etube Specification Sheet

Description

E-tube is a sturdy polypropylene geotextile (woven) that has been engineered specifically for controlling erosion and containing and/or retaining sediment in disturbed areas. It is a mesh tube filled with organic filter material that is placed perpendicular to sheet-flow runoff. The e-tube, which is oval to round in cross section, provides a three-dimensional filter that retains sediment and other pollutants (e.g., suspended solids, nutrients, and motor oil) while allowing the cleaned water to flow through. The e-tube can be used in place of traditional sediment and erosion control tools such as a silt fence or straw bale barrier.

E-tubes are generally placed along the perimeter of a site, or at intervals along a slope, to capture and treat storm water that runs off as sheet flow. E-tubes are flexible and can be filled in place or filled and moved into position, making them especially useful on steep or rocky slopes where installation of other erosion control tools is not feasible. There is greater surface area contact with soil than typical sediment control devices, thereby reducing the potential for runoff to create rills under the device and/or create channels carrying unfiltered sediment.

Additionally, they can be laid adjacent to each other, perpendicular to storm water flow, to reduce flow velocity and soil erosion. E-tubes can also be used on pavement as inlet protection for storm drains and to slow water flow in small ditches. E-tubes are 8,9,12, 18 and 24 inches in diameter. Organic cotton, biodegradable e-tubes are available for required applications.

E-tubes can be unvegetated or vegetated. Vegetated e-tubes can be left in place to provide long-term filtration of storm water as a post-construction best management practice (BMP). The vegetation grows into the slope, further anchoring the e-tube. Unvegetated e-tubes are often cut open when the project is completed, and the organic filter material is spread around the site as a soil amendment or mulch. The e-tube mesh fabric is then disposed of unless it is biodegradable. Advantages the e-tube 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
- It can be installed on frozen or rocky surfaces where trenching is not viable.
- The operator must dispose of only a relatively small volume of material (the mesh)

Applicability

E-tubes are applicable to construction sites or other disturbed areas where storm water runoff occurs as sheet flow. Common industry practice for 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). E-tubes can be used on steeper slopes with faster flows if they are spaced more closely, stacked beside and/or on top of each other, made in larger diameters, or used in combination with other storm water BMPs.

Siting and Design Considerations

Materials: Several types of materials can be utilized for filter material in the e-tube. The key to achieving the proper balance between sediment removal and flow-through rate is using a material with the proper particle size. Filter material with a high percentage of fine particles will clog and create a barrier to flow. Alternatively, filter material with particles that are too large will allow flows to pass through the barrier with little or no resistance, eliminating the velocity reduction and sediment trapping benefits of the barrier. Filter material normally consists of a wood chips or mulch that is screened to remove some of the fines and produce the desired gradation.

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

Siting: Although e-tubes 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 e-tubes at the top and base of the slope or placing a series of e-tubes 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 e-tubes are recommended for areas prone to high rainfall or sites with severe grades or long slopes.

