

SILT CURTAIN - FLOATING

(feet)
CODE 836



(Source: EPA Document Floating Silt Curtain Courtesy of Geofabrics Australasia)

DEFINITION

A temporary sediment control barrier consisting of a vertically suspended geosynthetic fabric installed within a body of water.

PURPOSE

The purpose of this practice is to provide sediment containment within a body of water for work in or near the body of water, as well as to deflect natural flow around the work area.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to:

1. Construction activities in or beside a water body (river, stream, lake, pond, etc.)
2. Soil disturbance in or adjacent to a body of water
3. Bridge construction
4. In-stream or stream bank excavation
5. In-stream or stream bank fill
6. Stream bank revetment/erosion protection
7. Upslope ground disturbance near a body of water
8. Dredging
9. Construction runoff near water bodies

10. Protection of sensitive areas from sediment and turbidity
11. Streambank stabilization

CRITERIA

The maximum flow velocity of the body of water shall be 5 fps. For flow velocities greater than 5 fps, a specifically designed system shall be required.

The isolated area shall be the minimum necessary to complete the work and in no case shall encompass more than 1/3 of the total stream width. The silt curtain shall be installed so it will not be disturbed by the construction activities.

The silt curtain shall be placed parallel to or at an angle to the direction of flow, not perpendicular to the flow and shall not extend across an entire waterway with moving water.

The silt curtain shall extend the full depth of the water body except where significant wind or wave action is present (Type III below). The curtain depth shall be 10% longer than the water depth (at the anticipated high water level) for Type I and Type II applications to ensure the curtain rests on the bottom.

Where significant wind and/or wave action (over 1 foot) is present for the

majority of the duration of the project, the depth of the silt curtain shall be 1 foot above the bottom at the mean low water level to prevent disturbing existing sediment on the bottom of the water body with the movement of the lower end of the silt curtain. Additionally, the maximum depth of the silt curtain where significant wind and/or wave action is present shall be 12 feet below the surface, regardless of the depth of the water body.

Both the top and the bottom of the silt curtain shall continue up onto the shore beyond the anticipated high water level. The bottom of the silt curtain shall be tapered to the shape of the shore. Furling straps may be used to adjust the length of the silt curtain up onto the shore.

Types of silt curtains:

The type of silt curtain selected shall be based on the average anticipated conditions.

Type I – no current, sheltered from wind and waves

Type II – moderate current (velocities up to 3.5 fps) and/or moderate wind and wave action

Type III – considerable current, high velocity (up to 5 fps), significant wind and wave action (over 1 foot) present

Components – The following components shall be used in the silt curtain, based on the anticipated conditions:

Fabric – The silt curtain shall be made from woven geotextile fabric meeting the requirements of material specification **592 GEOTEXTILE**, Table 1, Class 1. Within navigable waters, the fabric shall be a bright color (yellow or orange are recommended) to attract the attention of any boaters or swimmers.

The primary sediment type and particle size to be trapped shall be identified and the appropriate filter fabric requirements specified as shown in material specification **592 GEOTEXTILE**.

The fabric selection shall take into account the volume of water that must pass through based on the anticipated volume of water flowing into the protected area. The fabric selection shall also take into account the expected pollutant particle size based on the primary sediment identified.

The seams of the fabric shall be vulcanized welded or sewn and shall have the same strength characteristics as the fabric.

Floatation – Floatation segments shall be sealed into a sewn or heat welded seam along the entire top of the silt curtain to form a continuous float. Possible floatation material includes expanded polystyrene, ethafoam floats, or closed cell solid plastic foam floats.

Load Line – Type II and Type III silt curtains shall require a load line. The load line shall be a minimum ½” diameter rope installed in the sleeve within the floatation segments. The anchor shall be attached to the load line between the panels.

