4.25 Sand Mound

Revision: ~~October 23~~July 18, 201~~32~~

4.25.1 Description

A sand mound is a soil absorption facility consisting of a septic tank, ~~pumping~~ dosing chamber ~~or dosing siphon and chamber~~, mound ~~fill~~ constructed of ~~selected~~ medium sand, ~~with~~ a pressurized small-diameter pipe distribution system, ~~cap,~~ and topsoil cap. ~~Figure 4-26~~ **Figure** Error! No text of specified style in document.~~Figure 4-27~~ provides a diagram of a sand mound.

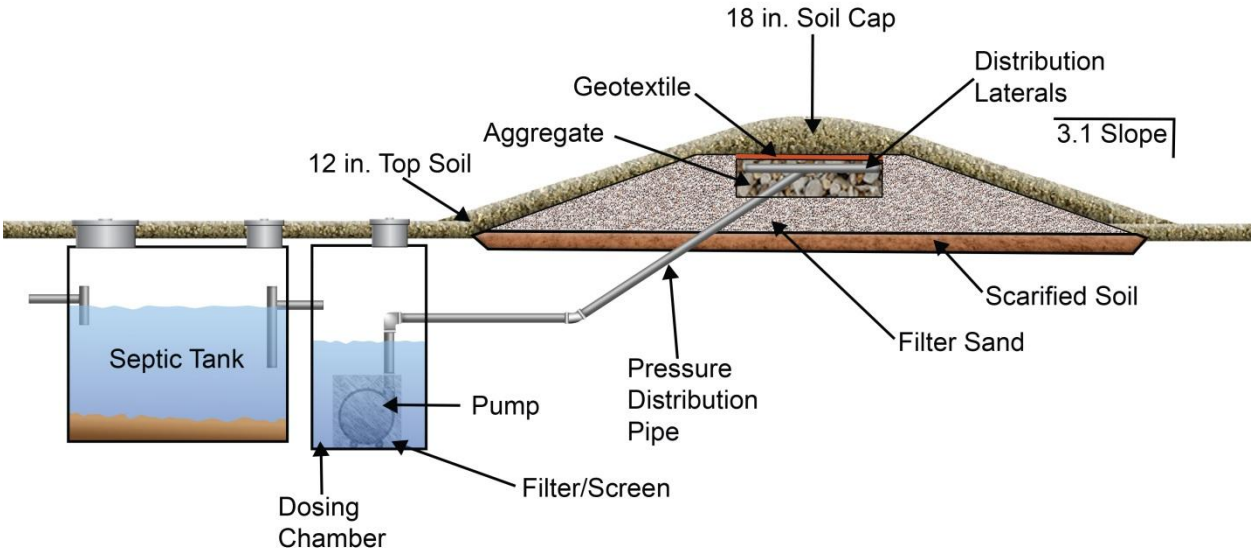

Figure Error! No text of specified style in document.**-~~26~~27. Cross sectional view of sand mound.**

4.25.2 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** Error! No text of specified style in document.**-1**~~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, and the dosing recommendations in section 4.25.4 are met, then **Error! Reference source not found.**~~Table 4-19~~ in Section **Error! Reference source not found.**~~4.23~~ "Intermittent Sand Filter," 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.~~2. Table Error! No text of specified style in document.**-2**~~Table 4-22~~ shows the maximum slope of natural ground, listed by soil design group.

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~~4.~~3. Sand mound must not be installed in flood ways, areas with large trees and boulders, in concave slopes, at slope bases, or in depressions.

~~5.~~4. Minimum pretreatment of sewage before disposal to the mound must be a septic tank sized according to IDAPA 58.01.03.007.07.

5. The maximum daily wastewater flow must be equal to or less than 1,500 GPD.

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

Table Error! No text of specified style in document.**-~~12~~1. 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 Error! No text of specified style in document.**-~~22~~2. Maximum slope of natural ground.**

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

4.25.3 Design

1. Absorption ~~Bed~~ bed design:

   a. Only absorption beds may be used. The maximum absorption bed disposal 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. It is recommended that beds be less than 10 feet wide if site conditions will allow.