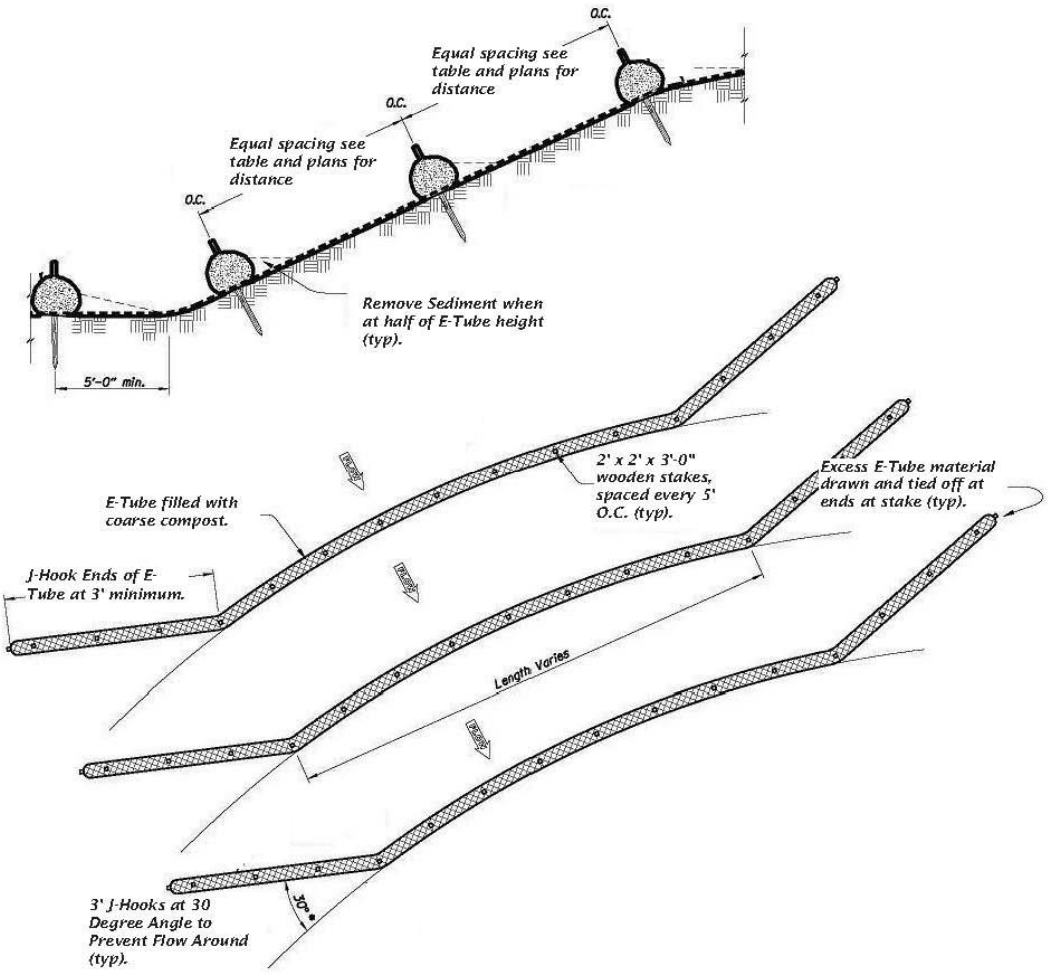
Table 1. Example of e-tube Filtering Parameters

Parameters	Units of Measure	Unvegetated e-tube
Particle Size	% passing a selected mesh size dry weight basis	>.053 mm 100% passing. <.053 mm 54-91% passing)

Table 2. Example of Slope, Slope Length and E-Tube Diameters

Slope	Slope Length	Diameter
<50:1	**250**	**9**
50:1 – 10:1	**125**	**9**
10:1 – 5:1	**100**	**12**
3:1 – 2:1	**50**	**18**
>2:1	**25**	**18 - 24**

Installation: No trenching is required; therefore, soil is not disturbed upon installation. Once the e-tube 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 tube at regular intervals; alternatively, stakes can be placed on the downstream side of the e-tube. Stakes should be wooden 2 inch by 2 inch by 3 ft. The spacing of the stakes should be equal distance across the length of the e-tube. For perimeter sediment control stakes should be placed 5 ft. apart. For ditch checks stakes should be placed 3 ft. apart. The ends of the e-tube should be directed upslope to prevent storm water from running around the end of the e-tube. The e-tube may be vegetated by incorporating seed into a compost fill material prior to placement in the e-tube. Since the e-tubes do not have to be trenched into the ground, they can be installed on frozen ground or even cement.



Limitations

E-tube offers 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 e-tube uniformly contacts the ground surface. E-tubes installed perpendicular to flow in areas where a large volume of storm water runoff is likely, but should not be installed perpendicular to flow in perennial waterways and large streams.

Maintenance Considerations

E-tubes should be inspected regularly, as well as after each rain event, to ensure that they are intact and the area behind the e-tube is not filled with sediment. If there is excessive ponding behind the e-tube or accumulated sediment reaches the top of the e-tube, an additional e-tube should be added on top or in front of the existing e-tube in these areas, without disturbing the soil or accumulated sediment. If the e-tube was overtopped during a storm event, the operator should consider installing additional e-tube on top of the original, placing an additional e-tube up the slope, or using an additional BMP such as hydro seeding, matting/netting or compost blankets in conjunction with the e-tube.

Effectiveness

A large number of qualitative studies have reported the effectiveness of filter tube devices in removing settle able solids, total suspended solids and turbidity reduction from sediment laden water, (see Dr. Amanda Cox, Colorado State University, 2011). These studies have consistently shown that filter tubes devices, i.e. e-tube, are at least as effective as traditional erosion and sediment control BMP's and often are more effective. E-tubes are often used in conjunction with hydro seeding, matting/netting, or compost blankets to form a storm water management system. Together these BMPs retain a very high volume of storm water, sediment and other pollutants.