Ballast Chain – The base of the silt curtain shall be weighted to prevent it from billowing up and to maintain contact with the channel/pond bottom. A galvanized chain shall be sewn or heat sealed into a sleeve along the bottom edge. For Type I silt curtains the ballast chain shall weigh at least 0.7 lb/ft (1/4” chain). For Type II and III silt curtains the ballast chain shall weigh at least 1.1 lb/ft (5/16” chain).

Mooring – The silt curtain shall be properly anchored both onshore and in the water. The silt curtain shall extend up onto shore and be tied to a post or stable, large diameter tree (8” diameter or more at breast height).

For Type II and Type III installations, the anchoring system shall be designed based on the anticipated conditions (Type I installations do not require an anchoring system). The in-water anchor system shall consist of an anchor, chain, anchor line, buoy, crown buoy, and mooring cable – as needed (see Figure 1). The silt curtain shall be anchored every 100 feet at a minimum. For higher flow situations – where the current approaches 5 fps and/or waves over 1 foot are anticipated - the silt curtain shall be anchored every 50 feet. Silt curtains subject to reversing currents, waves, or flow from both sides shall be anchored on both sides.

The anchors shall be placed such that the slope of the anchor line is 7 horizontal to 1 vertical – this will minimize the stress on the silt curtain and increase the holding power of the anchor. A minimum ½” diameter rope shall be used for the anchor line.

The crown buoy shall be used to indicate the location of the anchor. Within navigable waters, the silt curtain and the anchor locations shall be clearly marked as they pose an obstacle to navigation.

Panel Connectors – Fabric panels shall have a minimum width of 50 feet. Adjacent panels shall be connected so as to provide a positive water seal and limit leakage using one of the following methods:

1. Sew the panels together using two stitch lines per seam and a stitch density of six to ten stitches per inch.
2. Join the panels of fabric using grommeted holes and rope lacing. The holes shall be only slightly larger than the rope to minimize leakage.
3. Use a slotted PVC pipe with evenly spaced gear clamps to connect the panels. Sew a ½” diameter rope into the ends of each panel and slide the ends of the panels down the slot in the PVC. The gear clamps shall be installed every 3 feet vertically and

shall pass through a slot cut in each panel.

4. Use commercially available aluminum slide-connectors.

Various manufactured devices are available and the criteria established by the manufacturers of these products shall be included with the plans.

The silt curtain shall be installed from a boat, when feasible. The curtain shall be rolled around the bottom ballast chain and furled, or tied, together at the top. Once the silt curtain is in the proper location, the load lines shall be properly anchored onshore and anchors shall be installed in the water, as specified. The curtain shall be un-furled in place. The installer shall ensure the lower edge of the curtain is in contact with the bottom of the water body.

CONSIDERATIONS

Any work within a stream is subject to the rules and regulations of the U.S. Army Corps of Engineers for in-stream modifications. A permit may also be required from the Illinois Department of Natural Resources.

For Type I installations (still water with little or no flow into the containment area), the fabric can be relatively impermeable, creating a containment barrier. In general, however, silt curtains are not designed as water impoundment dams and should not be expected to stop the flow of a significant amount of water. The main purpose is to isolate the work area and allow sediment to settle out of suspension. If a dry work area is required within a body of water, see practice standards **COFFERDAM 803** and/or **DEWATERING 813**.

When a silt curtain is placed within a moving body of water, the constriction may increase the potential for erosion of the far bank. Erosion should be monitored regularly and corrected, as needed.

When a large amount of silt or other fine sediment is expected, the geotextile fabric may be selected to reduce the amount of flow through the silt curtain to allow for settlement. The fabric selection should take into account the amount of water flowing into the containment area as well as the anticipated flow conditions.

Additional length should be provided in the vertical height to accommodate the water level fluctuations during the life of the silt curtain. However, the silt curtain should not be too long or sediment will accumulate in the pleats on the bottom and may pull the silt curtain under the water.

Where construction activities are to take place next to a body of water, attempts should be made to maintain a vegetated buffer strip of sufficient width to trap sediment. See practice standard **BUFFER STRIP 801**.

