4.25 Sand Mound

Revision: October 23, 2012

Description

A sand mound is a soil absorption facility consisting of a septic tank, pumping chamber or dosing siphon and chamber, and mound fill of selected sand with a small-diameter pipe distribution system, cap, and topsoil. Figure 4-25 provides a diagram of a sand mound.

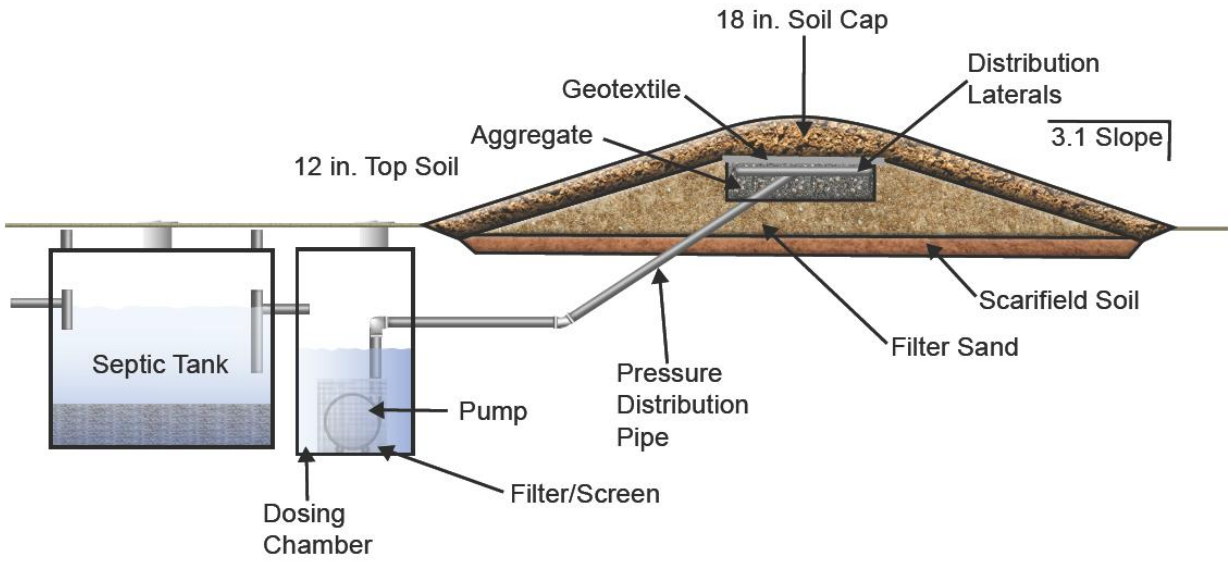

Figure 4-25. Cross sectional view of sand mound.

Approval Conditions

1. Effective soil depth to limiting layers may vary depending upon thickness of filter sand beneath the absorption bed:

    a. If 12 inches of filter sand is placed beneath the absorption bed, then Table 4-21 lists the minimum depth of natural soil to the limiting layer.

    b. If 24 inches of filter sand is placed beneath the absorption bed, then Table 4-19, in the intermittent sand filter section, identifies the effective soil depth to limiting layers.

2. For soil textural classifications of sandy clay, silty clay, clay, or coarser-textured soils with percolation rates from 60 to 120 minutes/inch, the minimum depth of natural soil to the limiting layer shall conform to soil design group C.

3. Table 4-22 shows the maximum slope of natural ground, listed by soil design group.

4. Sand mound must not be installed in flood ways, areas with large trees and boulders, in concave slopes, slope bases, or depressions.

5. Minimum pretreatment of sewage before disposal to the mound must be a septic tank sized according to IDAPA 58.01.03.007.07.

6. Design flow must be 1.5 times the wastewater flow.

Table 4-21. Minimum depth of natural soil to limiting layer.

Soil Design Group	Extremely Impermeable Layer (feet)	Extremely Permeable Layer (feet)	Normal High Ground Water (feet)
A, B	3	3	3
C	3	2	2

Table 4-22. Maximum slope of natural ground.

Design Group	A	B	C-1	C-2
Slope (%)	20	20	12	6

Design

Figure 4-26 can be used with Table 4-23 (sand mound design checklist) for flat and sloped sites.

