Federal Specifications for Compost Filter Socks for Sediment & Erosion Control

As specified by
American Association of State Highway and Transportation Officials
US Army Corps of Engineers
United States Department of Agriculture
Natural Resources Conservation Service
U.S. Environmental Protection Agency
How Filter Socks Work

Filter socks are an Low Impact Development (LID) tool typically used during the construction phase of the construction process to facilitate streambank stabilization and to act as temporary filters to protect inlets to stormdrains and provide perimeter controls. They are three-dimensional tubular devices used to trap the physical, chemical, and biological pollutants in stormwater. Once installed, they also create a temporary ponding area behind the sock, which facilitates the deposition of suspended solids. Filter socks are able to be rapidly installed on a construction site area to protect water quality downstream. They may be usually used in conjunction with other, more technologically complex and permanent LID tools. If runover or damaged, they are easily repaired. Appropriate for slopes up to 2:1 (1:1 if used in conjunction with slope stabilization/erosion control technology on slopes > 4:1) Appropriate for high flow areas. May be used to provide erosion and sediment control in areas that are appropriate for silt fence. Organic matter in filter socks binds phosphorus, metals, and hydrocarbons that may be in stormwater. The sock may also be directed seeded and left in place as a permanent vegetative feature. If not left in place, it may be incorporated as a soil amendment once construction activity is complete. The filter media is adjustable to meet specific filtering performance needs as determined by the Engineer or Landscape Architect in charge of the project.

Construction Materials Needed

Required construction materials are:

1. **Handtools**: Shovels, picks, hoses, wheelbarrows.
2. **Marking Materials**: Flagging, flags, or spray paint to delineate area.
3. **Compost**: Use only mature compost that has been certified by the U.S. Composting Council’s Seal of Testing Assurance Program (www.compostingcouncil.org), and meets the following specifications:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Acceptable Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>5.0–8.5</td>
</tr>
<tr>
<td>Moisture Content</td>
<td>&lt; 60%</td>
</tr>
<tr>
<td>Organic Matter</td>
<td>&gt; 25%, dry weight</td>
</tr>
<tr>
<td>Particle size</td>
<td>99 % passing 2-in. sieve</td>
</tr>
<tr>
<td></td>
<td>30 – 50% passing 3/8-in. sieve</td>
</tr>
<tr>
<td>Physical contaminants</td>
<td>&lt; 1%, dry weight</td>
</tr>
</tbody>
</table>

4. **Filter sock netting**: 5mm thick continuous HDPE filament, tubular knitted mesh with 3/8-in. openings. Use biodegradable plastic if filter sock will not be removed after construction. Use 12-in. diameter netting for most applications. In very high flow areas, use 18-in. diameter netting.
5. **Stakes**: Use 2x2-in. wooden stakes.
Installation Procedure
To install:
1. Locate/Mark any utilities.
2. Check all permits.
3. Obtain compost meeting specifications.
4. Obtain filter sock netting.
5. Fill filter sock netting with compost.
6. Mark out area for filter sock; orient length of sock parallel to the slope so that the runoff enters as sheet flow.
7. In high-flow or steep-slope areas, orient a second sock parallel to the first to dissipate flows.
8. Lay filter sock netting out as planned.
10. Stake filter sock every 10 ft. Stakes should be driven through the center of the sock, and 1 ft into the ground.
11. If sock netting must be joined, fit beginning of the new sock over the end of the old sock, overlapping by 1–2 ft. Fill with compost; then stake the join.

Typical Maintenance Schedule
Inspect filter socks periodically, and especially after large storm events. Ensure that the filter sock is intact, and that the area upstream has not filled with sediment. If the upstream area has filled with sediment, or if the filter sock has been overtopped, install additional filter socks further upstream. Sediment behind the sock should be removed when the depth of the sediment reaches 3.25-in. for an 8-in. sock, 4.75-in. for a 12-in. sock and 7.25-in. for an 18-in. sock. For socks with greater diameters, remove sediment behind the sock when the accumulated sediment depth reaches 40 percent of the design diameter of the sock.

Regional Considerations
Climate concerns will vary with each locality. Filter socks are more or less effective depending on a variety of climatic factors, primarily temperature and moisture regimes.
See also: Climate Chart in Appendix E1

Potential Limitations
Certain site conditions may limit the appropriateness of filter socks. In very uneven terrain, the area where the filter sock will rest should be leveled to ensure good contact between the sock and the ground.
Compost filter socks are applicable where stormwater runoff occurs as sheet flow.
Drainage areas should not exceed 0.25 acre per 100 ft of device length.
Flow should not exceed 1 cu ft/second.
If compost filter socks are to be used on steeper slopes with faster flows, they must be spaced more closely, stacked beside and/or on top of each other, made in larger diameters, or used in combination with other stormwater BMPs such as compost blankets.

Effectiveness of Filter Socks
Runoff Volume Reduction. Compost filter socks slow the rate of stormwater runoff, reducing peak flows. They do not provide storage. Compost filter socks are easily installed, with low life-cycle costs and offer high levels of durability and sediment control, medium levels of soluble pollutant and runoff volume control. They are approved for American Association of State Highway and Transportation Officials (AASHTO) & USEPA National Pollutant Discharge Elimination System (NPDES) Phase II. Installation of filter socks does not require trenching or further site disruption and may be installed year round including on frozen ground and on dense and compacted soils as long as stakes can be driven.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Reported Removal Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sediment (TSS)</td>
<td>97–99%</td>
</tr>
<tr>
<td>Motor Oil Removal</td>
<td>96%</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>34–99%*</td>
</tr>
<tr>
<td>Nitrate</td>
<td>25%</td>
</tr>
</tbody>
</table>

Sources: Faucette et al. 2005; Filtrexx 2007. *depending on formulation of filter media
Typical Construction Details of Filter Sock Installation

References


http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=120
Utilization of Compost Filter Socks

Issued November 2010

This technical note was prepared by Ray Archuleta, National Manure Management Technology Development Team, East National Technology Support Center, Natural Resources Conservation Service, Greensboro, North Carolina, and Britt Faucette, Ph.D CPESC, LEED–AP, Director of Research and Technical Services, Filtrexx Foundation, Grafton, Ohio.

