this subrule shall comply with the following tables. Table IIa provides a correlation between percolation rates and soil loading rates. Table IIb provides soil loading rates based upon soil texture and structure. Table IIa and Table IIb shall be used to determine the appropriate soil loading rate. Table IIc specifies linear feet of lateral trenches required based upon the soil loading rate, wastewater flow rate, and trench width.

#### Table IIa

**Maximum Soil Application Rates Based Upon Percolation  
Rates - Monthly Averages in gal/ft<sup>2</sup>/day**

Percolation Rate (minutes per inch)	Septic Tank Effluent <sup>1,2</sup> CBOD <sub>5</sub> 25 mg/L - 215 mg/L; TSS 30 mg/L - 150 mg/L	Pretreated Effluent CBOD <sub>5</sub> ≤ 25 mg/L; TSS ≤ 30 mg/L
0 to 5	1.2	1.6
Fine sands	0.5	0.9
6 to 10	0.8 – 0.6	1.2
11 to 29	0.6 – 0.5	0.9
30 to 45	0.5 – 0.4	0.7
46 to 60	0.4 – 0.2	0.5
61 to 120	0.0	0.3
Greater than 120	0.0	0.0

<sup>1</sup>Typical waste strengths for domestic waste. Pretreatment should be considered for waste of higher strength.

<sup>2</sup>Percolation rates and soil loading rates do not precisely correlate; therefore, a range is provided.

**Table IIb  
Maximum Soil Loading Rates Based Upon Soil Evaluations  
in gal/ft<sup>2</sup>/day for Septic Tank Effluent**

Soil Texture	Single Grain	Massive	Structure - Granular, Blocky, or Prismatic			Platy	
			Weak	Moderate	Strong	Weak	Moderate to Strong
Coarse sand and gravel	1.2 (1.6)	X	1.2 (1.6)	X	X	1.2 (1.6)	X
Medium sands	0.7 (1.4)	X	0.7 (1.4)	X	X	0.7 (1.4)	X
Fine sands	0.5 (0.9)	X	0.5 (0.9)	X	X	0.5 (0.9)	X
Very fine sands <sup>1</sup>	0.3 (0.5)	X	0.3 (0.5)	X	X	0.3 (0.5)	X
Sandy loam	X	0.3 (0.5)	0.45 (0.7)	0.6 (1.1)	0.65 (1.2)	0.4 (0.6)	0.3 (0.5)
Loam	X	0.4 (0.6)	0.45 (0.7)	0.5 (0.8)	0.55 (0.8)	0.4 (0.6)	0.3 (0.5)
Silty loam	X	NS	0.4 (0.6)	0.5 (0.8)	0.5 (0.8)	0.3 (0.5)	0.2 (0.3)
Clay loam	X	NS	0.2 (0.3)	0.45 (0.7)	0.45 (0.7)	0.1 (0.2)	0.1 (0.2)
Silty clay loam	X	NS	0.2 (0.3)	0.45 (0.7)	0.45 (0.7)	NS	NS

Notes: Values in ( ) are for pretreated effluent. "X" means not found in nature. "NS" means not suitable for soil absorption.

<sup>1</sup>Flow rates are difficult to determine for some very fine sands; experience may provide better information and flow rates.

**Table IIc  
Minimum Length of Absorption Trenches in Lineal Feet  
by Width of Trench and Soil Loading Rate**

Soil loading rate gal/ft <sup>2</sup>	Two bedroom, 300 gpd <sup>1</sup>	Three bedroom, 450 gpd <sup>1</sup>	Four bedroom, 600 gpd <sup>1</sup>	Five bedroom, 750 gpd <sup>1</sup>	Six bedroom, 900 gpd <sup>1</sup>

	Width of trench in feet									
	2'	3'	2'	3'	2'	3'	2'	3'	2'	3'
0.1	Not suitable for soil absorption trenches									
0.2	750	500	1125 <sup>2</sup>	750	1500 <sup>2</sup>	1000 <sup>2</sup>	1875 <sup>2</sup>	1250 <sup>2</sup>	2250 <sup>2</sup>	1500 <sup>2</sup>
0.3	500	333	750	500	1000 <sup>2</sup>	666	1250 <sup>2</sup>	833 <sup>2</sup>	1500 <sup>2</sup>	1000 <sup>2</sup>
0.4	375	250	562	375	750	500	938 <sup>2</sup>	625	1125 <sup>2</sup>	750
0.5	300	200	450	300	600	400	750	500	900 <sup>2</sup>	600
0.6	250	167	375	250	500	333	625	417	750	500
0.7	214	143	321	214	428	286	536	357	643	429
0.8	188	125	281	188	375	250	469	312	562	375
0.9	167	111	250	167	333	222	417	278	500	333
1.0	150	100	225	150	300	200	375	250	450	300
1.1	136	91	205	136	273	182	341	227	409	273
1.2	125	84	188	125	250	167	313	208	375	250

<sup>1</sup>gpd - gallons per day. Design flow rates are based on 150 gallons per bedroom per day.

