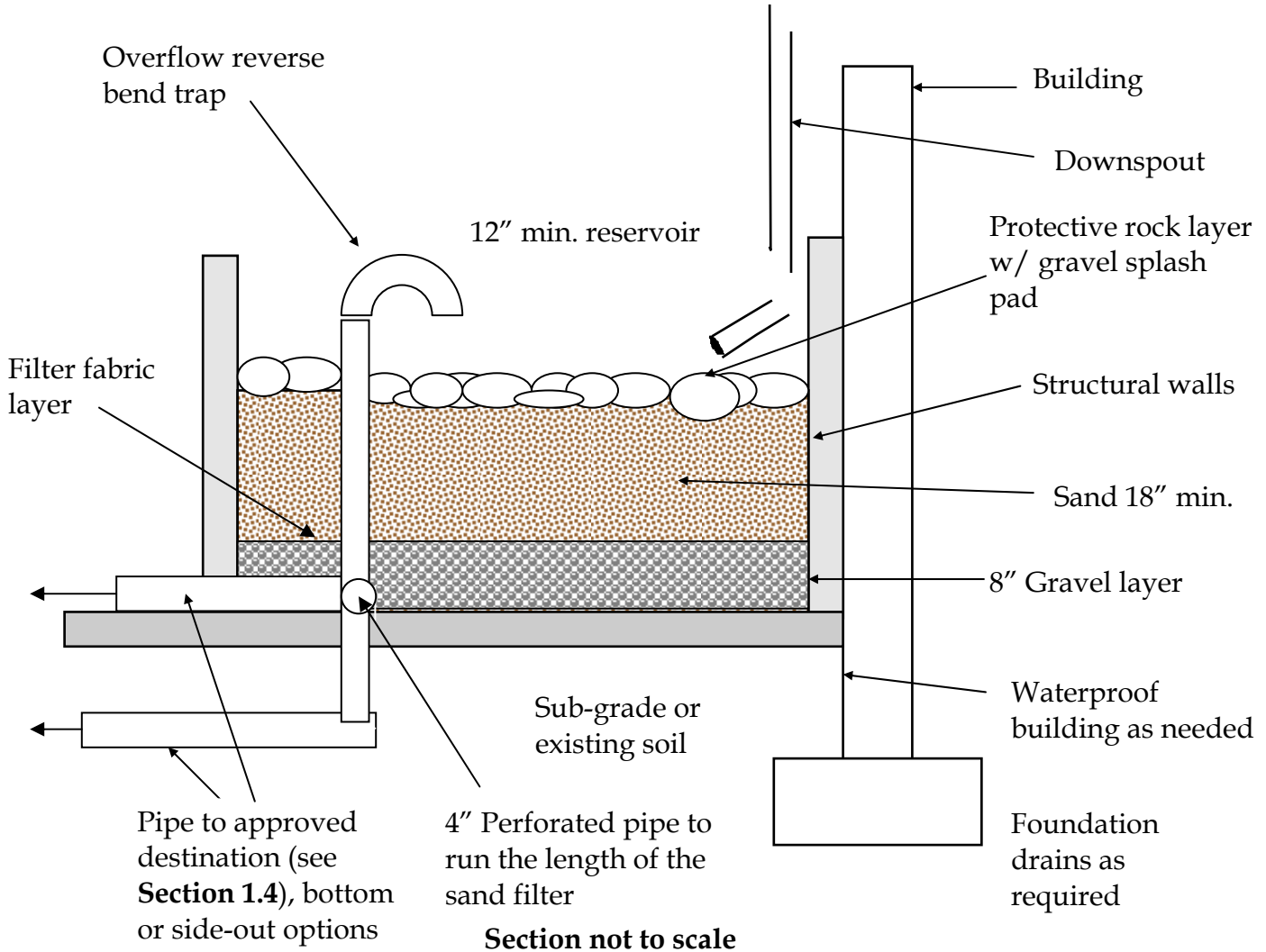


# Sand Filter



<u>Stormwater Management Goals Achieved</u>	<u>Acceptable Sizing Methodologies</u>
√ Pollution Reduction.....	SIM <sup>1</sup> , PRES
√ Flow Control.....	SIM
√ Destination.....	PRES <sup>2</sup>

This facility is **not** classified as an Underground Injection Control structure (UIC).

SIM=Simplified Approach, PRES= Presumptive Approach, PERF= Performance Approach

**Notes:** Sand filters can be used to manage stormwater from any impervious surface, and must be located on private property.