For further information, contact the East National Technology Support Center at (336) 370–3331.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720–2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, SW, Washington, DC 20250–9410, or call (800) 795–3272 (voice) or (202) 720–6382 (TDD). USDA is an equal opportunity provider and employer.
Utilization of Compost Filter Socks

Introduction

According to a national water quality assessment, 35 percent of the United States streams are severely impaired and 75 percent of the population lives within 10 miles of an impaired water body (U.S. Environmental Protection Agency 2007). Sediment from stormwater runoff is the leading pollutant of surface waters in the United States; however, under stable soil conditions nearly 80 percent of stormwater pollutants can be in soluble or dissolved forms (Berg and Carter 1980). Typical stormwater runoff pollutants include sediment, nutrients, harmful bacteria, heavy metals, and petroleum hydrocarbons. Since 1995, nutrients, pathogens, and heavy metals have accounted for more than 21,000 cases of water quality impairment (U.S. Environmental Protection Agency 2007). Figure 1 is an aerial photo (taken in 2008) of high turbidity in Tom-A-Lex Lake after a rainfall-runoff event. This lake is located 7 to 14 miles southwest of Thomasville and High Point, North Carolina (combined population of 122,000). Soil erosion, sedimentation, and surface water turbidity are increased by soil disturbance from agricultural tillage and urbanization. These human activities are the leading contributors to sedimentation in our Nation’s waters.

A major function of soil organic matter is filtration of pollutants introduced through natural infiltration and subsurface hydrologic flow patterns, prior to ground and surface water recharge.

Organic matter in compost has been shown to provide stormwater filtration benefits in overland sheet and concentrated flow situations (Faucette et al. 2009a; Keener, Faucette, and Klingman 2007). Bio-based management practices used for stormwater pollution prevention should be designed to reduce runoff sediment and soluble pollutants to protect and preserve natural ecosystems and the valuable services provided. This technical note illustrates the effectiveness of compost filter socks as a stormwater filtration practice and provides guidance on proper use.

Compost filter socks

The compost filter sock is a tubular mesh sleeve that contains compost of a particular specification suitable for stormwater filtration applications. The compost filter sock is a linear, land-based treatment that removes stormwater pollutants through filtration of soluble pollutants and sediments and by deposition of suspended solids (fig. 2). The compost filter sock is typically available in 8-inch (200 mm), 12-inch (300 mm), 18-inch (450 mm), and 24-inch (600 mm) diameters.

Applications

Compost filter socks can be used in a variety of stormwater management applications. Recommended applications include the following:

- perimeter sediment control
- as a check dam to reduce soil erosion in swales, ditches, channels, and gullies
- storm drain and curb storm inlet protection
- reduction of fecal coliform, E. coli, nitrogen, phosphorus, heavy metals, and petroleum hydrocarbons from stormwater
- reduction of suspended solids and turbidity in effluents

(Agronomy Technical Note 4, November 2010)
Advantages

Compost filter socks provide many benefits when used as a stormwater management practice. Advantages include:

- No trenching is required, thereby no soil, plant, or root disturbance; and can be installed on severely compacted or frozen soils and paved surfaces.

- Compost filter socks are made from bio-based recycled, and locally available materials. recycled, and locally available materials.

Limitations

Although compost filter socks are quite versatile, this management practice does have limitations. If the compost quality is not maintained, particularly for biological stability and particle size distribution, performance may be severely diminished. If the land surface is not prepared correctly, the compost filter sock may not make sufficient ground contact. This condition may allow untreated stormwater to flow under the treatment. Compost filter socks should not be placed in perennial waterways or streams. Heavy equipment moving over compost filter socks may damage or greatly diminish their field performance and capacity. Although not required, compost filter socks should be used in conjunction with other integrated stormwater management practices. Finally, if installation guidelines are not followed or maintenance is not conducted, the compost filter sock may not perform at an optimum level.
Effectiveness

Compost filter socks have been extensively researched and evaluated at the USDA Agricultural Research Service (ARS) and universities. Research literature has shown that this management practice can physically filter fine and coarse sediment and chemically filter soluble pollutants from stormwater. A USDA ARS study showed that compost filter socks can remove 65 percent of clay and 66 percent of silt particulates; 74 percent of total coliform bacteria and 75 percent of E. coli; 37 percent to 72 percent of Cd, Cr, Cu, Ni, Pb, and Zn; 99 percent of diesel fuel; 84 percent of motor oil; 43 percent of gasoline; 17 percent of ammonium-N; and 11 percent of nitrate-N from stormwater runoff (Faucette et al. 2009a).

Another USDA ARS study reported that compost filtersocks removed 59 percent to 65 percent of total P, 14 percent to 27 percent of soluble P, 62 percent to 90 percent of total suspended solids (TSS), and 53 percent to 78 percent of turbidity in stormwater runoff (Faucette et al. 2008). A study published in the Journal of Soil and Water Conservation, conducted at the University of Georgia, compared the performance of compost filter socks, straw bales, and mulch berms, on field test plots. Compost filter socks reduced runoff TSS and turbidity by 76 percent and 29 percent, straw bales by 54 percent and 12 percent, and mulch berms by 51 percent and 8 percent, respectively (Faucette et al. 2009a).

An Ohio State University study evaluated the hydraulic flow-through rate for compost filter socks and silt fence. It was determined that compost filter socks have a 50 percent greater flow-through rate than silt fence without a reduction in sediment removal efficiency performance (Keener, Faucette, and Klingman 2007). Field evaluation of compost filter socks by the City of Chattanooga Water Quality Program reported that use of this management practice reduced parking lot stormwater TSS by 99 percent, chemical oxygen demand (COD) by 92 percent, and oil/grease by 74 percent (Faucette, Minkara, and Cardoso 2009).

Compost quality

Compost quality is extremely important for the function and performance of compost filter socks. Adherence to parameter range limits presented in table 1 will ensure compost material used for compost filter sock applications will meet associated design criteria and the unique advantages attributed to this management practice. It is recommended that compost is analyzed for these parameters using Test Methods for the Examination of Composting and Compost (TMECC) guidelines, test methods uniquely designed for evaluating compost quality. Furthermore, compost that has the U.S. Composting Council Seal of Testing Assurance (STA) label or third party testing and certification is preferred.

All compost should be odor free and have no recognizable original feedstock materials. Composts should adhere to Title 40 Code of Federal Regulations (CFR) Part 503, which ensures safe standards for pathogen reduction and heavy metals contents (table 1).

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Units of measure</th>
<th>Compost</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>pH units</td>
<td>6.0–8.0</td>
</tr>
<tr>
<td>Soluble salt concentration</td>
<td>dS/m (mmhos/cm)</td>
<td>Maximum 5</td>
</tr>
<tr>
<td>Moisture content</td>
<td>percent, wet weight basis</td>
<td>30-60</td>
</tr>
<tr>
<td>Organic matter content</td>
<td>percent, dry weight basis</td>
<td>25-65</td>
</tr>
<tr>
<td>Particle size</td>
<td>percent passing a selected mesh size, dry weight basis</td>
<td>2 in (51 mm) 100% passing −0.375 in (10 mm), 10%-30% passing</td>
</tr>
<tr>
<td>Biological stability</td>
<td>mg C02–C per gram of organic matter per day</td>
<td>&lt;8</td>
</tr>
<tr>
<td>Carbon dioxide evolution rate</td>
<td>percent, dry weight basis</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

Source: U.S. Environmental Protection Agency (2006)

Siting and design

Compost filter socks should be placed on contours, perpendicular to stormwater flow, and on prepared ground surfaces. Compost filter socks, used as a sediment control barrier, should be placed 5 feet (1.5 m) beyond the toe of the slope to allow runoff accumulation, sediment deposition, and maximum sediment storage. The ends of the compost filter socks should be pointed upslope to prevent untreated stormwater flow around the treatment. See table 2 for recommended spacing and diameter requirements of compost filter socks for a range of slopes (Keener, Faucette, and Klingman 2007). When used as a slope interruption management practice, compost filter socks should be placed horizontally on slopes with the ends of the compost filter sock pointing upslope. This practice will reduce sheet flow velocity, dissipate sheet flow, and reduce sediment and runoff. (Agronomy Technical Note 4, November 2010)
flow energy, and reduce soil erosion. Slope interruption practices can be used to reduce slope lengths for LS factors when predicting site soil loss with RUSLE 2.

