

**3701-29-15 General soil absorption standards.**

- (A) Soil absorption components shall be designed to minimize the risk of exposure to sewage effluent, contamination of groundwater and surface water and provide for:
  - (1) Treatment of effluent through infiltration and movement through an adequate thickness of unsaturated soil before the effluent reaches ground water or an aquifer, highly permeable materials directly connected to groundwater, flow restrictive layers, the land surface, or surface water; and
  - (2) Dispersal of treated effluent in the landscape to prevent surfacing or ponding of treated or partially treated effluent.
- (B) A STS design shall consider all site conditions identified in the soil evaluation and designs shall ensure all requirements of this rule are met.
- (C) The minimum vertical separation distance, unsaturated in situ soil, permissible effluent quality and distribution method shall be selected from paragraphs (D), (E), (F) and (G) of this rule as determined from the soil evaluation. Table 2 summarizes these requirements.

Table 2. VSD and in situ soil requirements

Paragraph	Limiting Condition	Minimum VSD (inches)	Minimum unsaturated in situ soil within infiltrative distance (inches)
(D)	Limiting condition not specified in this table	18	8
(E)(1)	Fractured and/or Karst bedrock	36	12
(E)(2)	Ground water or aquifer	36	12
(E)(3)	Other limiting conditions identified in soil evaluation or by the board of health as having high risk of not meeting 3701-29-15 (A)	36	12
(F)	Highly weathered soils with weak structure or low to very low permeability developed on the low lime till plains are present	24	8
(G)	Perched seasonal water if not established by board of health	12	8
(G)	Perched seasonal water as established by a board of health	6	6

- (D) Except for paragraphs (E), (F) (G) and (H) of this rule, the required minimum vertical separation distance shall be eighteen inches, and the required minimum unsaturated in situ soil thickness within the infiltrative distance shall be eight inches, to all limiting conditions.
- (E) The required minimum vertical separation distance of thirty-six inches and the required minimum in situ soil thickness of twelve inches within the infiltrative distance shall be required when the following site conditions are present:
- (1) Fractured and karst bedrock;
  - (2) Groundwater or an aquifer; or
  - (3) Other limiting conditions identified in the soil evaluation or otherwise identified by the board of health as having a high risk of not meeting the requirements of paragraph (A) of this rule.
- (F) The required minimum vertical separation distance of twenty-four inches, and the required minimum in situ soil thickness of eight inches within the infiltrative distance shall be required to seasonal water table when highly weathered soils with weak structure or low to very low permeability developed on the low lime till plains are present.
- (G) Except for paragraph (E), (F) and (H) of this rule, when a seasonal water table is present, the board of health may establish a vertical separation distance no less than six inches and no greater than eighteen inches, with a required minimum thickness of in situ soil within the infiltrative distance of no less than six inches when effluent is discharged to the soil absorption component. Unless otherwise established by the board of health, the vertical separation distance to the seasonal water table shall be twelve inches, and the required minimum thickness of in situ soil beneath the infiltrative surface shall be eight inches when effluent is discharged to the soil absorption component.
- (H) A board of health may establish the required minimum vertical separation distance of greater than zero inches and less than six inches, and the required minimum in situ soil thickness within the vertical separation distance of greater than zero inches and less than six inches where the seasonal water table is present and the sewage effluent is pretreated to less than one thousand fecal coliform CFU per one hundred milliliters. The infiltrative surface shall not be placed below the depth of the seasonal water table.
- (I) Soils defined as highly permeable materials within the infiltrative distance cannot be used to meet the vertical separation and in situ soil requirements of this rule.
- (J) When no limiting condition or flow restrictive layer is present beneath the infiltrative surface, the soil absorption component shall be placed at a depth to promote oxygen exchange and improved treatment of effluent.
- (K) The vertical separation distance required in paragraphs (D), (E), (F), (G) and (H) of this rule may be reduced using soil depth credits allowed in paragraph (L) of this rule or met through the use of an engineered drainage system to uniformly lower the level of the seasonal water table, provided the soil absorption component is installed with the required minimum in situ soil thickness and the soil depth is adequate to accept and treat all effluent from the system.

