4.25 Sand Mound

Description

A soil absorption facility consisting of a septic tank, pumping chamber or dosing siphon and chamber, mound fill of selected sand with a small diameter pipe distribution system, cap and top soil. See Figure 4-24 for a diagram of a sand mound.

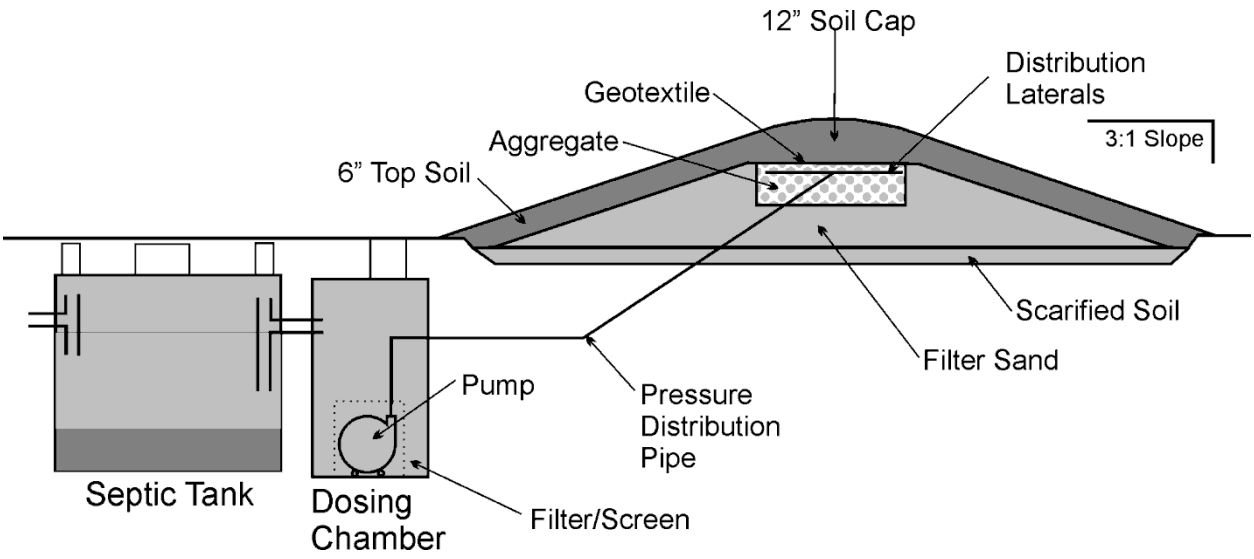

Figure 4-24. Cross-Sectional View of Sand Mound

Conditions for Approval

1. Effective soil depth to limiting layers may vary depending upon thickness of filter sand beneath the absorption bed:
    a. If 12" of filter sand is placed beneath the absorption bed, then Table 4-19 lists the minimum depth of natural soil to the limiting layer.
    b. If 24" of filter sand is placed beneath the absorption bed, then Table 4-17, in the intermittent sand filter section, identifies the effective soil depth to limiting layers.

Table 4-19. Minimum Depth of Natural Soil to Limiting Layer, in Feet

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

2. For Soil Textural classifications of Sandy Clay, Silty Clay, Clay or coarser textured soils with percolation rates from 60 to 120 min. per inch, the minimum depth of natural soil to the limiting layer shall conform to that for Soil Design Group C.

3. Table 4-20 shows the maximum slope of natural ground, listed by soil design group.

Table 4-20. Maximum Slope of Natural Ground

Design Group	A	B	C-1	C-2
Slope, Percent	20	20	12	6

4. The sand mound must not be installed in flood ways, areas with large trees and boulders, in concave slopes, slope bases or depressions.
5. The minimum pretreatment of sewage prior to disposal to the mound must be a septic tank sized according to the rules. Design flow must be 1.5 times the wastewater flow.

Design

Figure 4-15 can be used with Table 4-22 (Sand Mound Design Checklist) for flat and sloped sites.