<sup>2</sup>Requires pressure distribution (pump).

(2) Unsuitable absorption. Conventional soil absorption trenches and at-grade systems shall not be installed in soils that have a percolation rate less than 1 minute per inch or greater than 60 minutes per inch.

*h. Construction details for all soil absorption trenches.*

(1) Depth. A trench bottom depth of 18 to 24 inches is recommended. Soil absorption trenches shall not exceed 36 inches in depth. Not less than six inches of porous soil shall be provided over the laterals. The minimum separation between the trench bottom and any confining layer shall be 36 inches.

(2) Length. No soil absorption trench shall be greater than 100 feet long unless the administrative authority approves the use of a drop box.

(3) Trench SD. At least six feet of undisturbed soil shall be left between each trench edge on level sites. Two feet of SD should be added for each five percent increase in slope from level.

(4) Grade. The trench bottom should be constructed level from end to end. On sloping ground, the trench shall follow a uniform land contour to maintain a minimum soil cover of six inches and a level trench bottom.

(5) Compaction. There shall be minimum use of, or traffic of heavy equipment on, the area proposed for soil absorption. In addition, heavy equipment shall not be used on the trench bottoms in the absorption area.

(6) Soils. Soil absorption systems shall not be installed in fill soil. Disturbed soils that have stabilized for at least one year shall require a recent percolation test or professional soil analysis.

(7) Soil smearing.

1. Soils with significant clay content should not be worked when wet.

2. If soil moisture causes trench bottom or sidewall smearing, the installation should be discontinued until conditions improve.

**69.5(2) Gravel aggregate systems.** The following provisions apply to gravel aggregate systems.

*a. Gravel.*

(1) A minimum of six inches of clean, washed river gravel, free of clay and clay coatings, shall be laid below the distribution pipe, and enough gravel shall be used to cover the pipe.

(2) This gravel shall be of such a size that 100 percent of the gravel will pass a 2½-inch screen and 100 percent will be retained on a ¾-inch screen.

(3) Limestone or crushed rock is not recommended for soil absorption systems; however, if used, it shall meet the following criteria:

1. The percent wear, as determined in accordance with the American Association of State Highway and Transportation Officials (AAHSTO) T 96, Grading C, 2022, available on the AAHSTO website at [store.transportation.org](http://store.transportation.org), shall not exceed 40 percent.

2. When gravel is subjected to the freezing and thawing test, Iowa DOT Materials Laboratory Test Method 211, Method A, April 15, 2025, available at [erl.iowadot.gov](http://erl.iowadot.gov), the percentage loss shall not exceed 10 percent.

3. The percent absorption, determined in accordance with Iowa DOT Materials Laboratory Test Method 202, April 15, 2025, available at [erl.iowadot.gov](http://erl.iowadot.gov), shall not exceed three percent.

*b. Trench width.* Soil absorption trenches for gravel systems shall have a minimum width of 24 inches and a maximum width of 36 inches at the bottom of the trench.

*c. Grade.* The distribution pipes shall be laid with a minimum grade of two inches per 100 feet of run and a maximum grade of six inches per 100 feet of run, with a preference given to the lesser slope.

*d. Pipe.*

(1) Distribution pipe used in gravity-based distribution type systems shall be PVC rigid plastic meeting ASTM 2729.

(2) The inside diameter shall be not less than four inches, with perforations at least ½ inch and no more than ¾ inch in diameter, spaced no more than 40 inches apart.

(3) Two rows of perforations shall be provided; located 120 degrees apart along the bottom half of the tubing and each 60 degrees up from the bottom centerline.

(4) The end of the pipe in each trench shall be sealed with a watertight cap unless, on a level site, a footer is installed connecting the trenches together.

(5) Coiled perforated plastic pipe shall not be used.

*e. Gravel cover.* Synthetic drainage fabric or other material approved by the manufacturer or administrative authority shall be laid so as to separate the gravel from the soil backfill.

**69.5(3) Chamber systems.** The following provisions apply to chamber systems.

*a. Use.* Chamber systems may be used as an alternative to gravel aggregate systems.