Appropriately sized rip-rap or other weights that keep the curtain in contact with the bottom may be used in lieu of the ballast chain for Type I silt curtain applications.

Depending on the expected water conditions, additional slack may be needed in the curtain so rising and falling water elevations will not cause the silt curtain to become submerged.

When determining the type of silt curtain to use, the average anticipated wind speed should be considered. One exceptionally windy day over the course of a multi-week project may not warrant increasing the type. For longer duration projects, especially those in larger bodies of water, a contingency plan may be needed for extended periods of inclement weather.

When a silt curtain is used within navigable waters, the waves created by passing boats should be taken into consideration when selecting the appropriate type and anchoring

methods. Also, a light buoy may be required to clearly identify the silt curtain.

When determining the overall length of the silt curtain, provide an additional 10 – 20% in straight line measurements for ease of installation, and to compensate for measuring errors, and to reduce stress on the barrier.

Ice and floating debris pose a potential for damage to the silt curtain. Floating debris should be removed immediately when it poses a threat to the silt curtain. Silt curtains are not recommended for use during the winter months, especially when freezing conditions are expected.

PLANS AND SPECIFICATIONS

Plans and specifications for installing silt curtain practices shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Locations of silt curtain practices.
2. Type of silt curtain.
3. Filter fabric specifications.
4. Installation, removal and disposal directions, per manufacturers' specifications.

Refer to standard drawing _____.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

If manufacturer's drawings are used, the designer shall verify that the requirements of this standard are met.

OPERATION AND MAINTENANCE

Each silt curtain practice or device shall be inspected on a daily basis at a minimum, using a boat where practical. The inspection shall check the condition of the floatation device, the fabric, load line, anchors, and buoys, as well as the location and functionality. Additionally,

the bottom of the silt curtain shall be inspected for folds and accumulated silt, which may pull the silt curtain under the water.

Any necessary repairs shall be made immediately. Additionally, the silt curtain shall be inspected after each runoff event, as well as after heavy winds. Accumulated sediment shall be removed per manufacturers' directions but not less than when the capacity for sediment storage has been reduced by half. Sediment that has been removed shall be placed and stabilized such that it will not reenter the water body.

Repairs or replacement of devices shall be made immediately. Follow manufacturer's recommendations for fabric and material repair.

Allow sediment to settle a minimum of 24 hours prior to removing the silt curtain. Fine sediment may require longer settling time.

If clay and/or silt particles are present in the area protected by the silt curtain and won't settle out (or it is infeasible to wait for them to settle out), the water in the protected area can be pumped out. The protected area will slowly fill with water through the silt curtain. Once the water level has stabilized, the silt curtain can be carefully removed.

The accumulated sediment shall be removed by hand prior to removing the silt curtain. If equipment is used to remove the sediment, care shall be taken not to disturb the silt curtain. After removal of the accumulated sediment, sufficient time shall be allowed for re-settlement before removing the silt curtain. However, if it is determined by the engineer and/or governing authority the removal of the sediment will cause more harm than leaving in the deposited sediment in place, carefully remove the silt curtain without disturbing the sediment.

The silt curtain shall be removed during calm weather and low flows. The silt curtain shall be removed by pulling it toward the construction area to minimize the release of trapped sediment. Both the top and bottom lines shall be pulled together like a parachute to pull the sediment ashore. Alternatively, the silt curtain may be furled and then removed, using a boat.

REFERENCES

Iowa State University. Center for Transportation Research and Education. Iowa Construction Site Erosion Control Manual, Chapter 3 – Structural Erosion Control Measures, 3.6 Flotation Silt Curtain. 2006.

Idaho Department of Environmental Quality. Storm Water Best Management Practices Catalog. BMP 45 Instream Sediment Trapping Devices. September 2005.

New York Standards and Specifications for Erosion and Sediment Control. Standard Specifications for Turbidity Curtain. August 2005.

