

## 4.24 In-Trench Sand Filter

Revision: February 6, 2014

### 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. 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 or very coarse sand. A complex installer's permit is needed to install pressurized in-trench sand filters and enveloped in-trench sand filters.

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 4.5.

### 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 shall be sized based on the native receiving soils at the medium sand, or pit run, and native soil interface.
4. 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 4-28).
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., 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 (Figure 4-29).
7. If the enveloped in-trench sand filter modification is used the following conditions must be met:
    - a. Enveloped in-trench sand filters may 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 as 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 2-10 must be preceded by an alternative pretreatment system (e.g., ETPS, intermittent sand filter, or recirculating gravel filter) (Figure 4-29).
      - 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 distance to ground water or a porous limiting layer shall use pressure distribution throughout the drainfield (Figure 4-30).
      - 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 12 inches above the seasonal and normal high ground water levels from the bottom of the enveloped sand filter.
      - ii. Reduced separation distances to nonporous limiting layers may not be approved through use of this design.
      - iii. Pressure distribution design shall meet the requirements of section 4.20.
    - d. The system shall be sized at 1.7 GPD/ft<sup>2</sup> if pretreatment is used. If pretreatment is not used, the system shall be sized 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.
    - f. Effective disposal area for the installation of an enveloped in-trench sand filter shall only be credited for 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. Medium sand used in filter construction must conform to the gradation requirements 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.

3. Minimum medium sand depths are dependent upon site-specific soil profiles. The following site-specific conditions outline the minimum sand filter depths:
  - a. Excavation through an impermeable/unsuitable soil layer to access suitable soils
    - i. Seasonal ground water or a porous limiting layer is not present.
    - ii. No minimum medium sand depth.
    - iii. 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.
  - b. Excavation through an impermeable/unsuitable soil layer to access suitable soils
    - i. Seasonal ground water or a porous limiting layer is present (Figure 4-28).
    - ii. The minimum medium sand depth is dependent upon meeting the method of 72 as outlined in section 2.2.3.2.
    - iii. Pit run material may not be installed until the method of 72 as described in section 2.2.3.2 is met.
  - c. Unsuitable native site soils consisting of very coarse sand
    - i. The filter sand shall envelop the drainfield so that at least 12 inches of medium sand is between the drainfield and the native soils as shown in Figure 4-29.
  - 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 drainfield so that at least 12 inches of medium sand is between the drainfield and the native soil as shown in Figure 4-30.
    - 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 ground 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.

Figure 4-28 shows two scenarios for use of in-trench sand filters. Figure 4-29 provides an example of an enveloped in-trench sand filter installed in unsuitable coarse native soil. Figure 4-30 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.