- (L) Soil depth credits for infiltrative surface elevation, pretreatment pathogen reduction, low pressure distribution and/or timed micro-dosed distribution shall be used as follows and in accordance with this chapter:
- (1) A one-to-one equivalency soil depth credit shall apply to soil absorption components that elevate the infiltrative surface above the ground surface to meet the required VSD through the use of sand fill material as specified in appendix B of rule 3701-29-15 of the Administrative Code, or other materials as approved by the director.
  - (2) Soil depth credits shall apply for pathogen reduction by pretreatment components as authorized by the director for effluent meeting the fecal coliform treatment standards and pretreatment component requirements of rule 3701-29-14 of the Administrative Code.
  - (3) A soil depth credit of twelve inches shall apply when distribution to the soil absorption area provides for timed micro-dosing controlled at each point of application not to exceed one quarter gallon per dose using a uniformly spaced orifice density applying no more than one gallon per four square feet of infiltrative area for each point of application per day. A soil absorption component in compliance with the requirements of appendix C of rule 3701-29-15 of the Administrative Code shall be eligible for this soil depth credit when the provisions of this paragraph are met.
  - (4) A soil depth credit of six inches shall apply when low pressure distribution to the soil absorption area provides for time dosed, uniform distribution of effluent to the infiltrative surface of leaching trenches when the provisions of rule 3701-29-15.1 and Appendix A of rule 3701-29-15 of the Administrative Code are met.
- (M) Low pressure or drip distribution of effluent shall be used in accordance with this chapter, required design specifications, and as follows:
- (1) Low pressure or drip distribution shall be required when applying effluent to the sand fill infiltrative surface of a soil absorption component, or when required by the product approval.
  - (2) Low pressure or drip distribution may be required by a board of health when the site and soil conditions at the location of the proposed soil absorption component present a significant risk for the surfacing of effluent, or where effluent may reach ground water or an aquifer before adequate treatment is achieved . Conditions where a board of health may require low pressure or drip distribution shall include, but is not limited to the presence of highly permeable materials directly connected to ground water or an aquifer, shallow limiting conditions, and soils with slow to very slow permeability.
- (N) The soil absorption component area shall be of adequate size and configuration to disperse the effluent and prevent public health nuisance conditions. When determining the size and configuration of the soil absorption component area the following minimum requirements shall be met:
- (1) Soil infiltration loading rates, including basal loading rates for sand fill systems, shall be based on effluent quality and on soil structure, grade and shape, texture, and consistence and shall be determined through reference to soil

evaluation information and the loading rate estimates in table 3 of this rule.

- (a) The selection of soil loading rates based on effluent quality shall be limited to a rate for septic tank effluent or a rate for pretreated effluent meeting the CBOD<sub>5</sub> and TSS standard under rule 3701-29-14 of the Administrative Code.
- (b) The structure, texture, structural grade and consistence of the most limiting in situ soil layer within six inches of the infiltrative surface, or basal surface if applicable, shall be used to determine a soil loading rate, unless the soil layers below the upper six inches are significantly less permeable.
- (c) The selected soil loading rate for the site shall be used to determine the total square feet of infiltrative surface or basal area required for the soil absorption component. The daily design flow is divided by the selected soil loading rate to calculate the minimum square feet of infiltrative surface area required for soil absorption.

**Table 3. Soil Infiltration Loading Rates**

Soil Characteristics			Soil Infiltration Loading Rate (gpd/ft <sup>2</sup> )		
Texture	Structure		CBOD <sub>5</sub>		Row
	Shape	Grade	>25mg/L (septic tank effluent)	≤25mg/L (Pretreated effluent)	
COS, S, LCOS, LS	—	OSG	0.8	1.6	1
FS, VFS, LFS, LVFS	—	OSG	0.4	1	2
CSL, SL	—	OM	0.2	0.6	3
	PL	1	0.2	0.5	4
		2, 3	0	0	5
	PR/BK/GR	1	0.4	0.7	6
		2, 3	0.6	1	7
FSL, VFSL	—	OM	0.2	0.5	8
	PL	1, 2, 3	0	0	9
	PR/BK/GR	1	0.2	0.6	10
		2, 3	0.4	0.8	11
L	—	OM	0.2	0.5	12
	PL	1, 2, 3	0	0	13
	PR/BK/GR	1	0.4	0.6	14
		2, 3	0.6	0.8	15
SIL	—	OM	0	0.2	16
	PL	1, 2, 3	0	0	17
	PR/BK/GR	1	0.4	0.6	18
		2, 3	0.6	0.8	19
SCL, CL, SICL	—	OM	0	0	20
	PL	1, 2, 3	0	0	21
	PR/BK/GR	1	0.2	0.3	22
		2, 3	0.4	0.6	23
SC, C, SIC	—	OM	0	0	24
	PL	1, 2, 3	0	0	25
	PR/BK/GR	1	0	0	26
		2, 3	0.2	0.3	27

