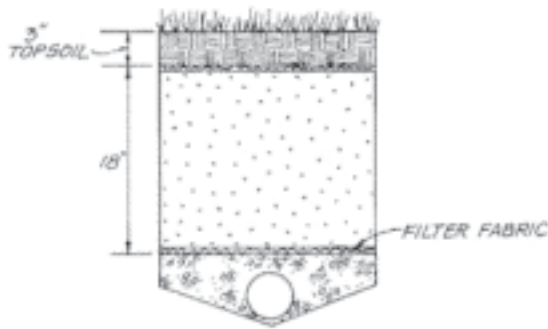


Sand Filter



A sand filter is composed of a pretreatment basin, a water storage reservoir, flow spreader, sand and underdrain piping. If groundwater contamination is a concern, a liner may be necessary, as well. Sand filters provide effective removal of virtually all types of pollutants and are especially effective at removing sediments and heavy metals. Runoff moves through the sand medium and pollutants are either trapped or strained out. Sand filters are ideally suited to capture the first flush but runoff carrying a large sediment load from construction sites can quickly clog the filter, rendering it ineffective.

One of the most appealing features of a sand filter is its applicability on small and ultra-urban sites. Filters can be placed both at the surface and underground, which makes them adaptable for a large number of sites. In addition, a sand filter provides an alternative for areas whose soils do not allow for an infiltration practice.

Advantages

- Applicable in drainage areas sized between 1 and 10 acres.
- May require less space than other BMPs
- High pollutant removals for sediment
- Can be used in ultra-urban areas and areas with steep slopes

AT-A-GLANCE SUMMARY

Benefit

- Major ●
- Moderate ◐
- Minor/None ○

Flow attenuation ○

Runoff volume reduction ○

Pollutant Removals

Sediment ●

Floatables ◐

Heavy metals ●

Oil and grease ◐

Fecal coliform ◐

BOD ◐

Total Phosphorous ◐

Nitrogen ◐

Costs ●

Maintenance ●

Sand Filter

Limitations

- Pretreatment of runoff required to keep the filter from clogging
- Expensive to install and maintain
- Not applicable in areas with high water tables
- Provides no quantity control
- Not applicable in areas that are expected to have high sediment loads

Maintenance

- For the first few months, sand filters should be inspected after every major storm event. After the 3-month period, the filter should be inspected every 6 months
- When maintaining, the first two or three inches of discolored sand should be replaced with new sand and the old sand should be de-watered and landfilled
- Sediment removal should be performed when the sediment is dry, in order to prevent smearing of the basin bottom
- Silt and sediment should be removed from the top of the filter when it has accumulated 1 inch or when the drawdown time increases by 20% or more from the original design value
- Rakes should be used to remove trash and debris
- Sediment, trash and debris should also be removed from pretreatment basins
- Vegetation near the sand filter should be maintained, healthy vegetation reduces the chance of the system clogging

Costs

A rough estimate for construction costs is \$10,000 - \$14,000 per impervious acre served, with design and maintenance costs being additional (Schueler, 1994).

Sand Filter

Design Specifications

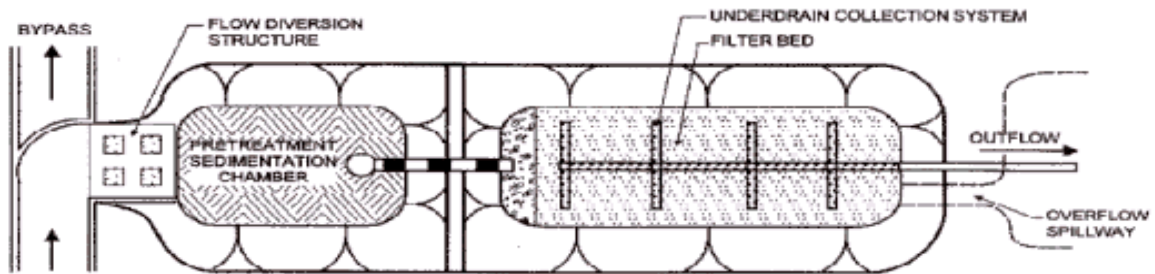
- Sand filters should be designed to empty the design storm in 24 hours or less.
- The water depth above the filter should be no greater than 6 feet.
- The layers of a sand filter:
 - sand
 - geotextile fabric
 - underdrain system
- Runoff entering a sand filter must first be pretreated. The length-to-width ratio of the presettling basin should be 3:1 and the depth at 3 to 6 feet.
- Inlet structures should be designed to spread flow across the surface of the filter
- Stone riprap should be installed to prevent gouging of the sand media.
- Sand should consist of a medium sand meeting the size gradation given below:

<u>U.S. Sieve Number</u>	<u>Percent Passing</u>
4	95-100
8	70-100
16	40-90
30	25-75
50	2-25
100	<4
200	<2

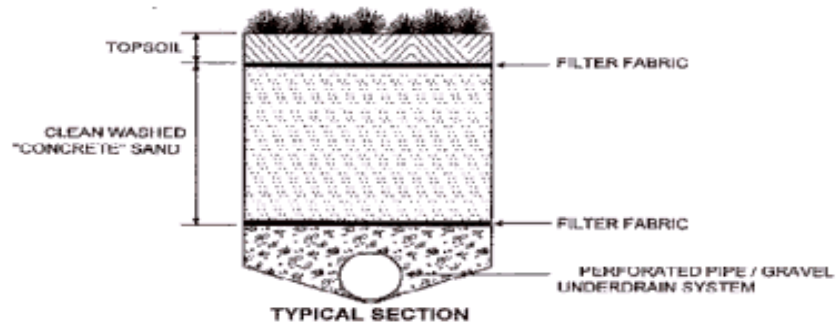
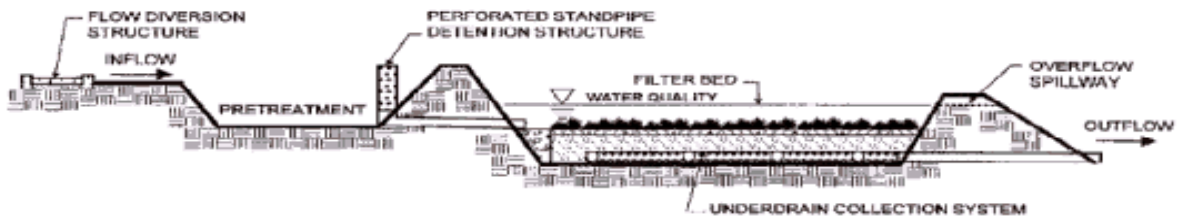
- A central collector pipe (with lateral feeder pipes or a geotextile drain strip in an 8-inch gravel backfill or drain rock bed) or a longitudinal pipe in an 8-inch gravel backfill or drain rock with a collector pipe at the outlet end may be used as an underdrain.
- The system should be sized for the 15-minute peak flow from a 2-year, 24-hour storm, with 1 foot of head above the invert of the upstream end of the collector pipe.
- All piping should be schedule 40 PVC or greater wall thickness.
- Underdrain pipes should have a minimum internal diameter of 6 inches.
- The main collector underdrain pipe should have a minimum slope of 0.5 percent.
- A geotextile layer must be installed between the sand and drain rock layers and placed so that one inch of drain rock is above the fabric. Drain rock should be 1.5 to 0.75-inch washed rock or gravel backfill.