Compost filter socks, used as a check dam (fig. 3) management practice, in swales, channels, and ditches, should have the center of the check dam at least 6 inches (150 mm) lower than the banks. Spacing check dams closer together will reduce flow velocity and bed erosion and increase pollutant removal. Compost filter socks used as check dams may be placed in a straight line across the channel, in a V formation or an inverted V formation, as determined by the designer.

When used as a drain inlet protection practice, the compost filter sock should be placed entirely in the sump, fully envelop the drain, and be placed on level ground to allow maximum runoff and sediment storage capacity. When used for curb inlet protection, the compost filter sock should not exceed the height of the intake opening or curb (fig. 4).

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Recommended spacing and diameter requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum slope length above compost filter sock in ft (m)</td>
</tr>
<tr>
<td></td>
<td>Diameter of compost filter sock required</td>
</tr>
<tr>
<td>Slope %</td>
<td>8-inch (200-mm)</td>
</tr>
<tr>
<td>2 (or less)</td>
<td>300 (90)</td>
</tr>
<tr>
<td>5</td>
<td>200 (60)</td>
</tr>
<tr>
<td>10</td>
<td>100 (30)</td>
</tr>
<tr>
<td>15</td>
<td>70 (20)</td>
</tr>
<tr>
<td>20</td>
<td>50 (15)</td>
</tr>
<tr>
<td>25</td>
<td>40 (12)</td>
</tr>
<tr>
<td>30</td>
<td>30 (9)</td>
</tr>
<tr>
<td>35</td>
<td>30 (9)</td>
</tr>
<tr>
<td>40</td>
<td>30 (9)</td>
</tr>
<tr>
<td>45</td>
<td>20 (6)</td>
</tr>
<tr>
<td>50</td>
<td>20 (6)</td>
</tr>
</tbody>
</table>

If used as a biofiltration enclosure (fig. 5), cell, or ring, the compost filter sock should be placed on level ground and should not be filled beyond 50 percent of its volumetric capacity. Compost filter socks may be stacked to increase volumetric design capacity.

(Agronomy Technical Note 4, November 2010)
Installation

Following installation guidelines is essential for proper field function and optimum performance of compost filter socks. No trenching is required. Compost filter socks may be placed on bare soil, grass, erosion control blankets, or paved surfaces.

- Land surface should be prepared by mowing grass or making soil or paved surfaces smooth.
- Compost filter socks shall be placed perpendicular to stormwater flow, across the slope, swale, ditch, or channel.
- Compost filter socks shall be placed on contours.
- On soil and begetated surfaces, under sheet flow conditions, compost filter socks shall be staked on 10-foot (3 m) centers. Under concentrated flow conditions compost filter socks shall be staked on 5-foot (1.5 m) centers.
- Stakes shall be driven through the center of the compost filter sock and installed a minimum of 8 inches (200 mm) into the existing soil, leaving a minimum stake height of 2 inches (50 mm) above the compost filter sock.
- Stakes shall be 2 inches (50 mm) by 2 inches (50 mm) hardwood stakes; for severe runoff or sedimentation conditions or loose soil conditions, such as fill slopes, metal stakes can be used.
- Loose compost may be used to backfill the compost filter sock to connect the ground and compost filter sock interface.
- Edges of the compost filter socks shall be turned upslope to prevent flow around the ends of the compost filter socks.
- Compost filter socks may be installed on top of any erosion control blanket.
- If used as a check dam, the center of the compost filter sock shall be a minimum of 6 inches (150 mm) below the bank of the swale or channel.
- If used as a drain inlet protector, compost filter socks shall fully enclose the drain.
- If used as a curb inlet protector, compost filter socks shall not be higher than the height of the curb.
- If used as a solids separator or dewatering device, the compost filter socks, the compost filter socks shall be placed in a ring and fully enclose polluted effluent or manure slurry.
- Compost filter socks may be seeded for permanent, LID, and in situ biofiltration applications.

Maintenance

Compost filter socks should be inspected regularly after runoff events to ensure proper function and performance. If hydraulic flow-through becomes restricted, an additional compost filter sock can be placed on top of the original to prevent over topping. Sediment should be removed once it reaches half the height of the compost filter sock. An additional compost filter sock may be installed on top of the original to increase sediment storage capacity or to prevent sediment disturbance.

If a compost filter sock becomes dislodged or is damaged, it should be repaired or replaced immediately. If the compost filter sock is used for a temporary application, the compost material may be spread over the landscape or incorporated into the soil at the end of the project, thereby increasing soil quality and reducing waste. The sock mesh should be properly disposed unless a biodegradable material is used.

(Agronomy Technical Note 4, November 2010)
Conclusion

Soil organic matter is one of nature’s natural storm-water filtration systems. This natural material allows water to pass through while trapping and removing harmful substances that degrade water quality. The compost filter sock, soil organic matter in a tube, harnesses the natural filtration process, and mitigates organic and inorganic pollutants created by human activity. Proper planning and the use of low-impact development will limit soil disturbance and reduce transport of nonpoint source pollutants to surface waters.

The Soils for Salmon (2010) urban stormwater program provides preventative guidelines, methods, and practices for building soils and reducing nonpoint source pollutants.

Compost filter socks should be applied as part of a comprehensive system approach to site stormwater management. Although no single management practice can mitigate the impacts of urbanization or soil disturbance, the compost filter sock is an excellent tool for filtering and reducing nonpoint source pollutants.

Table 3 is a list of applications in accordance with U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) National Conservation Practice Standards (CPS) where compost filter socks may be used.

