

4.24 In-Trench Sand Filter

Revision: ~~May 1, 2000~~ July 18, 2013

4.24.1 Description

An in-trench sand filter is a standard trench or bed system receiving effluent by either gravity or low-pressure flow, under which is placed a filter of medium sand meeting the definitions provided in section 2.1.4. ~~An acceptable modification~~The standard design is typically used to excavate through impermeable or unsuitable soil layers down to ~~more~~ permeable or suitable soils. ~~The standard design may also and have~~ ~~place~~ clean pit run sand and gravel placed between the medium sand and more permeable soils or ground water as long as minimum medium sand depths are utilized. A modified design to the standard in-trench sand filter is known as the enveloped in-trench sand filter. Enveloped in-trench sand filters consist of a disposal trench with medium sand placed below and to the sides of the ~~drainrock~~ drainfield and are utilized for sites with native soils consisting of very coarse sand. A complex installer's permit is needed to install pressurized in-trench sand filters and enveloped in-trench sand filters. A basic installer's permit may be used to install gravity flow in-trench sand filters that are not preceded by any complex alternative system components.

The term drainfield only applies to the aggregate as defined in IDAPA 58.01.03.008.08 or the gravelless trench components approved in section 5.6 of this manual. Medium sand and pit run may be installed deeper than 48 inches below grade as long as the drainfield maintains a maximum installation depth of 48 inches below grade in compliance with IDAPA 58.01.03.008.04.

4.24.2 Approval Conditions

1. Except as specified herein, the system must meet the dimensional and construction requirements of a standard trench, bed, or pressure distribution system.
2. The in-trench sand filter or any of its modifications may be used over very porous strata, coarse sand and gravel, or ground water.
3. The standard in-trench sand filter system ~~is shall be sized according to~~ based on the native receiving soils at the medium sand, or pit run, and native soil interface ~~or at 1.2 gallons/ft², whichever is less.~~
4. Standard in-trench sand filters must maintain a 12 inch minimum depth of suitable native soil below the filter above a porous or non-porous limiting layer.
5. Standard in-trench sand filters must maintain a minimum separation distance of 12 inches from the bottom of the drainfield to the seasonal high ground water level.
6. Standard in-trench sand filters must maintain a separation distance from the bottom of the drainfield and the normal high ground water level that is capable of meeting the Method of 72 as described in section 2.2.3.2.

- a. Approval condition 6 may be waived if the standard in-trench sand filter is preceded by an alternative pretreatment system (e.g., extended treatment package system, intermittent sand filter, or recirculating gravel filter) as long as the bottom of the drainfield still meets the minimum separation distances of the applicable alternative pretreatment system (see Figure 4.26).
7. If the enveloped in-trench sand filter modification is used the following conditions must be met:
- a. Enveloped in-trench sand filters may ~~only~~ be installed in unsuitable native soils consisting of coarse sand or very coarse sand, or in suitable soils over limiting layers.
 - i. Unsuitable native site soils shall be evaluated and certified to not be any larger than the diameter of very coarse sand as described in Table 2-1.
 - ii. Unsuitable soils that have application rates greater than clay loam as described in Table 2-9 are not suitable for installation of an enveloped in-trench sand filter.
 - b. Enveloped in-trench sand filters installed in unsuitable soils (e.g., coarse sand and very coarse sand) as described in Table 2-1 and Table 2-9 must be preceded by an alternative pretreatment system (e.g., extended treatment package system, intermittent sand filter, or recirculating gravel filter), see Figure 4-26.
 - i. Enveloped in-trench sand filters installed in unsuitable soils must maintain a minimum of 12 inches above the seasonal high water level from the bottom of the enveloped sand filter.
 - c. Enveloped in-trench sand filters installed in suitable soils over ground water or a porous limiting layer to obtain a reduced separation distances to the ground water or porous limiting layer shall utilize pressure distribution throughout the drainfield.
 - i. Enveloped in-trench sand filters installed in suitable soils to obtain a reduced separation distance to ground water or a porous limiting layer must maintain a minimum of:
 - 1. 12 inches above the seasonal high water level from the bottom of the drainfield, and
 - 2. 12 inches above the normal high water level from the bottom of the enveloped sand filter.
 - ii. Reduced separation distances to non-porous limiting layers may not be approved through use of this design.