- 1) Projects greater than 15,000 square-feet of impervious surface area to manage must use the Presumptive Approach to size the Sand Filter for pollution reduction.
- 2) Residential applications with NRCS soils types A or B soils may size

# Sand Filter



**Description:** There are two sand filter options. One is designed with an impervious bottom or is placed on an impervious surface. It can be used for all soil types. The other option, for native soils with a minimum infiltration rate of 0.5 inches per hour (NRCS soil types A and B), allows filtered water to infiltrate into the ground. For both options, pollutant reduction is achieved as the water filters through the sand; flow control is obtained by slowing the discharge rate as the water filters through the sand. Filters may be constructed in-ground or above grade. Because they can include a waterproof lining, sand filters are extremely versatile and can be used next to foundation walls, adjacent to property lines (if less than 30" in height), or on slopes. An overflow to an approved conveyance/ destination method per **Section 1.4** will be required.

**Design Considerations:** When designing sand filters, the structural walls can often times be incorporated with building foundation plans.

**Construction Considerations:** Special attention needs to be paid to the filter waterproofing if constructed adjacent to building structures.

## Design Requirements:

**Soil Suitability:** Lined sand filters are appropriate for all soil types. Filters designed to infiltrate into native soils are appropriate in soils with a minimum infiltration rate of 0.5 inches per hour (NRCS soil types A, B, & C).

**Dimensions and Slopes:** Facility storage depth must be at least 12 inches, unless a larger-than-required planter square-footage is used. Minimum sand filter width is 18 inches. Filter slopes shall be less than 0.5%.

**Setbacks:** Required setback from property lines is 5 feet, unless the sand filter height is less than 30 inches. Required setback from building structures is 10 feet, unless the sand filter is properly lined. Easements for non-buildable areas may be required if facilities are located next to property lines.

**Structural Walls:** Sand filter walls shall be made of stone, concrete, brick, or wood. Chemically treated wood that can leach out toxic chemicals and contaminate stormwater shall not be used.

# Sand Filter

**Sizing:** Sand filters sized with the Simplified Approach shall be designed to receive less than 15,000 square-feet of impervious area runoff. For sand filters a Simplified Approach sizing factor of 0.07 for *Infiltration Sand Filters* and 0.03 for *Filtration Sand Filters* may be used to receive credit for pollution reduction. For projects with more than 15,000 square-feet of impervious surface, additional facilities may be required to meet flow control requirements. A high-flow overflow to an approved destination point must be provided or the Presumptive Approach must be used in conjunction with measured infiltration rates to receive credit for stormwater destination. In cases when pollution reduction is the only stormwater management goal, the Presumptive Approach in conjunction with measured infiltration rates may be used to downsize the Simplified Approach sizing factor. Sand filters shall be designed to pond water for less than 18 hours after each storm event.

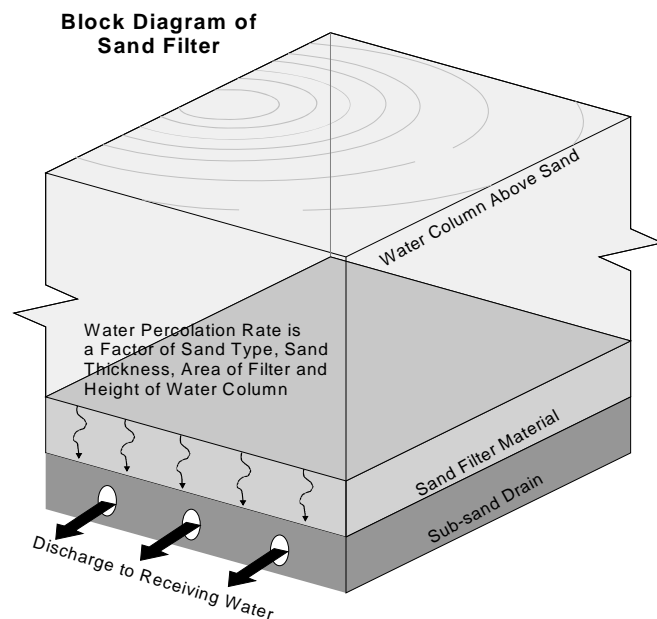
**Vegetation:** Plantings are optional in sand filters. For aesthetic purposes, potted plants may be submerged in the sand filter.

**For public sand filters, the following additional criteria shall apply:**

The sand filter consists of an inlet structure, sand bed, underdrain piping, and basin liner. Criteria for these components are provided below.

