

## U.S. Environmental Protection Agency National Pollutant Discharge Elimination System (NPDES)

### Compost Filter Socks

Minimum Measure: Construction Site Storm-Water Runoff Control

Subcategory: Sediment Control

A compost filter sock is a type of contained compost filter berm. It is a mesh tube filled with composted material that is placed perpendicular to sheet-flow runoff to control erosion and retain sediment in disturbed areas. The compost filter sock, which is oval to round in cross section, provides a three-dimensional filter that retains sediment and other pollutants (e.g., suspended solids, nutrients, and motor oil) while allowing the cleaned water to flow through (Tyler and Faucette, 2005).

The filter sock can be used in place of a traditional sediment and erosion control tool such as a silt fence or straw bale barrier. Composts used in filter socks are made from a variety of feed stocks, including municipal yard trimmings, food residuals, separated municipal solid waste, bio-solids, and manure.

Compost filter socks are generally placed along the perimeter of a site, or at intervals along a slope, to capture and treat storm-water that runs off as sheet flow. Filter socks are flexible and can be filled in place or filled and moved into position, making them especially useful on steep or rocky slopes where installation of other erosion control tools is not feasible.

There is greater surface area contact with soil than typical sediment control devices, thereby reducing the potential for runoff to create rills under the device and/or create channels carrying unfiltered sediment.

Additionally, they can be laid adjacent to each other, perpendicular to storm-water flow, to reduce flow velocity and soil erosion. Filter socks can also be used on pavement as inlet protection for storm drains and to slow water flow in small ditches. Filter socks used for erosion control are usually 12 inches in diameter, although 8 inch, 18 inch, and 24 inch–diameter socks are used in some applications. The smaller, 8 inch–diameter filter socks are commonly used as storm-water inlet protection.

Compost filter socks can be vegetated or unvegetated. Vegetated filter socks can be left in place to provide long-term filtration of storm-water as a post-construction best management practice (BMP). The vegetation grows into the slope, further anchoring the filter sock. Unvegetated filter socks are often cut open when the project is completed, and the compost is spread around the site as soil amendment or mulch. The mesh sock is then disposed of unless it is biodegradable.

Three advantages the filter sock has over traditional sediment control tools, such as a silt fence, are:

- Installation does not require disturbing the soil surface, which reduces erosion
- It is easily removed. The operator must dispose of only a relatively small volume of material (the mesh)
- These advantages lead to cost savings, either through reduced labor or disposal costs. The use of compost in this BMP provides additional benefits, include the following:

The compost retains a large volume of water, which helps prevent or reduce rill erosion and aids in establishing vegetation on the filter sock.

The mix of particle sizes in the compost filter material retains as much or more sediment than traditional perimeter controls, such as silt fences or hay bale barriers, while allowing a larger volume of clear water to pass through. Silt fences often become clogged with sediment and form a dam that retains storm-water, rather than letting the filtered storm-water pass through.

*\*In addition to retaining sediment, compost can retain pollutants such as heavy metals, nitrogen, phosphorus, oil and grease, fuels, herbicides, pesticides, and other potentially hazardous substances—improving the downstream water quality (USEPA, 1998).*

*Nutrients and hydrocarbons adsorbed and/or trapped by the compost filter can be naturally cycled and decomposed through bioremediation by microorganisms commonly found in the compost matrix (USEPA, 1998).*

## Applicability

Compost filter socks are applicable to construction sites or other disturbed areas where storm-water runoff occurs as sheet flow. Common industry practice for compost filter devices is that drainage areas do not exceed 0.25 acre per 100 feet of device length and flow does not exceed one cubic foot per second (see Siting and Design Considerations). Compost filter socks can be used on steeper slopes with faster flows if they are spaced more closely, stacked beside and/or on top of each other, made in larger diameters, or used in combination with other storm-water BMP's such as compost blankets.

## Siting and Design Considerations

**Compost Quality:** Compost quality is an important consideration when designing a compost filter sock. Use of sanitized, mature compost will ensure that the compost filter sock performs as designed and has no identifiable feedstock constituents or offensive odors. The compost used in filter socks should meet all local, state, and Federal quality requirements. Bio-solids compost must meet the Standards for Class A bio-solids outlined in 40 Code of Federal Regulations (CFR) Part 503. The U.S. Composting Council (USCC) certifies compost products under its Seal of Testing Assurance (STA) Program. Compost producers whose products have been certified through the STA Program provide customers with a standard product label that allows comparison between compost products. The current STA Program requirements and testing methods are posted on the [USCC](#) website.