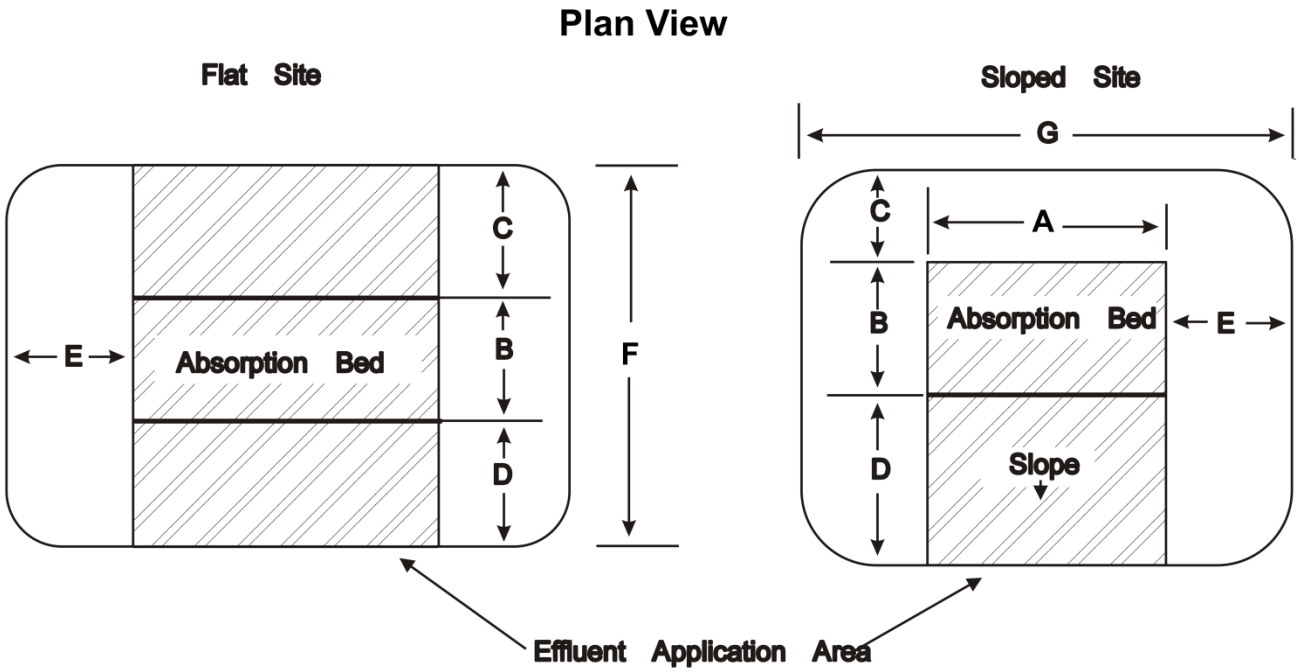

Figure 4-26. Design illustrations for sand mound installation on flat and sloped sites (use with sand mound design checklist).

1. Bed design:

   a. Only absorption beds may be used. The maximum bed area should be 2,250 ft^2 (A x B). Beds in commercial or large systems should be a maximum of 15 feet wide (B ≤ 15 feet), and beds for individual dwellings a maximum of 10 feet wide (B ≤ 10 feet). Beds should be as long and narrow as practical, particularly on sloped ground, to minimize basal loading.

   b. Application rate of effluent in the sand bed should be calculated at 1.0 gallon/ft^2 (sand HAR = 1.0 gallon/ft^2).

   c. Absorption beds for commercial establishments that discharge other than normal strength domestic waste should be sized at 0.5 gallon/ft^2 or 40 pounds BOD/acre/day, whichever is greater.

   d. Absorption bed must be filled with 9 inches of clean drainrock.

   e. Drainrock portion of the sand mound must be covered with a geotextile after installation and testing of the pressure distribution system.

2. Sand fill design:

   a. Filter sand must conform to ASTM C-33, with less than 2% passing the #200 sieve. A manufactured sand is recommended.

      1) Minimum depth of sand below the bed shall be 1 foot.

      2) Flat sites: The effective area will be A x (C+B+D).

      3) Sloped sites: The effective area will be A x (B+D).

   Equation 4-16 shows the calculation for the absorption bed area.

$$\frac{\text{Design Flow (GPD)}}{\text{Soil Application Rate } (\text{GPD}/\text{ft}^2)}$$

Equation 4-16. Effluent application area.

