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

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Engineer Research and Development Center

Filter Socks Technology Draft 06.29.2007

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 Sock Construction Procedure:
- Inspect area, locate and mark utilities
- Select site for filter sock
- Check and acquire appropriate permits
- Install filter sock materials as per construction specification

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:

Factor	Acceptable Range
pH	5.0–8.5
Moisture Content	< 60%
Organic Matter	> 25%, dry weight
Particle size	99 % passing 2-in. sieve 30 – 50% passing 3/8-in. sieve
Physical contaminants	< 1%, dry weight

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.
9. Fill filter sock with compost.
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.

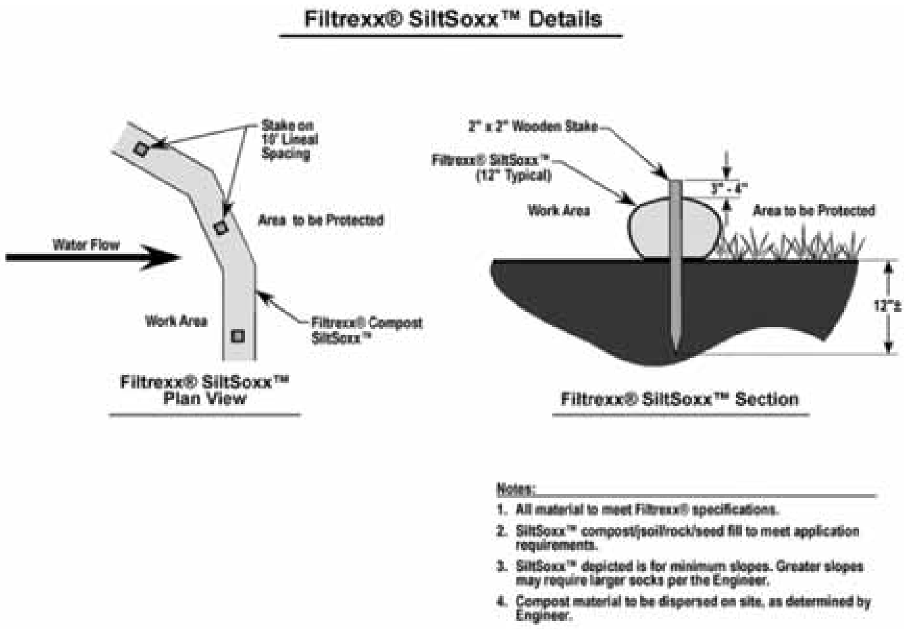
Effectiveness of Filter Socks

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.

Pollutant Removal Effectiveness

Pollutant	Reported Removal Rate
Sediment (TSS)	97–99%
Motor Oil Removal	96%
Phosphorus	34–99%*
Nitrate	25%
Sources: Faucette et al. 2005; Filtrexx 2007. *depending on formulation of filter media	

Typical Construction Details of Filter Sock Installation



Engineering Design Drawing for SiltSoxx™*

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Utilization of Compost Filter Socks

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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.

Figure 1 Sediment contributing to high turbidity in Tom-A-Lex Lake after storm event (Photo by Ray Archuleta, NRCS, 2008)

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

- slope interruption practice used to reduce sheet flow velocities and prevent rill and gully erosion
- energy dissipation of sheet and concentrated stormwater flow, thereby reducing soil erosion and habitat destruction
- use on paved, compacted, frozen, or tree-rooted areas where trenching is not possible or is undesireable
- treatment of polluted effluents, pump water, wash water, sediment dredge, lagoon water, pond water, manures, and slurries
- *in-situ* biofiltration and bioremediation of stormwater pollutants
- capture irrigation-induced sediment from flood and sprinkler irrigation systems
- use RUSLE 2 for design applications
- use in low impact development (LID), green infrastructure, and green building programs
- protection of sensitive wildlife habitat, wetlands, water bodies, and ecosystems

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.

