Northeast Tri County Health District

Standards and Guidance for Performance, Application, Design, and Operation & Maintenance

Sand Lined Trench Systems

Based on the Washington State Department of Health "Recommended Standards and Guidance for Performance, Application, Design, and Operation & Maintenance for Sand Lined Trench Systems, July 2009

Effective: March 1, 2010

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How this RS&G is organized:

Standards Section	Explanation
Performance	How this technology is expected to perform (treatment level and function).
Application	How this technology is to be applied. This section includes conditions that must be met prior to proceeding with design. Topics in this section describe the "approved" status of the technology, component listing requirements, permitting, installation, testing and inspection requirements, etc.
Design	How this technology is to be designed and constructed (includes minimum standards that must be met to obtain a permit).
Operation and Maintenance	How this technology is to be operated and maintained (includes responsibilities of various parties, recommended maintenance tasks and frequency, assurance measures, etc).
Appendices	Design examples, figures and tables, specific applications, and design and installation issues.

Introduction

Sand lined trenches provide biodegradation or decomposition of wastewater constituents by bringing the wastewater into close contact with a well developed aerobic biological community attached to the surfaces of the filter media. This process requires unsaturated downward flow of the effluent through the filter media. The media may be coarse mineral sand or equivalently sized crushed glass meeting one of the media specifications listed in Appendix A. As a departure from the intermittent sand filter, the media is not contained in a watertight vessel. Instead, the media is placed in trenches or beds in the native soil. Proper function requires that influent to the sand filter be distributed over the media in controlled, uniform doses. In order to achieve accurate dosing, these systems require timed dosing with associated pump chambers, electrical components, and distribution network, with a minimum of 4 to 18 doses per day (depending on sand media used) spread evenly over a 24 hour period. The effluent is absorbed into the native soil at the bottom of the sand lined trenches, which accomplishes dispersal into the subsoil environment and some further treatment. A sand lined trench is a combined treatment component and soil dispersal component.

Possible Applications:

A sand lined drainfield trench (sand filter) may be selected for a site with excessively permeable (Type 1) soils. The addition of 24 inches of filter media (coarse sand) to a pressure distribution subsurface soil absorption system provides the wastewater treatment not provided by the Type 1 soil. Treated wastewater is discharged directly to the receiving soil for dispersal into the subsoil environment. See Figure 2.1. If the soil adjacent to the layer of drainrock atop the sand media is Type 1, additional filter media sand or an impervious material must be placed between the type 1 soil and the drainrock making up the trench's sidewalls and endwall to prevent short-circuiting. When sand is used for protection against short-circuiting, a minimum of six (6) inches of filter media sand is required. The sand bed under the drainrock will also be widened by six (6) inches on each side. See Figures 2.2 and 2.3. When an impervious material is used, it must be 30 mil PVC and must extend from above the gravel bed to six (6) inches below the gravel/sand interface. See Figure 2.4.

A sand lined drainfield trench (sand filter) may also be selected for a site that has its more suitable soils for dispersal (and further treatment) at a depth greater than three feet. Filter media (course sand) is placed below the drain rock to provide adequate levels of treatment so deeper soils more suitable for dispersal into the subsoil environment can be "reached." See Figure 3.

A bottomless sand filter is a special case of sand lined drainfield trench which is quite similar operationally to an intermittent sand filter that is not lined on the bottom. It may be selected to utilize more suitable soils high in the soil profile for dispersal and treatment. The containment vessel must be designed by and/or approved by a qualified professional engineer and have a support foundation to prevent vertical and horizontal movement of the vessel. See Figure 4.

Figure 1 - Process Flow

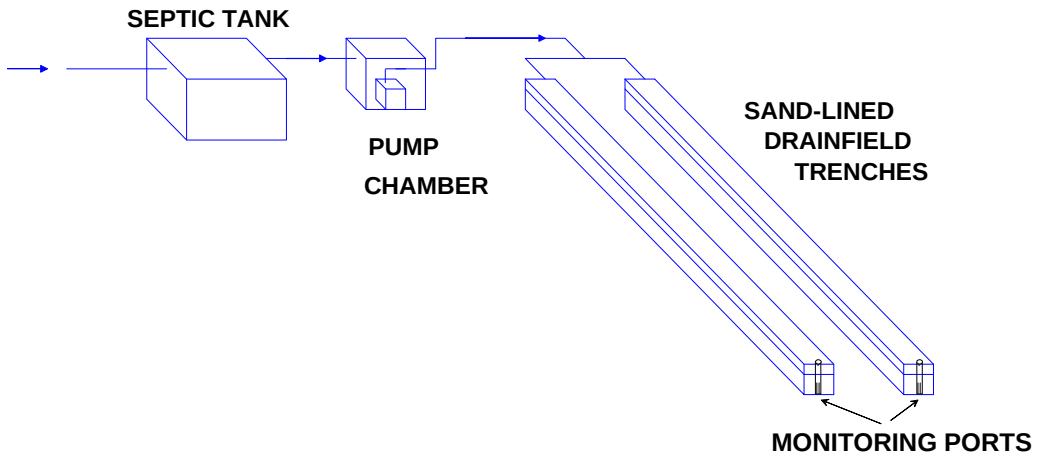


Figure 2.1 - Soil Type 1 at Bottom of Trench/Bed
(Extends to or Below Bottom of Gravel/Gravelless Trench/Bed)