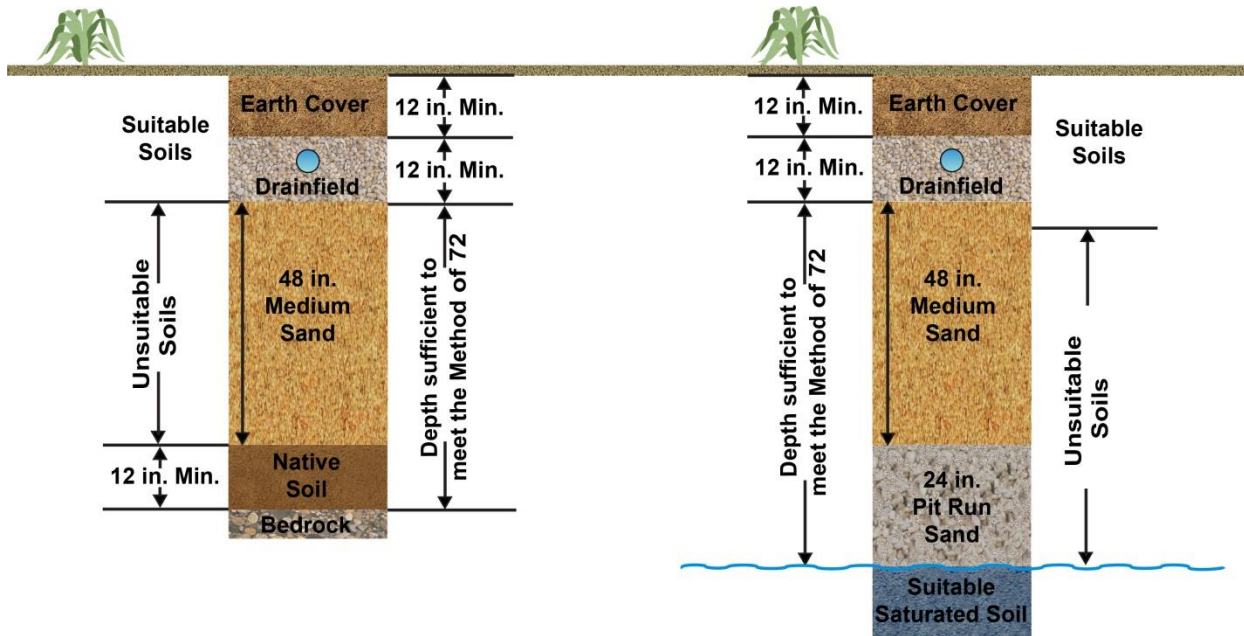


Figure 4-28. In-trench sand filter accessing suitable soils through an unsuitable soil layer.