Figure 2 Compost filter socks used for capturing sediment

Typically composed of plant materials indigenous to the bioregion (native or adapted) in which it will be used, these compost materials enrich the biological production process of soils, thereby increasing the stability and services of the soil ecosystem.

- Filter socks can be spread or incorporated into existing soil, increasing soil organic matter, improving soil quality, and reducing waste and disposal costs.
- Sediment, nutrients, harmful bacteria, heavy metals, and petroleum hydrocarbons are reduced in stormwater runoff.
- Soil erosion on hill slopes, slows flow velocity in swales and ditches are reduced, and energy of sheet and concentrated flows are reduced.
- Filter socks are easily designed and customized for a variety of land-based filtration and pollutant removal applications.
- Compost filter socks can be used for biofiltration, as a LID integrated management practice, and in green building programs such as the Leadership in Energy and Environmental Design (LEED) Green Building Rating System™.
- Microorganisms in compost materials can naturally bioremdiate trapped pollutants *in-situ.*
- Compost filter socks may be seeded at the time of installation to increase pollution filtration, wildlife habitat, and ecosystem restoration attributes.

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-though 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 1 Compost quality guidelines

Parameters	Units of measure	Compost
pH	pH units	6.0–8.0
Soluble salt concentration (electrical conductivity)	dS/m (mmhos/cm)	Maximum 5
Moisture content	percent, wet weight basis	30-60
Organic matter content	percent, dry weight basis	25-65
Particle size	percent passing a selected mesh size, dry weight basis	2 in (51 mm) 100% passing –0.375 in (10 mm), 10%-30% passing
Biological stability Carbon dioxide evolution rate	mg $C0_2$–C per gram of organic matter per day	<8
Physical contaminants (human made inerts)	percent, dry weight basis	<1

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 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).

Figure 3 Compost filter sock check dam

Figure 4 Compost filter sock curb inlet

Table 2 Recommended spacing and diameter requirements

	Maximum slope length above compost filter sock in ft (m)			
	Diameter of compost filter sock required			
Slope %	**8-inch (200-mm)**	**12-inch (300-mm)**	**18-inch (450-mm)**	**24-inch (600-mm)**
2 (or less)	300 (90)	375 (110)	500 (150)	650 (200)
5	200 (60)	250 (75)	275 (85)	325 (100)
10	100 (30)	125 (35)	150 (45)	200 (60)
15	70 (20)	85 (25)	100 (30)	160 (50)
20	50 (15)	65 (20)	70 (20)	130 (40)
25	40 (12)	50 (15)	55 (16)	100 (30)
30	30 (9)	40 (12)	45 (13)	65 (20)
35	30 (9)	40 (12)	45 (13)	55 (18)
40	30 (9)	40 (12)	45 (13)	50 (15)
45	20 (6)	25 (8)	30 (9)	40 (12)
50	20 (6)	25 (8)	30 (9)	35 (10)

Compost filter socks may be seeded at the time of manufacture and installation if used for permanent applications, such as biofiltration, LID, or green infrastructure projects. Seed is easily blended with the compost media prior to filling the mesh net sleeve. Seed selection and rate should be determined based on local climate and site conditions and vegetation requirements. Native vegetation should be selected when possible (fig. 6).

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.

Figure 5 Compost filter sock biofiltration system

Figure 5 Vegetated compost filter sock

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 sshall be placed prependicular 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 into the existing soil, leaving a minimum stake height of 2 inches (50 mm) above of 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.

Conclusion

Soil organic matter is one of natures 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 3 NRCS Conservation Practices where compost filter socks may be used (http://www.nrcs.usda.gov/technical/Standards/nhcp.html)

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

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Construction Site Stormwater Runoff Control

Compost Filter Socks

Description

Installation of filter socks in a road ditch by Earth Corps for Indiana Department of Transportation. The filter socks will be staked through the center. Source: Filtrexx International, LLC.