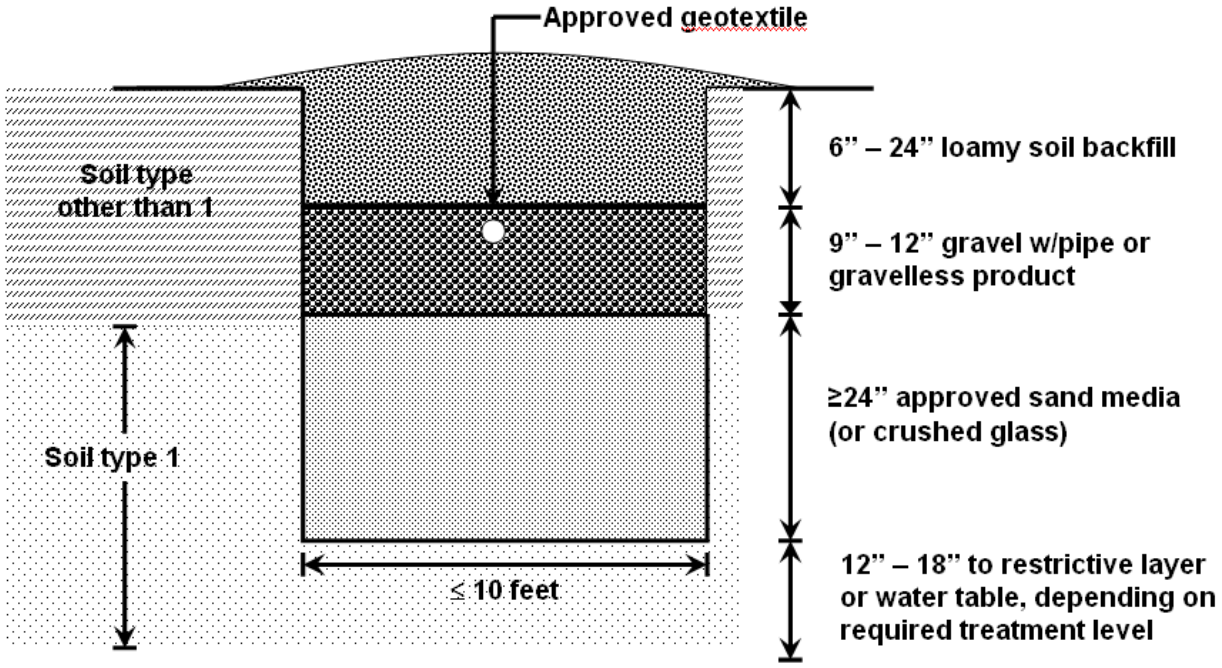


Figure 2.2 - Type 1 Soil Extending up into Trench/Bed Zone (Option 1)
(Extends Above Bottom of Gravel/Gravelless Trench/Bed)

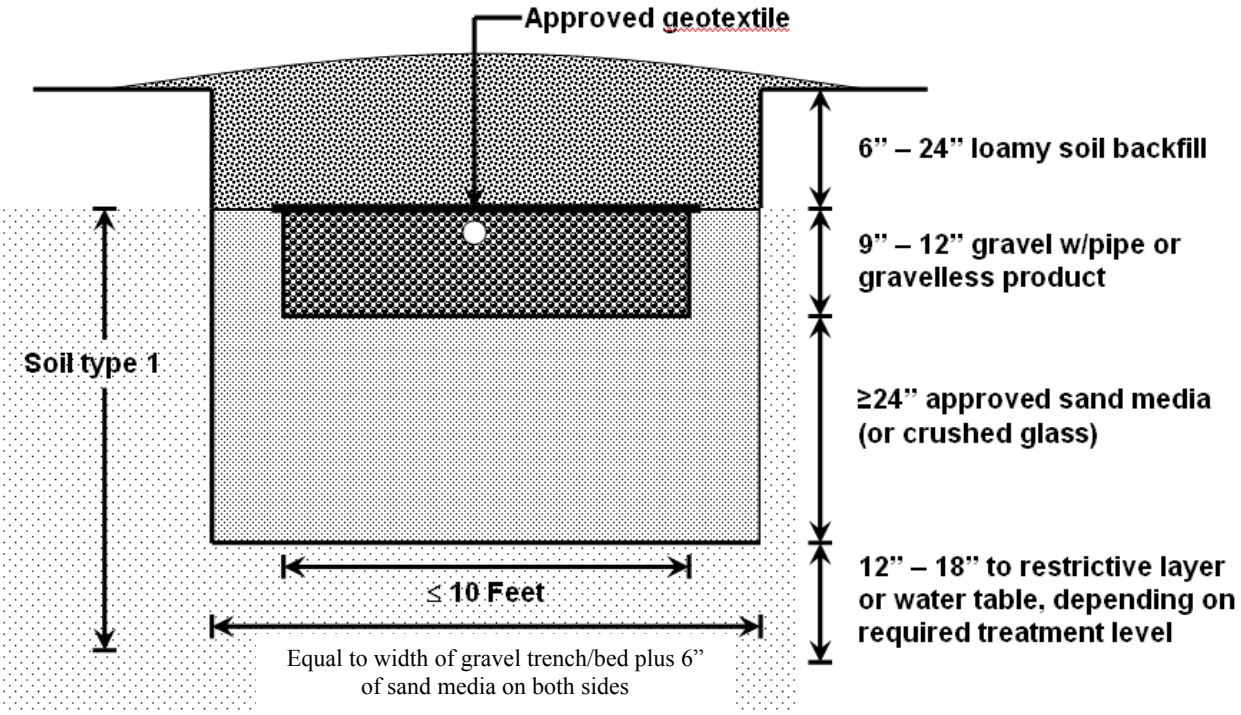


Figure 2.3 - Type 1 Soil Extending up into Trench/Bed Zone (Option 2)
(Extends Above Bottom of Gravel/Gravelless Trench/Bed)

