567—69.6(455B) Secondary treatment—subsurface absorption systems. Soil absorption systems are the best available treatment technology and shall always be used where possible.

69.6(1) *General requirements.*

a. Locations. All subsurface absorption systems shall be located on the property to maximize the vertical separation distance from the bottom of the absorption trench to the seasonal high groundwater level, bedrock, hardpan or other confining layer, but under no circumstances shall this vertical separation be less than 3 feet.

b. Soil evaluation. A percolation test or professional soil analysis is required before any soil absorption system is installed.

(1) Percolation test. The percolation test procedure is outlined in Appendix B.

(2) Alternative analysis. If a professional soil analysis is performed, soil factors such as soil content, color, texture, and structure shall be used to determine a percolation rate.

(3) *Acceptable percolation rate.* An area is deemed suitable for conventional soil absorption if the average percolation test rate is 60 minutes per inch or less and greater than 1 minute per inch. However, if an alternative type system is proposed (e.g., mound), then the percolation test should be extended to determine whether a percolation rate of 120 minutes per inch is achieved.

(4) *Confining layer determination.* An additional test hole 6 feet in depth or to rock, whichever occurs first, shall be provided in the center of the proposed absorption area to determine the location of groundwater, rock formations or other confining layers. This 6-foot test hole may be augered the same size as the percolation test holes or may be made with a soil probe.

c. Groundwater. If seasonal high groundwater level is present within 3 feet of the trench bottom final grade and cannot be successfully lowered by subsurface tile drainage, the area shall be classified as unsuitable for the installation of a standard subsurface absorption system. Consult the administrative authority for an acceptable alternative method of wastewater treatment.

d. Site limitations. In situations where specific location or site characteristics would appear to prohibit normal installation of a soil absorption system, design modifications may be approved by the administrative authority which could overcome such limitations. Examples of such modifications could be the installation of subsurface drainage, use of shallow or at-grade trenches, use of dual soil treatment areas, mound system or water conservation plans.

e. Prohibited drainage. Roof, foundation and storm drains shall not discharge into or upon subsurface absorption systems. Nothing shall enter the subsurface absorption system which does not first pass through the septic tank.

f. Prohibited construction. There shall be no construction of any kind, including driveways, covering the septic tank, distribution box or absorption field of an on-site wastewater treatment and disposal system. Vehicle access should be infrequent, primarily limited to vegetation maintenance.

g. Driveway crossings. Connecting lines under driveways shall be constructed of schedule 40 plastic pipe or equivalent, and shall be protected from freezing.

h. Easements. No wastewater shall be discharged upon any property under ownership different from the ownership of the property or lot upon which it originates unless easements to that effect are legally recorded and approved by the administrative authority.

69.6(2) *Trench length requirements.*

a. Percolation charts. Table IIIa specifies lineal feet of lateral trenches required in accordance with the results of the standard percolation tests. Tables IIIb and IIIc list optional methods for determining length of lateral trenches or sizing of absorption beds. The alternative option for increased rock usage (Table IIIb) shall be used only when the size of lots limits the use of trench lengths prescribed in Table IIIa. Absorption beds (Table IIIc) shall not be used except when the lot size limitations preclude the installation of a lateral trench system. Further details concerning limitations of these two alternatives should be obtained from the administrative authority prior to requesting authorization for installation.

b. Unsuitable absorption. Conventional subsurface soil absorption trenches shall not be installed in soils that have a percolation rate less than 1 minute per inch or greater than 60 minutes per inch. Plans for an alternative method of wastewater treatment shall be submitted to the administrative authority for approval prior to construction.

Table IIIa
Soil Absorption System Sizing Chart
(Lineal feet of absorption trench)

Min. Per Inch	Two-Bedroom 300 gal/day[1]	Three-Bedroom 450 gal/day	Four-Bedroom 600 gal/day	Five-Bedroom 750 gal/day	Six-Bedroom 900 gal/day
1-5[2]	160	200	260	340	400
6-15	200	300	400	500	600
16-30	300	400	500	600	700
31-45	400	500	600	800	900
46-60	500	600	700	900	1,100

[1]For domestic, nonhousehold wastewater flow rates, refer to Appendix A.

[2]For soils having more than 50 percent of very fine sand by weight, plus fine sand having a particle size range of 0.05 millimeters (sieve size 270) to 0.25 millimeters (sieve size 60), the 16-30 min. per inch values shall be used when gravelless pipe is installed.

Table IIIb
Alternative Option for Increased Rock Usage
(Only if necessary)

Depth of gravel[1] below distribution line	Reduction in trench lengths as taken from Table IIIa
12″	20%
18″	33%
24″	40%

[1]Total depth of trench must not exceed 36″. Soil profile must be consistent with the percolation rate throughout the depth used. Separation from groundwater and confining layers must be maintained.