- (d) When the total square feet of infiltrative surface or basal area required for a replacement system or alteration of an existing system cannot be met based on the daily design flow, the system design may allow the storage of effluent combined with time dosing and low pressure distribution to control and reduce the daily dose of effluent flow to the soil absorption area to a daily dose flow that is less than the daily design flow. The daily dose flow to the soil absorption area is then divided by the site soil loading rate to calculate the total square feet of infiltrative surface area required for the soil absorption component. For purposes of this rule, daily dose flow means the maximum amount of effluent that can be applied to the soil absorption component based on the site and soil conditions in accordance with this chapter.
- (2) The HLLR shall be used to determine the minimum required length of the soil absorption component or basal area parallel to surface contours and shall be based on soil characteristics, land slope, site conditions, infiltrative distance, and the nature and depth to limiting conditions.
- (a) The HLLR shall be determined based on the soil evaluation information with reference to table 4 to determine the rate based on the soil conditions, slope and infiltrative distance.
  - (b) The minimum length of the soil absorption component shall be determined by dividing the daily design flow by the hydraulic linear loading rate selected from table 4 of this rule.

**Table 4: Hydraulic Linear Loading Rate Table**

Soil Characteristics			Hydraulic Linear Loading Rate (gpd/ft)									Row	
			Slope 0-4%			Slope 5-9%			Slope >10%				
Texture	Structure		Infiltrative Distance (inches)			Infiltrative Distance (inches)			Infiltrative Distance (inches)				
	Shape	Grade	8-12	12-24	24-48	8-12	12-24	24-48	8-12	12-24	24-48		
COS, S, LCOS, LS	-	OSG	4.0	5.0	6.0	5.0	6.0	7.0	6.0	7.0	8.0	1	
FS, VFS, LFS, LVFS	-	OSG	3.5	4.5	5.5	4.0	5.0	6.0	5.0	6.0	7.0	2	
CSL, SL	-	OM	3.0	3.5	4.0	3.6	4.1	4.6	5.0	6.0	7.0	3	
	PL	1	3.0	3.5	4.0	3.6	4.1	4.6	4.0	5.0	6.0	4	
		2, 3											5
	PR/BK/G R	1	3.5	4.5	5.5	4.0	5.0	6.0	5.0	6.0	7.0	6	
2, 3		3.5	4.5	5.5	4.0	5.0	6.0	5.0	6.0	7.0	7		
FSL, VFSL	-	OM	2.0	2.3	2.6	2.4	2.7	3.0	2.7	3.2	3.7	8	
	PL	1, 2, 3											9
		1	3.0	3.5	4.0	3.3	3.8	4.3	3.6	4.1	4.6	10	
	PR/BK/G R	2, 3	3.3	3.8	4.3	3.6	4.1	4.6	3.9	4.4	4.9	11	
-		OM	2.0	2.3	2.6	2.4	2.7	3.0	2.7	3.2	3.7	12	
L	PL	1, 2, 3											13
		1	3.0	3.5	4.0	3.3	3.8	4.3	3.6	4.1	4.6	14	
	PR/BK/G R	2, 3	3.3	3.8	4.3	3.6	4.1	4.6	3.9	4.4	4.9	15	
		-	OM	2.0	2.5	3.0	2.2	2.7	3.2	2.4	2.9	3.4	16
SIL	PL	1, 2, 3											17
		1	2.4	2.7	3.0	2.7	3.0	3.3	3.0	3.5	4.0	18	
	PR/BK/G R	2, 3	2.7	3.0	3.3	3.0	3.5	4.0	3.3	3.8	4.3	19	
		-	OM										
SCL, CL, SICL	PL	1, 2, 3											21
		1	2.0	2.5	3.0	2.2	2.7	3.2	2.4	2.9	3.4	22	
	PR/BK/G R	2, 3	2.4	2.9	3.4	2.7	3.0	3.3	3.0	3.5	4.0	23	
		-	OM										
SC, C, SIC	PL	1, 2, 3											25
		1											26
	PR/BK/G R	2, 3	2.0	2.5	3.0	2.2	2.7	3.2	2.4	2.9	3.4	27	