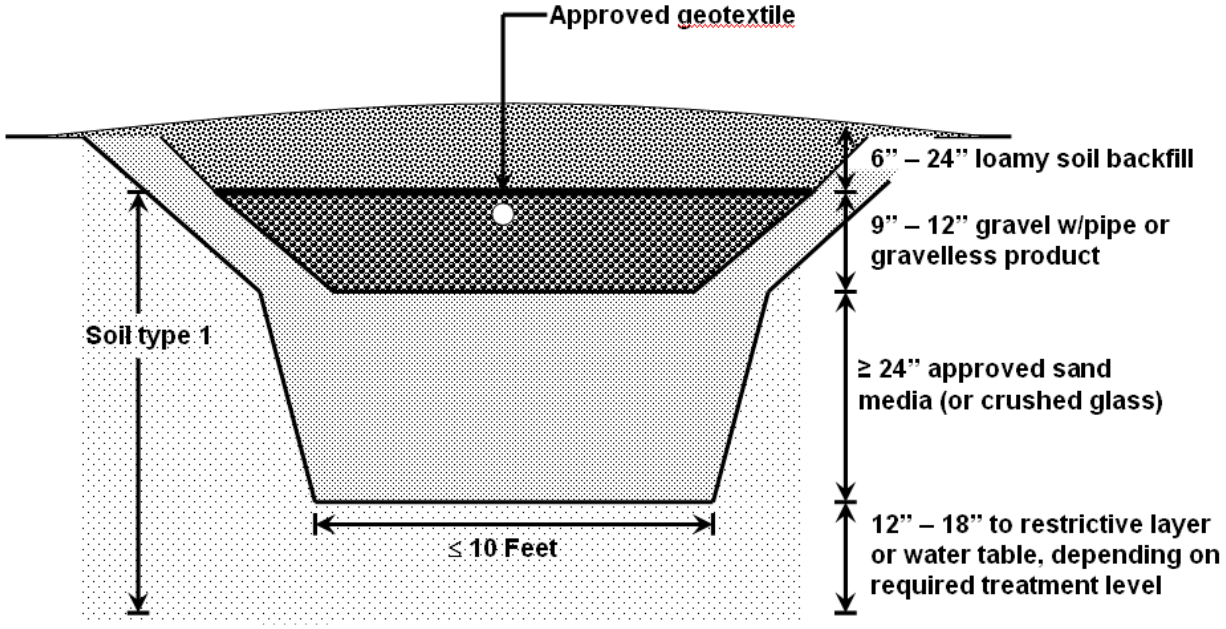


Figure 2.4 - Type 1 Soil Extending up into Trench/Bed Zone (Option 3)
(Extends Above Bottom of Gravel/Gravelless Trench/Bed)

