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Practice Standards and Specifications

SEDIMENT FENCE

Definition A temporary sediment control measure consisting of fabric located at the bottom, stretched, and supported by posts.

Purpose To retain sediment from small disturbed areas by reducing the velocity of sheet flows to allow sediment deposition.

Conditions Where Practice Applies Where runoff can be slowed behind the sediment fence without damaging the face of the sediment fence.

Do not install sediment fences across streams, ditches, or waterways, or other areas of concentrated flow.

Sediment fences should be placed along topographic elevations contours, where it can intercept sediment runoff that is in dispersed sheet flow. Sediment fences should not be used where grade slopes greater than 10 feet to 100 feet.

A sediment fence is a system to retain sediment on the construction site. The fence retains sediment primarily by extending flow and promoting deposition. In operation, generally the fence becomes clogged with fine particles, which reduce the flow rate. This causes a pond to develop behind the fence. The designer should anticipate ponding and provide sufficient storage areas and overflow outlets to prevent flow from overtopping the fence. Sheet sediment fences are not designed to withstand high water levels, flows from rain that only shallow pools of water. To the ends of a sediment fence into higher ground to prevent flow around the end of the fence must be checked. The design level. Cutting each end of the fence up into a "T" pattern may be appropriate to prevent end flow. Provide stabilized outlets to protect the fence system and release sheet flows that exceed the design flow.

Deposition occurs in the storage pond formed behind the fence. The designer can direct flows to specified deposition areas through appropriate positioning of the fence or by providing an excavated area behind the fence. Fine deposition areas at accessible points to promote routine cleanup and maintenance. Sheet sediment fences are a diversion of sheet slightly off the center. A maximum slope of 2 percent is recommended. This technique may be used to control shallow, uniform flows from small disturbed areas. The fence should be installed with 12 inches of TMC DOT #7 or #57 washed stone over the face of the fence. Sediment fences are not to be used on slopes or near drainage ditches where there is little movement of water. Confusing or diverting runoff unnecessarily with a sediment fence may create erosion and sedimentation problems that would not otherwise occur.

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Table 6.62a Maximum Slope Length and Slope for which Sediment Fence is Applicable

Table with 3 columns: Slope Length (ft), Slope Length (ft), Maximum Area (ft²). Rows include slopes from <math>< 1\%</math> to >20%.

Ensure that drainage area is no greater than 1/4 acre per 100 feet of fence. This is the maximum drainage area when the slope is less than 2 percent. When all runoff is to be stored behind the fence, ensure that the maximum slope length behind a sediment fence does not exceed the specifications shown in Table 6.62a. The steeper slope length allowed for steeper slopes will greatly reduce the maximum drainage area. For example, a 10-20% slope may have a maximum slope length of 25 feet. For a 100-foot length of sediment fence, the drainage area would be 250 x 1000 = 25000 ft², or 0.6 acres.

Make the fence stable for the 10-year peak storm flow.

Ensure that the depth of impounded water does not exceed 1.5 feet at any point along the fence.

If non-erectable outlets are provided, slope length may be increased beyond that shown in Table 6.62a, but runoff from the area to be deposited and bypassed equally and erosion potential along the fence must be checked. The velocity of the flow at the outlet or outlet support post should be in keeping with Table 6.65a, Appendix B.5.

Provide a riprap splash pad or other outlet protection device for any point where flow will enter the sediment fence, such as natural depression or swale. Ensure that the maximum height of the fence at a proposed, reinforced outlet does not exceed 6 feet and that support post spacing does not exceed 4 feet.

The design life of a synthetic sediment fence should be 6 months.

Materials 1. Use a synthetic fiber fabric of at least 95% by weight of polypropylene or polyester, which is certified by the manufacturer or supplier as conforming to the requirements in ASTM D 4641, which is shown in part in Table 6.62b.

Synthetic fiber fabric should contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0 to 120°F.

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- 2. Ensure that posts for sediment fences are 1.25 in./linear ft minimum steel with a minimum length of 5 feet. Make sure that steel posts have projections to facilitate fastening the fabric.
3. For reinforcement of standard strength fiber fabric, use wire fence with a minimum 14 gauge and a maximum mesh spacing of 6 inches.

