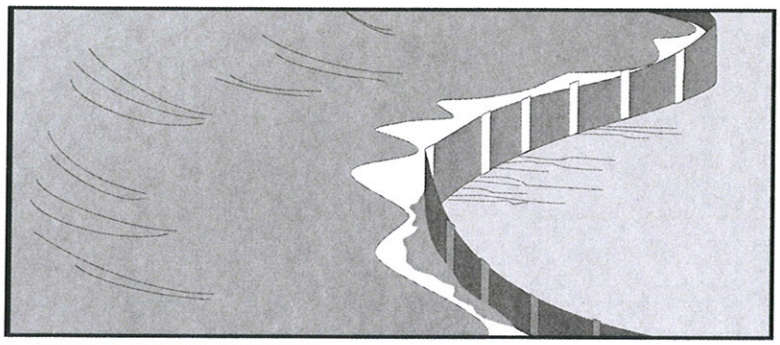
ACTIVITY: Silt Fence

WTCP-09



Targeted Constituents				
● Significant Benefit		◗ Partial Benefit		○ Low or Unknown Benefit
● Sediment	○ Heavy Metals	○ Floatable Materials	○ Oxygen Demanding Substances	
○ Nutrients	○ Toxic Materials	○ Oil & Grease	○ Bacteria & Viruses	○ Construction Wastes

Implementation Requirements				
● High		◗ Medium		○ Low
◗ Capital Costs	◗ O & M Costs	◗ Maintenance	○ Suitability for Slopes >5%	◗ Training

Description

A silt fence is made of a filter fabric which has been entrenched, attached to supporting poles, and sometimes backed by a wire fence for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

A silt fence is a temporary sediment barrier consisting of filter fabric stretched across and attached to supporting posts, entrenched, and depending upon the strength of the fabric used, supported with wire fence. Silt fences trap sediment in two ways: (1) by intercepting and detaining small amounts of sediment from disturbed areas during construction operations in order to promote sedimentation behind the fence; and (2) by decreasing the velocity of low flows (up to 0.5 cfs (1.4×10^{-2} m^3/s)) in swales. In simpler terms, a silt fence does not filter the water it slows it down enough for the sediment to settle out of the runoff water. This management practice is likely to create a significant reduction in sediment.

Silt fences, while much more effective than straw bales and brush barriers, are not as effective as sand bag barriers or rock filters (especially continuous berms). The difference in effectiveness is due to the durability and maintenance requirements.

Suitable Applications

- Along the downstream perimeter of the phase construction.
- Below the toe of a cleared slope.
- Upstream of sediment traps or basins.
- Along streams and channels (not across).
- Around temporary spoil areas.
- Across swales with catchments less than 1 acre (0.4 ha) (per 400-feet (125.7 m) of fence) and below other small cleared areas.

Installation/ Application Criteria

- Silt fences are typically installed with ¼ area draining to every 100-feet (31.4 m) of silt fence. They are designed to function under a 10-year storm event and may be operated for as long as 5 to 8 months. Silt fences are designed to pond water behind them, so it is crucial that they are sufficiently anchored and follow contours. Silt fences that are not entrenched and follow contours can result in worsened erosion.

- Silt fences may be used for downstream perimeter control, placed upstream of the point(s) of discharge of sheet flow from a site. They may also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion, and perpendicular to minor swales or ditch lines for up to one acre contributing drainage areas. Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows.

- Use principally in areas where sheet flow occurs.

- Install along a level contour, so water does not pond more than 1.5 feet (0.5 m) at any point.

- The maximum slope perpendicular to the fence line should be 1:1.

- No more than 0.25 acre (0.1 ha) per 100 ft. (31.4 m), or 0.5 cfs (1.4×10^{-2} m^3/s) of concentrated flow should drain to any point along the silt fence.

- Turn ends of fence uphill to prevent scour from wash around.

- Provide area behind the fence for runoff to pond and sediment to settle (Approx. 1200 sq.ft. (111.5 m^2) per acre (0.4 ha) draining to the silt fence).

- Select filter fabric which retains 85% of the soil, by weight, based on sieve analysis, but is not finer than an equivalent opening size of 70.

- Select standard duty or heavy duty prefabricated silt fence based on criteria shown below:

Standard Duty Silt Fence

- Slope of area draining to fence is 4:1 (H:V) or less.
- Use is generally limited to less than five months.
- Area draining to fence produces low sediment loads.
- Use prefabricated standard duty silt fence.