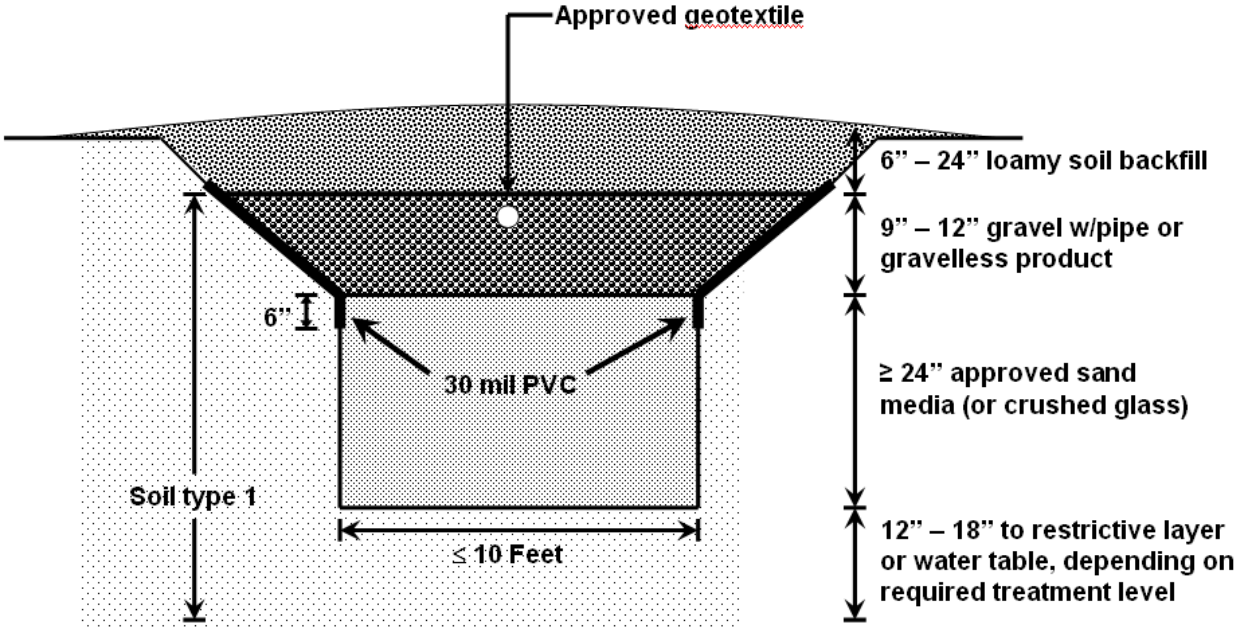


Figure 3 - Reaching More Suitable Soils at a Depth Greater Than 3 Feet

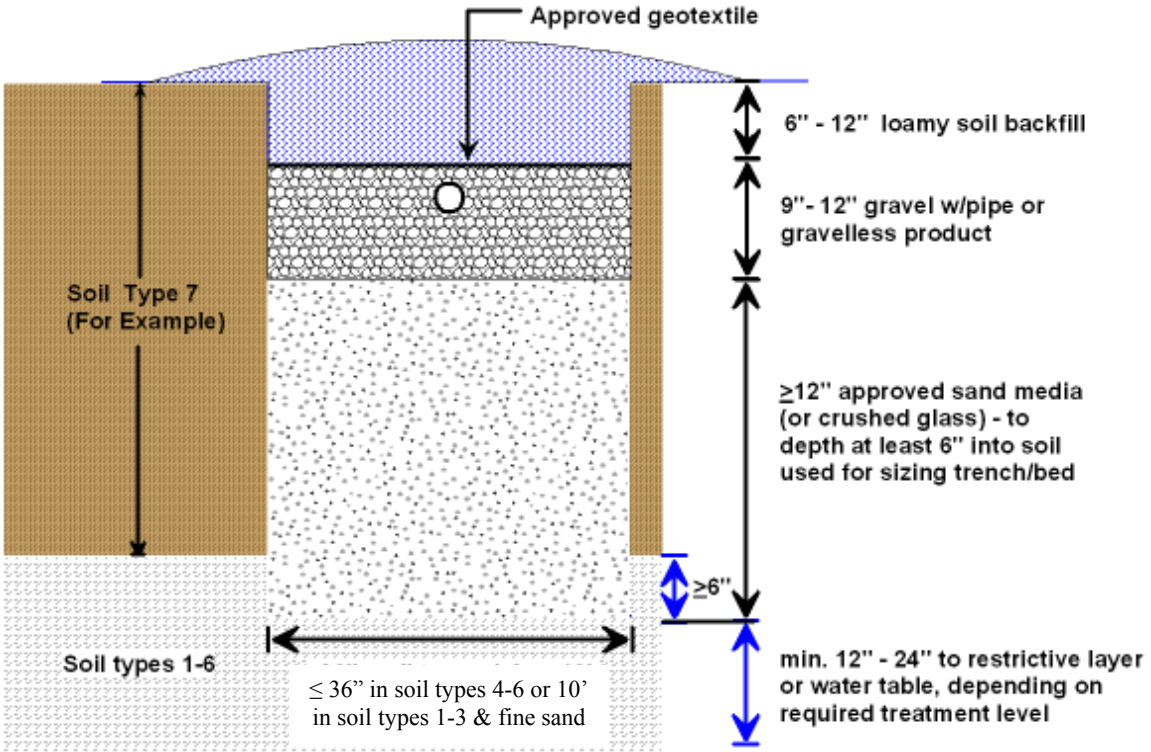
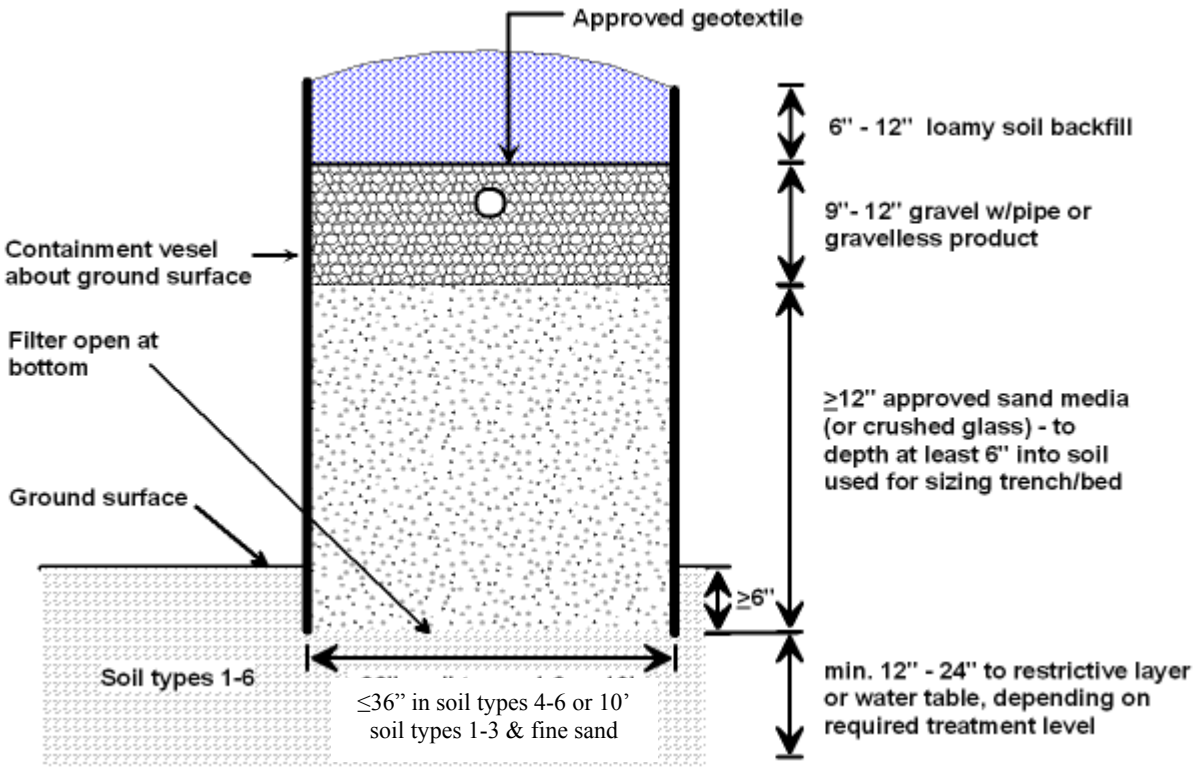


Figure 4 - Bottomless Sand Filter



1. Performance Standards

1.1. Treatment Level C

Based on sand column studies and field testing on intermittent sand filters, sand-lined trenches when constructed and used according to these standards and guidance with a minimum depth of 12 inches of filter media, followed by 24 inches of receiving soils, are expected to perform to Treatment Level C.

1.2. Treatment Level B

Based on sand column studies and field testing of intermittent sand filters, sand lined trenches when constructed and used according to these standards and guidance with a minimum depth of 24 inches of filter media are expected to perform to Treatment Level B.

1.3. Treatment Level A

When preceded by a treatment product listed on the Washington State Department of Health List of Registered On-site Treatment and Distribution Products as meeting Treatment Level B, a sand lined trench (properly sited, designed, installed, operated, and maintained in a manner consistent with these recommended standards and guidance) is expected to achieve treatment performance equal to Treatment Level A.

2. Application Standards

2.1. Listing

Sand lined trenches are a public domain treatment technology and are included in the Washington State Department of Health's List of Registered On-site Treatment and Distribution Products (Registered List) as a Category 1 combined treatment and soil dispersal technology (designed to treat residential sewage).

2.2. Permitting

Installation and, if required, operational permits must be obtained from the health officer prior to installation and use.

3. Design Standards

3.1. Design Approval

Before construction can begin, the design must be approved by health officer. All site inspections before, during, and after the construction must be accomplished by the health officer.

3.2. Influent Characteristics

3.2.1. Residential Wastewater: Sand lined trenches are designed for treating residential strength wastewater. The wastewater applied to sand lined trenches must not be higher in strength than Treatment Level E (or grab samples with results no greater than 220 mg/l BOD5, or 145 mg/l TSS). Lower wastewater strengths, without increased flow rates are preferable for assuring long term operation of a sand lined trench system.

3.2.2. Non-Residential Wastewater: High-strength wastewater and wastewater from non-domestic sources (such as restaurants, hotels, bed and breakfast establishments, industrial and commercial wastewater sources) must be individually evaluated for treatability and degree of pretreatment required prior to distribution to sand lined trenches for final treatment and dispersal.