Table 6.62b Specifications for Sediment Fence Fabric

Table with 5 columns: Test Method, Unit, Support/Slit Force, Un-Support/Slit Force, Type of Value. Rows include Grab Strength, Machine Direction, X-Machine Direction, Permeability, Aperture Opening Size, Ultraviolet Stability.

CONSTRUCTION 1. Construct the sediment barrier of standard strength or extra strength synthetic fiber fabric.

2. Ensure that the height of the sediment fence does not exceed 24 inches above the ground surface. (Higher fences may impound volumes of water sufficient to cause failure of the structure.)

3. Construct the fiber fabric from a continuous roll to the length of the barrier to avoid joints. What joints are necessary, securely fasten the fiber cloth only at a support post with 4 feet minimum overlap to the next post.

4. Support standard strength fiber fabric by wire mesh fastened securely to the up-slope side of the posts. Extend the wire mesh support to the bottom of the trench. Fasten the wire mesh to the fabric on the up-slope side of the fence post. Wire or plastic zip ties should have minimum 50 pound tensile strength.

5. When a wire mesh support fence is used, space posts a maximum of 6 feet apart. Support posts should be driven securely into the ground a minimum of 24 inches.

6. Extra strength fiber fabric with 6 post spacing does not require wire mesh support fence. Securely fasten the fiber fabric directly to posts. Wire or plastic zip ties should have minimum 50 pound tensile strength.

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- 7. Excavate a trench approximately 4 inches wide and 8 inches deep along the proposed line of posts and collapse from the bottom (Figure 6.62a).
8. Place 12 inches of fabric along the bottom and side of the trench.
9. Backfill the trench with standard weight filter fabric and compact. Through compaction of the backfill is critical to slit fence performance.
10. Do not attach fiber fabric to existing trees.

SEDIMENT FENCE INSTALLATION USING THE SLICING METHOD Instead of excavating a trench, placing fabric and then backfilling, the sediment fence may be installed using specially designed equipment that inserts the fabric into a cut created in the ground with a slit (Figure 6.62b).

The base of both end posts should be at least one foot higher than the middle of the fence. Check with a level if necessary.

2. Install posts 4 feet apart in critical areas and 6 feet apart on standard applications.

3. Install posts 2 feet deep on the downstream side of the slit fence, and as close as possible to the fabric, embedding posts through the fabric from upstream water pressure.

4. Attach posts with the staples facing away from the slit fabric.

5. Attach the fabric to each post with three ties, all spread within the top 3 inches of the fabric. Attach each tie diagonally 45 degrees behind the fabric, with each post at least 1 inch vertically apart. Also, each tie should be positioned to hang on a post nipple when tightened to prevent sagging.

6. Wrap approximately 6 inches of fabric around the end posts and secure with a tie.

7. No more than 24 inches of a 36 inch fabric is allowed above ground level.

8. The installation should be checked and corrected for any deviations before completion.

9. Compaction is vitally important for effective results. Compact the soil immediately next to the slit fence with the front wheel of the tractor, sled shoe, or roller exerting at least 40 pounds per square inch. Compact the upstream side first, and then each side twice for a total of 4 trips.

The base elements are easily found in bulk quantities. Lime can also be obtained in large quantities. They must be thoroughly incorporated into the soil through appropriate mechanical means. Ground surface applications without proper soil mixing will result in poor results.

In addition to the base fertilizers, other water elements are needed to produce healthy and vigorous growth. These include but may not be limited to sulfur, manganese, zinc, boron, chlorine and molybdenum. If not already included with bulk mixes of the base elements, they can be obtained from commercial suppliers.

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BLOCK AND GRAVEL INLET PROTECTION (Temporary)

Definition A sediment control barrier formed around a storm drain inlet by the use of standard concrete block and gravel.

Purpose To help prevent sediment from entering storm drains before stabilizing the contributing watershed. This practice allows early use of the storm drain system.