*b. Installation.* The manufacturer's specifications and installation procedures shall be adhered to.

*c. Trench length.* The total length of soil absorption trench for chambers 22 inches wide shall be the same as specified in Table IIc for a two-foot-wide conventional soil absorption trench. Chambers 33 inches wide or greater shall be sized as specified in Table IIc for a three-foot-wide conventional soil absorption trench.

*d. Sidewall.* The chambers shall have at least six inches of sidewall effluent soil exposure height.

**69.5(4) EPS aggregate systems.** The following provisions apply to EPS aggregate systems.

*a. Use.* EPS aggregate systems may be used as an alternative to gravel aggregate systems.

*b. Installation.* The manufacturer's specifications and installation procedures shall be adhered to.

*c. Trench length.* The total length of soil absorption trench using a 12-inch EPS aggregate bundle configuration less than 33 inches wide shall be the same as specified in Table IIc for a two-foot-wide conventional soil absorption trench. Twelve-inch EPS aggregate bundle configurations 33 inches wide or greater shall be sized as specified in Table IIc for a three-foot-wide conventional soil absorption trench.

*d. EPS bundles.* EPS bundles may be configured in a trench, bed, at-grade, or mound application to obtain the desired width, height, and length. EPS bundles containing a distribution pipe shall be connected end-to-end with an internal coupling device.

**69.5(5) Mound systems.** The following provisions apply to mound systems.

*a. General design and use.*

(1) Mound systems shall:

1. Only be permitted when a thorough site evaluation has been conducted and landscaping, dwelling placement, effect on surface drainage, and general topography have been considered;

2. Be constructed only upon undisturbed naturally occurring soils or where a soil analysis has determined the site is suitable; and

3. Be located in accordance with the SDs in Table I in 567—paragraph 60.2(2) "c" as measured from the outer edge of the sand in the mound.

(2) Mound systems shall not be utilized on:

1. Sites subject to flooding with a ten-year or greater frequency;

2. Soils where the high groundwater level, impermeable bedrock, or soil strata having a percolation rate exceeding 120 minutes per inch occurs within 12 inches of natural grade; or

3. Where creviced bedrock occurs within 20 inches of natural grade.  
(3) No buildings, driveways, or other surface or subsurface obstructions shall be permitted within 50 feet on the downgradient side of the mound when the mound is constructed on a slope greater than five percent.

(4) No future construction shall be permitted in the effluent disposal area as long as the mound is in use.

*b. Specifications and design standards.* The specifications provided in these rules for mounds are minimal and may not be sufficient for all locations. Other design information beyond the scope of these rules may be necessary to properly design a mound system. Refer to Appendix C of this chapter for mound system construction design standards.

**69.5(6)** *At-grade systems.* The following provisions apply to at-grade systems.

*a. General design and use.*

(1) At-grade systems shall:

1. Only be permitted when a thorough site evaluation has been conducted and landscaping, dwelling placement, effect on surface drainage, and general topography have been considered;

2. Be constructed only upon undisturbed naturally occurring soils or where a soil analysis has determined the site is suitable; and

3. Be located in accordance with the SDs in Table I in 567—paragraph 60.2(2) “c” as measured from the outer edge of the distribution bed in the system.

(2) At-grade systems shall not be utilized on:

1. Sites subject to flooding with a ten-year or greater frequency, or

2. Soils where a confining layer occurs or soil strata having a percolation rate exceeding 60 minutes per inch occur within 36 inches of natural grade.

(3) No buildings, driveways, or other surface or subsurface obstructions shall be permitted within 25 feet on the downgradient side of an at-grade system when the system is constructed on a slope greater than five percent.

(4) No future construction shall be permitted in this effluent disposal area as long as the at-grade system is in use.

*b. Specifications and design standards.* The specifications provided in these rules for at-grade systems are minimal and may not be sufficient for all locations. Other design information beyond the scope of these rules may be necessary to properly design an at-grade system. Refer to Appendix D of this chapter for at-grade system construction design standards.

**69.5(7)** *Soil absorption bed systems.* The following provisions apply to soil absorption bed systems.

*a. General design and use.* Soil absorption bed systems shall:

(1) Only be permitted when a thorough site evaluation has been conducted, and landscaping, dwelling placement, effect on surface drainage, and general topography have been considered;

(2) Be constructed only upon undisturbed naturally occurring soils or where a soil analysis has determined the site is suitable; and

(3) Be located in accordance with the SDs specified in Table I in 567—paragraph 60.2(2) “c.”

*b. Specifications and design standards.* Refer to Appendix E of this chapter for soil absorption bed system construction design standards.

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