Sand Filter

- Cleanout wyes with caps or junction boxes must be provided at both ends of the collector pipes. Cleanouts must extend to the surface of the filter. A valve box must be provided for access to the cleanouts
- Construction of the sand filter should take place after a site has been stabilized



PLAN VIEW

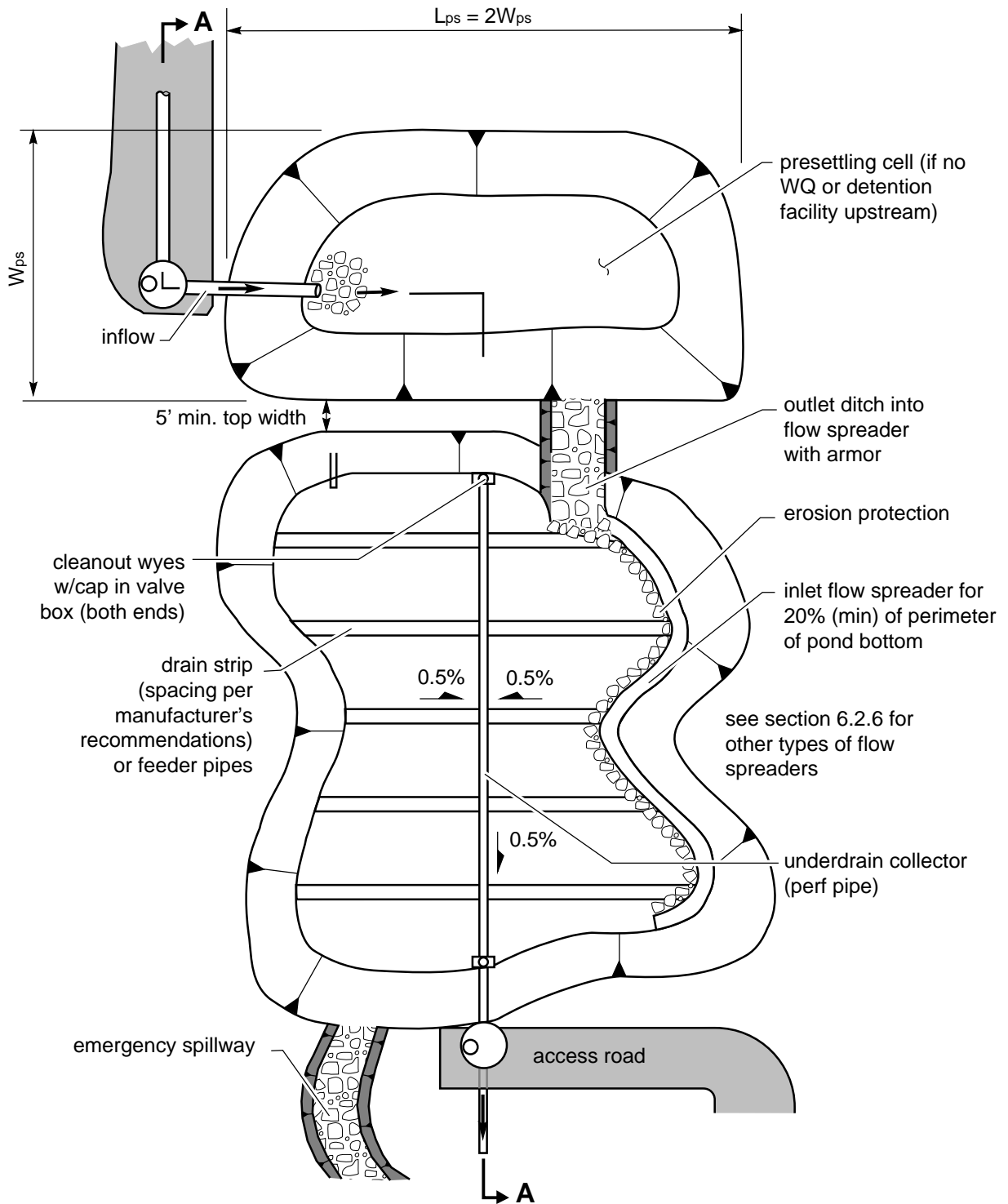


TYPICAL SECTION

PROFILE

Sample design ideas for a sand filter.
 Source: The Stormwater Manager's Resource Center

Sand Filter



Surface Sand Filter

Source: Washington State Department of Ecology, 2000.