      4) Slope of all sides must be 3 horizontal to 1 vertical (3:1) or flatter.

      5) Sand mound must be covered with a minimum topsoil depth of 12 inches. The soil cap at the center of the mound must be crowned to 18 inches. Topsoil and soil cap must be a sandy loam, loamy sand, or silt loam.

      6) Mound should be protected to prevent damage caused by vehicular, livestock, or excessive pedestrian traffic. The toe of the mound must be protected from compaction.

      7) Sand fill area must be as long and narrow as practical, with plan view dimension G exceeding dimension F (Figure 4-26).

Construction

1. Pressure line from the dosing chamber should be installed first and should be located upslope of the mound. If located downslope, consider using anti-seep collars on the trench. If a pump is to be used, the pressure line should slope down to the pump so that the pressure line will drain between discharges.

2. Grass, shrubs, and trees must be cut close to ground surface and removed from the mound site. If extremely heavy vegetation or organic mat exists, these materials should be removed before scarification and replaced with filter sand (typically 3 or 4 inches of filter sand is added.) When the soil is dry, the ground in the area of the sand fill should then be scarified or ripped to a depth of 6–8 inches. Scarification/ripping is important to provide vertical windows in the soil. Tree stumps are not to be removed. If stumps are numerous, additional area should be calculated into the total sand area to compensate for the lost area.

3. Sand fill will then be placed and shaped before it freezes or rains. No vehicles with pneumatic tires should be permitted on the sand or plowed area to prevent the soils from being compacted. For sloped sites, all work is done from the upslope side.

4. Absorption bed will be shaped and filled with clean drainrock.

5. After leveling the drainrock, the low-pressure distribution system manifold and laterals will be installed. The system should be tested for uniformity of distribution.

6. Geotextile must be placed over the absorption bed and backfilled with 12 inches of soil on the sides and shoulders, and 18 inches of soil on the top center. Soil types must be sandy loam, loamy sand, or silt loam.

7. Typical lawn grasses and other appropriate low-profile vegetation should be established as soon as possible, preferably before the system is put into operation. Do not plant trees or shrubs on the mound. Trees with roots that aggressively seek water must be planted at least 50 feet from the mound (poplar, willow, cottonwood, maple, elm, etc.).

8. A standpipe must be installed within the bed, down to the fill sand, so that ponding water can be measured periodically.

Inspections

1. Site inspections must be made by the Director before, during, and after construction.

2. Designer or owner must certify that the system has been installed according to the approved plans.

Table 4-23 is a sample sand mound design checklist, and Table 4-24 is a blank checklist for sand mound design.

Table 4-23. Sample sand mound design checklist.

	Sand Mound Design Checklist (Example for a three-bedroom house on soil design subgroup B-2 soils, flat site)	
1	Determine soil application rate (AR) (Example: B-2 soil)	AR = GPD/ft^2 (Example: 0.45 GPD/ft^2)
2	Determine daily flow rate (DFR) (Example: 250 GPD x 1.5 safety factor)	DFR = GPD (Example: 375 GPD)
	Bed Design	
3	$Area = \frac{Daily\_Flow\_Rate\_GPD(\#2)}{Sand\_Application\_Rate\_{}^{GPD}/_{ft^2}\left(1.0\_{}^{GPD}/_{ft^2}\right)}$	Area = ft^2 (Example: 375 ft²)
4	Width (B): $Width\_(B) = \sqrt{\frac{Area\_(\#3) \times Soil\_AR\_(\#1)}{Sand\_Application\_Rate\_\left(1.0\,{}^{GPD}/_{ft^2}\right)}}$ Maximum bed width: Commercial = 15 feet Residential = 10 feet Example: $Width\_(B) = \sqrt{\frac{(\#3 \times \#1)}{1.0\,{}^{GPD}/_{ft^2}}} \approx 13\,ft$	Width (B) = feet (Example: 13 feet or 10 feet max) (Example: use 10 feet)
5	Length (A): $Length\_(A) = Area\_(\#3)/Width\_(\#4)$ (Example: 375 ft²/10 feet)	(A) feet (Example: 37.5 feet)
	Sand Mound Design	
6	Total area (TA): $TA = DFR\_(\#2)/soil\_AR\_(\#1)$ (Example: 375 gallon/0.45 gallon/ft^2)	TA = ft^2 (Example: 833 ft²)
7	Effluent application area (EAA) = Total area–bed area: EAA = TA (#6) – Area (#3) = (Example: 833 ft^2 - 375 ft^2 = 458 ft^2)	EAA = ft^2 (Example: 458 ft²)
8	Flat site perimeter (C,D): 0.5 x [EAA (#7)/length (#5)] (Example: 0.5 x [458 ft^2/37.5 feet] = 6.1 feet)	(C) = (D) = feet (5.25 feet minimum) (Example: 6.1 feet)
9	Sloped site: Downslope length (D) = EAA (#7)/length (#5) (Example: D = 458 ft^2/37.5 feet = 12.2 feet)	(D) = feet (Example: 12.2 feet)