3.3. Design Flow (Daily Wastewater Flow Estimates)

3.3.1. Residential - For all residential applications, a minimum wastewater design flow of at least 120 gallons/bedroom/day must be used.

3.3.2. Non-Residential - For non-residential applications, a minimum wastewater design flow equal to 150% of the estimated daily flow should be used.

3.4. Pretreatment

3.4.1. If the wastewater is residential sewage, settleable and floatable solid separation by a properly sized two-compartment septic tank with effluent baffle screening will suffice.

Pretreatment with some other wastewater sedimentation/initial treatment unit may be used instead of a septic tank.

3.4.2. If the wastewater is from a non-domestic source, influent to the sand lined trenches must be equivalent to residential strength septic tank effluent.

Aerobic treatment or some other treatment process may be needed to modify the influent to the sand lined trenches to within the range of residential septic tank effluent quality.

3.5. Location Requirements

The minimum setback requirements for sand lined trenches are the same as required for a soil dispersal component (NETCHD Regulation 01-2007, Section 12.)

3.6. Sand Lined Trench Design

3.6.1. Media Specifications - Filter media must meet either the Coarse Sand Media or ASTM C-33 specification for particle size graduation detailed in Appendix A. Filter media used in constructing a sand lined trench must be accompanied with a written certification from the supplier that the media fully conforms to one of the media specifications listed in Appendix A as determined by ASTM D136 (dry sieving) and ASTM C-117 (wet sieving).

3.6.2. Sizing the Infiltrative Surface - The minimum required infiltrative surface area (the top surface of the filter media) must be determined by dividing the design flow estimate by the loading rate.

3.6.2.1. Table 1 displays the loading rates to be used when sizing sand lined trenches, using the appropriate daily wastewater design flows. As is evident from Table 1, the loading rate for the sand lined trench is dependent on the soil type (the original, undisturbed soil) at the bottom of the filter media that receives the treated effluent. Soil types and textures are noted in Table 1. Column A.

3.6.2.2. Table 1. Column B, contains the maximum loading rates assuming septic tank effluent is being discharged to the underlying soils. When these loading rates are used, the designer is choosing not to use a reduction due to the treatment effluent receives as it flows through the filter media.

3.6.2.3. Table 1. Column C contains the maximum loading rates available when a designer chooses to use a reduction due to the treatment effluent receives upon flowing through the filter media. This will only impact the size of the system that is initially installed, not the area needed to be saved. Whenever a reduction is used, the designer must assure and show on the design that sufficient area exists for 100% of the area needed using the loading rates in Table 1. Column B for both the primary and reserve areas.

3.6.2.4. Increases in loading rates (reductions in installed infiltrative surface area) are not permitted due to the use of either a gravelless distribution product or a treatment technology preceding the sand lined trench that meets Treatment Level D.

3.6.3. Depth of media - The depth of filter media is dependent upon the treatment level requirement of a given site. There must always be a minimum depth of 12 inches of filter media regardless of the level of pretreatment.

3.6.3.1. In order to be expected to produce effluent meeting Treatment Level B, a minimum depth of 24 inches of filter media is required regardless of the level of pretreatment. This means that a sand lined trench system with a minimum of 24 inches of media preceded by a treatment technology identified on the List of Registered On-site Treatment and Distribution Products as meeting Treatment Level B can be expected to produce effluent meeting Treatment Level A.

3.6.3.2. In order to be expected to produce effluent meeting Treatment Level C, a minimum depth of 12 inches of filter media is required. This allows the use of the loading rates in Table 1. Column C and will produce an effluent whose quality is expected to meet Treatment Level C.

3.6.4. Minimum Vertical Separation – The required minimum vertical separation (original, undisturbed, unsaturated soil) is dependent on the Treatment Level to be achieved. Depending on the vertical separation used, Table VI of Section 14, NETCHD Regulation 01-2007 must be used to determine which treatment level must be met. For Treatment Level B, a minimum of 12 inches of vertical separation must be maintained below the bottom of the trench where the treated effluent is applied to the native soil of Soil Type 2-6. If the receiving soils are Soil Type 1, a minimum vertical separation of 18 inches must be maintained for treated effluents meeting Treatment Level B. For Treatment Level C, a minimum vertical separation of 24 inches is required in Soil Types 2-6. These vertical separations must be free of the following conditions:

3.6.4.1. The maximum seasonal high groundwater level.

3.6.4.2. A layer of creviced or porous bedrock.

3.6.4.3. A strata of impermeable soil or bedrock.

Generally, when the site evaluation indicates the depth of soil to a water table is less than 18 inches, there is a need to confirm that there are at least 12 inches during the wet season. Therefore when there is any doubt that there is sufficient unsaturated soil depth, the permit should be held for a wet season evaluation to identify accurately the location of high water tables. As potential vertical separation (or soil depth) decreases seasonal site checks to evaluate water table levels become increasingly critical to the on-site sewage system design, function, and to the protection of public health.

3.6.5. Excavation Depth - The infiltrative surface at the bottom of the filter media (the bottom of the excavation) must be installed at least 6 inches into original, undisturbed soil, except where the original soil is Soil Type 1. The maximum excavation depth for filter media placement shall not exceed ten feet from finished grade.

