

City of Pueblo – Stormwater Facilities Operation & Maintenance Manual

4.2 Sand Filters

Sand filters are stormwater control measures that remove pollutants from runoff by filtration through specialized filter media, or sand bed. During rainfall, stormwater accumulates in the surcharge zone and gradually infiltrates through the sand bed and into the underlying underdrain. The underdrain then discharges the filtered runoff into the storm drain system.

4.2.1 *Functional Description*

Sand filters have six main components: 1) inflow points (inlets), 2) energy dissipaters, 3) filter media, 4) underdrain, 5) outlet structure, and 6) containment walls. Water enters the sand filter through an inflow point, often a pipe roof downspout, surface channel, or a curb cut. Energy dissipation devices, typically riprap, are designed to reduce erosion of filter media near the inlet. The specific filter material of the sand bed is part of the sand filter design and should be replaced with the same material, when required. Underdrains prevent stormwater discharge to groundwater by capturing stormwater underneath the filter material and directing it to an outlet structure. Most sand filter facilities have underdrains, although not all. Outlet structures are where excess water that exceeds the storage capacity of the sand filter and water from the underdrain (if present) will discharge to the storm drain system. Containment walls surround the sand media and create an artificial shallow pool for the containment of water.

4.2.2 *Inspection Requirements*

Sand filters should be inspected twice per year following a precipitation event to ensure they are functioning correctly. In addition to observing for adequate infiltration, the facility should be checked for erosion and repaired if necessary. Sand filters should drain completely within 24 hours of a storm event.

4.2.3 *Maintenance*

4.2.3.1 *Routine Maintenance*

Debris and trash removal is required routinely to keep the detention area and overflow structure clear and minimize clogging of the filter media.

Vegetation should not be present inside of sand filters unless explicitly included in the design drawings. Any vegetation noticed on an inspection or during other maintenance work should be fully and completely removed by the roots.

Sediment should be removed from inflow points as needed. This might be a minimal volume of sediment; however, if ignored, it can lead to significant blockage of the inlet and impediment of filter material. Sediment should also be removed from energy dissipation components to prevent similar issues. Waste sediment may be contaminated with various pollutants and must be disposed of properly.

4.2.3.2 Minor and Major Improvements

The top 2 inches of the sand filter should be scarified to maintain an adequate infiltration rate, which typically is necessary once every two to five years or as needed. Once this has been performed two or three times, replenish the top layers up to the original design depth with new clean filter material. If, after replacing with clean filter material, the sand filter is still failing to fully drain within 24 hours, a complete replacement of sand filter material may be required or a repair to the underdrain system, if present, may be necessary, if present. A minimum depth of 12 inches of media should be maintained at all times.

Erosion and structural repairs do not have an attached time frame for maintenance but should be addressed immediately anytime either are noted during an inspection. Do not change the type of structure, size, quality, or species of vegetation when repairing the facility or addressing erosion.

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Table 4-2. Sand Filters: Common Indicators of Required Maintenance

Component	Hazard	Indicator	Solution
Inflow Structure (Inlet)	Debris	Pile of trash mixed with sediment	Shovel out trash and sediment and dispose of properly.
	Undesired Vegetation	Large woody vegetation surrounding the pipe	Chainsaw and root removal should be used to prevent damage to concrete.
	Erosion	Gaps between components or often these gaps will be filled with dirt. Cracked concrete	Minor repair may require adding energy dissipation techniques such as riprap or concrete patching. Major repairs may require an engineer and heavy equipment.
	Blockage	Sediment or filter media above the level of the inlet that impedes flow. Ponding of water outside of the inlet	Immediate removal of the sediment and filter media that is impeding the flow.
Energy Dissipater	Debris and Sediment	Ponding of water, visible trash, and noxious smells	Removal of trash and sediment using proper methods.
	Any Vegetation	Any vegetation in the energy dissipation components (also a sign that sediment may need to be removed)	Immediate removal of vegetation and sediment if necessary.
	Weathering	Cracking of concrete	Concrete patching.
	Riprap Migration	Riprap stones are found elsewhere in the sand trap beyond the original design area. Riprap stones are missing	Movement of the displaced riprap back to the original location of riprap. If this is a repeated issue, it is recommended that the current riprap is replaced with larger D50 riprap.

Component	Hazard	Indicator	Solution
Filter Media	Debris	Visible trash	Immediate removal of trash and restoration of any damaged media.
	Vegetation	Any vegetation growing in the filter media. This may also be a sign that the filter media needs attention	Complete plant removal of all vegetation, including roots. If this is a significant issue or the filter media seems to be draining poorly, it is recommended that the sand media is raked at a minimum.
	Erosion and Grading	Sand media is no longer smooth and flat and now possesses grooves or drainage channels	Replacement of lost filter media and likely maintenance of the inlet and energy dissipaters is required. For grading issues, simple raking might be sufficient.
	Caking	A thick layer of obvious sediment built up over the top of the filter media. Often this allows vegetation to grow in the sediment and may produce noxious smells	Complete removal of the top two inches of filter media. Potentially more if it is noticed the cake layer is deeper than two inches or roots have proceeded deeper.
	Snow Storage	Snow storage evidence present in the winter and spring	Contact snow removal companies or the City and instruct them to no longer store snow there.
	Oil/Chemical Sheens	Visible sheen on filter or water surface, gas, or chemical smell	May indicate a possible illicit discharge inside of the watershed. Contact the stormwater authority immediately.
Underdrain	Sediment Buildup or Blockage	Sand filter no longer drains fully in the 24 hours after a storm, no matter the amount of filter material replacement that happens	Immediate removal of sediment to access the underdrain and then replacement of the underdrain. New filter media should be used after the underdrain is replaced.

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Component	Hazard	Indicator	Solution
Outlet Structure	Debris	Well screen, orifice plate, and or trash rack are all visibly covered in trash and debris	Cleaning to remove trash.
	Removed or Missing parts	Any of the designed parts are moved or missing from previous inspections and design drawings	Replace part and securely fasten down access. Repetitive loss resulting from repeated vandalism may require contacting law enforcement.