   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.~~c. Absorption bed must be filled with 9 inches of clean drainrock, 6 inches of which must be below the pressurized distribution pipes.

   d. ~~Drainrock portion of the sand mound~~The absorption bed drainrock must be covered with a geotextile after installation and testing of the pressure distribution system.

e. Two observation ports should be installed extending from the drainrock/medium sand interface through the soil cap at approximately the ¼ and ¾ points along the absorption bed. The observation ports should contain perforations in the side of the pipe extending up 4 inches from the bottom of the port. Observation ports must be capped.

f. Absorption bed disposal area or dimensions may not be reduced through the use of extra drainrock, pretreatment, or gravelless drainfield products.

~~e.~~g. Pressurized laterals within the absorption bed should not be further than 24 inches from the absorption bed sidewall and should not be spaced farther than 48 inches between each lateral within the absorption bed.

2. Medium ~~Sand~~ sand fill design:

a. ~~Filter~~ Mound sand fill must conform to ~~ASTM C-33, with less than 2% passing the #200 sieve~~the medium sand definition provided in section 2.1.4 of this manual. ~~A manufactured sand is recommended.~~

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

c) Medium sand fill shall extend out a minimum of 24 inches level from the top edge of the absorption bed on all sides (medium sand fill absorption perimeter), and then uniformly slope as determined by the mound dimensions and the slope limitations as described in 4.25.3.2.f.

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

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

Equation Error! **No text of specified style in document.-1**~~Equation 4-16~~ shows the calculation for the absorption bed area.

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

Equation Error! No text of specified style in document.-1~~6~~. Effluent application area.

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

~~d)~~g) Sand fill area must be as long and narrow as practical, with plan view dimension G exceeding dimension F (**Figure** Error! No text of specified style in document.**-2**~~Figure 4-27~~).

h) Slope correction factors as provided in Table 4-23 shall be used to determine the downslope width of the medium sand fill for sloped sites.

Table Error! No text of specified style in document.**-3~~23~~. Down slope correction factors for sloped sites.**

Slope (%)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Correction Factor	1.03	1.06	1.10	1.14	1.18	1.22	1.27	1.32	1.38	1.44	1.51	1.57	1.64	1.72	1.82	1.92	2.04	2.17	2.33	2.50

Figure Error! No text of specified style in document.~~-2Figure 4-27~~ can be used with **Table** Error! No text of specified style in document.~~-4Table 4-23~~ (sand mound design checklist) for flat and sloped sites.

3. Soil cap design:

a) 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 to promote runoff.

~~e)~~b) Topsoil and soil cap must be a sandy loam, loam~~y sand~~, or silt loam. Soils meeting the soil design group classifications of A and C shall not be used for the topsoil and soil cap cover.

c) 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.

~~f)~~d) Mounds on slopes should have design considerations taking surface runoff diversion into account.

e) ~~Sand fill area must be as long and narrow as practical, with plan view dimension G exceeding dimension F (Figure 4-27).~~

4.25.4 Dosing Recommendations

1. Timed dosing should be utilized.
    a. Surge capacity should be considered to be incorporated into the dosing chamber.
2. Dose frequency should be short.
3. Distribution piping orifices should be closely spaced.
    a. Recommended spacing is 4 – 6 ft^2 of disposal area per orifice.

~~1.~~4. Dosing volume should be roughly 5 times the volume of the lateral pipe volume, but should not exceed 20% of the design volume.