City of Kelowna, British Columbia, Canada. Best Management Practices for Erosion & Sediment Control – Instream Works. July 21, 1998.

Francinques, N. R. and Palermo, M. R. (2005) "Silt Curtains as a Dredging Project Management Practice," DOER Technical Notes Collection (ERDC TN-DOER-21), US Army Engineering Research and Development Center, Vicksburg, MS.

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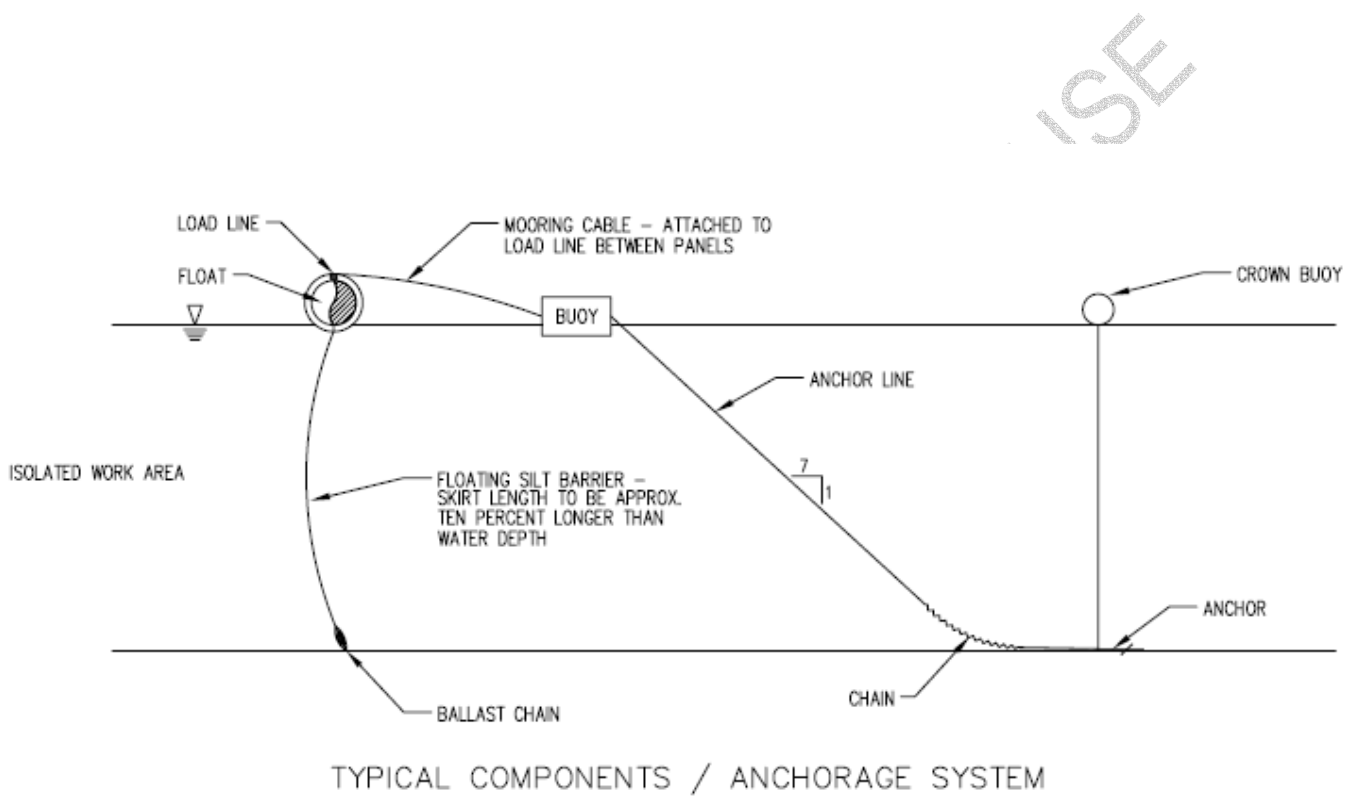


Figure 1