DPS Montgomery County Department of Permitting Services

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SEPARATOR SAND FILTER (SEPSF)

Revised January 2009

A. Facility Description

This facility is based on a design developed by the Washington D.C. Environmental Regulation Administration and consists of an underground stormwater sand filter contained in a structural shell with 3 chambers.

The 3-foot deep plunge pool in the first chamber and the throat of the second chamber, which are hydraulically connected by a nonrestrictive underwater rectangular opening, absorb energy and provide pre-treatment by trapping grit, hydrocarbons, and floatable trash.

The remaining portion of the second chamber contains a typical DPS sand filter. The filter material consists of gravel, sand, and geotextile fabric. At the bottom is a subsurface drainage system consisting of 6-inch diameter perforated PVC pipe(s) in a 12-inch thick gravel bed. The primary filter media is 18 inches of sand. A layer of geotextile fabric secured by a 6-inch thick layer of gravel is placed on top of the sand. The fabric is a protective feature that can be readily replaced when the filter surface becomes clogged. The third chamber, or clearwell, collects the flow from the underdrain pipes and directs it to the storm drain system.

B. Design Considerations

1. Applicability

A major advantage of the Separator Sand Filter is that it takes up less surface area than many other types of facilities. It can be placed within road rights-of-way or under parking lots, sidewalks, or planting spaces adjacent to buildings. The maximum allowable drainage area to a separator sand filter is one acre. For larger watersheds, multiple BMP's are required.

2. Structural Requirements

The structure must be designed by a licensed structural engineer to meet proper loading requirements, and a copy of the structural computations must be submitted to DPS. All structures must be watertight.

3. Design Storm

The facility must be designed to store the entire water quality volume (WQV). Larger flows must be diverted away from the facility via a flow splitter. Do not design the facility to store more than 110% of the WQV.

4. Infrastructure Elevations

For cost, reliability, and maintenance reasons, DPS requires the facility to work by gravity flow. Therefore, sufficient vertical clearance must be provided between the invert of the inflow pipe(s) and the invert of the outfall pipe.

5. Accessibility and Headroom for Maintenance

All three chambers must have personnel access manholes with appropriate access steps and must meet MCDPWT access requirements. Access steps must be provided in all facilities. Steps must extend below the filter media in the filter chamber to allow access when the media is removed. The top of the facility may be no more than 4 feet below finished grade. The facility also must be accessible to vacuum trucks for removal of accumulated trash, sediments, and hydrocarbons. A minimum headspace of 48 inches above the filter must be provided if the ceiling to the chamber is a fixed structure. All manholes must be vented, and be a minimum 30-inch diameter. An additional access of at least 48-inch diameter must be provided over the filter chamber. Wherever it is practical, the structure should be located away from traffic bearing areas, so the entire surface of the facility may be covered with removable sections of metal grating. Under this condition the interior headspace limitation and manhole requirements will not apply, and the grating will allow for easier inspection and maintenance. Grated facilities shall not be designed to receive surface flows.

C. <u>Design Procedures</u>

1. Determine Governing Site Parameters

Determine the required Water Quality Volume (WQV).

2. Select Filter Depth and Determine Maximum Ponding Depth

Select the filter depth (sand and gravel) at 36 inches and determine the maximum achievable storage depth over the filter (H). Maximum achievable depth is a function of flow splitter design.

3. Compute the Minimum Area of the Sand Filter (A_f)

For applications in Montgomery County, the following formula is used:

$$A_f = WQV\ (0.1)$$

If WQV (0.1) < 200, use 200 square feet as the minimum surface area.

4. Select Filter Width and Compute Filter Length and Adjusted Filter Area (See Figure):

Note: From this point, the formulae assume a rectangular cross section of the filter shell.

Considering site constraints, select the filter width (W). Then compute the total storage length (L_v)

$$L_v = WQV / W(H + 0.8)$$

(Note that 0.8 is based on a filter depth of 3 feet.)

5. Compute Length of the First and Second Chambers

First Chamber (L_1) = 1/3 L_v

Second Chamber (L_2) = 2/3 L_v

D. Filter Specification and Details

1. Upper Gravel Layer

The washed gravel layer at the top of the sand filter media must be 6 inches thick and meet MSHA size #7 (Table 901A).