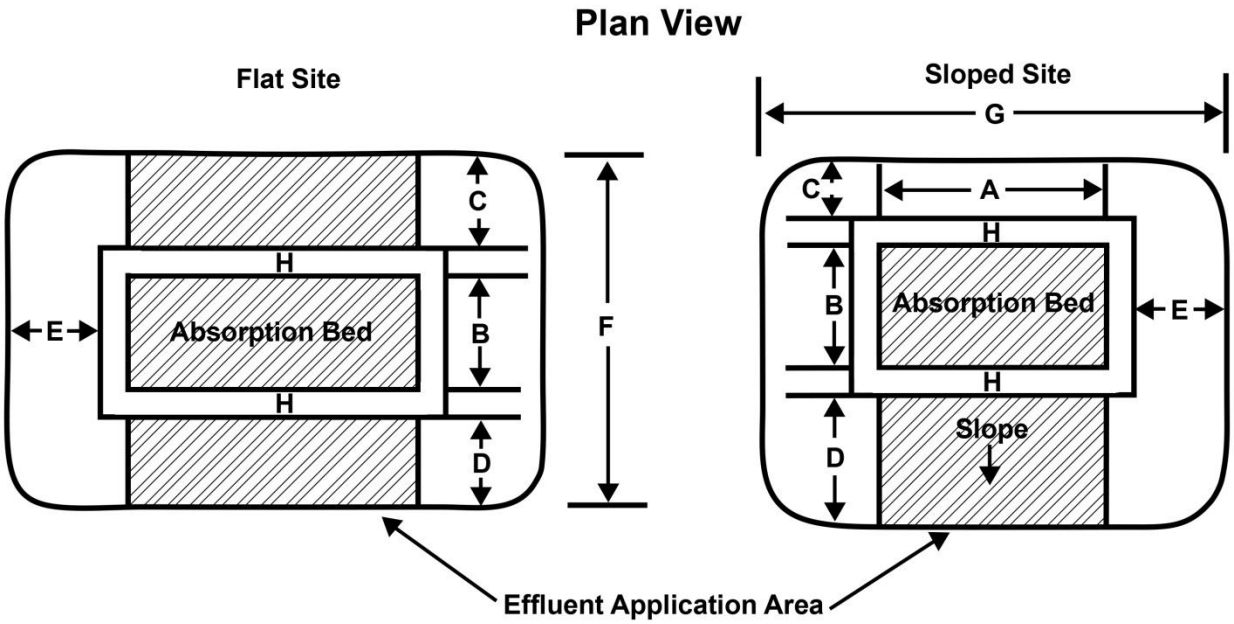

Figure Error! No text of specified style in document.**-~~22~~7. Design illustrations for sand mound installation on flat and sloped sites (use with sand mound design checklist).**

Table Error! No text of specified style in document.**-~~423~~. ~~Sample~~ Example sand mound design checklist.**

	Sand Mound Design Checklist (Example for a three-bedroom house on soil design subgroup B-2 soils, flat site, 12 inch medium sand fill depth below absorption bed)	
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 x 1.5 (Example: 375 GPD)
	Absorption 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 *Beds may be designed narrower than determined by this equation if desired. Beds are recommended to be as long and narrow as site conditions allow.* 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	Medium sand fill absorption bed perimeter area (SFAP): Flat Site: SFAP = 2 x [2 feet x length (#5)] Sloped Site: SFAP = 2 feet x length (#5) (Example: 2 x [2 feet x 37.5 feet])	SFAP = ft^2 (Example: 150 ft^2)
~~8~~7	Effluent application area (EAA) = Total area–(bed area + SFAP): EAA = TA (#6) – [Area (#3) + SFAP (#7)] = (Example: 833 ft^2 – [375 ft^2 + 150 ft^2] = ~~458~~ 308 ft^2)	EAA = ft^2 (Example: ~~458~~ 308 ft²)

~~9~~8	Flat site perimeter (C,D): 0.5 x [EAA (#~~7~~8)/length (#5)] *Perimeter width must meet or exceed dimension meeting a 3:1 slope* (Example: 0.5 x [~~45~~8 ~~3~~08 ft^2/37.5 feet] = ~~6~~4.1 feet)	(C) = (D) = feet (5.25 feet minimum for 3:1 slope in 12 in. mound, 8.25 feet minimum for 3:1 slope in 24 in. mound) (Example: ~~6~~4.1 feet, use default of 5.25 to meet minimum slope)
10~~9~~	Sloped site: Downslope length (D) = [EAA (#~~7~~8)/length (#5)] x DCF *Downslope width must meet or exceed the dimension meeting a 3:1 slope based on down slope height of the medium sand fill absorption bed permimeter* (Example: D = [~~45~~8 ~~3~~83 ft^2/37.5 feet] x 1.0 = ~~12~~10.2 feet)	(D) = feet (Example: ~~12~~10.2 feet)
11~~0~~	Sloped site: Upslope (C) = (Bed depth + max. sand depth) x 3 *Upslope width must meet or exceed the dimension meeting a 3:1 slope based on upslope height of the medium sand fill absorption bed permimeter* (Example: C = [0.75 feet + 1.0 foot] x [3] = 5.25 feet)	(C) = feet (Example: 5.25 feet)
12~~1~~	End slope (E) = (Bed depth + max. sand depth) x 3 *End slope width must meet or exceed dimension meeting a 3:1 slope based on the height of the medium sand fill absorption bed permimeter at the absorption bed ends* (Example: [0.75 feet + 1.0 feet] x [3] = 5.25 feet)	(E) = feet (Example: 5.25 feet)
13~~2~~	Total width (F) = B + C + D + 2(H) (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)~~
14~~3~~	Total length (G) = A+(2 x E) + 2(H) (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), downslope correction factor (DCF)