Table IIIc
Alternative Option for Use of Absorption Bed[1]

Percolation Rate Min./Inch	Absorption Area/Bedroom Sq. Ft.	Loading Rate/Day Gal./Sq. Ft.
1-5	300	.5
6-15	400	.375
16-30	600	.25

[1]Absorption beds may only be used when site space restrictions require and shall not be used when the soil percolation rate exceeds 30 min./inch.

69.6(3) *Construction details.* (All soil absorption trenches.)

a. Depth. Lateral trenches shall not exceed 36 inches in depth unless authorized by the administrative authority, but a more shallow trench bottom depth of 18 to 24 inches is recommended. Not less than 6 inches of porous soil shall be provided over the laterals. Minimum separation between

trench bottom and groundwater, rock formation or other confining layers shall be 36 inches even if extra rock is used under the pipe.

b. Length. No lateral absorption trench shall be greater than 100 feet long.

c. Separation distance. At least 6 feet of undisturbed soil shall be left between each trench edge on level sites. The steeper the slope of the ground, the greater the separation distance should be. Two feet of separation distance should be added for each 5 percent increase in slope from level.

d. Grade. 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 6 inches while ensuring a level trench bottom.

e. Compaction. There shall be minimum use or traffic of heavy equipment on the area proposed for soil absorption. In addition, it is prohibited to use heavy equipment on the bottom of the trenches in the absorption area.

f. Fill soil. Soil absorption systems shall not be installed in fill soil. Disturbed soils which have stabilized for at least one year would require a recent percolation test.

g. Bearing strength. Soil absorption systems shall be designed to carry loadings to meet AASHTO H-10 standards.

h. Soil smearing. Soils with significant clay content should not be worked when wet. If soil moisture causes sidewall smearing, the trench bottom and sidewalls shall be scarified.

69.6(4) *Gravel systems.*

a. Gravel. A minimum of 6 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. This gravel shall be of such a size that 100 percent will pass a 2½-inch screen and 100 percent will be retained on a ¾-inch screen. Limestone or crushed rock is not recommended for soil absorption systems. If used it shall meet the following criteria:

(1) Abrasion loss. The percent wear, as determined in accordance with the AASHTO T 96, Grading C, shall not exceed 40 percent.

(2) Freeze and thaw loss. When subjected to the freezing and thawing test, Iowa DOT Materials Laboratory Test Method 211, Method A, the percentage loss shall not exceed 10 percent.

(3) Absorption. The percent absorption, determined in accordance with Iowa DOT Materials Laboratory Test Method 202, shall not exceed 3 percent.

(4) Gradation. The aggregate shall have not more than 1.5 percent by weight pass a No. 16 sieve.

b. Trench width. Lateral trenches for gravel systems shall be a minimum of 24 inches and a maximum of 36 inches in width at the bottom of the trench.

c. Grade. The distribution pipes shall be laid with a minimum grade of 2 inches per 100 feet of run and a maximum grade of 6 inches per 100 feet of run, with a preference given to the lesser slope.

d. Pipe. Distribution pipe shall be PVC rigid plastic meeting ASTM Standard 2729, or other suitable material approved by the administrative authority. The inside diameter shall be not less than 4 inches, with perforations at least ½ inch and no more than ¾ inch in diameter spaced no more than 40 inches apart. Two rows of perforations shall be provided located 120 degrees apart along the bottom half of the tubing (each 60 degrees up from the bottom centerline). 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. Coiled perforated plastic pipe shall not be used when installing absorption systems.

e. Gravel cover. Unbacked, rolled, 3½-inch-thick fiberglass insulation, untreated building paper, synthetic drainage fabric, or other approved material shall be laid so as to separate the gravel from the soil backfill.

69.6(5) *Gravelless pipe systems.*

a. Application. Gravelless subsurface absorption systems may be used as an alternative to conventional 4-inch pipe placed in gravel-filled trenches. However, they cannot be used in areas where conventional systems would not be allowed due to poor permeability, high groundwater, or insufficient depth to bedrock.

b. Installation. Manufacturer's specifications and installation procedures shall be adhered to.

c. Material. The 8- and 10-inch I.D. corrugated polyethylene tubing used in gravelless systems shall meet the requirements of ASTM F667, Standard Specification for Large Diameter Corrugated Polyethylene Tubing.

d. Perforations. Two rows of perforations shall be located 120 degrees apart along the bottom half of the tubing (each 60 degrees up from the bottom centerline). Perforations shall be cleanly cut into each inner corrugation along the length of the tubing and should be staggered so that there is only one hole in each corrugation.

