

6.3 Silt Fence



Description

Silt fence is a sediment-trapping practice utilizing a geotextile fence, topography and sometimes vegetation to cause sediment deposition. Silt fence reduces runoff’s ability to transport sediment by ponding runoff and dissipating small rills of concentrated flow into uniform sheet flow. Silt fence is used to prevent sediment-laden sheet runoff from entering into downstream creeks and sewer systems.

Conditions Where Practice applies

Silt fence is used where runoff occurs as sheet flow or where flow through small rills can be converted to sheet flow. Major factors in its use are slope, slope length, and the amount of drainage area from which the fence will capture runoff. Silt fence cannot effectively treat flows in gullies, ditches or channels. For concentrated flow conditions see specifications for temporary diversions, sediment traps and sediment basins.

Planning Considerations

Alternatives: Silt Fence vs. Temporary Diversions and Settling Ponds. While silt fence requires less space and disturbs less area than other control measures there are significant disadvantages to its use. Silt fence is not as effective controlling sediment as routing runoff through a system of diversions and settling ponds. Settling ponds and earth diversions are more durable, easier to construct correctly and significantly more effective at removing sediments from runoff. Additionally earth diversions and settling ponds are less apt to fail during construction and typically require less repair and maintenance.

Proper installation is critical. Experience from ODNR and other field testing has shown that nearly 75 percent of silt fence does not function properly due to poor installation. Proper installation consists of it being installed: (1) on the contour; (2) with sufficient geotextile material buried; (3) with the fence pulled taut and supported on the downstream side by strong posts: (4) and with the fence backfilled and compacted.

Two general methods are used to install silt fence: (1) utilizing traditional method of digging the trench, installation of the fence materials, then backfilling and compaction; or (2) a method using an implement to static slice or narrow plow while installing the geotextile in the slot opening, followed by compaction and installation of posts. The latter methods generally installs silt fence more effectively and efficiently.

Silt fence is most applicable for relatively small areas with flat topography. Silt fence should be used below areas where erosion will occur in the form of sheet and rill erosion. For moderately steep areas, the area draining to the silt fence should be no larger that one quarter acre per 100 feet of fence length, the slope length no longer than 100 feet, and the maximum drainage gradient no steeper than 50 percent (2:1). This practice should be sited so that the entire fence ponds runoff and facilitates settling of suspended solids.

Design Criteria

Proper installation of silt fence requires utilizing the site topography. This is critical because the sediment removal process relies on ponding runoff behind the fence. As a ponding occurs behind the fence, coarser materials are allowed to settle out. Leaving a long, flat slope behind the silt fence maximizes areas for ponding (sediment deposition), and for water to disperse and flow over a much larger surface area of the silt fence. For silt fence to work effectively, runoff must be allowed to maintain sheet flow, to pond and to be released slowly. However, if silt fence is used without regard to a site's topography, it will typically concentrate runoff, increasing the likelihood of blocking and overtopping of the fence, thus reducing or eliminating its effectiveness.

Level Contour – For silt fence to promote deposition, it must be placed on the level contour of the land, so that flows are dissipated into uniform sheet flow that has less energy for transporting sediment. Silt fence should never concentrate runoff, which will result if it is placed up and down slopes rather than on the level contour.

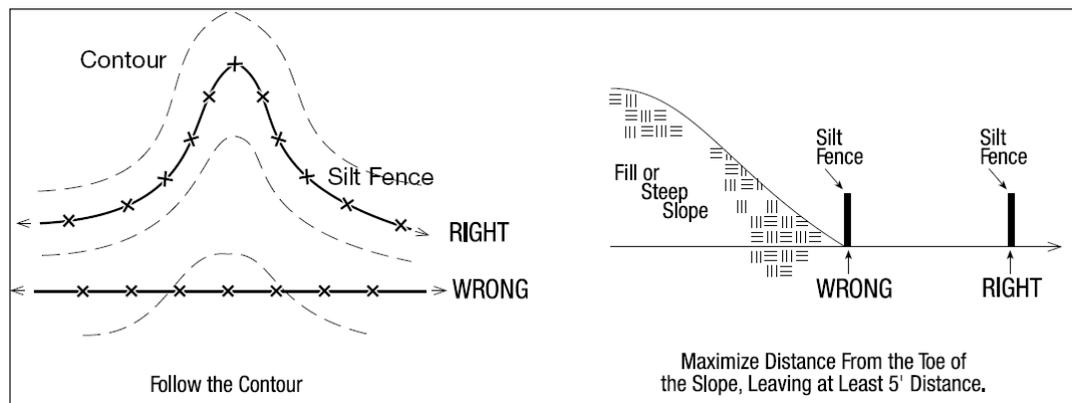


Figure 6.3.1 Silt fence layout

Flat Slopes – Slope has the greatest influence on runoff’s ability to transport sediment, therefore silt fence should be placed several feet away from the toe of a slope if at all possible, to encourage deposition. Silt fence generally should be placed on the flattest area available to increase the shallow ponding of runoff and maximize space available for deposited sediment.