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

Parameters [a,1,4]	Units of Measure[a]	Vegetated Filter Berm/ Sock[a]	Unvegetated Filter Sock[b]
pH[2]	pH units	5.0 – 8.5	6 – 8
concentration[2] (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 rate situations	- 2 in. (51 mm), 100% passing - 0.375 in. (10 mm), 10% – 30% passing
Stability[3] Carbon dioxide evolution rate	mg CO_2-C per gram of organic matter per day	<8	(same as vegetated)
Physical contaminants (manmade inerts)	%, 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 (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

Slope	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 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, h eavy 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.

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

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Standard Specification for Compost for Erosion/Sediment Control (Filter Berms and Filter Socks)

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

Parameters[1,4]	Reported as (units of measure)	Filter Berm to be Vegetated	Filter Berm to be left Un-vegetated	Filter Sock Media
pH2	pH units	5.0 - 8.5	N/A	5.0 – 8.5
Soluble Salt Concentration[2] (electrical conductivity)	dS/m (mmhos/cm)	Maximum 5	N/A	N/A
Moisture Content	%, wet weight basis	30 – 60	30 – 60	<60
Organic Matter Content	%, dry weight basis	25 – 65	25 – 100	25 – 100
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[3] Carbon Dioxide Evolution Rate	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

Annual Rainfall/Flow Rate	Flow Rates
Low	4-6 gallons/minute
Average	6-10 gallons/minute
High	>10 gallons/minute

Notes: Specifying the use of compost products that are certified by the US Composting Council's Seal of Testing Assurance (STA) Program (www.compostingcouncil.org) will allow for the acquisition of products that are analyzed on a routine basis, using the specified test methods. STA participants are also required to provide a standard product label to all customers, allowing easy comparison to other products.

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

Annual Rainfall/Flow Rate	Total Precipitation & Rainfall Erosivity Index	Dimensions for the Compost Filter Berm (height x width)
Low	1-25", 20-90	1'x 2' – 1.5' x 3' (30 cm x 60 cm – 45 cm x 90 cm)
Average	26-50", 91-200	1'x 2' - 1.5' x 3' (30 cm x 60 cm – 45 cm x 90 cm)
High	51" and above, 201 and above	1.5'x 3' – 2' x 4' (45 cm x 90 cm – 60cm x 120 cm)

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 seemless appearance. The socks may be staked at the overlapped area (where the sleeve is) to keep the sections together. Sleeving 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 perpendiular 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/.

Test Methods for Compost Characterization

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

ADDITIONAL INFORMATION

For additional information on regional precipitation rates or rainfall erosivity indexes go on-line at http://www.cpc.ncep.noaa.gov/products/analyses_monitoring/regional_monitoring/us_12-month_precip.html or http://danpatch.ecn.purdue.edu/~wepphtml/wepp/wepptut/jhtml/imagedir/usa.gif

US Composting Council Seal of Testing Assurance Program documents, at http://tmecc.org/sta/, or www.compostingcouncil.org.

REFERENCES

<u>ASTM Standards:</u>

- D 2977, Standard Test Method for Particle Size Range of Peat Materials for Horticultural Purposes.

<u>US EPA Test Methods:</u>

- US EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. SW-846. 3rd Edition.

<u>TMECC Sampling and Test Methods:</u>

- 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).

<u>Other Standards:</u>

- US Composting Council Seal of Testing Assurance Program documents.

Development of Landscape Architecture Specifications for Compost Utilization, The U.S. Composting Council and the Clean Washington Center. 1997.

* 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

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SWPP Cut Sheet: Filtrexx® SiltSoxx™

Sediment & Perimeter Control Technology

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.

APPLICATION

Filtrexx® SiltSoxx™ are to be installed down slope of any disturbed area requiring erosion and sedi-ment
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 disturbed areas subject to sheet runoff, interrill and rill erosion
- 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.