<table>
<thead>
<tr>
<th>NRCS Conservation Practice Standard</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Area Planting</td>
<td>(342)</td>
</tr>
<tr>
<td>Channel Stabilization</td>
<td>(584)</td>
</tr>
<tr>
<td>Diversion</td>
<td>(362)</td>
</tr>
<tr>
<td>Grade Stabilization Structure</td>
<td>(410)</td>
</tr>
<tr>
<td>Land Reclamation</td>
<td>(453, 455, 543)</td>
</tr>
<tr>
<td>Lined Waterway or Outlet</td>
<td>(468)</td>
</tr>
<tr>
<td>Recreation Area Improvement</td>
<td>(562)</td>
</tr>
<tr>
<td>Recreation Trail and Walkway</td>
<td>(568)</td>
</tr>
<tr>
<td>Runoff Management System</td>
<td>(570)</td>
</tr>
<tr>
<td>Streambank and Shoreline Protection</td>
<td>(580)</td>
</tr>
<tr>
<td>Vegetative Barrier</td>
<td>(601)</td>
</tr>
</tbody>
</table>

References


(Agronomy Technical Note 4, November 2010)
Construction Site Stormwater Runoff Control

Compost Filter Socks

Description

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 threedimensional 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 feedstocks, including municipal yard trimmings, food residuals, separated municipal solid waste, biosolids, and manure.

Compost filter socks are generally placed along the perimeter of a site, or at intervals along a slope, to capture and treat stormwater 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 stormwater 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 stormwater inlet protection.

Compost filter socks can be vegetated or unvegetated. Vegetated filter socks can be left in place to provide long-term filtration of stormwater as a postconstruction 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 stormwater, rather than letting the filtered stormwater 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 stormwater 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 stormwater BMPs 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. Biosolids compost must meet the Standards for Class A biosolids 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 (www.tmecc.org/sta/index.html).

The nutrient and metal content of some composts are higher than some topsoils. This, however, does not necessarily translate into higher metals and nutrient concentrations or loads in stormwater runoff. A recent study by Glanville, et al. (2003) compared the stormwater 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 topsoils 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 hydroseed 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 (DOTs) 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 stormwater 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

<table>
<thead>
<tr>
<th>Parameters a,1,4</th>
<th>Units of Measure a</th>
<th>Vegetated Filter Berm/Sock b</th>
<th>Unvegetated Filter Sock b</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH²</td>
<td>pH units</td>
<td>5.0 – 8.5</td>
<td>6 – 8</td>
</tr>
<tr>
<td>Concentration² (electrical conductivity)</td>
<td>dS/m (mmhos/cm)</td>
<td>Maximum 5</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Moisture content</td>
<td>%, wet weight basis</td>
<td>30 – 60</td>
<td>30 – 60</td>
</tr>
<tr>
<td>Organic matter content</td>
<td>%, dry weight basis</td>
<td>25 – 60</td>
<td>25 – 65</td>
</tr>
<tr>
<td>Particle size</td>
<td>% passing a selected mesh size, dry weight basis</td>
<td>- 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 rate situations - 2 in. (51 mm), 100% passing - 0.375 in. (10 mm), 10% – 30% passing</td>
<td></td>
</tr>
<tr>
<td>Stability³ Carbon dioxide evolution rate</td>
<td>mg CO₂-C per gram of organic matter per day</td>
<td>&lt;8</td>
<td>(same as vegetated)</td>
</tr>
<tr>
<td>Physical contaminants (manmade inerts)</td>
<td>%, dry weight basis</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

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

Notes:

1. Recommended test methodologies are provided in (www.tmecc.org/tmecc/).
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

<table>
<thead>
<tr>
<th>Slope</th>
<th>Slope Length (feet)</th>
<th>Sock Diameter (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50:1</td>
<td>250</td>
<td>12</td>
</tr>
<tr>
<td>50:1-10:1</td>
<td>125</td>
<td>12</td>
</tr>
<tr>
<td>10:1-5:1</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td>3:1-2:1</td>
<td>50</td>
<td>18</td>
</tr>
<tr>
<td>&gt;2:1</td>
<td>25</td>
<td>18</td>
</tr>
</tbody>
</table>

### 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 stormwater 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 stormwater 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 stormwater (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 BMPs and often are more effective. Compost filter socks are often used in conjunction with compost blankets to form a stormwater management system. Together, these two BMPs retain a very high volume of stormwater, sediment, and other pollutants.

The compost in the filter sock can also improve water quality by absorbing various organic and inorganic contaminants from stormwater, 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 stormwater (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 stormwater.

Cost Considerations

The Texas Commission on Environmental Quality reports that the cost of a 12-inch diameter compost filter sock ranges from $1.40 to $1.75 per linear foot when used as a perimeter control (McCoy, 2005). The costs for an 18-inch diameter sock used as a check dam range from $2.75 to $4.75 per linear foot (McCoy, 2005). These costs do not include the cost of removing the compost filter sock and disposing of the mesh once construction activities are completed; however, filter socks are often left on site to provide slope stability and postconstruction stormwater 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


AASHTO. 2003 Standard Specifications for Transportation Materials and Methods of Sampling and Testing, Designation MP-9, Compost for Erosion/Sediment Control (Filter Berms), Provisional, American Association of State Highway Officials, Washington, D.C.


Personal communications, 2005. Industry representatives were interviewed regarding the particle size and composition of composts currently used in vegetated and unvegetated filter socks. These representatives included Britt Faucette and Rod Tyler of Filtrexx, International, LLC; Nora Goldstein of BioCycle, Journal of Composting & Organics Recycling; and Ron Alexander of R. Alexander Associates, Inc.


Filter Berms and Filter Socks: Standard Specifications for Compost for Erosion/Sediment Control

Completed by:
Ron Alexander
1212 Eastham Drive
Apex, NC 27502
Telephone - 919-367-8350
Fax - 919-367-8351
E-mail - alexassoc@earthlink.net
Website - www.alexassoc.net

* These specifications contain all of the technical text found in the ‘Official’ American Association of State Highway & Transportation Officials (AASHTO) versions found in their 2003 AASHTO Provisional Standards manual. The Compost for Erosion/Sediment Control ‘Filter Berms’ is designated as specification MP 9 - 03, and the ‘Compost Blankets’ as specification MP 10 - 03. For copy of the official AASHTO specifications, contact AASHTO’s Publications and Communications Technical Assistant at 202-624-5800

SCOPE

This specification covers compost produced from various organic by-products for use as a filter berm or filter sock media for erosion/sediment control. The technique described in this specification is primarily used for temporary erosion/sediment control applications, where perimeter controls are required or necessary.

The compost berm technology is appropriate for slopes up to a 2:1 grade (horizontal distance : vertical distance) and on level surfaces and should only be used in areas that have sheetflow drainage patterns (not areas that receive concentrated flows).

The filter sock technology is appropriate for areas outlined in Section 1.2 as well as areas of high sheet erosion, around inlets, and in other disturbed areas of construction sites requiring sediment control. Unlike filter berms, the filter sock technology may be used in areas that have concentrated flow drainage patterns, up to 10 gallons per minute per linear foot of filter sock.