4.25.4 Construction

1. Pressure line from the dosing chamber should be installed first ~~and should be located upslope of the mound~~. The pressure line should slope down to the pump so that the pressure line will drain between discharges. If the sand mound is located downslope of the pump chamber, 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~~,~~ and shrubs~~, and trees~~ must be cut close to ground surface and removed from the mound site.

    a. 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~~.~~).

    b. Larger than two inch caliper trees and large boulders are not to be removed. Trees should be cut as close to ground level as possible and the stumps left in place. If stumps or boulders occupy a significant area in the mound placement area, additional area should be calculated into the total basal area of the mound to compensate for the lost infiltrative area.

~~2.~~3. When the soil is dry, and site vegetation has been cut or removed the ground in the basal placement area of the sand ~~fill~~ mound 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.~~4. 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~~ scarified area to prevent the soils from being compacted. For sloped sites, all work ~~is~~ should be done from the upslope side of the mound placement area if possible.

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

~~4.~~6. Two observation ports should then be installed extending from the drainrock/medium sand interface through the soil cap at approximately the ¼ and ¾ points along the absorption bed. The observation ports should contain perforations in the side of the pipe extending up 4 inches from the bottom of the port. Observation ports must be capped.

~~5.~~7. 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.~~8. 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, loam~~y sand~~, or silt loam.

~~7.~~9. Typical lawn grasses ~~and~~ or other appropriate low-profile vegetation should be established on the mound cap as soon as possible, preferably before the system is put into operation. Do not plant trees or shrubs on the mound, or within the mature rooting radius of the tree or shrub. Trees with roots that aggressively seek water ~~must~~ should be planted at least 50 feet from the mound (~~e.g~~i.e., 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.~~

4.25.5 Inspections

1. Site inspections ~~must be made by the Director before, during, and after construction~~shall be conducted by the Director at the following minimum intervals (IDAPA 58.01.03.011.01):~~.~~

    a. Pre-construction

        i. Recommended that pre-construction conference be conducted with the property owner, Director, design engineer, and complex installer present

    b. During construction as needed

        i. Scarification, pressure line installation, medium sand mound construction, absorption bed construction, pressure distribution piping

    c. After construction

        i. Pump drawdown/alarm check, pressure test of distribution network, soil cap material and placement

2. The d~~D~~esigner ~~or owner~~ must certify that the system has been installed according to the approved plans and provide as-built plans for the sand mound construction (IDAPA 58.01.03.005.15).

Table Error! No text of specified style in document.~~-4Table 4-23~~ is a sample sand mound design checklist, and **Table** Error! No text of specified style in document.~~-5Table 4-24~~ is a blank checklist for sand mound design.

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Table Error! No text of specified style in document.**-5~~2~~4. 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 x 1.5*	DFR = _____GPD
	Absorption 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	Medium sand fill perimeter area (SFAP) Flat site: SFAP = 2 x [2 feet x length (#5)] Sloped site: SFAP = 2 feet x length (#5)	SFAP = _____ft^2
~~7~~8	Effluent application area (EAA) = Total area – (Bed area + SFAP): EAA = TA (#6) – [Area (#3) + SFAP (#7)]	EAA = _____ft^2
~~8~~9	Flat site perimeter (C,D): 0.5 x [EAA (#~~7~~8)/length (#5)] (5.25 feet minimum)	(C) = (D) = _____ft
~~9~~10	Sloped site: Downslope length (D) = [EAA (#~~7~~8)/length (#5)] x DCF	(D) = _____ft
~~10~~11	Sloped site: Upslope (C) = (Bed depth + max. sand depth) x 3	(C) = _____ft
~~11~~12	End slope (E) = (Bed depth + max. sand depth) x 3	(E) = _____ft
~~12~~13	Total width (F) = B + C + D + 2(H)	(F) = _____ft
~~13~~14	Total length (G) = A+(2 x E) + 2(H) (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), downslope correction factor (DCF)