FILTER SOCK
(a.k.a. biofilter sock)

A filter sock consists of a tubular mesh casing that is filled with a natural material, such as compost or wood chips. They are typically filled on site using a pneumatic blower truck (Figure B2-4). Filter socks function as settling controls, decreasing flow velocities to cause gravitational settling of suspended sediments behind and within the sock.

Figure B2-4: Filter sock being filled on site

Depending on the fill material used, contaminants other than sediment may also be attenuated and degraded through chemical and biological processes. For example, the microbial activity in compost – present at much higher concentrations than in soil – can degrade hydrocarbons and convert them to nontoxic by-products (Khan, et al., 2006). Despite the capabilities of filter sock variations, the guidance herein focuses on the removal of sediment (and sediment-bound contaminants) with compost and wood-chip filled socks, which occurs primarily through physical settling.

- **Wood chip fill** │ Socks filled with uncomposted wood chips can be an effective means of causing construction sediment to settle out of suspension. This process can also result in significant removal of other contaminants that adhere to sediment particles, such as metals and nutrients. Where sediment removal is the only objective, wood chip filled socks are often more cost effective than their compost filled counterparts.
- **Compost fill** │ The properties of compost - including its texture, porosity, water retention capacity and hummus content – make it an effective media for filtering out sediment and other contaminants, including those which do not adhere to sediment particle surfaces (e.g. petroleum hydrocarbons, soluble nutrients). Beyond this added contaminant removal benefit, socks filled with compost can also support vegetation, which means they can be seeded at the time of installation. Alternatively, compost from socks with biodegradable mesh can be spread around and seeded as part of their decommissioning.

Figure B2-5: Compost fill (left) and wood chip fill (right) used in filter socks.

Application

Filter socks can be used in a variety of sediment control applications depending on their circumference, length and how they are placed/positioned. Common sediment control applications of filter socks include:

- As flow interruption on level and sloped areas where they are applied along contours, perpendicular to runoff sheet flows;
- At the base of slopes, at a recommended distance of at least 1.5 m from the based in order to provide adequate space for sediment deposition;
- Along the site perimeter in areas of sheet flow;
- Perpendicular to channelized flow in swales and ditches where they function as check dams;
- Around storm drain inlets receiving sheet flows;
- At the base of topsoil stockpiles;
- Around sediment bags as part of a dewatering treatment train (see 'sediment bags' on p. B2-25);
- During frozen conditions in place of sediment fence that cannot be trenched in; and
- Any other areas where it is necessary to dissipate flow velocities and pond water to promote sediment settling.

Design and installation

Product specifications - casing

- Biodegradable and non-biodegradable casings are available depending on the intended application. Where filter socks are being used for permanent stabilization, particularly for construction projects in natural water features, biodegradable mesh casing can be a useful option. Confirm casing life span with the product manufacturer / supplier.
- Non-biodegradable mesh casing should be UV stable and durable. Typical thickness is approximately 5 mm and size of openings is approximately 3 mm.

Product specifications – wood chip fill

- Free of any refuse, weeds, contaminants or other materials toxic to plants, wildlife or humans.
- Material shall be relatively free (<1% by dry weight) of inert or foreign man made materials.
- Wood chip fill material must also meet the following specifications:
  - pH: 5.0 - 8.0
  - Particle size: 99% passing a 50mm sieve and a maximum of 40% passing a 9.5mm sieve
  - Moisture content: ≤ 60%

Product specifications – compost fill

- Free of any refuse, weeds, contaminants or other materials toxic to plant growth.
- Material shall be relatively free (<1% by dry weight) of inert or foreign man made materials.

- Stable, humus-like material produced from the aerobic decomposition of organic feedstocks, composted and cured until maturity.
- Certified to comply with mandatory Ontario Ministry of Environment Conservation and Parks (OMECP) Compost Quality Standards for Category 'AA' or 'A' and Canadian Food and Inspection Agency (CFIA) regulations T-4-93 (CFIA, 1997a) and T-4-120 (CFIA, 1997b).
- Analytical methods acceptable for the eleven regulated metals and the pathogen testing are described in the Sampling and Analysis Protocol of O. Reg. 267/03. Analytical methods that should be used for determination of mature compost respiration rate, moisture content, organic matter, foreign matter content and other relevant parameters are those referenced in the Bureau de Normalization du Quebec (BNQ) Industry Standard CAN/BNQ 0413-200/2005 "Organic soil conditioners – Composts".

Product performance

- Filter sock products should be capable of removing at least 70% of suspended solids.
- Removal performance should be based on testing by an independent third party.
- Testing should be carried out using American Society for Testing and Materials (ASTM) Standard D7351-13, which is the "Standard Test Method for Determination of Sediment Retention Device Effectiveness in Sheet Flow Applications".