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- d. The system shall be sized at 1.7 GPD/ft² if pretreatment is utilized. If pretreatment is not utilized the system shall be sized at 1.2 gallons/ft² based on the native soils at the medium sand and native soil interface.
- ~~e.~~ Enveloped in-trench sand filters may not be used in Large Soil Absorption System designs.
- ~~e.f.~~ Effective disposal area for the installation of an enveloped in-trench sand filter shall only be credited to the width of the drainfield installed. Medium sand width enveloping the drainfield is not credited as disposal area.

4.24.3 Design and Construction

1. ~~Filter~~ Medium sand used in filter construction must conform to the gradation requirements of ASTM C-33 (less than 2% may pass a #200 sieve) as described in section 2.1.4.
2. Pit run backfill material, if used, is to meet a soil design subgroup A-1 soil classification.
 - a. Pit run backfill material may only be used if the minimum medium sand fill depths are met.
- 2.3. ~~The following m~~ Minimum filter medium sand depths ~~must be used~~ are dependent upon site specific soil profiles. The following site specific conditions outline the minimum sand filter depths:
 - a. ~~Gravity flow system = 4 feet~~ Excavation through an impermeable/unsuitable soil layer to access suitable soils and seasonal ground water or a porous limiting layer is not present.
 - i. No minimum medium sand depth.
 - ii. Pit run material may not only be installed until medium sand has been installed to a depth at depths of 8 feet below grade or more, medium sand must be used from the bottom of the drainfield to a depth of 8 feet below grade.
 - b. ~~Pressure distribution = 2 feet in design group C soils~~
~~3 feet in design group A and B soils~~ Excavation through an impermeable/unsuitable soil layer to access suitable soils and seasonal ground water or a porous limiting layer is present (Figure 4-25).
 - i. The minimum medium sand depth is dependent upon meeting the Method of 72 as outlined in section 2.2.3.2.
 - ii. Pit run material may not be installed until the Method of 72 as described in section 2.2.3.2 is met.
 - c. Unsuitable Nnative site soils consisting of very coarse sand.

- i. The filter sand shall envelop the drainrock so that at least 1 foot of medium sand is between the drainrock and the native soils as shown in Figure 4-26.
- e.d. Suitable native site soils and a seasonal ground water level or porous limiting layer is present and the drainfield is pressurized and designed with a reduced separation distance to the ground water or porous limiting layer.
- i. The filter sand shall envelop the drainrock so that at least 1 foot of medium sand is between the drainfield and the native soil as shown in figure 4-27.
 - ii. The filter sand shall maintain a depth of:
 - 1. 2 feet below the drainfield in design group C soils
 - 2. 3 feet below the drainfield in design group A and B soils
 - iii. A minimum of 12 inches of suitable soils must be maintained between the sand filter and the normal high ground water level or a porous limiting layer.

~~5. When the native soils are design subgroup A-1 or coarser, the filter sand shall envelop the drainrock so that at least 1 foot of filter sand is between it and the native soils, as shown in Figure 4-25.~~

~~6. The seasonal or normal ground water must not come within 12 inches of the bottom of the sand filter.~~

Figure Error! No text of specified style in document. ~~1~~ ~~Figure 4-25~~ shows two ~~types~~ scenarios for use of in-trench sand filters. **Figure** Error! No text of specified style in document. ~~2~~ ~~Figure 4-26~~ provides an example of an enveloped in-trench sand filter installed in unsuitable coarse native soil. Figure 4-27 provides an example of an enveloped in-trench sand filter installed in suitable native soils with a reduced separation distance to ground water or a porous limiting layer.