e. Top marking. The tubing should be visibly marked to indicate the top of the pipe.

f. Filter wrap. All gravelless drainfield pipe shall be encased, at the point of manufacture, with a geotextile filter wrap specific to this purpose.

g. Trench width. If dug with a backhoe, the minimum trench width for the gravelless system shall be 18 inches in sandy loam soil to ensure proper backfill around the bottom half of the pipe. In clay soils, the minimum trench width shall be 24 inches. If the pipe is laid in with a wheel trencher leaving a curved trench bottom, the trench width may be just 2 inches wider than the outside diameter of the pipe.

h. Length of trench. The total length of absorption trench for a 10-inch gravelless tubing installation shall be the same as given in Table IIIa for a conventional absorption trench, except for fine sandy soils as noted in Table IIIa footnote. An increase of at least 20 percent in total trench length shall be required if 8-inch tubing is used rather than 10-inch.

69.6(6) *Chamber systems.*

a. Application. Chamber systems may be used as an alternative to conventional 4-inch pipe placed in gravel-filled trenches. However, they cannot be used in areas where conventional systems would not be allowed due to poor permeability, high groundwater, or insufficient depth to bedrock.

b. Installation. Manufacturer's specifications and installation procedures shall be closely adhered to.

c. Length of trench. The total length of absorption trench for chambers 24 inches or less in bottom width shall be the same as given in Table IIIa for a conventional absorption trench. For chambers greater than 33 inches in width a reduction of 25 percent from the lengths given in Table IIIa may be used.

d. Sidewall. The chambers shall have at least 6 inches of sidewall effluent soil exposure height.

69.6(7) *Gravity distribution.* Dosing is always recommended and preferred to improve distribution, improve treatment and extend the life of the system.

a. On a hillside, septic tank effluent may be serially loaded to the soil absorption trenches by drop boxes or overflow piping (rigid sewer pipe). Otherwise, effluent shall be distributed evenly to all trenches by use of a distribution box or commercial distribution regulator approved by the administrative authority.

b. Design. When a distribution box is used, it shall be of proper design and installed with separate watertight headers leading from the distribution box to each lateral. Header pipes shall be rigid PVC plastic pipe meeting ASTM Standard 2729 or equivalent.

c. Outlets height. The distribution box shall have outlets at the same level at least 4 inches above the bottom of the box to provide a minimum of 4 inches of water retention in the box.

d. Baffles. There shall be a pipe tee or baffle at the inlet to break the water flow.

e. Unused outlets. All unused outlet holes in the box shall be securely closed.

f. Interior coating. All distribution boxes shall be constructed of corrosion-resistant rigid plastic materials, or other corrosion-resistant material approved by the administrative authority.

g. Outlets level. All outlets of the distribution box shall be made level. A 4-inch cap with an offset hole approximately 2½ inches in diameter shall be installed on each outlet pipe. These caps shall be rotated until all outlets discharge at the same elevation. Equivalent leveling devices may be approved by the local authority.

h. Equal length required. The soil absorption area serviced by each outlet of the distribution box shall be equal.

69.6(8) *Dosing systems.*

a. Pump systems.

(1) Pump and pit requirements. In the event the effluent from the septic tank outlet cannot be discharged by gravity and still maintain proper lateral depths, the effluent shall discharge into a watertight vented pump pit with an inside diameter of not less than 24 inches, equipped with a tight-fitting manhole cover at grade level. The sump vent shall extend a minimum of 6 inches above grade level and shall be a minimum size of 1¼ inches fitted with a return bend. The pump shall be of a submersible type of corrosion-resistant material.

(2) Pump setting. The pump shall be installed in the pump pit in a manner that ensures ease of service and protection from frost and settled sludge. The pump shall be set to provide a dosing frequency of approximately twice a day based on the maximum design flow. No on-site electrical connections shall be made in the pump pit. These connections shall be made in an exterior weatherproof box.

(3) Pressure line size. The pressure line from the pump to the point of discharge shall not be smaller than the outlet of the pump it serves.

(4) Drainage. Pressure lines shall be installed to provide total drainage between dosings to prevent freezing or be buried below frost level up to the distribution box.

(5) High water alarm. Pump pits shall be equipped with a sensor set to detect if the water level rises above the design high water level when the pump fails. This sensor shall activate an auditory or visual alarm to alert the homeowner that repairs are required.

(6) Discharge point. The effluent shall discharge under pressure into a distribution box or may be distributed by small diameter pipes throughout the entire absorption field.

b. Dosing siphons. Dosing siphons may also be used. Manufacturer's specifications shall be adhered to for installation. Similar dosing volumes and frequencies are recommended. Dosing siphons require periodic cleaning to ensure their continued proper operation.