Flow Around Ends – To prevent water ponded by the silt fence from flowing around the ends, each end must be constructed upslope so that the ends are at a higher elevation.

Vegetation – Dense vegetation also has the effect of dissipating flow energies and causing sediment deposition. Sediment-trapping efficiency will be enhanced where a dense stand of vegetation occurs for several feet both behind and in front of a silt fence.

Table 6.3.1 Maximum area contributing area using slope length

Maximum Slope Length Above Silt Fence		
Slope		Slope Length (ft.)
0% - 2%	Flatter than 50:1	250
2% - 10%	50:1 - 10:1	125
10% - 20%	10:1 - 5:1	100
20% - 33%	5:1 - 3:1	75
33% - 50%	3:1 - 2:1	50
> 50%	> 2:1	25

Note: For larger drainage areas, see standards for temporary diversions, sediment traps and sediment basins.

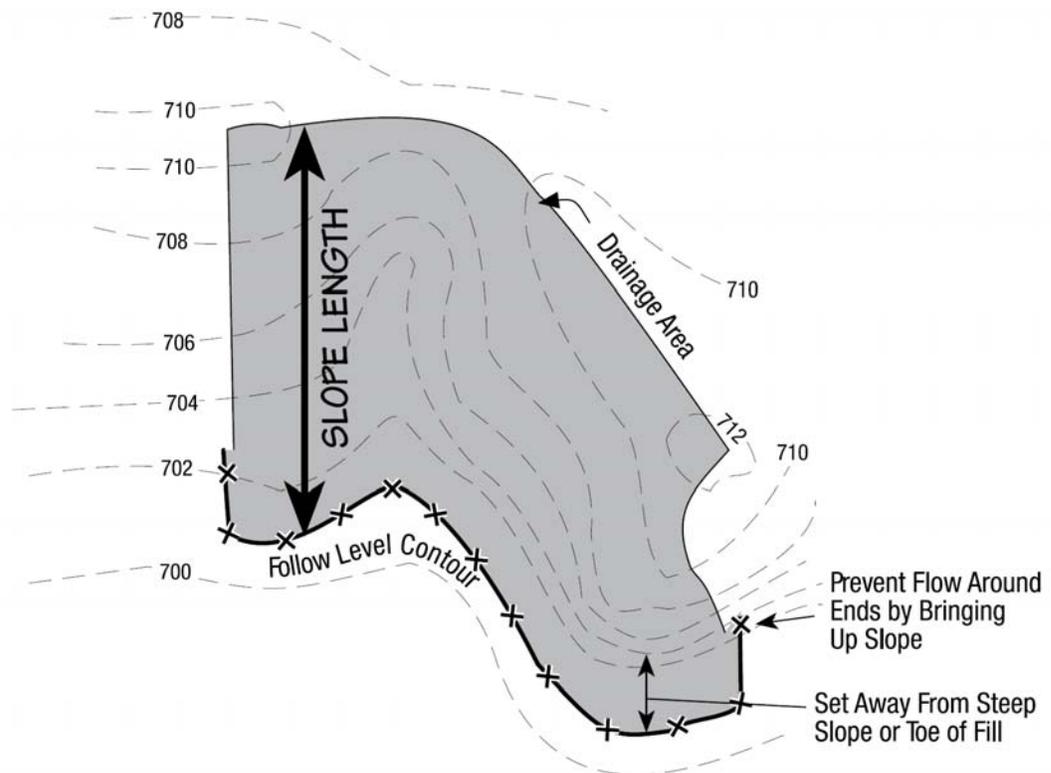


Figure 6.3.2 Silt fence and allowable drainage area

Dispersing Flow – Proper applications of silt fence allow all the intercepted runoff to pass as diffused flow through the geotextile. Runoff should never overtop silt fence, flow around the ends, or in any other way flow as concentrated flow from the practice. If any of these failures occurs, an alternative silt fence layout, or other practices are needed.

In cases where additional support of the fabric is needed, either wire or geogrid fencing may be used as a backing on the fabric. In these instances, the reinforcing material should be attached/erected first, then the fabric installed.