Conditions Where Practice Applies When storm drain inlets are to be made operational before permanent stabilization of the disturbed drainage area. This method of inlet protection applies to both drop inlets and curb inlets where heavy flows are expected, and are not to be used for inlet protection on residential streets.

Design Criteria Keep the drainage area no greater than 1 acre unless site conditions allow for frequent removal and adequate disposal of accumulated sediment. Keep the height of the barrier at least 12 inches and no greater than 24 inches. Do not use concrete. Limit the slope to prevent erosion and bypass flow.

Remove the first course of blocks at least 2 inches below the crest opening of the storm drain for lateral support. Support subsequent courses laterally if needed by placing a 2 x 4 inch wood stud through the block openings that is perpendicular to the block courses meeting support. Lay stone blocks on their side in the bottom row for dewatering the pool (Figure 6.62a).

Place gravel just below the top of the blocks on slopes of 2:1 or flatter. Place hardware cloth or comparable wire mesh with 1/2-inch openings over all block openings to hold gravel in place.

The top elevation of the structure must be at least 6 inches lower than the ground elevation down-slope from the inlet. It is important that all storm flows pass over the structure and into the storm drain and not just the structure. Temporary diking below the structure may be necessary to prevent bypass flow. Material may be excavated from inside the sediment pool for this purpose.

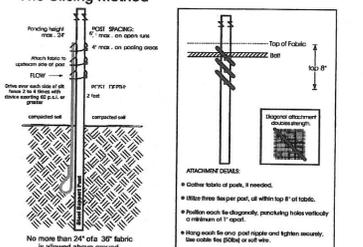
Revisions: 6.20, Temporary Diversions; 6.41, Outlet Stabilization Structure; Appendix B.5, Estimating Runoff.

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The Slicing Method



No more than 24" of fabric is allowed above ground.

Vibratory plow is not appropriate because of horizontal compaction.

Figure 6.62b Schematic for using the slicing method to install a sediment fence. Adapted from Silt Fence that Works.

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POROUS Baffles

Definition Porous barriers installed inside a temporary sediment trap, skimmer basin, or sediment basin to reduce the velocity and turbulence of the water flowing through the measure, and to facilitate the settling of sediment from the water before discharge.

Purpose Sediment traps and basins are designed to temporarily pool runoff water to allow sediment to settle before the water is discharged. Unfortunately, they are usually not very efficient due to high turbulence and "short-circuiting" flows which take runoff quickly to the outlet with little interaction with the water. Porous baffles improve the rate of sediment retention by distributing the flow and reducing turbulence. This process can improve sediment retention.

This practice should be used in any temporary sediment trap, skimmer basin, or temporary sediment basin.

Porous baffles effectively spread the flow across the entire width of a sediment basin or trap. Water flows through the baffle material, but is slowed sufficiently to back up the flow, causing it to spread across the entire width of the baffle (Figure 6.65a).

Spreading the flow in this manner utilizes the full cross section of the basin, which in turn reduces flow rates or velocity as much as possible. In addition, the turbulence is also greatly reduced. This combination increases sediment deposition and retention and also decreases the particle size of sediment returned.

The installation should be similar to a sediment fence (Figure 6.62b). The fabric should be 700 g/m² coil erosion blanket (Figure 6.65c) or equal. A support wire across the top will help prevent excessive sagging if the material is attached to it with appropriate ties.

References: Inlet Protection 6.50, Excavated Drop Inlet Protection (Temporary) 6.51, Hardware Cloth, and Gravel Inlet Protection (Temporary)

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4. If fine stone and gravel are used, keep the slope toward the inlet no steeper than 3:1. Leave a minimum 1-foot wide level zone area between the structure and extend the inlet to prevent gravel from entering inlet. On the slope toward the inlet, use stone 3 inches in diameter or larger. On the slope away from the inlet use 1/2-inch to 3/4-inch gravel (NCDOT #57 washed stone) at a minimum thickness of 1 foot.

Maintenance Inspect the barrier at least weekly and after each significant (1/2 inch or greater) rainfall and make repairs as needed.

Remove sediment as soon as necessary to provide adequate storage volume for subsequent rains.