GENERAL DESCRIPTION

Compost is the product resulting from the controlled biological decomposition of organic material, occurring under aerobic conditions, that has been sanitized through the generation of heat and stabilized to the point that it is appropriate for its particular application. Active composting is typically characterized by a high-temperature phase that sanitizes the product and allows a high rate of decomposition, followed by a lower-temperature phase that allows the product to stabilize while still decomposing at a slower rate. Compost should possess no objectionable odors or substances toxic to plants, and shall not resemble the raw material from which it was derived. Compost contains plant nutrients but is typically not characterized as a fertilizer.

Compost may be derived from a variety of feedstocks, including agricultural, forestry, food, or industrial residuals; biosolids (treated sewage sludge); leaf and yard trimmings; manure; tree wood; or source-separated or mixed solid waste. Proper thermophilic composting, meeting the US Environmental Protection Agency’s definition for a ‘process to further reduce pathogens’ (PFRP), will effectively reduce populations of human and plant pathogens, as well as destroy noxious weed seeds and propagules.

Compost is typically characterized as a finely screened and stabilized product that is used as a soil amendment. However, most composts also contain a wood based fraction (e.g., bark, ground brush and tree wood, wood chips, etc.) which is typically removed before use as a soil amendment. This coarser, woody fraction of compost plays an important role when compost is used in erosion and sediment control. It is even possible to add fresh, ground bark or composted, properly sized wood based materials to a compost product, as necessary, to improve its efficacy in this application.

Compost products acceptable for this application must meet the chemical, physical and biological properties outlined in the following section.

CHEMICAL, PHYSICAL AND BIOLOGICAL PARAMETERS

Compost products specified for use in this application must meet the criteria specified in Table 1. The products' parameters will vary based on whether vegetation will be established on the filter berm or if it will be self contained in a filter sock.

Only compost products that meet all applicable state and federal regulations pertaining to its production and distribution may be used in this application. Approved compost products must meet related state and federal chemical contaminant (e.g., heavy metals, pesticides, etc.) and pathogen limits pertaining to the feedstocks (source materials) in which it is derived.
Table 1 – Filter Berm and Filter Sock Media Parameters

<table>
<thead>
<tr>
<th>Parameters&lt;sup&gt;1,4&lt;/sup&gt;</th>
<th>Reported as (units of measure)</th>
<th>Filter Berm to be Vegetated</th>
<th>Filter Berm to be left Un-vegetated</th>
<th>Filter Sock Media</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH&lt;sup&gt;2&lt;/sup&gt;</td>
<td>pH units</td>
<td>5.0 - 8.5</td>
<td>N/A</td>
<td>5.0 – 8.5</td>
</tr>
<tr>
<td>Soluble Salt Concentration&lt;sup&gt;2&lt;/sup&gt; (electrical conductivity)</td>
<td>dS/m (mmhos/cm)</td>
<td>Maximum 5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Moisture Content</td>
<td>%, wet weight basis</td>
<td>30 – 60</td>
<td>30 – 60</td>
<td>&lt;60</td>
</tr>
<tr>
<td>Organic Matter Content</td>
<td>%, dry weight basis</td>
<td>25 – 65</td>
<td>25 – 100</td>
<td>25 – 100</td>
</tr>
</tbody>
</table>
| Particle Size            | % passing a selected mesh size, dry weight basis | • 3” (75 mm), 100% passing  
• 1” (25mm), 90% to 100% passing  
• 3/4” (19mm), 70% to 100% passing  
• 1/4” (6.4mm), 30% to 75% passing  
Maximum:  
• particle size length of 6” (152mm)  
(no more than 60% passing 1/4” (6.4 mm) in high rainfall/flow rate situations) | • 3” (75 mm), 100% passing  
• 1” (25mm), 90% to 100% passing  
• 3/4” (19mm), 70% to 100% passing  
• 1/4” (6.4mm), 30% to 75% passing  
Maximum:  
• particle size length of 6” (152mm)  
(no more than 50% passing 1/4” (6.4 mm) in high rainfall/flow rate situations) | • 2” (50 mm) 99% passing  
• 3/8” (10 mm), 30-50% passing (or 50-70% retained)  
Maximum:  
• 2” |
| Stability<sup>3</sup>     | mg CO2-C per g OM per day     | <8                          | N/A                               | N/A               |
| Physical Contaminants (man-made inerts) | %, dry weight basis | 1                           | <1                               | <1                |

1 Recommended test methodologies are provided in Test Methods for the Examination of Composting and Compost (TMECC, The US Composting Council)

2 Each specific plant species requires a specific pH range. Each plant also has a salinity tolerance rating, and maximum tolerable quantities are known. When specifying the establishment of any plant or turf species, it is important to understand their pH and soluble salt requirements, and how they relate to the compost in use.

3 Stability/Maturity rating is an area of compost science that is still evolving, and as such, other various test methods could be considered. Also, never base compost quality conclusions on the result of a single stability/maturity test.

4 Landscape architects and project (field) engineers may modify the allowable compost specification ranges based on specific field conditions and plant requirements.
Very coarse (woody) composts that contain less than 30% of fine particles (1mm in size) should be avoided if optimum reductions in total suspended solids (TSS) is desired or if the berm is to be seeded.

In regions subjected to higher rates of precipitation and/or greater rainfall intensity, larger compost filter berms or filter socks should be used. In these particular regions, coarser compost products are preferred as the filter berm must allow for an improved water percolation rate. Design note: Engineers should inquire as to the flow rate per linear foot of filter sock in order to ensure drainage rate of tool being used is in accordance with total watershed management plan. Required flow through rates are outlined in Table 2.

**Table 2 – Suggested Compost Filter Sock Flow Rates**

<table>
<thead>
<tr>
<th>Annual Rainfall/Flow Rate</th>
<th>Flow Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>4-6 gallons/minute</td>
</tr>
<tr>
<td>Average</td>
<td>6-10 gallons/minute</td>
</tr>
<tr>
<td>High</td>
<td>&gt;10 gallons/minute</td>
</tr>
</tbody>
</table>

**FIELD APPLICATION**

The following steps shall be taken for the proper installation of compost as a filter berm or filter sock media for erosion/sediment control on both level and sloped areas. Either device should be placed as prescribed on the engineering plans.

**Filter Berms**

Parallel to the base of the slope, or around the perimeter of affected areas, construct a trapezoidal berm at the dimensions specified in Table 3. In general, when compost filter berms are used to control erosion/sediment near, or on a slope, the base of the berm should be twice the height of the berm. Compost shall be applied to the dimensions specified in Table 3.