- (c) The soil horizon selected to determine the hydraulic linear loading rate shall also meet the following requirements and may be adjusted as follows with approval from the board of health:
  - (i) The most restrictive soil horizon within the infiltrative distance shall be used to determine the HLLR;
  - (ii) Low permeability soil horizons located between the infiltrative surface and the limiting condition may be excluded from the calculation of HLLR if the cumulative thickness is less than twenty per cent of the infiltrative distance upon concurrence of the designer and the board of health.
  - (iii) Any soil horizon below the depth of the required minimum VSD may be considered to be a limiting condition when selecting the HLLR.
- (d) Adjustments to the HLLR for designs shall be considered by the designer and may be required by the board of health based on the following site conditions:
  - (i) Where the infiltrative distance is less than eight inches, the HLLR may be decreased to reduce the risk of flooding of the trench bottoms, seepage at the toe of mounds or saturating the soil around drip tubing. Designs shall also consider decreasing the HLLR where the flow restrictive layer, seasonal water table or infiltrative surface is less than eight inches below the original ground surface to reduce the risk of inadequate dispersal of sewage and surfacing of effluent; or
  - (ii) When the distance to the limiting condition falls near the boundary between the columns for infiltrative distance on table 4 of this rule, designers and boards of health may choose the appropriate HLLR or modify the HLLR.
- (e) HLLR for STS designs with greater than twenty-four inches of in situ soil within the infiltrative distance may be adjusted with concurrence of the designer and the board of health as follows:
  - (i) Up to two gallons per day per foot may be added to the selected HLLR value in table 4 of this rule where fractured glacial till is the uppermost limiting condition.
  - (ii) Up to three gallons per day per foot may be added to the selected HLLR value in table 4 of this rule where fractured bedrock is the uppermost limiting condition or highly permeable material is present above the limiting condition not to exceed ten gallons per day per foot.
  - (iii) Up to three gallons per day per foot may be added to the selected HLLR value in table 4 of this rule where no limiting condition is present within sixty inches of the natural ground surface.
- (f) If site and soil conditions indicate horizontal subsurface flow volumes will be greater than normal, the minimum horizontal isolation distances shall be increased in undisturbed areas around the perimeter or downslope of the soil absorption component as necessary for adequate dispersal and prevention of surface seepage.

- (g) A soil absorption component may be split into two or more portions or zones to meet the required HLLR for each portion or zone.
  - (h) The calculated length along contour for soil absorption components using the linear loading rates specified in table 4 of this rule can be decreased up to ten per cent for new construction on existing lots upon the effective date of the rules, and up to thirty per cent for replacement sites to allow installation based solely on site limitations. Where reductions in length along contour between twenty and thirty per cent are allowed, low pressure or drip distribution of effluent into the soil absorption component shall be required as specified in rule 3701-29-15.1 and appendices A, B or C of rule 3701-29-15 of the Administrative Code as applicable. Perimeter drains may also be required to facilitate subsurface drainage away from the site.
  - (i) Alternative methods to determine the HLLR and length along contour may include the use of analytical solutions developed by Khan, et al. (1976), Hantush (1967), and Finnemore and Hantzsche (1983) or numerical finite element or finite difference computer models capable of simulating flow of water in saturated and unsaturated systems. The use of alternative methods shall be detailed in the system design with approval by the board of health.
- (O) General requirements for designing a STS soil absorption component are as follows:
- (1) Effluent dispersal components shall be oriented parallel to natural surface contours and shall not be sited on slopes exceeding limitations specified in this chapter or applicable design manuals or product specification as referenced in accordance with this paragraph;
  - (2) The use of perimeter drains, and/or an increase in the extent of fill beyond the edge of elevated shallow trenches, mounds or drip distribution systems may be required by a board of health when the flow restrictive layer is less than twelve inches from the original ground surface, the depth to seasonal water table is less than eight inches below the original ground surface, or when the infiltrative surface is less than eight inches below the original ground surface;
  - (3) On sites where the installation of zones within the same system or multiple systems directly upgradient from each other on the same slope is unavoidable, there should be no less than fifty feet between soil absorption components unless ground water mounding or flow models are used to support lesser or greater separation distances. The designer and the board of health shall ensure that proper spacing and dispersal of effluent occurs in the landscape and does not create a public health nuisance;
  - (4) Observation ports shall be provided to monitor the infiltrative surface of the soil absorption component as required in this chapter or approval by the director and when determined to be necessary by the board of health;
  - (5) Site modification that requires the use of fill material either for soil absorption or between soil absorption components shall follow manufacturer's specifications as applicable and shall comply with the following:
    - (a) When the trench depth design results in the distribution product or media extending above natural grade of the in situ soil, fill material placed between the trenches after installation of the distribution media shall be of silt loam,