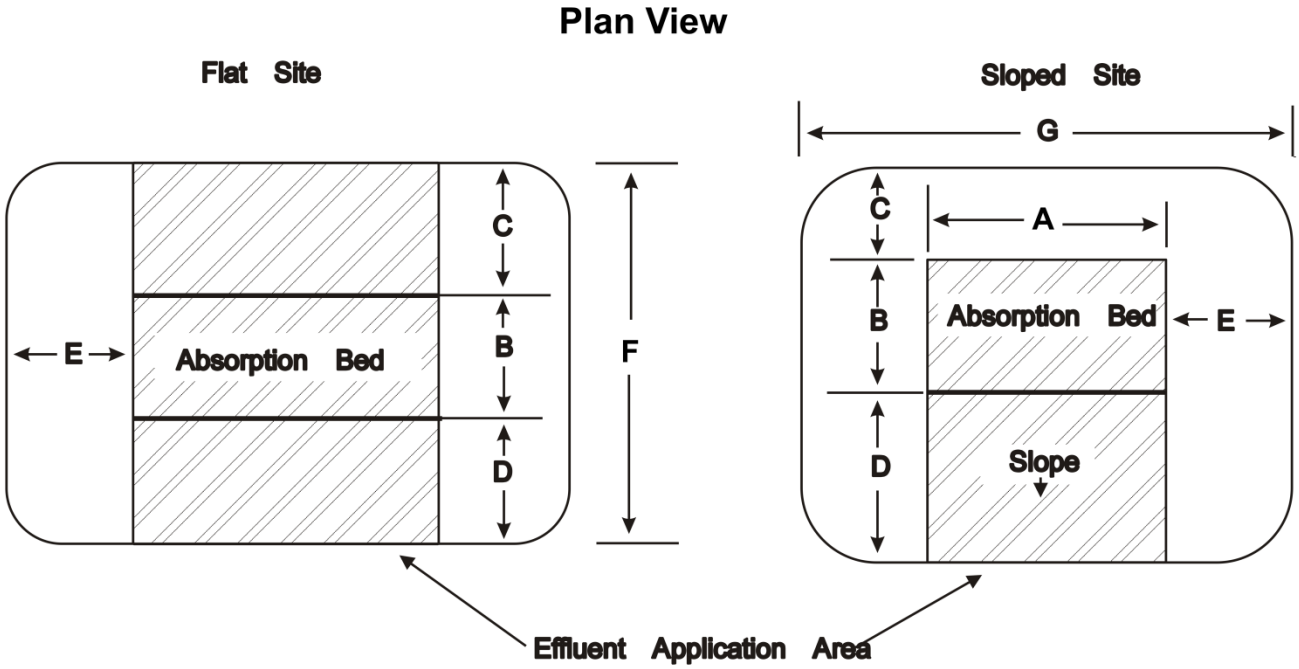

Figure 4-15. Illustration Used in Conjunction with Sand Mound Design Checklist for Flat and Sloped Sites

1. Bed design:
   a) Only absorption beds may be used. The maximum bed area should be 2250 square feet (A x B). Beds in commercial or large systems should be a maximum of fifteen feet (B < 15') wide and beds for individual dwellings less than ten feet (B < 10') wide. Beds should be as long and narrow as practical, particularly on sloped ground, to minimize basal loading.

b) The application rate of effluent in the sand bed should be calculated at 1.0 gallon per square foot (sand AR = 1.0 g/ft^2).

c) Absorption beds for commercial establishments that discharge other than normal strength domestic waste should be sized at 0.5 gallons per square foot (0.5 g/ft^2) or 40 lbs. BOD/acre/day, whichever is greater.

d) The bed must be filled with nine inches (9") of clean drain rock.

e) The drain rock 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.

b) The minimum depth of filter sand below the bed shall be one foot (1'), and the effective soil depths to limiting layers are identified in Table 4-19. If two feet (2') of filter sand is placed beneath the bed, then effective soil depth to limiting layers may be reduced to those listed in the intermittent sand filter section Table 4-17.

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

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

Equation shows the calculation for the absorption bed area.

Equation 4-16. Effluent Application Area = $\dfrac{\text{Design Flow (gpd)}}{\text{Soil Application Rate } (\text{gpd}/\text{ft}^2)}$

e) The slope of all sides must be 3 horizontal to 1 vertical (3:1) or flatter.

f) The sand mound must be covered with a minimum topsoil depth of six (6) ~~to twelve (12)~~ inches. The soil cap at the center of the mound must be crowned to twelve (12) inches. Topsoil and soil cap must be a sandy loam, loamy sand, or silt loam.