Heavy Duty Silt Fence

- Slope of area draining to fence is 1:1 (H:V) or less.
- Use generally limited to eight months. Longer periods may require fabric replacement.
- Area draining to fence produces moderate sediment loads.
- Use prefabricated heavy-duty silt fence. Heavy duty silt fences typically have the following physical characteristics:

(1) Fence fabric has greater tensile strength than other fabric types available from manufacturer.
(2) Fence fabric has a greater permittivity than other fabric types available from manufacturer.
(3) Fence fabric may be reinforced with a backing or additional support to increase fabric strength.
(4) Posts may be spaced closer together than other premanufactured silt fence types available from manufacturer.

- Most manufactured silt fencing has a colored band that indicates the depth of trenching required. If the lower colored band is visible then the silt fence is not trenched deep enough.
- Install silt fence along a level contour, with the last 6 ft (1.9 m) of fence turned up slope. Except for the ends, the difference in elevation between the highest and lowest point along the top of the silt fence shall not exceed one-third the fence height.
- Posts should be spaced a maximum of 6 feet (1.9 m) apart and driven securely into the ground a minimum of 30 inches (0.8 m).
- A trench should be excavated approximately 8 inches (20.3 cm) wide and 12 inches (30.5 cm) deep along the line of posts and upslope from the barrier.
- When standard strength filter fabric is used, a wire mesh support fence should be fastened securely to the upslope side of the posts using heavy-duty wire staples at least 1 inch (2.5 cm) long, tie wires or hog rings. The wire should extend into the trench a minimum of 4 inches (10.2 cm).
- The standard strength filter fabric should be stapled or wired to the fence, and 40 inches (102 cm) of the fabric should extend into the trench. When extra-strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated and the filter fabric stapled or wired directly to the posts.
- Avoid the use of joints. The filter fabric should be purchased in a continuous roll, then cut to the length of the barrier. When joints are necessary, filter cloth should be spliced together only at a support post, with a minimum 6-inch (15.2-cm) overlap, and both ends securely fastened to the post.
- The trench should be backfilled with compacted native material.
- Generally, silt fencing should be used in conjunction with erosion source controls up slope to provide effective control.

Maintenance

- Inspect weekly and after each rainfall.
- Repair wherever fence is damaged.
- Remove sediment when it reaches 1/3 the height of the fence.

- Inspect silt fence when rain is forecast. Perform required maintenance before the storm event.
- Remove silt fence when no longer needed. Fill and compact post holes and anchorage trench, remove sediment accumulation, and grade alignment to blend with adjacent ground.

Limitations

- Do not place fence on a slope, or across any contour line. This may result in worse erosion than not installing the fence at all.
- Do not use in streams, channels, or anywhere flow has concentrated.
- Do not use in locations where ponded water may cause flooding.
- Limit the length of slope draining to any point along the silt fence to 100 ft. (30 m) or less.
- Limit length of any single run of silt fence to 500 ft. (150 m).
- Must be placed along a level contour.
- Don't use below slopes subject to creep, slumping, or landslides.
- Don't use silt fences to divert flow.

Additional Information

Silt fences are preferable to straw barriers in many cases. Laboratory work at the Virginia Highway and Transportation Research Council has shown that silt fences can trap a much higher percentage of suspended sediments than can straw bales. While the failure rate of silt fences is lower than that of straw barriers, there are many instances where silt fences have been improperly installed.

Selection of a filter fabric is based on soil conditions at the construction site (which affect the equivalent opening size (EOS) fabric specifications) and characteristics of the support fence (which affect the choice of tensile strength). The designer should specify a filter fabric that retains the soil found on the construction site yet will have openings large enough to permit drainage and prevent clogging. The following criteria is recommended for selection of the equivalent opening size:

1. If 50 percent or less of the soil, by weight, will pass the U.S. standard sieve No. 200, select the EOS to retain 85 percent of the soil. The EOS should not be finer than EOS 70.
2. For all other soil types, the EOS should be no larger than the openings in the U.S. Standard Sieve No. 70 [0.0083 in. (0.21 mm.)] except where direct discharge to a stream, lake, or wetland will occur, then the EOS should be no larger than Standard Sieve No. 100.

To reduce the chance of clogging, it is preferable to specify a fabric with openings as large as allowed by the criteria. No fabric should be specified with an EOS smaller than U.S. Standard Sieve No. 100 [0.0059 in. (0.15 mm)]. If 85 percent or more of a soil, by weight, passes through the openings in a No. 200 sieve [0.0029 in. (0.074 mm)], filter fabric should not be used. Most of the particles in such a soil would not be

retained if the EOS was too large, and they would clog the fabric quickly if the EOS was small enough to capture the soil.

