4.23 In-Trench Sand Filter

Revision: July 22, 2015

4.23.1 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 3.2.8.1.2. There are two classifications of an in-trench sand filter:

- Standard in-trench sand filter
- Enveloped in-trench sand filter

The standard design is typically used to excavate through impermeable or unsuitable soil layers down to suitable permeable soils. The standard design may also have clean pit run sand and gravel placed between the medium sand and the suitable permeable soils or ground water as long as minimum medium sand depths are used. 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.

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 drainfield and are used for sites with native soils consisting of coarse to very coarse sand or gravel. The enveloped in-trench sand filter has three subcategories based on effluent distribution and treatment (section 4.23.3.2).

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 5.7 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. Minimum installation depths must meet the capping fill trench requirements as outlined in section 4.3.

4.23.2 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. Any subclassification of an in-trench sand filter may be used over very porous strata, coarse sand and gravel, or ground water.
3. A basic permitted installer may install standard or standard enveloped gravity flow in-trench sand filters that are not preceded by any complex alternative system components.
4. A permitted complex installer is required to install a pretreated enveloped in-trench sand filter, pressurized enveloped in-trench sand filter, or any other in-trench sand filters that are preceded by, or contain, a complex system component.
5. Medium sand used in filter construction must conform to the gradation requirements as described in section 3.2.8.1.2.

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6. Pit run backfill material, if used, must conform to the gradation requirements as described in section 3.2.8.1.4.

4.23.3 Design and Construction Requirements

Each classification of the in-trench sand filter has its own unique minimum design and construction criteria that must be followed. The following subsections describe the minimum design and construction requirements for each classification of the in-trench sand filter.

4.23.3.1 Standard In-Trench Sand Filter Design and Construction

1. Minimum medium sand depths depend upon site-specific soil profiles.
2. There is no minimum medium sand depth if seasonal ground water or a porous limiting layer is not present (see example 2 in section 2.2.5.2).
3. If seasonal ground water or a porous limiting layer is present the minimum medium sand and pit run depths are dependent upon meeting the method of 72 as outlined in section 2.2.5.2 (Figure 4-36).
4. Pit run material may only be installed 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 regardless of the drainfield installation depth.
5. The standard in-trench sand filter system shall be sized based on the most restrictive native receiving soil below the medium sand, or pit run, and native soil interface to a depth capable of meeting the method of 72 as described in section 2.2.5.2.
6. Standard in-trench sand filters must maintain a 12-inch minimum depth of suitable native soil below the filter above a porous or nonporous limiting layer (Figure 4-36).
7. 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.
8. Standard in-trench sand filters must maintain a separation distance from the bottom of the drainfield and any limiting layer that is capable of meeting the method of 72 as described in section 2.2.5.2.

   Design and construction condition 8 may be waived if the standard in-trench sand filter is preceded by an alternative pretreatment system (e.g., ETPS, 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.

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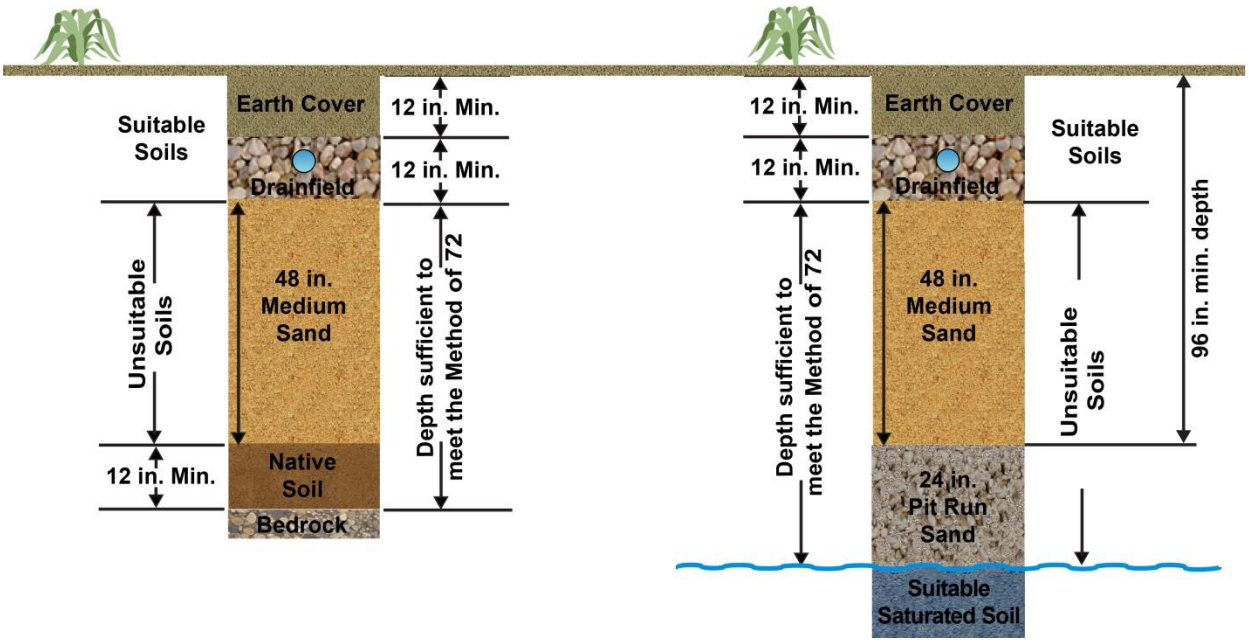