**Table 3 – Compost Filter Berm Dimensions**

<table>
<thead>
<tr>
<th>Annual Rainfall/Flow Rate</th>
<th>Total Precipitation &amp; Rainfall Erosivity Index</th>
<th>Dimensions for the Compost Filter Berm (height x width)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>1-25” , 20-90</td>
<td>1’ x 2’ – 1.5’ x 3’ (30 cm x 60 cm – 45 cm x 90 cm)</td>
</tr>
<tr>
<td>Average</td>
<td>26-50” , 91-200</td>
<td>1’ x 2’ - 1.5’ x 3’ (30 cm x 60 cm – 45 cm x 90 cm)</td>
</tr>
<tr>
<td>High</td>
<td>51” and above, 201 and above</td>
<td>1.5’x 3’ – 2’ x 4’ (45 cm x 90 cm – 60 cm x 120 cm)</td>
</tr>
</tbody>
</table>

Compost filter berm dimensions should be modified based on specific site (e.g., soil characteristics, existing vegetation) and climatic conditions, as well as particular project related requirements. The severity of slope grade, as well as slope length will also influence the size of the berm.

In regions subjected to higher rates of precipitation and/or rainfall intensity, as well as spring snow melt, larger berms should be used. In these regions, and on sites possessing severe grades or long slope lengths, berms possessing a larger dimension may be used. Berms may be placed at the top and the base of the slope, a series of berms may be constructed down the profile of the slope (15-25’ apart), or berms may be used in conjunction with a compost blanket (surface applied compost). In these particular regions, as well as regions subject to wind erosion, coarser compost products are also preferred for use in filter berm construction.

In regions subject to lower rates of precipitation and/or rainfall intensity, smaller berms may be used. However, the minimum filter berm dimensions shall be 1’ high (30 cm) by 2’ wide (60 cm).
Note: specific regions may receive higher rainfall rates, but this rainfall is received through low intensity rainfall events (e.g., the Northwestern U.S.). These regions may use smaller berms.

Larger berms should also be used where required to be in place and functioning for more than one year.

Compost shall be uniformly applied using an approved spreader unit; including pneumatic blowers, specialized berm machines, etc. When applied, the compost should be directed at the soil surface, compacting (settling) and shaping the berm to some degree. The filter berm may also be applied by hand when approved by the Project Engineer or Landscape Architect/Designer.

On highly unstable soils, use compost filter berms in conjunction with appropriate structural measures. If used in conjunction with a silt fence, the silt fence fabric shall be laid on the soil surface with the lip facing the slope. The compost filter berm shall be constructed at the base of the silt fence (downhill side) and over the entire fence fabric lip.

Seeding the berm may be done, if desired, in conjunction with pneumatic blowing, or following berm construction with a hydraulic seeding unit, or by hand.

**FILTER SOCKS**

Filter socks shall either be made on site or delivered to the jobsite. The filter sock shall be produced from a 5 mil thick continuous HDPE filament, woven into a tubular mesh netting material, with openings in the knitted mesh of 3/8” (10mm). This shall then be filled with compost meeting the specifications outlined in Table 1 to the diameter of the sock. Filter sock netting materials are also available in biodegradable plastics for areas where removal and disposal are not planned. Filter socks contain the compost, allowing filtration to occur even during peak storm events and concentrated flows.

Filter socks will be placed at locations indicated on plans as directed by the engineer. Filter socks should be installed parallel to the base of the slope or other affected area, perpendicular to sheet flow. In extreme conditions (i.e., 2:1 slopes), or when sheet flow flows to the area from a parcel above the work zone, a second sock shall be constructed at the top of the slope in order to dissipate flows.

On location where greater than a 200-foot long section of ground is to be treated with a filter sock, the sock lengths should be sleeved. After one sock section (200 feet) is filled and tied off (knotted) or zip tied, the second sock section shall be pulled over the first (1-2 feet) and ’sleeved’ creating a overlap. Once overlapped, the second section is filled with compost starting at the sleeved area to create a seamless appearance. The socks may be staked at the overlapped area (where the sleeve is) to keep the sections together. Sleeveing at the joints is necessary because it reduces the opportunity for water to penetrate the joints when installed in the field.

In general, 12” diameter filter sock will replace normal (24”) silt fences and 18” diameter filter sock will replace ‘super silt’ (36”) silt fences reinforced with steel posts.

If the filter sock is to be left as a permanent filter or part of the natural landscape, it may be seeded at time of installation for establishment of permanent vegetation. The Engineer shall specify seed requirements.

Filter socks may be used in direct flow situations perpendicular to runoff channels not exceeding 3 feet (90 cm) in depth. Normally, 8” filter socks should be used. Be sure to stake the filter sock perpendicular to water flow, at a minimum interval of 10 linear feet, using a 2” (5 cm) by 2” (5 cm) wooden stakes. The stakes should be projected through the center of the filter sock and into the soil 1’ (30 cm) foot deep, and leaving 3” to 4” (7.5 to 10 cm) protruding above the Filter sock.

**TEST METHODS**

The chemical, physical and biological analysis of the compost shall be determined in accordance with the Test Methods for the Examination of Compost and Composting (TMECC), jointly published by the US Department of Agriculture and the US Composting Council (2002 publishing as a part of the USDA National Resource Conservation Technical Bulletin Series). (See Appendix A.)

ASTM D 2977, Standard Test Method for Particle Size Range of Peat Materials for Horticultural Purposes shall be used to determine gradation of the compost.
SAMPLING, INSPECTION, PACKING, AND MARKING

The sampling, testing, packing, and marking of compost samples shall be done in accordance with TMECC 02.01-B (Selection of Sampling Locations for Windrows and Piles).

KEYWORDS

Compost, filter socks, compost logs, compost tubes, filter tubes, filter logs, compost wattles, compost socks, erosion control, sediment control, filter berm, sheet flow.

APPENDIX FOR SPECIFICATIONS

METHODS FOR THE SAMPLING AND CHARACTERIZATION OF COMPOST

Sampling procedures to be used for purposes of this specification (and the Seal of Testing Assurance program) are as provided in 02.01 Field Sampling of Compost Materials, 02.01-B Selection of Sampling Locations for Windrows and Piles of the Test Methods for the Examination of Compost and Composting (TMECC), Chapter 2, Section One, Sample Collection and Laboratory Preparation, jointly published by the USDA and USCC (2002 publishing as a part of the USDA National Resource Conservation Technical Bulletin Series). The sample collection section is available online at http://tmecc.org/tmecc/.

Test Methods to be used for purposes of this specification are as provided in The Test Methods for the Examination of Compost and Composting (TMECC), Jointly published by the USDA and USCC (2002 publishing as a part of the USDA National Resource Conservation Technical Bulletin Series). A list of such methods is provided in the table below and online at http://tmecc.org/tmecc/.