The nutrient and metal content of some composts are higher than some top soils. This, however, does not necessarily translate into higher metals and nutrient concentrations or loads in storm-water runoff. A recent study by Glanville, et al. (2003) compared the storm-water runoff water quality from compost- and topsoil-treated plots. They found that although the composts used in the study contained statistically higher metal and nutrient concentrations than the top soils used, the total masses of nutrients and metals in the runoff from the compost-treated plots were significantly less than plots treated with topsoil. Likewise, Faucette et al. (2005) found that nitrogen and phosphorus loads from hydro seed and silt fence treated plots were significantly greater than plots treated with compost blankets and filter berms. In areas where the receiving waters contain high nutrient levels, the site operator should choose a mature, stable compost that is compatible with the nutrient and pH requirements of the selected vegetation. This will ensure that the nutrients in the composted material are in organic form and are therefore less soluble and less likely to migrate into receiving waters.

The American Association of State Highway Transportation Officers (AASHTO) and many individual State Departments of Transportation (DOT's) have issued quality and particle size specifications for the compost to be used in filter berms (USCC, 2001; AASHTO, 2003). The compost specifications for vegetated filter berms developed for AASHTO Specification MP 9-03 (Alexander, 2003) are also applicable to vegetated compost filter socks (personal communication, B. Faucette, R. Tyler, and N. Goldstein, 2005). These specifications are provided as an example in Table 1. Installations of unvegetated compost filter socks, however, have shown that they require a coarser compost than unvegetated filter berms. The Minnesota DOT erosion control compost specifications for "compost logs" recommend 30 to 40 percent weed-free compost and 60 to 70 percent partially decomposed wood chips. They recommend that 100 percent of the compost passes the 2-inch (51 mm) sieve and 30 percent passes the 3/8-inch (10 mm) sieve. Research on these parameters continues to evolve; therefore, the unvegetated filter sock parameters shown in Table 1 are a compilation of those that are currently in use by industry practitioners (personal communication, B. Faucette, R. Tyler, R. Alexander, and N. Goldstein, 2005). The DOT or Department of Environmental Quality (or similar designation) for the state where the filter sock will be installed should be contacted to obtain any applicable specifications or compost testing recommendations.

**Design:** Filter socks are round to oval in cross section; they are assembled by tying a knot in one end of the mesh sock, filling the sock with the composted material (usually using a pneumatic blower), then knotting the other end once the desired length is reached. A filter sock the length of the slope is normally used to ensure that storm-water does not break through at the intersection of socks placed end-to-end. In cases where this is not possible, the socks are placed end-to-end along a slope and the ends are interlocked. The diameter of the filter sock used will vary depending upon the steepness and length of the slope; example slopes and slope lengths used with different diameter filter socks are presented in Table 2.

**Siting:** Although compost filter socks are usually placed along a contour perpendicular to sheet flow, in areas of concentrated flow they are sometimes placed in an inverted V going up the slope, to reduce the velocity of water running

down the slope. The project engineer may also consider placing compost filter socks at the top and base of the slope or placing a series of filter socks every 15 to 25 feet along the vertical profile of the slope. These slope interruption devices slow down sheet flow on a slope or in a watershed. Larger diameter filter socks are recommended for areas prone to high rainfall or sites with severe grades or long slopes. Coarser compost products are generally used in regions subject to high rainfall and runoff conditions.

Table 1. Example Compost Filter Parameters

Parameters a, 1, 4 Units of Measure

Vegetated Filter Berm/ Sock A Unvegetated Filter Sock B  
 pH<sup>2</sup> pH units 5.0 – 8.5 6 – 8  
 Soluble salt concentration<sup>2</sup>  
 (electrical conductivity) dS/m (mmhos/cm) Maximum 5 Not applicable  
 Moisture content %, wet weight basis 30 – 60 30 – 60  
 Organic matter content %, dry weight basis 25 – 65 25 – 65  
 Particle size % passing a selected mesh size, dry  
 weight basis - 3 in. (75 mm), 100% passing - 1 in. (25 mm), 90 – 100%  
 Passing - 0.75 in. (19 mm), 70 – 100%  
 Passing - 0.25 in. (6.4 mm), 30 – 75% passing  
 Maximum particle size length of 6 in. (152 mm)  
 Avoid compost with less than 30% fine particle (1 mm) to achieve optimum reduction of total suspended solids  
 No more than 60% passing 0.25 in. (6.4 mm) in high rainfall/flow - 2 in. (51 mm), 100% passing - 0.375 in. (10  
 mm), 10% – 30%  
 Passing rate situations Stability<sup>3</sup>  
 Carbon dioxide evolution Rate mg CO<sub>2</sub>-C per gram of organic matter per day <8 (same as vegetated)  
 Physical contaminants (manmade inserts) %, dry weight basis <1 <1

Sources: a Alexander, 2003; b Personal communication, B. Faucette, R. Tyler, N. Goldstein, R. Alexander, 2005

#### Notes:

- 1 Recommended test methodologies are provided in [Test Methods for the Evaluation of Composting and Compost].
- 2 Each plant species requires a specific pH range and has a salinity tolerance rating.
- 3 Stability/maturity rating is an area of compost science that is still evolving, and other test methods should be considered. Compost quality decisions should be based on more than one stability/maturity test.
- 4 Landscape architects and project engineers may modify the above compost specification ranges based on specific field conditions and plant requirements.