2. Geotextile Fabric

The geotextile fabric beneath the 6 inch layer of gravel on top of the sand filter shall be Enkamat 7020, Tensar TM-3000, North American Green P-300, or DPS approved equivalent. Filter fabric **must not** be used in these facilities.

The fabric rolls must be cut with sufficient dimensions to cover the entire surface of the filter with a 6-inch wall overlap.

3. Sand Filter Layer

Washed ASTM C33 Fine Aggregate Concrete Sand is utilized for applications in Montgomery County. DPS requires a uniform standard sand depth of 18 inches. **Manufactured sand or stone dust is not acceptable**.

4. Gravel Bed Around Underdrain Pipe(s)

The washed gravel layer surrounding the underdrain pipe(s) must meet MSHA size #7 (Table 901A), and be a uniform depth of 12 inches.

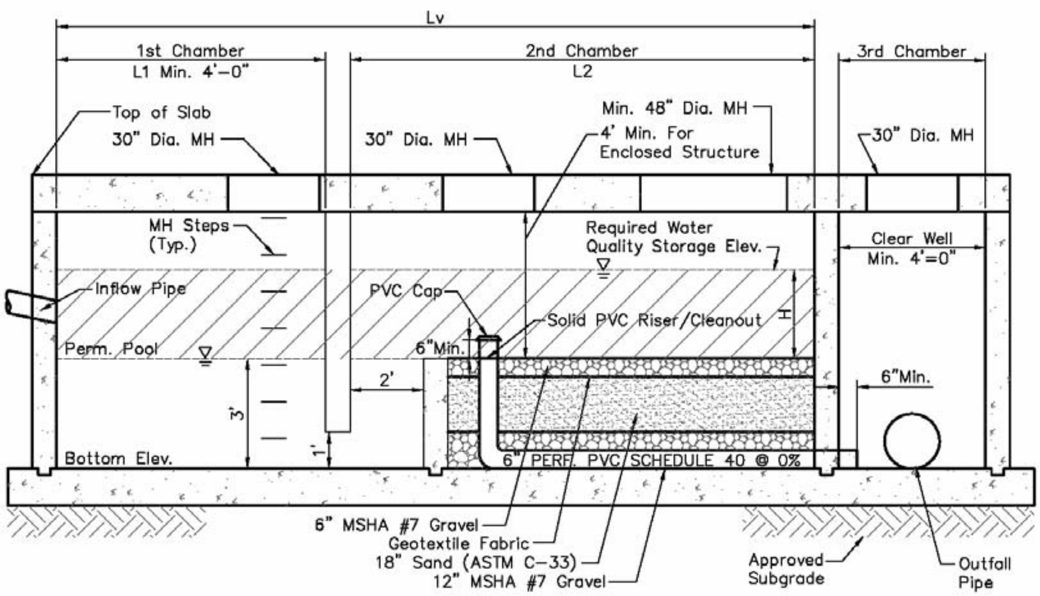
5. Underdrain Pipe

The underdrain pipe consists of 6-inch diameter schedule 40 or stronger perforated PVC pipes at 0.00% slope. Perforations must be 3/8 inch in diameter and must be located 4 inches on center, every 90 degrees around the pipe.

Access for cleaning all underdrain piping is needed. Cleanouts for each pipe should extend at least 6 inches above the top of the upper filter surface (i.e., the top layer of the upper gravel) and have a removable waterproof cap.

6. Concrete

Concrete design shall meet the requirements of ACI 350, Environmental Engineering Concrete Structures, with freezing and thawing exposures. Concrete shall be a type II or IIA cement, with a 28 day compressive strength of 4500 psi for cast in place and 5000 psi for pre-cast structures. Concrete shall also meet the requirements of Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials, Section 420, Mix No. 6.



TYPICAL SECTION SEPARATOR SAND FILTER

	MONTGOMERY COUNTY DEPARTMENT OF PERMITTING SERVICES WATER RESOURCES	MONTGOMERY COUNTY SEPARATOR SAND FILTER (MCSSF) DETAIL	DATE: 01/05 SCALE: NONE