loam, sand, loamy sand or sandy loam texture. Fill material shall be applied in a manner that protects and creates an interface with the underlying in situ soil and prevents compaction of material between trenches;

- (b) Fill material applied to the natural ground surface prior to the excavation of leaching trenches for the purpose of creating trench sidewall shall be sand, loamy sand, or sandy loam texture soil capable of maintaining trench sidewall stability during installation and shall be applied in a manner that both protects and creates an interface with the underlying in situ soil; and
  - (c) Unless evaluated as suitable, fill material shall not be present in the vertical separation distance below the infiltrative surface of soil absorption components. Careful consideration shall be given prior to siting soil absorption components in settled non-compacted fill material including but not limited to strip mine spoils to determine the development of pedogenic features and its suitability for soil absorption. Over time, fill material may develop the characteristics of soil; however, it shall be thoroughly evaluated for such characteristics, in addition to treatment and dispersal capacities;
- (6) Designs shall prevent damage to components or operational failures due to freezing temperatures; and
- (7) The STS design for a soil absorption component may include referenced design manuals, proprietary soil absorption component specifications including those for gravelless and chamber products, or alternative aggregate product specifications provided these do not conflict with this chapter. Unless an available internet source for any referenced manual or specification is included in a STS design, the design manual, proprietary soil absorption component specifications, or alternative aggregate product specifications shall accompany the plan. Inclusion of referenced resources does not substitute for critical information or calculations required for board of health approval of a STS design.
- (P) Installation shall be conducted by a registered installer in a manner consistent with an approved STS design to assure proper operation and future servicing or monitoring of the soil absorption component.
- (1) Areas designated for installation and replacement shall be undisturbed and be protected from damage or disturbance. If any disturbance or damage has occurred, installation shall not proceed and the registered installer shall contact the owner, designer, and the board of health.
  - (2) Soil moisture conditions shall be evaluated at the time of installation throughout the soil absorption area. The excavation or preparation of the soil infiltration interface, such as a trench or basal area, shall not proceed when there is a risk of smearing, compaction, or clogging of pore spaces as demonstrated by any of the following:
    - (a) A wire test in the field where the soil crumbles when rolled between the palms of the hands before a wire one-eighth inch in diameter can be formed;
    - (b) When the moisture content is less than the plastic limit as established in ASTM standard D4318; or

- (c) Other means established by the board of health.
- (3) Proprietary soil absorption components or alternative aggregate product specified in an approved STS design shall be installed in accordance with the manufacturer's installation instructions or product specifications and the approved STS design provided these do not conflict with this chapter.
- (4) Baseline records including but not limited to system startup reports, and any soil absorption component O&M instructions shall be provided by the installer to both the owner and the board of health as a condition of installation approval.
- (Q) STS soil absorption components shall be operated, maintained, and monitored as required by the operation permit issued by the board of health to assure compliance with the requirements of this chapter.
- (R) A board of health may not issue a variance to paragraphs (E) and (H) of this rule.

Replaces: 3701-29-10, 3701-29-11

Effective: 01/01/2015

Five Year Review (FYR) Dates: 01/01/2020

CERTIFIED ELECTRONICALLY

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Certification

09/29/2014

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Date

Promulgated Under: 119.03  
 Statutory Authority: 3718.02  
 Rule Amplifies: 3718.02  
 Prior Effective Dates: 7/1/1974, 7/1/77, 7/2/07, 7/30/07