Figure 4-36. In-trench sand filter accessing suitable soils through an unsuitable soil layer.

4.23.3.2 Enveloped In-Trench Sand Filter Design and Construction

The three subcategories of the enveloped in-trench sand filter include in-trench sand filters that receive the following:

- Standard domestic strength effluent
- Pretreated effluent
- Pressure distributed effluent

All the subcategories of enveloped in-trench sand filters have the following same design and construction requirements:

1. The filter sand shall envelop the drainfield so that at least 12 inches of medium sand is between the sides and ends of the drainfield and native soils.
2. Effective disposal area for installing an enveloped in-trench sand filter shall only be credited for the width and length of the drainfield installed. Medium sand width enveloping the drainfield is not credited as disposal area.
3. Enveloped in-trench sand filters may not be used in large soil absorption system designs.

Additionally, each subcategory has design and construction criteria that are independent of the other subcategories. The following subsections describe the minimum independent design and construction requirements for each subcategory of the enveloped in-trench sand filter.

4.23.3.2.1 Standard Enveloped In-Trench Sand Filter Design and Construction

1. The native site soils consist of unsuitable coarse to very coarse sand or gravel meeting the equivalent diameters described in Table 2-1.

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2. Unsuitable soils that have application rates less than clay loam as described in Table 2-9 are not suitable for installation of an enveloped in-trench sand filter.
3. The minimum depth of filter sand below the drainfield shall be 6 feet (Figure 4-37).
4. The enveloped in-trench sand filter must maintain a minimum of 12 inches above any limiting layer from the bottom of the filter sand.
5. The drainfield shall be sized at 1.2 GPD/ft^2.