<table>
<thead>
<tr>
<th>Compost Parameters</th>
<th>Reported as</th>
<th>Test Method</th>
<th>Test Method Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td></td>
<td>TMECC 04.11-A</td>
<td>Electrometric pH Determinations for Compost. 1:5 Slurry Method</td>
</tr>
<tr>
<td>Soluble salts</td>
<td>dS/m (mmhos/cm)</td>
<td>TMECC 04.10-A</td>
<td>Electrical Conductivity for Compost. 1:5 Slurry Method (Mass Basis)</td>
</tr>
<tr>
<td>Primary plant nutrients:</td>
<td>%, as-is (wet) &amp; dry weight basis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Total N</td>
<td>TMECC 04.02-D</td>
<td>Nitrogen. Total Nitrogen by Combustion</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>P2O5</td>
<td>TMECC 04.03-A</td>
<td>Phosphorus. Total Phosphorus</td>
</tr>
<tr>
<td>Potassium</td>
<td>K2O</td>
<td>TMECC 04.04-A</td>
<td>Potassium. Total Potassium</td>
</tr>
<tr>
<td>Calcium</td>
<td>Ca</td>
<td>TMECC 04.04-Ca</td>
<td>Secondary and Micro-Nutrient Content. Calcium</td>
</tr>
<tr>
<td>Magnesium</td>
<td>Mg</td>
<td>TMECC 04.04-Mg</td>
<td>Secondary and Micro-Nutrient Content. Magnesium</td>
</tr>
<tr>
<td>Moisture content</td>
<td>%, wet weight basis</td>
<td>TMECC 03.09-A</td>
<td>Total Solids and Moisture at 70±5°C</td>
</tr>
<tr>
<td>Organic matter content</td>
<td>%, dry weight basis</td>
<td>TMECC 05.07-A</td>
<td>Matter Method. Loss On Ignition Organic Matter Method</td>
</tr>
<tr>
<td>Particle size</td>
<td>Screen size passing through</td>
<td>TMECC 02.12-B</td>
<td>Laboratory Sample Preparation. Sample Sieving for Aggregate Size Classification.</td>
</tr>
<tr>
<td>Stability (respirometry)</td>
<td>mg CO2-C per g TS per day</td>
<td>TMECC 05.08-B</td>
<td>Respirometry. Carbon Dioxide Evolution Rate</td>
</tr>
<tr>
<td>Maturity (Bioassay)</td>
<td>% (average)</td>
<td>TMECC 05.05-A</td>
<td>Biological Assays. Seedling Emergence and Relative Growth</td>
</tr>
<tr>
<td>Percent Emergence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative Seedling Vigor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


ASTM Standards:
• D 2977, Standard Test Method for Particle Size Range of Peat Materials for Horticultural Purposes.

US EPA Test Methods:

TMECC Sampling and Test Methods:
• Test Methods for the Examination of Compost and Composting (TMECC), Jointly published by the USDA and USCC (2002 publishing as a part of the USDA National Resource Conservation Technical Bulletin Series).

Other Standards:


* These specifications contain all of the technical text found in the 'Official' American Association of State Highway & Transportation Officials (AASHTO) versions found in their 2003 AASHTO Provisional Standards manual. The Compost for Erosion / Sediment Control 'Filter Berms' is designated as specification MP 9 - 03, and the 'Compost Blankets' as specification MP 10 - 03. For copy of the official AASHTO specifications, contact AASHTO's Publications and Communications Technical Assistant at 202-624-5800

This material is based on work supported by the Federal Highway Administration under Cooperative Agreement Number DTFH61-98-X-00095 through the Recycled Materials Resource Center at the University of New Hampshire, Durham, New Hampshire.

1. PURPOSE & DESCRIPTION
Filtrexx® SiltSoxx™ are a three-dimensional tubular sediment control and storm water runoff filtration device typically used for perimeter control of sediment and other soluble pollutants (such as phosphorus and petroleum hydrocarbons), on and around construction activities.

2. APPLICATION
Filtrexx® SiltSoxx™ are to be installed down slope of any disturbed area requiring erosion and sediment control and filtration of soluble pollutants from runoff. SiltSoxx™ are effective when installed perpendicular to sheet or low concentrated flow. Acceptable applications include:
- Site perimeters
- Above and below exposed and erodable slopes
- Around area drains or inlets located in a ‘sump’
- On compacted soils where trenching of silt fence is difficult or impossible
- Around sensitive trees where trenching of silt fence is not beneficial for tree survival or may unnecessarily disturb established vegetation.
- On frozen ground where trenching of silt fence is impossible.
- On paved surfaces where trenching of silt fence is impossible.

3. INSTALLATION
1. SiltSoxx™ are used for perimeter control of sediment and soluble pollutants in storm runoff shall meet Filtrexx® Soxx™ Material Specifications and use Certified Filtrexx® FilterMedia™.
2. SiltSoxx™ will be placed at locations indicated on plans as directed by the Engineer.
3. SiltSoxx™ should be installed parallel to the base of the slope or other disturbed area. In extreme conditions (i.e., 2:1 slopes), a second SiltSoxx™ shall be constructed at the top of the slope.
4. Effective SiltSoxx™ height in the field should be as follows: 8” Diameter SiltSoxx™ = 6.5” high, 12” Diameter SiltSoxx™ = 9.5” high, 18” Diameter SiltSoxx™ = 14.5” high, 24” Diameter SiltSoxx™ = 19” high.
5. Stakes shall be installed through the middle of the Sediment control on 10 ft (3m) centers, using 2 in (50mm) by 2 in (50mm) by 3 ft (1m) hard wood stakes. In the event staking is not possible, i.e., when SiltSoxx™ are used on pavement, heavy concrete blocks shall be used behind the SiltSoxx™ to help stabilize during rainfall/runoff events.
6. Staking depth for sand and silt loam soils shall be 12 in (300mm), and 8 in (200mm) for clay soils.
7. Loose compost may be backfilled along the upslope side of the SiltSoxx™, filling the seam between the soil surface and the device, improving filtration and sediment retention.
8. If the SiltSoxx™ are to be left as a permanent filter or part of the natural landscape, it may be seeded at time of installation for establishment of permanent vegetation. The Engineer will specify seed requirements.
9. Filtrexx® SiltSoxx™ are not to be used in perennial, ephemeral, or intermittent streams. See design drawing schematic for correct Filtrexx® SiltSoxx™ installation (Figure 1.1).

4. INSPECTION AND MAINTENANCE
Routine inspection should be conducted within 24 hrs of a runoff event or as designated by the inspector to make sure they maintain their shape and are producing adequate hydraulic flow-through. If
ponding becomes excessive, additional SiltSoxx™ may be required to reduce effective slope length or sediment removal may be necessary. SiltSoxx™ shall be inspected until area above has been permanently stabilized and construction activity has ceased.