The fence should be supported by a wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Filter fabric material should contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0°F to 120°F.

Primary References

California Storm Water Best Management Practice Handbooks, CDM et.al. for the California SWQTF, 1993.

Caltrans Storm Water Quality Handbooks, CDM et.al. for the California Department of Transportation, 1997.

Subordinate References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

Environmental Action Manual, City of Austin, Texas, 1989.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, June 1981.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April, 1992.

Sedimentation and Erosion Control Practices, An Introductory of Current Practices (Draft), USEPA, 1990.

Stormwater Management Manual for the Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency – November 1988.

Inspection Checklist

- Does the silt fence follow a contour?
- Are the ends of the silt fence turned uphill for the last 6 ft. (1.8 m)?
- Is the anchor trench depth color band visible?
- Is the silt fence secure to the posts?
- Has sediment accumulated behind the fence by more than $^1/_3$ the height of the fence? If yes, then clear it.
- Does any 100-foot (30.5 m) of silt fence serve more than ¼ acre (0.1 ha) of exposed area?
- Is there any indication of washaround or underwash? If yes, then reset the fence and determine if it is overloaded (i.e. another fence should be installed upstream).

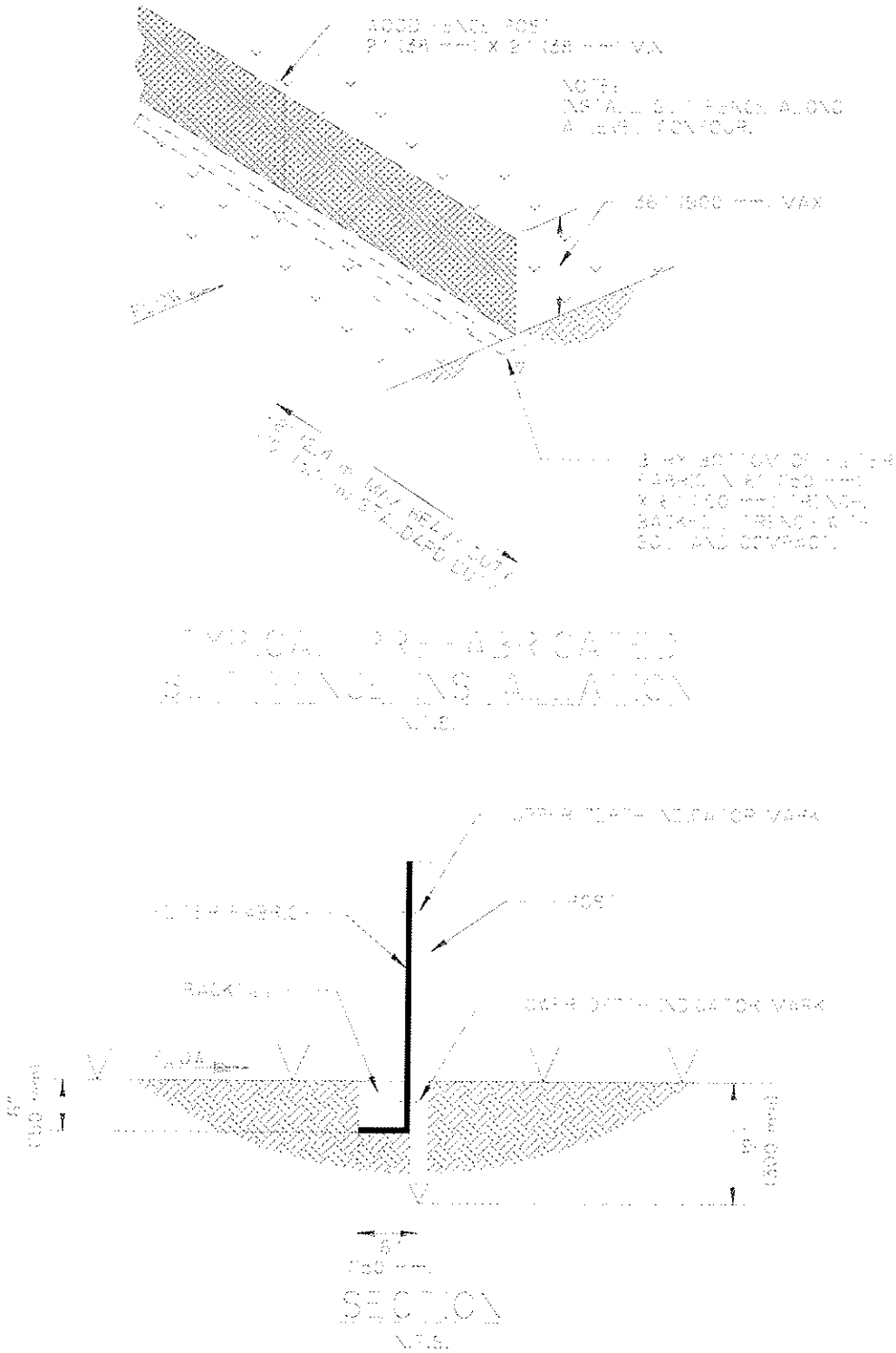


Figure WTCP-09-1
Silt Fence Anchoring

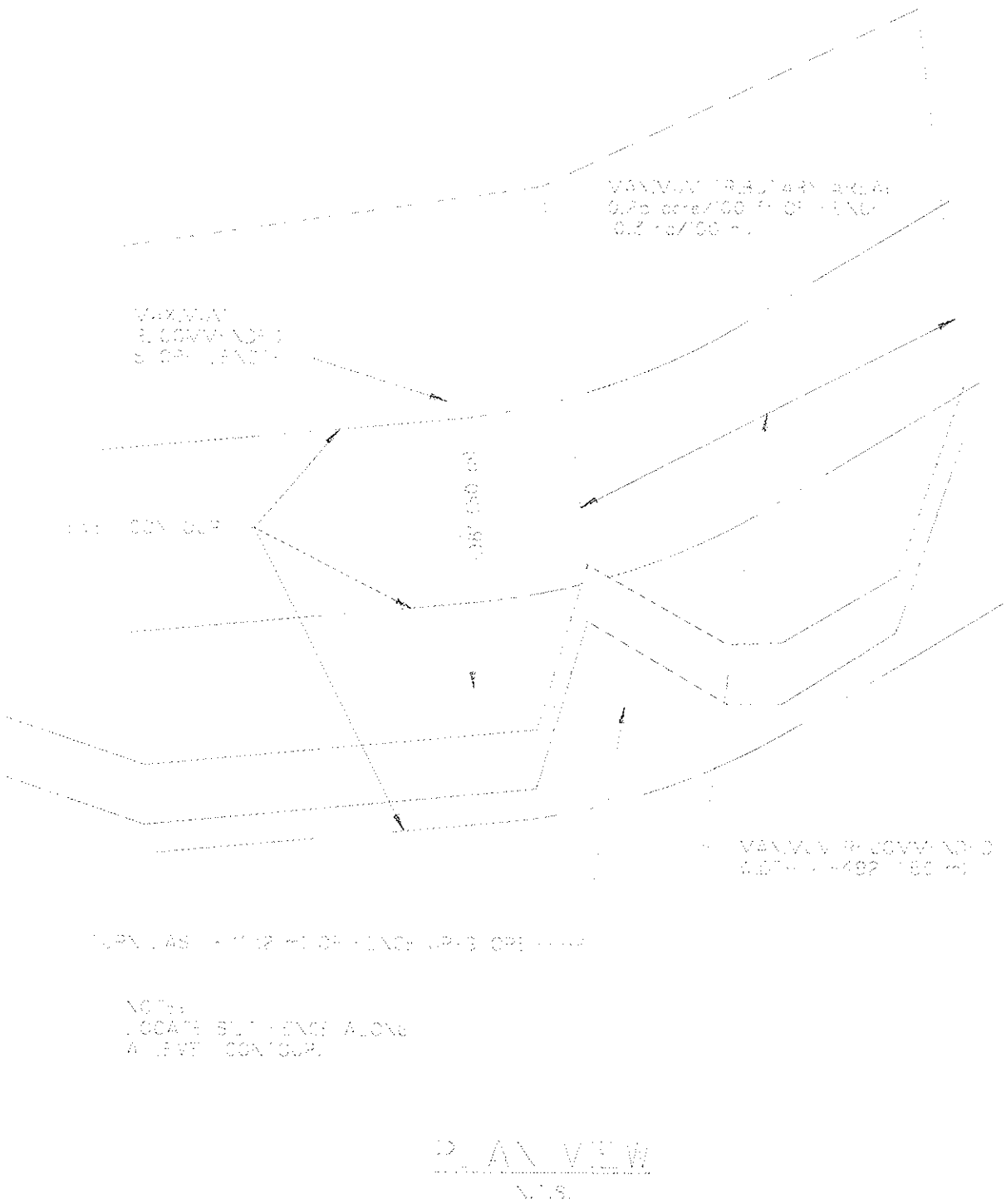


Figure WTCP-09-2
Silt Fence End Layout