Table 1. Loading Rates for Sand Lined Trenches

A **Soil Type**	B **Septic Tank Effluent Application Rate (GPD/ft^2)**	C **Sand lined Trench Application Rate (GPD/ft^2)**
Soil Type 1: (Gravelly and very gravelly coarse sands, all extremely gravelly soils except where soil types 5 & 6 make up the non-gravel component.)	1.0[1]	1.0[1]
Soil Type 2: (Coarse sands)	1.0[1]	1.0[1]
Soil Type 3: (Medium sands, loamy coarse sands, loamy medium sands)	0.8	1.0[1]
Soil Type 4: (Fine sands, loamy fine sands, sandy loams, loams)	0.6	1.0[1]
Soil Type 5: [Very fine sands, loamy very fine sands; or silt loams, sandy clay loams, clay loams, and silty clay loams with a moderate or strong structure (excluding a platy structure)]	0.4	0.6[2]
Soil Type 6: (Other silt loams, sandy clay loams, silty clay loams, and clay loams)	0.2	0.3[2]
Soil Type 7: (Sandy clay, clay, silty clay, and strongly cemented firm soils, soils with a moderate or strong platy structure, any soils with a massive structure, any soils with appreciable amounts of expanding clays)	Not suitable	Not suitable

[1] A loading rate of 1.0 gpd/ft2 for ASTM C-33 sand may be too high for long term service. Concern has been expressed with premature failure and/or clogging of sand lined trench systems with ASTM C-33 sand as the filter media. Several possible contributing factors have been discussed including: a) the ASTM C-33 specification allows for too large of a percentage of fine material (passing a No. 100 sieve) which may cause the finer material to become suspended in the filter causing an impermeable barrier near the top of the filter, b) loading rates of 1.0 gal/ft2/day are inappropriate and should be reduced. While the Technical Review Committee recognizes the concerns, the committee feels that the data presented is inconclusive at this time. To address premature clogging of ASTM C-33 sand, different strategies are available, including: a) reduce loading rates applied to sand lined trench systems to no more than 0.8 gal/ft2/day; b) incorporate into the system design methods of improving oxygen exchange within the filter such as; increasing the dose frequency and/or including a venting system in the filter with vents extended to the atmosphere (vents may need to include an odor scouring device such as an activated carbon filter installed on the end of the vent); c) quality control of the sand media, such as frequent testing of the media to ensure that the media used consistently meets the ASTM C-33 specification.

[2] The maximum increase in loading rates for Soil Types 5 and 6, as noted in NETCHD Regulation 01-2007 Section 16(6), is a factor of 1.5.

3.6.6. Use of Beds

3.6.6.1. Absorption beds are allowed (in lieu of trenches) if the receiving soil is Soil Type 1, 2, 3 or fine sand. The maximum bed width must be no greater than 10 feet.

3.6.6.2. When a bed in a bottomless sand filter is permitted (see subsection 3.6.5.1.), the bed width is dependent on the available vertical separation (See Table 2.)

Table 2. Maximum Bed Width for Bottomless Sand Filters When a Bed is Permitted[1]

Type of Restrictive Layer	Available vertical separation (inches)		
	≥12 - <18[2]	≥18 - <24	≥24
Water table or other restrictive layer, excluding non-creviced bedrock.	5 ft.	7.5 ft.	10 ft.
Bedrock, non-creviced.	Not allowed	7.5 ft.	10 ft.

1 The noted bed widths are the maximum cumulative widths permitted for one or more beds on the same downhill plane on a single parcel (see subsection 3.12.6.).

3.6.7. Bottomless sand filter - filter bed containment: The bottomless sand filter containment vessel must be designed and/or approved by a qualified professional engineer. The containment vessel must have a support foundation to prevent vertical and horizontal movement of the vessel.

3.7. Wastewater Distribution

3.7.1. Pressure distribution: Pressure distribution with timed dosing is required and must comply with the pressure distribution standards and guidance. This requirement applies to all pressure distribution related components.

3.7.2. Wastewater application to the filter media: The wastewater must be applied to the layer of drain rock atop the filter media, sprayed upward against the top of gravelless chambers, or may be contained within some other gravelless distribution product in a way to assure uniform distribution.

3.7.3. Minimum Dosing Frequency: A timed dosing system is required. The dosing frequency or dose volume is dependent on the media specification used. To assure that appropriate dose volumes are delivered to the sand lined trench, the timer must be set to dose the filter at the following minimum dosing frequency:

Media Specification	Minimum Number of Doses/Day
Coarse Sand Media	18 times per day
ASTM C-33	4 times per day

3.8. Reserve Area

3.8.1. Replacement or reserve area must equal 100% of that required for a gravity gravel-filled drainfield receiving residential septic tank effluent using the loading rates in Table 1. Column B.

3.9. Installation Issues

3.9.1. Check the moisture content of the soil at 7-8 inches deep. If it is too wet, smearing and compaction will result, reducing the infiltration capacity of the soil. Soil moisture can be determined by rolling a soil sample between the hands. If it rolls into a wire, the site is too wet to prepare. If it crumbles, site preparation can proceed. If the site is too wet to prepare, do not proceed until the soil moisture decreases.

3.9.2. In order to prevent differential settling when the sand lined trench system is put into service, the filter media must have a uniform density throughout.

Uniform density may be accomplished one of two ways, depending on the moisture content of the filter media during construction. If the filter media is so dry that it can be poured (like salt or sand in an hourglass), it can simply be poured to fill the sand filter excavation, then settled lightly (not compacted) to allow about 5% settling -i.e., volume reduction. However, if the filter media is moist enough that it cannot be poured, it should be placed in successive 6-inch lifts with each lift lightly settled. The intent of the settling in both cases are no large voids in the media that will collapse later when effluent is added. The light settling may be accomplished by walking on the sand, then raking (with hand tools) into the corners, along the sides, around the pumpwell (if applicable) and around monitor ports. The final bulk density should be approximately 1.3 to 1.4 g/cm^3 (81.2 to 87.4 lb/ft^3). Higher densities will reduce infiltration rates and oxygen exchange potential.

3.9.3. A geotextile filter fabric must be placed on the gravel bed. The cover soil must be capable of maintaining vegetative growth while not impeding the passage of air (sandy loam or coarser).

3.9.3.1. The geotextile barrier must be a fabric that is spun-bound (non-woven), free of any chemical treatment or coated which reduces permeability, inert to chemicals commonly found in soil, free of petroleum products, and have a fabric weight of three to four ounces per square yard, or an apparent opening size (AOS) of 0.212 to 0.300 millimeters.

3.10. Observation Ports

Observation ports must be installed in at least two places in each drainfield line or bed. One observation port must be installed to the bottom of the drainrock/top of the media

interface. A second observation port must be installed to the bottom of the media. See Appendix B for sample ports.

