Sediment Barrier - Silt Fence Standard

This Standard is intended to guide designers on the purpose, design, material selection, installation, and maintenance of a silt fence when used as a temporary sediment control barrier for sheet flow applications to minimize sediment transport from a disturbed area susceptible to erosion.

Keywords: silt fence, sediment barrier, perimeter control, sediment control, erosion

1 DEFINITION

1.1 A temporary sediment barrier downstream of a disturbed area consisting of a geotextile material anchored into the soil and supported by posts.

2 PURPOSE

2.1 To intercept sediment-laden runoff from a disturbed area and facilitate sediment capture by reducing the velocity of sheet flow runoff and promoting deposition.

3 DESIGN

Silt fence used as a sediment barrier must include design consideration of hydrologic input, placement, flow bypass, and dewatering.

3.1 Hydrology and Capacity

3.1.1 Silt fence segments must be designed to impound runoff from the design storm event and create favorable conditions for sediment to settle out of suspension.

3.1.2 Selection of the design storm should be based on site-specific characteristics including: project location, duration of disturbance, and acceptable levels of risk to downstream receiving waters. Lacking site-specific guidance, a 2-yr, 24-hr design storm event is recommended.

3.1.3 It is recommended that the silt fence retain the entire volume of the design storm runoff without overtopping, prior to flow bypass or dewatering. The impounded depth should not exceed 0.61 m (2 ft).

3.1.4 In the case that the design storm runoff volume exceeds the storage capacity of the silt fence, the area draining to each silt fence installation should be divided into manageable areas based on site hydrology or alternative upstream practices should be used.

3.2 Placement

3.2.1 The use of silt fence to create a flow diversion or to delineate project limits is discouraged.

3.2.2 Silt fence should only be used downstream of a disturbed area that is susceptible to generating sheet flow.

3.2.3 Silt fence should be installed in a manner to maximize the impoundment volume of sediment-laden runoff.

3.2.4 Silt fence should be placed on level runs, parallel to the contour with each end of the fence turned upslope higher than the runoff impoundment elevation to ensure that runoff ponds to provide a favorable environment for settlement to occur.

3.2.5 In areas where level placement is infeasible, "J"-hooks or "C"-shaped configurations may be employed to impound runoff.

3.3 Dewatering and Overflow Outlets

3.3.1 Due to the potential for geotextile blinding (clogging) after one or more storm events, an effective means for dewatering must be included to prepare the silt fence for subsequent storms and minimize the chance of overtopping or periods of excessive ponding.

3.3.2 The silt fence, at full storage capacity, should dewater in 4 to 12 hours.

3.3.3 Overflow outlet(s) must be included for runoff that exceeds the design storm event.

3.3.4 The overflow outlet must convey the peak flow rate (Q_p) for the design storm event.

3.3.5 One outlet option which has been well tested is a perforated board with a weir. This is installed in a break along the silt fence, which is sealed to the board. The board has several 2.5 cm (1 in.) diameter orifices, and a v-notch weir at the top, placed 46 cm (18 in.) from the bottom, to maintain volumetric storage (Fig. 1).

Fig. 1: Example dewatering board & overflow weir.

3.3.6 Discharge from silt fence segments should be controlled to be non-erosive. Erosion control or scour protection, such as a geotextile splash apron and/or riprap, must be used immediately downstream of the dewatering and overflow outlet.

4 MATERIALS

4.1 Silt fence geotextile, anchoring, and support materials shall be of strength and dimensions to withstand hydrostatic and hydrodynamic forces imposed by the captured and impounded runoff of the design storm.

4.2 Silt fence geotextile should be comprised of a minimum 119 g/m^2 (3.5 oz/yd^2) non-woven, equivalent woven, or alternative material.

4.3 Supplemental support of the geotextile may be needed at the discretion of the designer. Support could entail a minimum 14-ga. steel wire fencing with mesh spacing not

to exceed 15 x 15 cm (6 x 6 in.), or equivalent alternative.

4.4 Posts such as studded steel posts of 1.98 kg/m (1.33 lb./ft), hardwood posts of 5.1 x 5.1 cm (2 x 2 in.), or equivalent alternative must be used to support the silt fence geotextile material.

5 INSTALLATION

5.1 Installed height should be, at a minimum, 61 cm (24 in.) above ground. The installed height should not exceed 81 cm (32 in.).

5.2 Posts should be driven into the ground a minimum depth of 46 cm (18 in.), with the height extending above ground meets or exceeds the silt fence height.

5.3 Silt fence geotextile material should be secured to the posts and reinforcement using staples, ring clips, wire ties, UV-stabilized zip ties, or an equivalent alternative.

5.4 Post spacing should be a function of installed silt fence height and reinforcing material. Spacing should be minimized to provide adequate structural stability, with a recommended spacing of 1.2 to 2.4 m (4 to 8 ft).

5.5 Silt fence geotextile material must be anchored into the ground by burying it in a trench and backfilling with compacted soil or by static slicing.

5.6 Embedment depth of the geotextile shall be a minimum of 15 cm (6 in.), with at least 30 cm (12 in.) buried within the trench. Consider additional entrenchment depth in weaker soils.

5.7 Offsetting the trench 15 cm (6 in.) upstream from the silt fence is recommended to improve post stability (Fig. 2).

5.8 A static slicing anchoring installation technique, as described in EPA's Silt Fence Factsheet, or approved mechanical alternative, may be used. Installers should refer to the equipment manufacturer's specification for proper installation.

5.9 Silt fence should be installed in continuous segments to avoid creating joints. When joints are unavoidable, end posts, geotextile materials, and any reinforcement backing, shall be wrapped around each other to provide a secure and seamless joint.

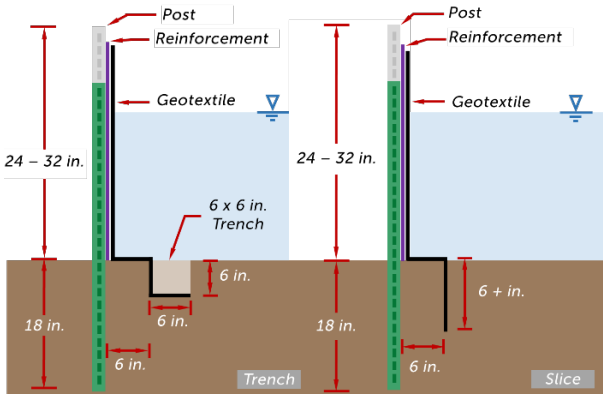

Fig. 2: Typical offset trenched and sliced methods.

6 INSPECTION AND MAINTENANCE

6.1 Sediment should be removed once accumulation reaches half of the height of the silt fence.

6.2 Silt fence should be inspected regularly and after significant runoff events for signs of damage or deterioration.

6.3 Common failure mechanisms include:

- structural failure of the posts and/or geotextile due to a storm that exceeds the design capacity;
- undercutting of silt fence toe due to insufficient anchoring, allowing flow to migrate underneath the practice;
- downstream scour due to high overflow velocity;
- improper contour tie-in leading to flow bypass around end of fence (i.e, flanking);
- lack of regular sediment removal, causing overtopping and/or structural failure; and
- inadvertent tears or holes in the fabric which release the water too quickly.

6.4 Immediate repair, per manufacturer's guidance, or replacement is required if there is evidence of damage or undercutting.

6.5 All sediment collected and silt fence shall be removed and disposed of properly once the site has achieved final stabilization and the project is complete.

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