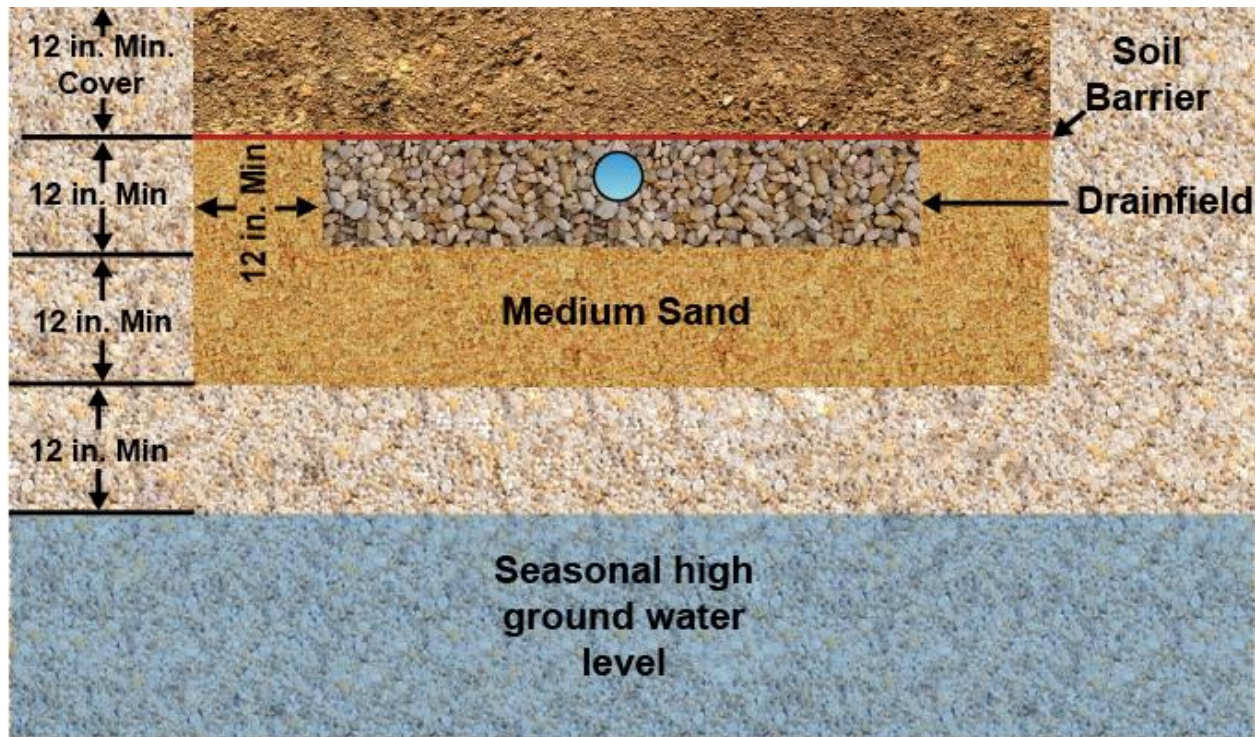


Figure 4-29. Enveloped in-trench sand filter with alternative pretreatment for installation in coarse native soils (i.e., coarse or very coarse sand).



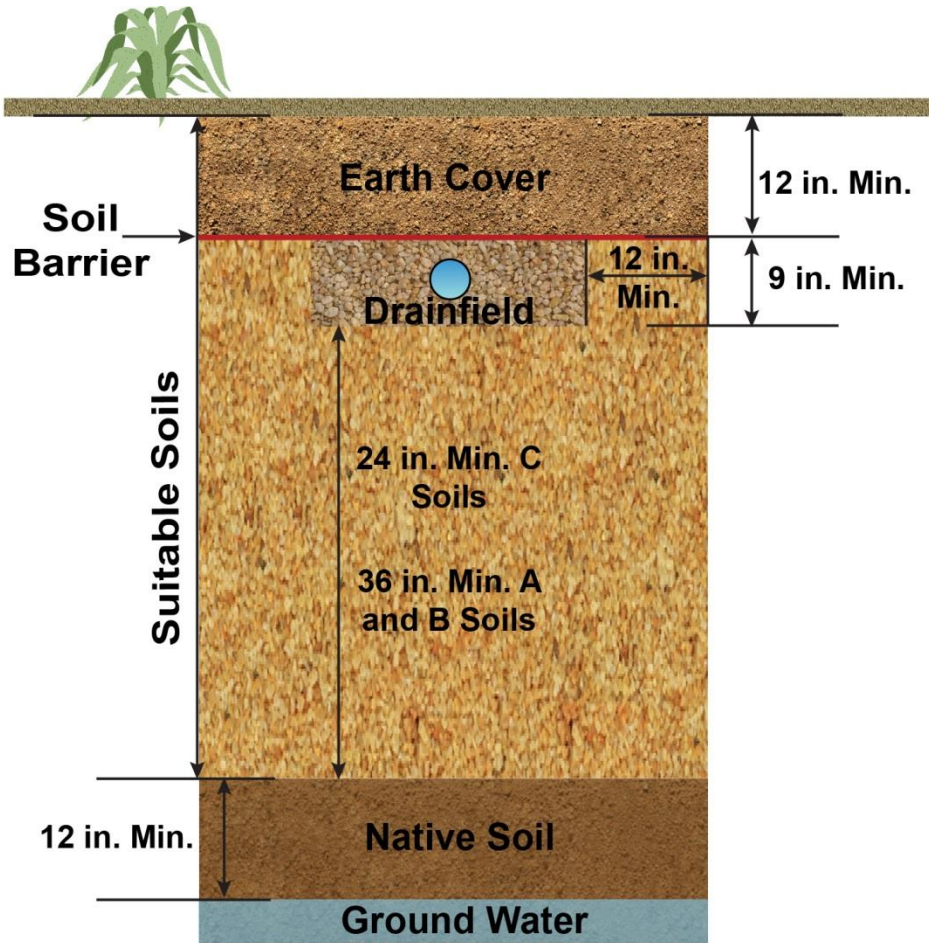


Figure 4-30. Enveloped pressurized in-trench sand filter for installation in suitable soils for a reduction in separation distance to ground water or a porous limiting layer.