Table 2. Example Compost Filter Sock Slopes, Slope Lengths, and Sock Diameters

Slope Length (feet)	Sock Diameter (inches)
<50:1	250 12
50:1–10:1	125 12
10:1–5:1	100 12
3:1–2:1	50 18
>2:1	25 18

Installation: No trenching is required; therefore, soil is not disturbed upon installation. Once the filter sock is filled and put in place, it should be anchored to the slope. The preferred anchoring method is to drive stakes through the center of the sock at regular intervals; alternatively, stakes can be placed on the downstream side of the sock. The ends of the filter sock should be directed upslope, to prevent storm-water from running around the end of the sock. The filter sock may be vegetated by incorporating seed into the compost prior to placement in the filter sock.

Since compost filter socks do not have to be trenched into the ground, they can be installed on frozen ground or even cement.

#### Limitations

Compost filter socks offer a large degree of flexibility for various applications. To ensure optimum performance, heavy vegetation should be cut down or removed, and extremely uneven surfaces should be leveled to ensure that the compost filter sock uniformly contacts the ground surface.

Filter socks can be installed perpendicular to flow in areas where a large volume of storm-water runoff is likely, but should not be installed perpendicular to flow in perennial waterways and large streams.

#### Maintenance Considerations

Compost filter socks should be inspected regularly, as well as after each rainfall event, to ensure that they are intact and the area behind the sock is not filled with sediment. If there is excessive ponding behind the filter sock or accumulated sediments reach the top of the sock, an additional sock should be added on top or in front of the existing filter sock in these areas, without disturbing the soil or accumulated sediment. If the filter sock was overtopped during a storm event, the operator should consider installing an additional filter sock on top of the original, placing an additional filter sock further up the slope, or using an additional BMP, such as a compost blanket in conjunction with the sock(s).

#### Effectiveness

A large number of qualitative studies have reported the effectiveness of compost filter socks in removing settleable solids and total suspended solids from storm-water (McCoy, 2005; Tyler and Faucette, 2005). These studies have consistently shown that compost filter socks are at least as effective as traditional erosion and sediment control BMP's and often are more effective.

Compost filter socks are often used in conjunction with compost blankets to form a storm-water management system. Together, these two BMP's retain a very high volume of storm-water, sediment, and other pollutants.

The compost in the filter sock can also improve water quality by absorbing various organic and inorganic contaminants from storm-water, including motor oil. Tyler and Faucette (2005) conducted a laboratory test using 13 types of compost in filter socks. They found that half of the compost filter socks removed 100 percent of the motor oil introduced into the simulated storm-water (at concentrations of 1,000 – 10,000 milligrams per liter [mg/L]) and the remaining compost filter socks removed over 85 percent of the motor oil from the storm-water.

#### Sock Diameters

Available in 9", 12" and 18" with lengths up to 100'.

Filter socks are often left on site to provide slope stability and post-construction storm-water control. The cost to install a compost filter sock will vary, depending upon the availability of the required quality and quantity of compost and the availability of an experienced installer.

#### References

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- ODEQ. 2004. *Best Management Practices for Storm-water Discharges Associated with Construction Activity, Guidance for Eliminating or Reducing Pollutants in Storm-water Discharges*, Oregon Department of Environmental Quality, Northwest Region.
- Personal communications, 2005. Industry representatives were interviewed regarding the particle size and composition of composts currently used in vegetated and Unvegetated filter socks.
- Nora Goldstein of Bio-Cycle, Journal of Composting & Organics Recycling; and Ron Alexander of R. Alexander Associates, Inc.
- Tyler, R. and B. Faucette. 2005. *Organic BMP's used for Storm-water Management—Filter Media Test Results from Private Certification Program*

The BioSock product incorporates a SynergyNet to reinforce the sock. The SynergyNet provides added protection against wear abrasion which prevents the compost ingredient from leaving the sock in the event of a tear in the sock fabric. The sock and SynergyNet are totally biodegradable and do not require post construction removal which will result in labor savings compared to other erosion control products such as silt fencing. BioSock can easily be placed on any hard surface without the need for bracing or pinning into place.

Don't be fooled by imitators claiming to be a reinforced compost filter sock. BioSock is the Best Available Technology on the compost filter sock market.