1. The Contractor shall maintain the SiltSoxx™ in a functional condition at all times and it shall be routinely inspected.
2. If the SiltSoxx™ have been damaged, it shall be repaired, or replaced if beyond repair.
3. The Contractor shall remove sediment at the base of the upslope side of the SiltSoxx™ when accumulation has reached 1/2 of the effective height of the SiltSoxx™, or as directed by the Engineer. Alternatively, a new SiltSoxx™ can be placed on top of and slightly behind the original one creating more sediment storage capacity without soil disturbance.
4. SiltSoxx™ shall be maintained until disturbed area above the device has been permanently stabilized and construction activity has ceased.
5. The FilterMediatm will be dispersed on site once disturbed area has been permanently stabilized, construction activity has ceased, or as determined by the Engineer.
6. For long-term sediment and pollution control applications, SiltSoxx™ can be seeded at the time of installation to create a vegetative filtering system for prolonged and increased filtration of sediment and soluble pollutants (contained vegetative filter strip). The appropriate seed mix shall be determined by the Engineer.

<table>
<thead>
<tr>
<th>Slope Percent</th>
<th>Maximum Slope Length Above SiltSoxx™ in Feet (meters)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8 in (200 mm) SiltSoxx™</td>
</tr>
<tr>
<td>2 (or less)</td>
<td>600 (180)</td>
</tr>
<tr>
<td>5</td>
<td>400 (120)</td>
</tr>
<tr>
<td>10</td>
<td>200 (60)</td>
</tr>
<tr>
<td>15</td>
<td>140 (40)</td>
</tr>
<tr>
<td>20</td>
<td>100 (30)</td>
</tr>
<tr>
<td>25</td>
<td>80 (24)</td>
</tr>
<tr>
<td>30</td>
<td>60 (18)</td>
</tr>
<tr>
<td>35</td>
<td>60 (18)</td>
</tr>
<tr>
<td>40</td>
<td>60 (18)</td>
</tr>
<tr>
<td>45</td>
<td>40 (12)</td>
</tr>
<tr>
<td>50</td>
<td>40 (12)</td>
</tr>
</tbody>
</table>

* Based on a failure point of 36 in (0.9 m) super silt fence (wire reinforced) at 1000 ft (303 m) of slope, watershed width equivalent to receiving length of sediment control device, 1 in/24 hr (25 mm/24 hr) rain event.

** Effective height of SiltSoxx™ after installation and with constant head from runoff as determined by Ohio State University.
**Table 1.1. Filtrexx® Soxx™ Material Specifications**

<table>
<thead>
<tr>
<th>Material Type</th>
<th>5 mil HDPE</th>
<th>5 mil HDPE</th>
<th>Multi-Filament Polypropylene (HDPP)</th>
<th>Multi-Filament Polypropylene SafteySoxx™</th>
<th>Multi-Filament Polypropylene DuraSoxx®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Characteristics</td>
<td>Photodegradable</td>
<td>Biodegradable</td>
<td>Photodegradable</td>
<td>Photodegradable</td>
<td>Photodegradable</td>
</tr>
<tr>
<td>Design Diameters</td>
<td>5 in (125mm), 8 in (200mm), 12 in (300mm), 18 in (400mm)</td>
<td>8 in (200mm), 12 in (300mm), 18 in (400mm), 24 in (600mm), 32 in (800mm)</td>
<td>8 in (200mm), 12 in (300mm), 18 in (400mm), 24 in (600mm), 32 in (800mm)</td>
<td>8 in (200mm), 12 in (300mm), 18 in (400mm), 24 in (600mm), 32 in (800mm)</td>
<td>8 in (200mm), 12 in (300mm), 18 in (400mm), 24 in (600mm), 32 in (800mm)</td>
</tr>
<tr>
<td>Mesh Opening</td>
<td>3/8 in (10mm)</td>
<td>3/8 in (10mm)</td>
<td>3/8 in (10mm)</td>
<td>1/8 in (3mm)</td>
<td>1/8 in (3mm)</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>26 psi (1.83 kg/cm²)</td>
<td>26 psi (1.83 kg/cm²)</td>
<td>44 psi (3.09 kg/cm²)</td>
<td>202 psi (14.2 kg/cm²)*</td>
<td>202 psi (14.2 kg/cm²)*</td>
</tr>
<tr>
<td>% Original Strength from Ultraviolet Exposure (ASTM G-155)</td>
<td>23% at 1000 hr</td>
<td>ND</td>
<td>100% at 1000 hr</td>
<td>100% at 1000 hr</td>
<td>100% at 1000 hr</td>
</tr>
<tr>
<td>Functional Longevity/ Project Duration</td>
<td>9 mo-3 yr</td>
<td>6-12 months</td>
<td>1-4 yr</td>
<td>2-5 yr</td>
<td>2-5 yr</td>
</tr>
</tbody>
</table>

* Tested at Texas Transportation Institute/Texas A&M University (ASTM 5035-95).

**Table 1.2. Filtrexx® Sediment Control Performance and Design Specifications Summary**

<table>
<thead>
<tr>
<th>Design Diameter</th>
<th>Design &amp; Performance</th>
<th>Effective Height</th>
<th>Effective Circumference</th>
<th>Density (when filled)</th>
<th>Maximum Continuous Length</th>
<th>Staking Requirement</th>
<th>Maintenance Requirement (sediment accumulation removal at X height)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 in (200mm)</td>
<td>12 in (300mm)</td>
<td>18 in (450mm)</td>
<td>24 in (600mm)</td>
<td>32 in (800mm)</td>
<td>Testing Lab/ Reference</td>
<td>Publication(s)</td>
<td></td>
</tr>
<tr>
<td>6.5 in (160mm)</td>
<td>9.5 in (240mm)</td>
<td>14.5 in (360mm)</td>
<td>19 in (480mm)</td>
<td>26 in (650mm)</td>
<td>The Ohio State University, Ohio Agricultural Research &amp; Development Center</td>
<td>Transactions of the American Society of Agricultural &amp; Biological Engineers, 2006</td>
<td></td>
</tr>
<tr>
<td>25 in (630mm)</td>
<td>38 in (960mm)</td>
<td>57 in (1450mm)</td>
<td>75 in (1900mm)</td>
<td>100 in (2500mm)</td>
<td>Soil Control Lab, Inc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 lbs/ft (20 kg/m)</td>
<td>32 lbs/ft (50 kg/m)</td>
<td>67 lbs/ft (100 kg/m)</td>
<td>133 lbs/ft (200 kg/m)</td>
<td>200 lbs/ft (300 kg/m)</td>
<td>Soil Control Lab, Inc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>unlimited</td>
<td>unlimited</td>
<td>unlimited</td>
<td>unlimited</td>
<td>unlimited</td>
<td>unlimited</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 ft (3m)</td>
<td>10 ft (3m)</td>
<td>10 ft (3m)</td>
<td>10 ft (3m)</td>
<td>10 ft (3m)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.25 (80mm)</td>
<td>4.75 (120mm)</td>
<td>7.25 (180mm)</td>
<td>9.5 (240mm)</td>
<td>13 (325mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>