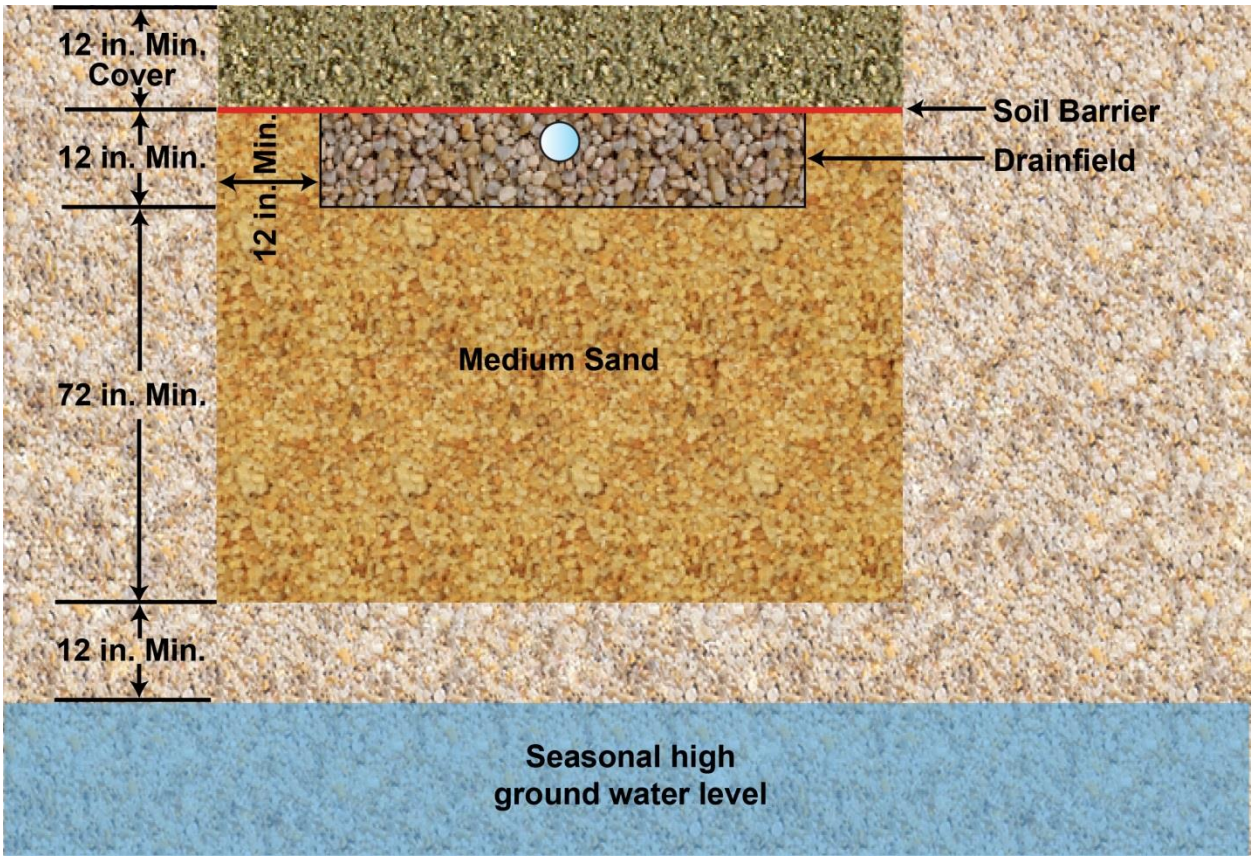

Figure 4-37. Standard enveloped in-trench sand filter for installation in coarse native soils (i.e., coarse or very coarse sand or gravel).

4.23.3.2.2 Pretreated Enveloped In-Trench Sand Filter Design and Construction

1. The effluent shall be pretreated with an extended treatment package system (section 4.8), recirculating gravel filter (section 4.21) or intermittent sand filter (section 4.22).
2. The native site soils shall consist of unsuitable coarse to very coarse sand or gravel meeting the equivalent diameters described in Table 2-1.
3. Unsuitable soils that have application rates less than clay loam as described in Table 2-9 are not suitable for installation of an enveloped in-trench sand filter.
4. The minimum depth of filter sand below the drainfield shall be 12 inches (Figure 4-38).

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5. The enveloped in-trench sand filter must maintain a minimum of 12 inches above seasonal or normal ground water levels and any other porous limiting layer from the bottom of the filter sand.
6. The enveloped in-trench sand filter must maintain a minimum of 12 inches above any nonporous limiting layer from the bottom of the filter sand.
7. The drainfield shall be sized at 1.7 GPD/ft^2.