10	Sloped site: Upslope (C) = (Bed depth + max. sand depth) x 3 (Example: C = [0.75 feet + 1.0 foot] x [3] = 5.25 feet)	(C) = feet (Example: 5.25 feet)
11	End slope (E) = (Bed depth + max. sand depth) x 3 (Example: [0.75 feet + 1.0 feet] x [3] = 5.25 feet)	(E) = feet (Example: 5.25 feet)
12	Total width (F) = B + C + D (Flat site example: 10 feet + 6.1 feet + 6.1 feet = 22.2 feet) (Sloped site example: 10 feet + 5.25 feet + 12.2 feet = 27.45 feet)	(F) = feet (Example: 22.2 feet) (Example: 27.45 feet)
13	Total length (G) = A+(2 x E) (G > F) (Example: [G] = 37.5 feet + [2 x 5.25 feet] = 48 feet)	(G) = feet (Example: 48 feet)
	Finished Mound Dimensions	
14	Sand mound length + 6 feet min. (G + 6) (Example: 48 feet + 6 feet = 54 feet)	(G+6) = feet (Example: 54 feet)
15	Sand mound width + 6 feet min. (F + 6) (Flat site example: 22.2 feet + 6 feet = 28.2 feet) (Sloped site example: 27.45 feet + 6 feet = 33.45 feet)	(F+6) = feet (Example: 28.2 feet) (Example: 33.45 feet)

Note: gallons per day per square foot (GPD/ft^2)

Table 4-24. Sand mound design checklist.

	Sand Mound Design Checklist	
1	Determine soil application rate (AR)	AR = _____GPD/ft^2
2	Determine daily flow rate (DFR)	DFR = _____GPD
	Bed Design	
3	$Area = \frac{Daily\_Flow\_Rate\_GPD(\#2)}{Sand\_Application\_Rate\_{}^{GPD}/_{ft^2}\left(1.0\_{}^{GPD}/_{ft^2}\right)}$	Area = _____ft^2
4	Width (B): $Width\_(B) = \sqrt{\frac{Area\_(\#3) \times Soil\_AR\_(\#1)}{Sand\_Application\_Rate\_\left(1.0\,{}^{GPD}/_{ft^2}\right)}}$ Maximum bed width: Commercial = 15 feet Residential = 10 feet	Width (B) = _____ft
5	Length (A): $Length\_(A) = Area\_(\#3)/Width\_(\#4)$	(A) _____ft
	Sand Mound Design	
6	Total area (TA): $EAA = DFR\_(\#2)/soil\_AR\_(\#1)$	TA = _____ft^2
7	Effluent application area (EAA) = Total area – Bed area: EAA = TA (#6) – Area (#3)	EAA = _____ft^2
8	Flat site perimeter (C,D): 0.5 x [EAA (#7)/length (#5)] (5.25 feet minimum)	(C) = (D) = _____ft
9	Sloped site: Downslope length (D) = EAA (#7)/length (#5)	(D) = _____ft
10	Sloped site: Upslope (C) = (Bed depth + max. sand depth) x 3	(C) = _____ft
11	End slope (E) = (Bed depth + max. sand depth) x 3	(E) = _____ft
12	Total width (F) = B + C + D	(F) = _____ft
13	Total length (G) = A+(2 x E) (G > F)	(G) = _____ft
	Finished Mound Dimensions	
14	Sand mound length + 6 feet min. (G + 6)	(G+6) = _____ft
15	Sand mound width + 6 feet min. (F + 6)	(F+6) = _____ft

Note: gallons per day per square foot (GPD/ft^2)