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.
5. 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.
6. 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.
7. Staking depth for sand and silt loam soils shall be 12 in (300mm), and 8 in (200mm) for clay soils.
8. 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.
9. 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.
10. 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).

INSPECTION AND MAINTENANCE

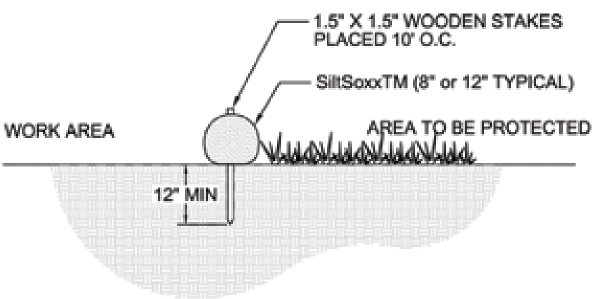
Routine inspection should be conducted within 24 hrs of a runoff event or as designated by the inspected to make sure they maintain their shape and are producing adequate hydraulic flow-through. If ponding becomes excessive, additional SiltSoxx™ may be required to reduce effective slope length or sediment 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.

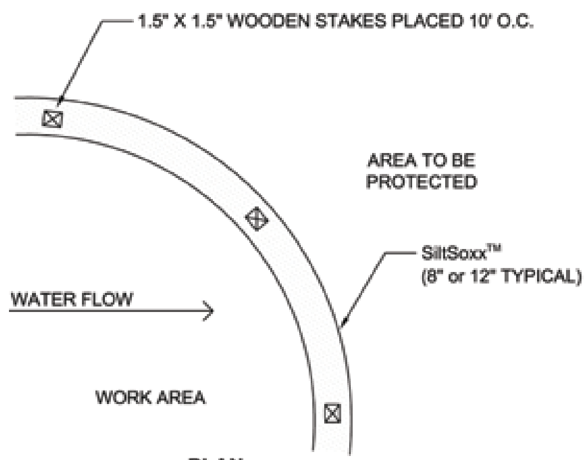
Slope Percent	Maximum Slope Length Above SiltSoxx™ in Feet (meters)*				
	8 in (200 mm) SiltSoxx™	12 in (300 mm) SiltSoxx™	18 in (450 mm) SiltSoxx™	24 in (600mm) SiltSoxx™	32 in (800mm) SiltSoxx™
	6.5 in (160 mm)**	9.5 in (240 mm) **	14.5 in (360 mm) **	19 in (480 mm) **	26 in (650 mm) **
2 (or less)	600 (180)	750 (225)	1000 (300)	1300 (400)	1650 (500)
5	400 (120)	500 (150)	550 (165)	650 (200)	750 (225)
10	200 (60)	250 (75)	300 (90)	400 (120)	500 (150)
15	140 (40)	170 (50)	200 (60)	325 (100)	450 (140)
20	100 (30)	125 (38)	140 (42)	260 (80)	400 (120)
25	80 (24)	100 (30)	110 (33)	200 (60)	275 (85)
30	60 (18)	75 (23)	90 (27)	130 (40)	200 (60)
35	60 (18)	75 (23)	80 (24)	115 (35)	150 (45)
40	60 (18)	75 (23)	80 (24)	100 (30)	125 (38)
45	40 (12)	50 (15)	60 (18)	80 (24)	100 (30)
50	40 (12)	50 (15)	55 (17)	65 (20)	75 (23)

* 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.



SECTION NTS



PLAN NTS

NOTES:
1. ALL MATERIAL TO MEET SPECIFICATIONS.
2. FILTER MEDIA TO MEET APPLICATION REQUIREMENTS
3. FILTER MEDIA TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEEER.

SiltSoxx™ for Sediment Control

NTS

TABLES & FIGURES:

Table 1.1. Filtrexx® Soxx™ Material Specifications

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

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

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

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

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