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

h) The sand fill area must be as long and narrow as practical, with plan view dimension G exceeding dimension F. (Refer to Figure 4-15.)

Construction

1. The pressure line from the dosing chamber should be installed first and should be located up-slope of the mound. If located downslope, consider using anti-seep collars on 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 prior to 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" to 8". The importance of the ripping is 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. The sand fill will then be placed and shaped before it freezes or rains. No pneumatic-tired vehicles should be permitted on the sand or plowed area in order to prevent the soils from being compacted. For sloped sites, all work is done from the up-slope side.
4. The absorption bed will be shaped and filled with clean drain rock.
5. After leveling the drain rock, 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 six (6) inches of soil on sides and shoulders, and twelve (12) inches of soil on the top center. Soil~~s~~ 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 fifty (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. The designer or owner must certify that the system has been installed per the approved plans.

Table 4-21 is a sample sand mound design checklist, and Table 4-22 is a blank checklist for sand mound design.

Table 4-21. Sample Sand Mound Design Checklist

	SAND MOUND DESIGN CHECKLIST {Example for a 3 bedroom house on B-2 soils, flat site}	
1	Determine soil Application Rate (AR) {Ex: B-2 soil}	AR = GPD/ft^2 {Ex: 0.45 gpd/ft^2}
2	Determine Daily Flow Rate (DFR) {Ex: 250 GPD x 1.5 safety factor}	DFR = GPD {Ex: 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 {Ex: 375 ft²}
4	$Width\_(B) = \sqrt{\frac{Area\_(\#3) \times Soil\_AR\_(\#1)}{Sand\_Application\_Rate\_\left(1.0\,{}^{GPD}/_{ft^2}\right)}}$ Width (B): Maximum Bed Width: Commercial = 15 ft, Residential = 10 ft. Ex: $Width\_(B) = \sqrt{\frac{(\#3 \times \#1)}{1.0\,{}^{GPD}/_{ft^2}}} \approx 13\,ft$	Width (B) = ft {Ex: 13 ft or 10 ft max} {Ex: use 10 ft}
5	Length (A): $Length\_(A) = Area\_(\#3)/Width\_(\#4)$ {Ex: 375 ft² / 10 ft}	(A) ft {Ex: 37.5 ft}
	SAND MOUND DESIGN:	
6	Total Area (TA): $EAA = DFR\_(\#2)/soil\_AR\_(\#1$ {Ex: 375 gal / 0.45 gal/ft^2}	TA = ft^2 {Ex. 833 ft²}
7	Effluent Application Area (EAA) = Total Area - Bed Area: EAA = TA (#6) – Area (#3) = {Ex. 833 ft^2 – 375 ft^2}	EAA = ft^2 {Ex. 458 ft²}
8	Flat site perimeter (C,D): 0.5x[EAA (#7) / Length (#5)] {Ex. 458/37.5)/2} {5.25 ft minimum}	(C) = (D) = ft {Ex. 6.1 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 {Ex: (0.75 ft + 1.0 ft) x (3)}	(E) = ft {Ex. 5.25 ft}
12	Total Width (F) = B + C + D {Ex. 10 + 6.1 + 6.1}	(F) = ft {Ex: 22.2 ft}
13	Total length (G) = A+(2 x E) (G > F) {Ex: (G) = 37.5 ft + 2 x 5.25 ft}	(G) = ft {Ex: 48 ft}
	FINISHED MOUND DIMENSIONS:	
14	Sand Mound Length + 6 ft Min. (G + 6) {Ex: 48 ft + 6 ft}	(G+6) = ft {Ex: 54 ft}
15	Sand Mound Width + 6 ft Min. (F + 6) {Ex: 22.2 ft + 6 ft}	(F+6) = ft {Ex: 28.2 ft}

Table 4-22. 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 ft, Residential = 10 ft.	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 ft 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 ft Min. (G + 6)	(G+6) = _____ft
15	Sand Mound Width + 6 ft Min. (F + 6)	(F+6) = _____ft