Sheet flow applications

- For optimal performance, the upslope area draining to the sock should be stabilized.
- Filter socks applied as sediment control for runoff sheet flow - e.g. at site perimeter, along contours of sloping areas, around storm drain inlets - should be sized such that flows from most storm events will not overtop the socks.
- Consult with supplier for guidance on selecting appropriate sock diameter based on slope grades and lengths and the design storm which is meant to be treated by the filter sock. In general, the sizing should be based on the 5 year design storm, however sizing for a larger design storm may be necessary where socks are being applied to protect adjacent natural features.

Figure B2-6: Filter socks installed along contours of a slope

- Prepare the ground surface prior to filter sock placement to ensure good ground contact. Creating a shallow depression in which to place the sock can help to improve ground contact.
- Place filter socks on level contours to ensure they receive sheet flows rather than concentrated flows.
- Where filter socks are applied at the base of a slope, a distance of at 1.5 m from the base is recommended in order to provide adequate space for sediment settling.
- Install socks perpendicular to the sheet flow path and install with ends turned upslope to discourage water from flowing around the ends.
- For slopes steeper than 2H:1V, multiple parallel filter socks may need to be installed on the slope to dissipate runoff energy and reduce the risk of rill erosion.
- Secure filter socks by staking them into place with long wooden stakes driven into the centre of the sock, or alternatively on both sides of the sock if tearing of the mesh casing is a concern. Where ground below is paved, secure with heavy concrete blocks or other appropriate means.
- Stakes should be driven into the ground at least 20 cm and extend above the height of the sock.
- Stakes should be placed at regular intervals as needed to secure the sock, with intervals varying based on the sock diameter and the slope of the drainage area. Confirm appropriate spacing with supplier.
- Consult with supplier to confirm recommended staking procedures, including staking depths and stake placement.

Concentrated flow applications:

- Filter socks can be used as sediment control check dam structures to treat concentrated flows in small open construction site channels like interceptor swales (Figure B2-7).
- For use of filter socks as check dams, consult with supplier for guidance on selecting appropriate sock diameter based on the design storm to be treated by the filter sock. In general, the sizing should be based on the 5 year design storm, however sizing for a larger design storm may be necessary where there is a low tolerance of risk of failure.
- Treatment of larger flow volumes should be addressed by selecting the largest sock diameter that is recommended for the swale and reducing the spacing interval between socks. Stacking of socks may also help increase capacity but should be decided on based on supplier guidance.

Figure B2-7: Filter socks installed in a swale

- Spacing of filter socks in the swale is based on the swale gradient and anticipated flows. Consult with supplier for guidance on optimal spacing along the swale.
- Prepare the ground surface prior to filter sock placement to ensure good ground contact. The sock should be pressed in to the ground during installation. Creating a shallow depression in which to place the sock can help to improve ground contact.

- The filter sock should be installed in the swale in a U-shape with ends pointed slightly upslope to encourage water to pond and – during large events – overtop the sock in the middle rather than around the sides. The sock should be long enough to extent to the top of the swale.
- As a minimum, stake into place in the centre and at both ends. To avoid damage to the casing, stakes can instead be placed on either side of the sock to create a brace. Stakes should be driven into the ground at least 20 cm and extend above the height of the sock.
- For best results, swales in which filter socks are installed should be stabilized.

Inspection and maintenance

- Inspect all filter socks weekly, and before and after significant rainfall (see definition in Section 10.1.2) or snowmelt events, and keep a record of the inspection.
- Look for any signs of erosion and areas where water is undermining the sock and consider how positioning, ground contact or flow rates can be adjusted to prevent continued undermining.
- Inspect positioning and placement of filter socks to ensure they haven't shifted substantially. Re-position and re-stake as needed.
- Where flows are exceeding the retention capacity of the sock (e.g. frequent overtopping, water flowing around check dams), re-consider filter sock diameters used, add additional socks (for swale applications) or stack socks to create a higher barrier.
- Where socks continue to fail on an ongoing basis, consider replacing with an alternative sediment retention device. If failure is a result of concentrated flows being directed to socks being applied for sheet flow control, consider re-designing surface water flow paths to reduce volumes being directed to the problem area.
- Sediment and/or debris accumulation behind socks should be removed before it reaches approximately 30% of the sock height.
- Any repair or maintenance needs identified should be repaired within 48 hours or sooner if natural receptors are at imminent and foreseeable risk of adverse impact. Higher priority should be assigned to repair of filter socks installed upgradient of natural features.

Decommissioning

- Remove and properly dispose of accumulated sediment.
- Where desired, and if fill material is not contaminated, socks may be cut open so that fill can be used onsite as mulch for restoration works.
- Remove and dispose of any non-biodegradable material.
- Where socks will be seeded and left as a permanent part of the landscape (e.g. in restoration areas) ensure it is seeded with a weed-free, native seed mix. In these instances, only socks with a biodegradable casing should be used.