3.11. Filter Media Surface and Excavation Surfaces

Both the top surface of the filter media and the bottom of the excavation must be level within ±0.5 inch. However, the surface should be broken up with the backhoe teeth to minimize the formation of a distinct layer between the sand and the original, undisturbed soil.

3.12. Bottomless Sand Filter Placement

3.12.1. While most of the following design conventions are recommended for all sand lined trenches, for system layout and placement of a bottomless sand filter they must be followed.

3.12.2. On sloping sites, the bottomless sand filter must be aligned with its longest dimension parallel to the contours so as not to concentrate the effluent into a small area as it moves laterally downslope.

3.12.3. The bottomless sand filter must not be aligned, by design or construction, perpendicular to the contours.

3.12.4. On all sites the bottomless sand filter must be as long and narrow as possible to limit the linear loading rate of effluent to assure that all the effluent infiltrates into the natural soil before it reaches the toe of the filter media.

3.12.5. If the site does not permit the design of a "long and narrow" bottomless sand filter along the contours of the site, other on-site sewage treatment and disposal technology must be selected. Bottomless sand filter systems are only suitable for sites where all of the design and siting criteria can be satisfactorily met.

3.12.6. When a bed is permitted, two or more bottomless sand filters on the same downhill plane are not permitted if the total bed width exceeds the specified maximum bed width in Table 2, unless the distance between beds is so great that a curtain drain meeting all the required setbacks can be properly installed between the farthest extensions of the two beds.

4. Operation, Monitoring, and Maintenance

4.1. Management

The health officer has the authority to require that an acceptable maintenance agreement be established, and supporting documents be developed and approved by the health officer, prior to the issuance of approvals for a proposed sand filter sewage system. It is recommended that a maintenance agreement be required when, in the

opinion of the health officer, the ongoing operation of the sand lined trench sewage system is best assured by the existence of such an agreement.

4.2. User's Manual

4.2.1. A user's manual for the sand lined trench system must be developed and / or provided by the system designer. These materials must contain the following, at a minimum:

4.2.1.1. Diagrams of the system components.

4.2.1.2. Explanation of general system function, operational expectations, owner responsibility, etc.

4.2.1.3. Names and telephone numbers of the system designer, NETCHD, component manufacturer, supplier/installer, and/or the management entity to be contacted in the event of a failure.

4.2.1.4. Information on the periodic monitoring and maintenance requirements of the sewage system: septic tank, dosing tanks, sand lined trenches, pumps, switches, alarms, etc.

4.2.1.5. Information on "trouble-shooting" common operational problems that might occur. This information should be as detailed and complete as needed to assist the system owner to make accurate decisions about when and how to attempt corrections of operational problems, and when to call for professional assistance.

4.3. Monitoring and Maintenance

4.3.1. Responsibility - For the on-site sewage system to operate properly, its various components need periodic monitoring and maintenance. Monitoring and maintenance are the responsibility of the homeowner, but may be best performed by experienced and qualified service providers. An Operation and Maintenance Manual must be developed and/or provided by the system designer with copies provided to the health officer, system owner and maintenance contractor. The maintenance manual must include the following listed recommended maintenance descriptions and schedules. The health officer may specify additional requirements.

4.3.2. Minimum Monitoring and Maintenance Description and Service Items

4.3.2.1. Type of use;

4.3.2.2. Age of system;

4.3.2.3. Specifications of all electrical and mechanical components installed (occasionally components other than those specified on the plans are used);

4.3.2.4. Nuisance factors, such as odors or user complaints;

4.3.2.5. Septic tank: inspect yearly for structural integrity, proper baffling, screen, ground water intrusion, and proper sizing. Inspect and clean effluent baffle screen and also pump tank as needed;

4.3.2.6. Dosing tanks: clean the effluent screen (spraying with a hose is a common cleaning method), inspect and clean the pump switches and floats yearly. Pump the accumulated sludge from the bottom of the chambers, whenever the septic tank is pumped, or more often if necessary;

4.3.2.7. Check monitoring ports for ponding: conditions in the monitoring ports must be observed and recorded by the service provider during all operation and maintenance activities for the sand lined trenches and other system components. For reduced size drainfields, these observations must be reported to the health officer responsible for permitting the system;

4.3.2.8. Inspect and test yearly for malfunction of electrical equipment such as timers, counters, control boxes, pump switches, floats, alarm system or other electrical components, and repair as needed. System checks should include improper setting or failure, of electrical, mechanical, or manual switches;

4.3.2.9. Mechanical malfunctions (other than those affecting sewage pumps) including problems with valves, or other mechanical or plumbing components;

4.3.2.10. Malfunction of electrical equipment (other than pump switches) such as timers, counters, control boxes, or other electrical components;

4.3.2.11. Material fatigue, failure, corrosion problems, or use of improper materials, as related to construction or structural design;

4.3.2.12. Neglect or improper use, such as loading beyond the design rate, poor maintenance, or excessive weed growth;

4.3.2.13. Installation problems, such as improper location or failure to follow design;

4.3.2.14. Overflow or backup problems where sewage is involved;

4.3.2.15. Specific chemical/biological indicators, such as BOD, TSS, fecal or total coliforms, etc. Sampling and testing may be required by the local health

officer on a case-by-case basis, depending on the nature of the problem, availability of laboratories, or other factors; and

4.3.2.16. Information on the safe disposal of discarded filter media. (See Appendix C.)

4.4. Conditions Requiring Action

4.4.1. When a monitoring inspection, or any other observation, reveal either of the following listed conditions, the owner of the system must take appropriate action, according to the direction and satisfaction of the health officer:

4.4.1.1. Drainfield system failure, as defined in NETCHD Regulation 01-2007 Section 3, or

4.4.1.2. A history of long-term, continuous, and increasing ponding of wastewater within the reduced-size drainfield, which if left unaddressed, will probably result in untimely failure.

4.4.2. Appropriate responses upon identification of conditions requiring actions:

4.4.2.1. Repair or modification of the drainfield system,

4.4.2.2. Expansion of the drainfield system, or

4.4.2.3. Modifications or changes within the structure relative to wastewater strength or hydraulic flows.

The repair or modification required may include the installation of additional drainfield to enlarge the system to 100% of the initial design size. Repair or modification is not limited to this option. A permit must be obtained before construction begins. Any repair or modification activity must be reported as part of the monitoring activity for the site.