## **Inlet Structure**

- 1) The inlet structure shall spread the flow of incoming water uniformly across the surface of the filter medium during all anticipated flow conditions. This flow shall be spread in a manner that prevents roiling or otherwise disturbing the filter medium.



## **Sand Bed/ Filter Medium**

- 1) The length-to-width ratio shall be 2:1 or greater.
- 2) The sand bed configuration may be either of the two configurations shown in **Exhibit 2-16**. All depths shown are final depths. The effects of consolidation and/or compaction must be taken into account when placing medium materials. The surface of the filter medium shall be level.

# Sand Filter

- 3) Sand used as filter medium shall be certified by a testing laboratory as meeting or exceeding the specifications presented below:

The filter bed medium shall consist of clean medium to fine sand with no organic material, or other deleterious materials and meeting the following gradation:

<u>Sieve Size</u>	<u>Percent Passing</u>
3/8"	100
#4	95-100
#8	80-100
#16	45-85
#30	15-60
#50	3-15
#100	< 4

## **Sand Bed with Gravel Filter (Exhibit 2-16:A)**

- 1) The top layer shall be a minimum of 18 inches of approved sand.
- 2) The sand shall be placed over an acceptable geofabric material covering a layer of ½- to 2-inch washed drain rock. The finished depth of this drain rock shall be sufficient to provide a minimum of 2 inches of cover over the underdrain piping system.
- 3) No gravel is required below the underdrain piping system.

## **Sand Bed Using Trench Design (Exhibit 2-16:B)**

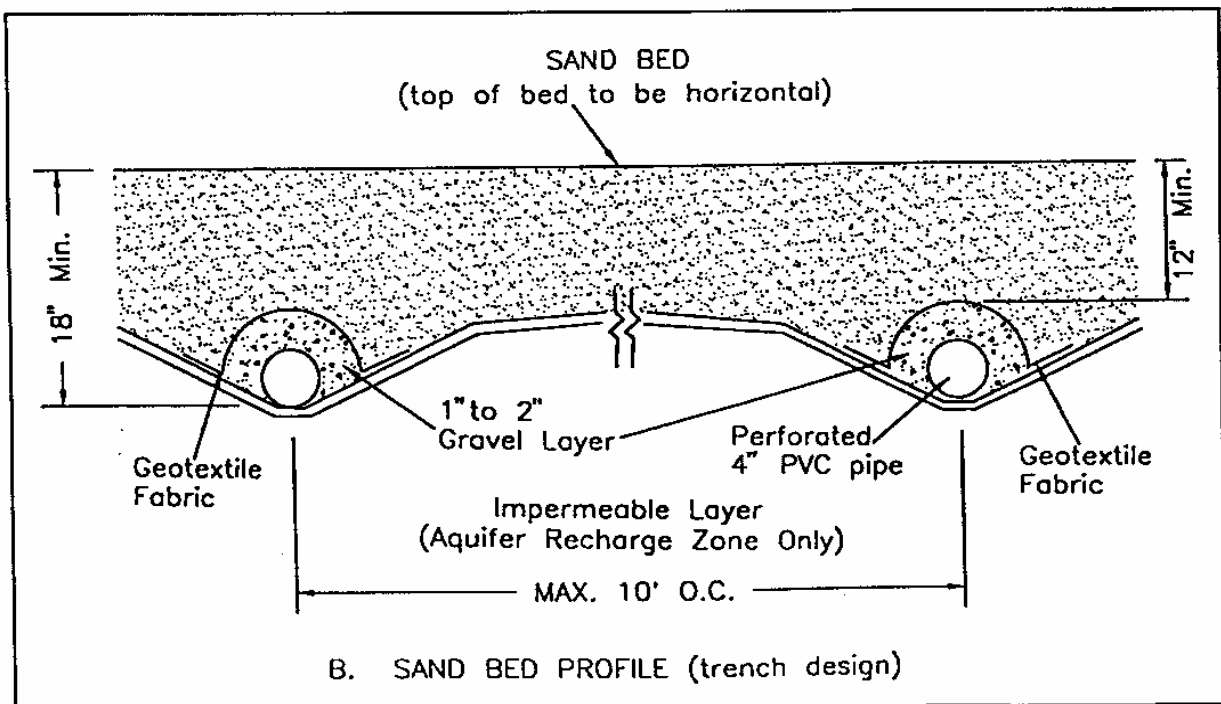
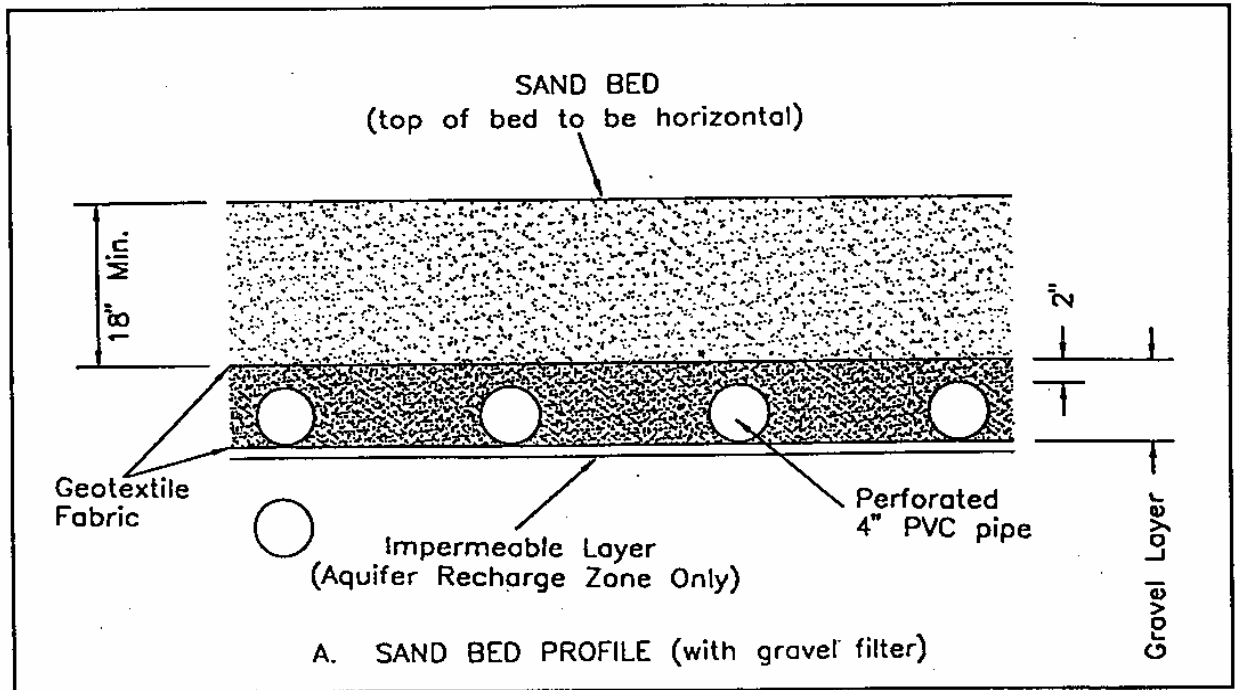
- 1) The top layer shall be a minimum of 12 inches of approved sand.
- 2) The sand shall be placed over an acceptable geotextile fabric material covering a layer of ½ to 2-inch washed drain rock. The finished depth of this drain rock shall be sufficient to provide a minimum of 2 inches of cover over the underdrain piping system.
- 3) The piping and gravel shall be underlain with geotextile fabric.