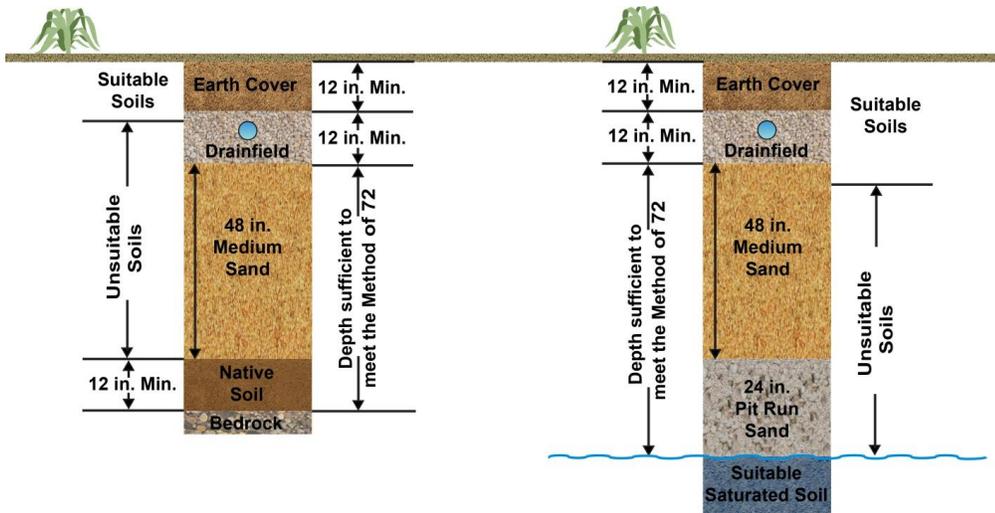


Figure Error! No text of specified style in document.-125. In-trench sand filter accessing suitable soils through an unsuitable soil layer.

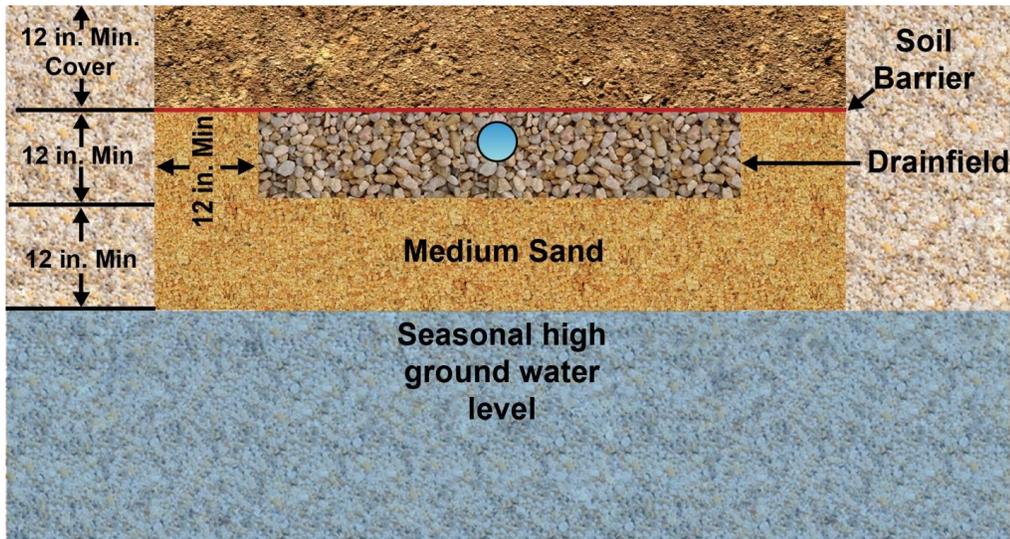


Figure Error! No text of specified style in document.-226. Enveloped in-trench sand filter with alternative pretreatment for installation in coarse unsuitable native soils (i.e., A-4coarse or very coarser sand).

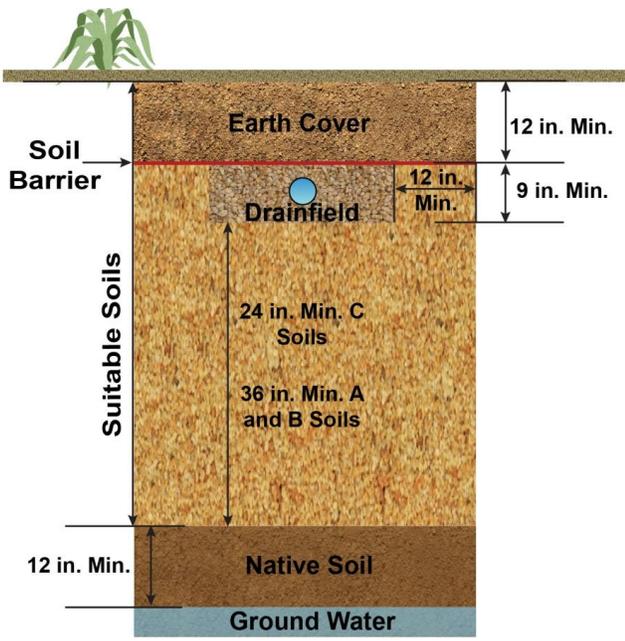


Figure Error! No text of specified style in document.-326. Enveloped pressurized in-trench sand filter for installation in suitable soils for a reduction in separation to ground water or a porous limiting layer.