Appendix A – Filter Media Specifications

I. Particle Size Analysis

A. The standard method to be used for performing particle size analysis must comply with one of the following:

1. The sieve method specified in ASTM D136 and ASTM C-117, or
2. The method specified in Soil Survey Laboratory Methods and Procedures for Collecting Soil Samples, Soil Survey Investigation Report #1, US Department of Agriculture, 1984.

B. Sand lined Drainfield Trench Filter Media (ASTM C-33)

a The filter media must meet either specification 1 or specification 2, below as determined by section A. Particle Size Analysis. Media may be either mineral sand or equivalently sized crushed glass.

1. Coarse Sand Media Specification
The filter media must meet items a, b, and c, below: (Source: State of Oregon On-Site Sewage Disposal Rules and the State of Wisconsin Single Pass Sand Filter Component Manual)

a Particle size distribution

Table 3. Coarse Sand Particle Size Distribution

Sieve	Particle Size	Percent Passing
3/8 in	9.50 mm	100
No. 4	4.75 mm	95 to 100
No. 8	2.36 mm	80 to 100
No. 16	1.18 mm	45 to 85
No. 30	0.6 mm	15 to 60
No. 50	0.3 mm	3 to 15
No. 100	0.15 mm	0 to 4

b Effective Particle Size (D10) > 0.3 mm.

c Uniformity Coefficient (D60/ D10) < 4.0

B. ASTM C-33 Specification

1. The filter media must meet items a, b, c, and d, below: (Source: ASTM C-33-03, Specification for Fine Aggregate)

a Particle size distribution:

Table 4. Fine Aggregate Particle Size Distribution

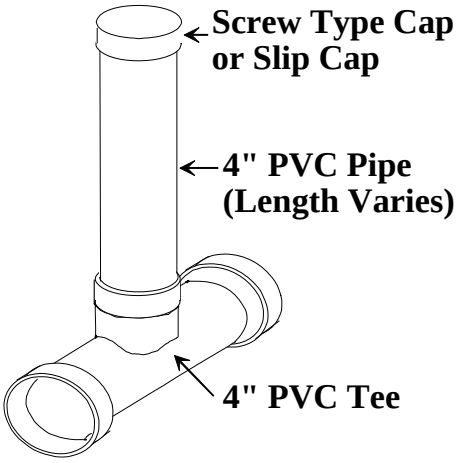
Sieve	Particle Size	Percent Passing
3/8 in	9.50 mm	100
No. 4	4.75 mm	95 to 100
No. 8	2.36 mm	80 to 100
No. 16	1.18 mm	50 to 85
No. 30	0.6 mm	25 to 60
No. 50	0.3 mm	5 to 30
No. 100	0.15 mm	0 to 10 (prefer <4)
[For No. 200 sieve, see note (d).]		

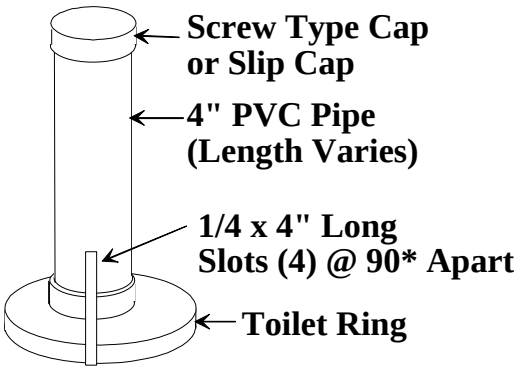
b The sand must have not more than 45% passing any one sieve and retained on the next consecutive sieve, of those shown above.

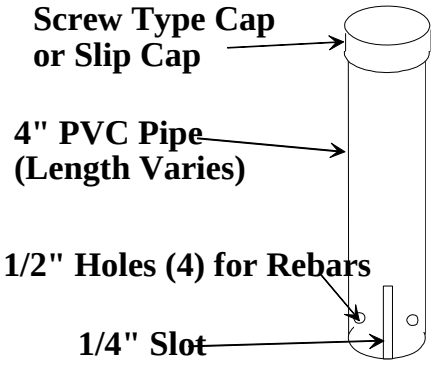
c The fineness modulus must not be less than 2.3 or more than 3.1, and is defined as a numeric quantity to control the distribution of filter media particle sizes within the specified range for sand lined trenches / beds. The fineness modulus is calculated by adding the cumulative percents of samples retained in the sieves shown above, dividing the sum by 100.

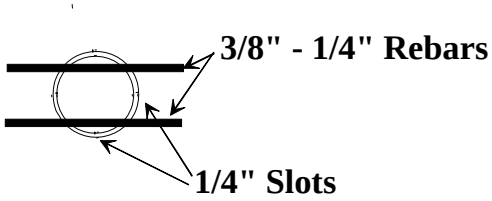
d The limit for material that can pass the No. 200 sieve must not be more than 3%. Nothing passing the No. 200 sieve is preferred.

Appendix B – Inspection/Monitor Ports









END VIEW (BOTTOM)

Appendix C – Disposal of Contaminated Filter Media

Whenever filter media is removed from a used filter, removing and disposing of contaminated filter media is to be done in a manner approved by the health officer. Handle this material carefully by using adequate protective sanitation measures. Thoroughly wash hands and any other exposed skin with hot water and soap, following contact with contaminated sand filter media.

This material may be applied to the soil, according to the following, only when approved by the health officer.

	APPLICATION	RESTRICTIONS/TIMETABLE
1.	Root crops, low-growing vegetables, fruits, berries used for human consumption.	Contaminated material must be stabilized and applied 12 months prior to planting.
2.	Forage and pasture crops for consumption by dairy cattle.	Forage and pasture crops not available until one month following application of stabilized material.
3.	Forage and pasture crops for consumption by non-dairy livestock.	Forage and pasture crops not available until two weeks following application of stabilized material.
4.	Orchards or other agricultural area where the material will not directly contact food products. Or where stabilized material has undergone further treatment, such as pathogen reduction or sterilization.	Less severe restrictions may be applicable.

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