## **Underdrain Piping**

- 1) The underdrain piping system shall consist of appropriately sized (minimum 4-inch diameter) collector manifold with perforated lateral branch lines. The pipe used in this conveyance system shall be schedule 40 polyvinyl chloride (PVC) material or an approved equal. Lateral spacing shall not exceed 10 feet.
- 2) The underdrain laterals shall be placed with positive gravity drainage to the collector manifold.
- 3) The collector manifold shall have a minimum 1 percent grade toward the discharge point.
- 4) All laterals and collector manifolds shall have cleanouts installed, accessible from the surface without removing or disturbing filter media.

# Sand Filter

Exhibit 2-16



# Sand Filter

## Checklist of minimal information to be shown on the permit drawings:

- 1) Facility dimensions and setbacks from property lines and structures
- 2) Profile view of facility, including typical cross-sections with dimensions
- 3) Structural wall material specification
- 4) Sand specification
- 5) Filter fabric specification
- 6) Rock surface layer specification
- 7) All stormwater piping associated with the facility, including pipe materials, sizes, slopes, and invert elevations at every bend or connection

**Inspection requirements and schedule:** The following table shall be used to determine which stormwater facility components require City inspection, and when the inspection shall be requested. Please note that, while not all facility components may require an inspection call, inspectors will inspect for all required components in the field.

Facility Component	Inspection Requirement
Sand filter grading	
Structural walls	Call for inspection
Piping	Call for inspection
Sand	
Filter fabric	
Rock layer	
Plantings (if applicable)	

**Operations and Maintenance requirements:** See Chapter 3.0.