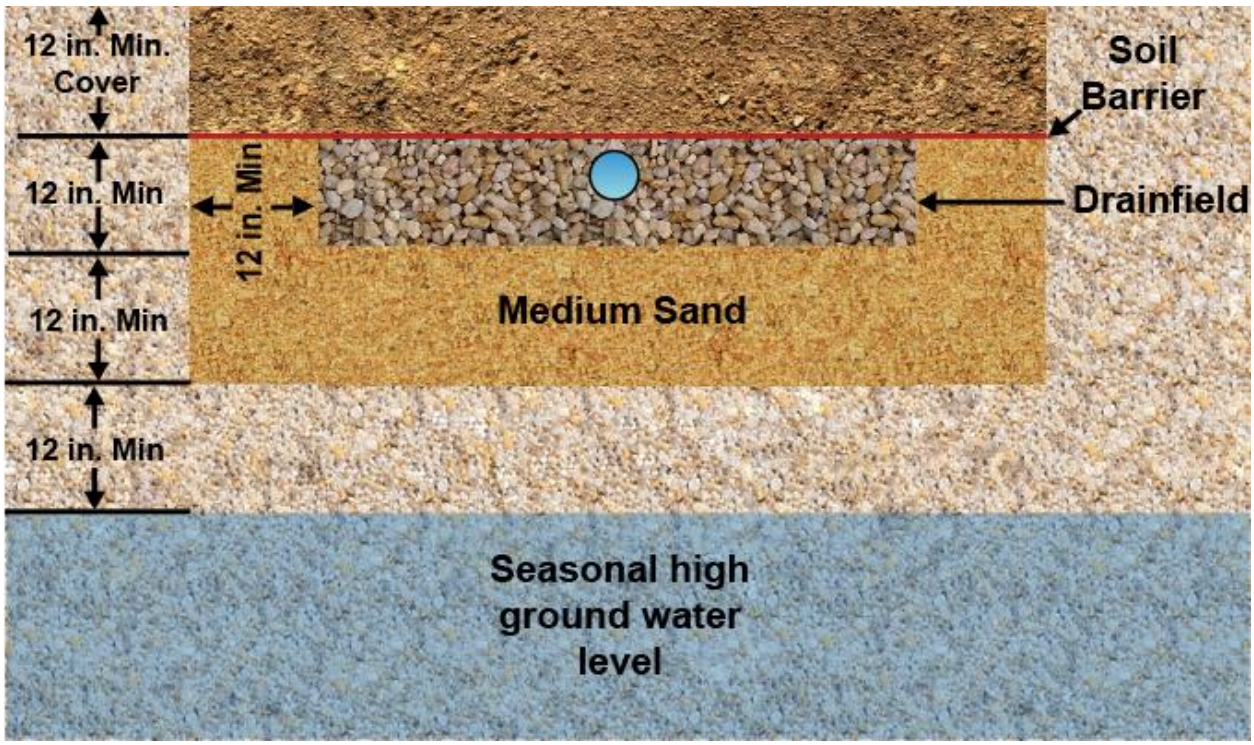

Figure 4-38. Enveloped in-trench sand filter with alternative pretreatment for installation in coarse native soils (i.e., coarse or very coarse sand or gravel).

4.23.3.2.3 Pressurized Enveloped In-Trench Sand Filter Design and Construction

1. The native site soils shall consist of suitable soils no coarser than medium sand or finer than clay loam as described in Table 2-9.
2. The drainfield shall be pressurized and designed according to section 4.19 by a PE licensed in Idaho.
3. The filter sand shall maintain a minimum depth of (Figure 4-39):
   a. 2 feet below the drainfield in design group C soils.
   b. 3 feet below the drainfield in design group A and B soils.
4. 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. The pressurized enveloped in-trench sand filter system shall be sized based on the most restrictive native receiving soil between the bottom of the medium sand filter and the normal high ground water level or a porous liming layer.

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6. Reduced separation distances to nonporous limiting layers may not be approved through use of this design.
7. Pressurized 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 12 inches above the seasonal and normal high ground water levels from the bottom of the filter sand.

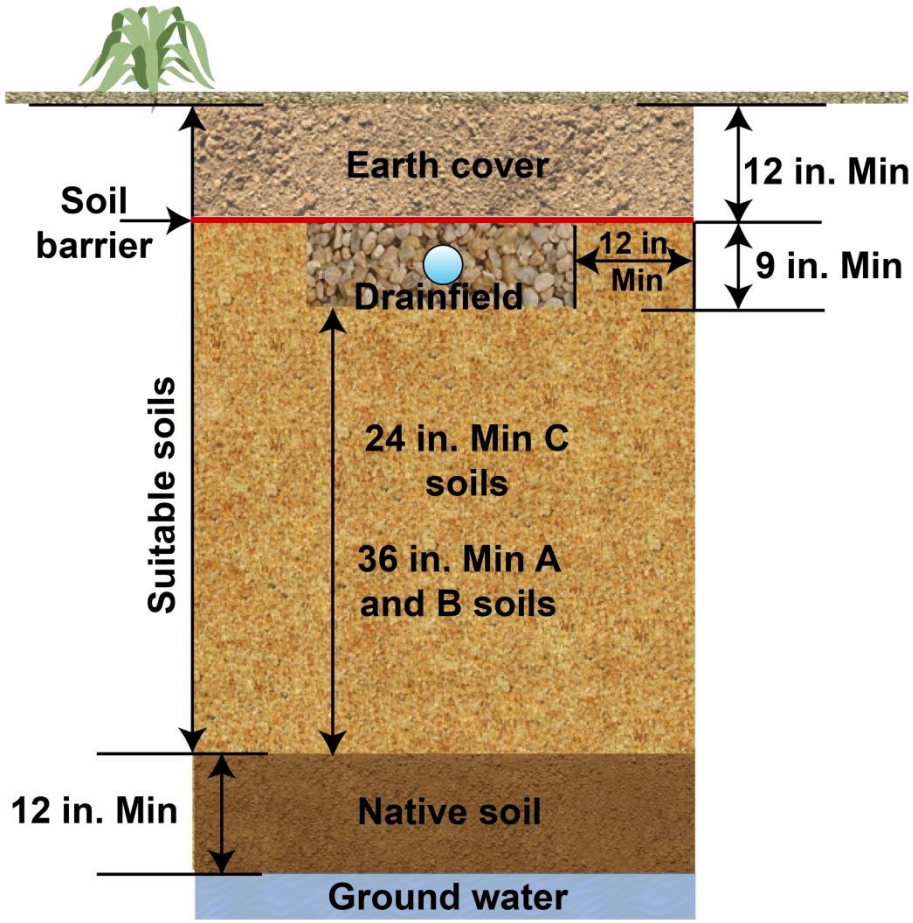

Figure 4-39. Enveloped pressurized in-trench sand filter for installation in suitable soils for a reduction in separation distance to ground water or a porous limiting layer.

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