Materials

Fence posts shall be a minimum length of 32 inches long, composed of nominal dimensioned 2-by-2-inch hardwood of sound quality. They shall be free of knots, splits and other visible imperfections which would weaken the posts. Steel posts may be utilized in place of wood provide the geotextile can be adequately secured to the post.

Silt fence geotextile must meet the minimum criteria shown in the table below.

Table 6.3.2

Minimum criteria for Silt Fence Fabric (ODOT, 2002)		
Minimum Tensile Strength	120 lbs. (535 N)	ASTM D 4632
Maximum Elongation at 60 lbs	50%	ASTM D 4632
Minimum Puncture Strength	50 lbs (220 N)	ASTM D 4833
Minimum Tear Strength	40 lbs (180 N)	ASTM D 4533
Apparent Opening Size	≤ 0.84 mm	ASTM D 4751
Minimum Permittivity	1X10 ⁻² sec. ⁻¹	ASTM D 4491
UV Exposure Strength Retention	70%	ASTM G 4355

Maintenance

Silt Fence requires regular inspection and maintenance to insure its effectiveness. Silt fences must be inspected after each rainfall and at least daily during prolonged rainfall. Silt fence found damaged or improperly installed shall be replaced or repaired immediately.

Sediment deposits shall be routinely removed when they reach approximately one-half the height of the silt fence.

Common Problems/Concerns

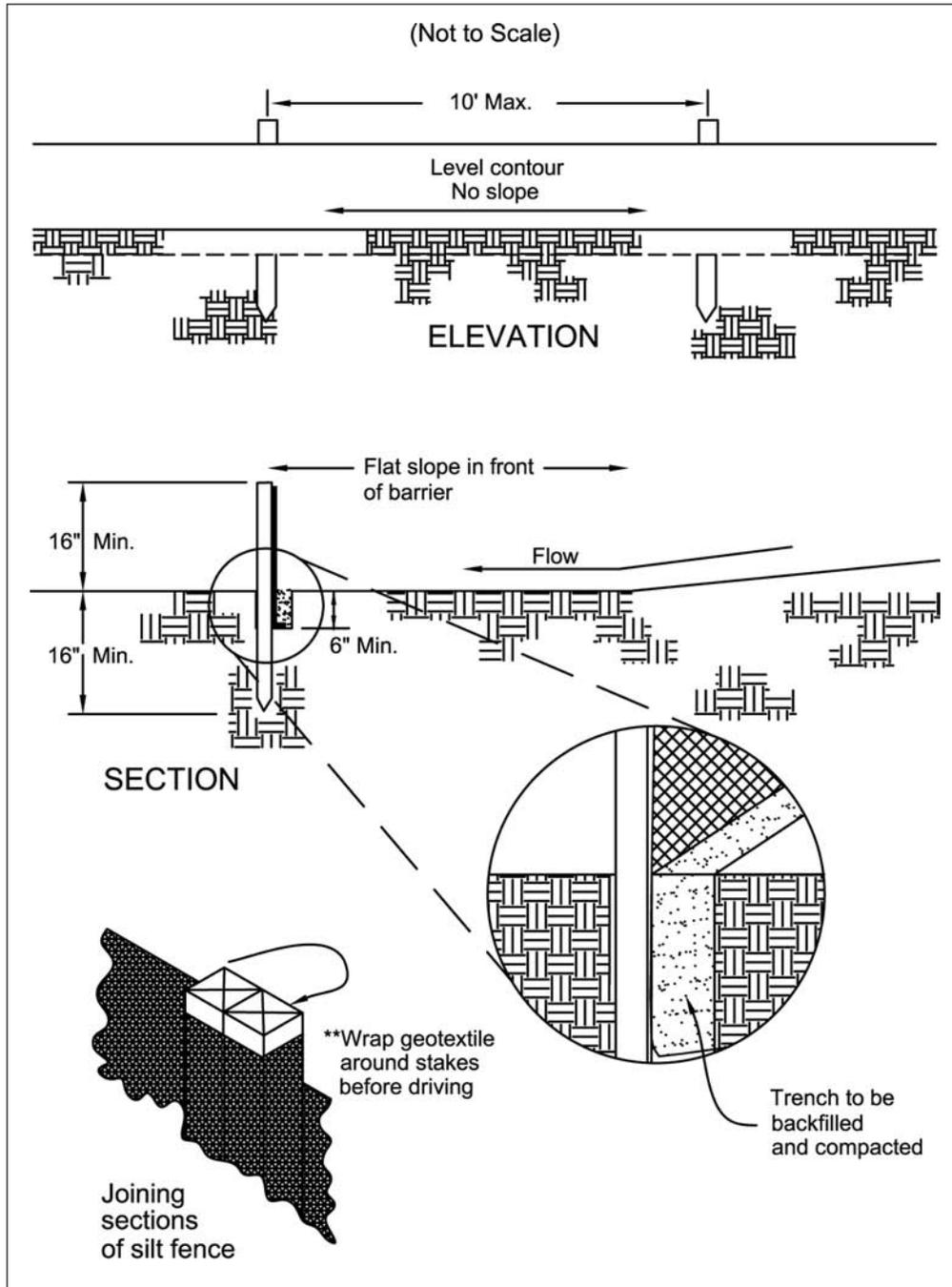
The predominant problems with silt fence regard inadequate installation or location that allows runoff to concentrate, overtop the fence, flow under the fabric or around the fence ends. If this occurs one of the following shall be performed, as appropriate:

- The location and layout of the silt fence shall be changed to conform to the level contour
- The silt fence shall be reinstalled with proper burial, backfill and compaction and support
- Accumulated sediment shall be removed
- Alternative practices shall be installed.

References

Construction and Material Specifications, January 1, 2002. State of Ohio Department of Transportation, P.O. Box 899, Columbus, Ohio 43216-0899, <http://www.dot.state.oh.us/construction/OCA/Specs/2002CMS/Specbook2002/Specbook2002.htm>

Specifications
for
Silt Fence



Specifications for **Silt Fence**

1. Silt fence shall be constructed before upslope land disturbance begins.
2. All silt fence shall be placed as close to the contour as possible so that water will not concentrate at low points in the fence and so that small swales or depressions that may carry small concentrated flows to the silt fence are dissipated along its length.
3. Ends of the silt fences shall be brought upslope slightly so that water ponded by the silt fence will be prevented from flowing around the ends.
4. Silt fence shall be placed on the flattest area available.
5. Where possible, vegetation shall be preserved for 5 feet (or as much as possible) upslope from the silt fence. If vegetation is removed, it shall be reestablished within 7 days from the installation of the silt fence.
6. The height of the silt fence shall be a minimum of 16 inches above the original ground surface.
7. The silt fence shall be placed in an excavated or sliced trench cut a minimum of 6 inches deep. The trench shall be made with a trencher, cable laying machine, slicing machine, or other suitable device that will ensure an adequately uniform trench depth.
8. The silt fence shall be placed with the stakes on the downslope side of the geotextile. A minimum of 8 inches of geotextile must be below the ground surface. Excess material shall lay on the bottom of the 6-inch deep trench. The trench shall be backfilled and compacted on both sides of the fabric.
9. Seams between sections of silt fence shall be spliced together only at a support post with a minimum 6-in. overlap prior to driving into the ground, (see details).
10. Maintenance—Silt fence shall allow runoff to pass only as diffuse flow through the geotextile. If runoff overtops the silt fence, flows under the fabric or around the fence ends, or in any other way allows a concentrated flow discharge, one of the following shall be performed, as appropriate: 1) the layout of the silt fence shall be changed, 2) accumulated sediment shall be removed, or 3) other practices shall be installed.

Sediment deposits shall be routinely removed when the deposit reaches approximately one-half of the height of the silt fence.

Silt fences shall be inspected after each rainfall and at least daily during a prolonged rainfall. The location of existing silt fence shall be reviewed daily to ensure its proper location and effectiveness. If damaged, the silt fence shall be repaired immediately.

Criteria for silt fence materials

1. Fence post – The length shall be a minimum of 32 inches. Wood posts will be 2-by-2-in. nominal dimensioned hardwood of sound quality. They shall be free of knots, splits and other visible imperfections, that will weaken the posts. The maximum spacing between posts shall be 10 ft. Posts shall be driven a minimum 16 inches into the ground, where possible. If not possible, the posts shall be adequately secured to prevent overturning of the fence due to sediment/water loading.
2. Silt fence fabric – See chart below.

Table 6.3.2 Minimum criteria for Silt Fence Fabric (ODOT, 2002)

FABRIC PROPERTIES	VALUES	TEST METHOD
Minimum Tensile Strength	120 lbs. (535 N)	ASTM D 4632
Maximum Elongation at 60 lbs	50%	ASTM D 4632
Minimum Puncture Strength	50 lbs (220 N)	ASTM D 4833
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