When the contributing drainage area has been properly stabilized, remove all materials and any unstable soil, and either remove or dispose of it properly. Bring the disturbed area to proper grade, then smooth and compact it. Appropriately stabilize all bare areas around the inlet.

References: Inlet Protection 6.50, Excavated Drop Inlet Protection (Temporary) 6.51, Hardware Cloth, and Gravel Inlet Protection (Temporary)

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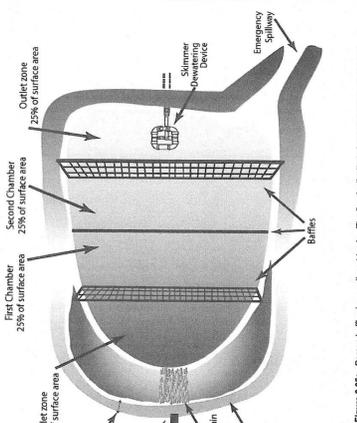


Figure 6.65a Porous baffles in a sediment basin. The flow is distributed evenly across the basin to reduce flow rates and turbulence, resulting in greater sediment retention.

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Baffles must be installed correctly in order to fully provide their benefits. Refer to Figure 6.65b and the following key points:

The baffle material needs to be secured at the bottom and sides using staples.

Most of the sediment will accumulate in the first bay, so this should be readily accessible for maintenance.

Extend 9 gauge wire to basin side or install T post to anchor baffle to side of basin and secure to vertical post.

Secure bottom of baffle to ground with 17 staples at 12" maximum spacing.

11 Gauge Landscape Staple

Steel Post 2" Depth

Baffle Material should be secured to the bottom and side of basin using 17" landscape staples.

Note: Install three (3) coil fiber baffles in basins at drainage outlets with a spacing of 1/4 the basin length. Two (2) coil fiber baffles can be installed in the basin less than 20 ft in length with a spacing of 1/3 the basin length.

Figure 6.65b Coil Fiber Baffle Detail Cross section of a porous baffle in a sediment basin.

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Gravel and Drop Inlet Protection (Permanent)

Definition A permanent sediment control measure consisting of a concrete structure with a gravel bed and a drop inlet.

Purpose To provide permanent sediment control for small disturbed areas by reducing the velocity of sheet flows to allow sediment deposition.

Conditions Where Practice Applies Where runoff can be slowed behind the sediment fence without damaging the face of the sediment fence.

Do not install sediment fences across streams, ditches, or waterways, or other areas of concentrated flow.

Sediment fences should be placed along topographic elevations contours, where it can intercept sediment runoff that is in dispersed sheet flow. Sediment fences should not be used where grade slopes greater than 10 feet to 100 feet.

A sediment fence is a system to retain sediment on the construction site. The fence retains sediment primarily by extending flow and promoting deposition. In operation, generally the fence becomes clogged with fine particles, which reduce the flow rate. This causes a pond to develop behind the fence. The designer should anticipate ponding and provide sufficient storage areas and overflow outlets to prevent flow from overtopping the fence. Sheet sediment fences are not designed to withstand high water levels, flows from rain that only shallow pools of water. To the ends of a sediment fence into higher ground to prevent flow around the end of the fence must be checked. The design level. Cutting each end of the fence up into a "T" pattern may be appropriate to prevent end flow. Provide stabilized outlets to protect the fence system and release sheet flows that exceed the design flow.

Deposition occurs in the storage pond formed behind the fence. The designer can direct flows to specified deposition areas through appropriate positioning of the fence or by providing an excavated area behind the fence. Fine deposition areas at accessible points to promote routine cleanup and maintenance. Sheet sediment fences are a diversion of sheet slightly off the center. A maximum slope of 2 percent is recommended. This technique may be used to control shallow, uniform flows from small disturbed areas. The fence should be installed with 12 inches of TMC DOT #7 or #57 washed stone over the face of the fence. Sediment fences are not to be used on slopes or near drainage ditches where there is little movement of water. Confusing or diverting runoff unnecessarily with a sediment fence may create erosion and sedimentation problems that would not otherwise occur.

Maintenance Inspect the barrier at least weekly and after each significant (1/2 inch or greater) rainfall and make repairs as needed.

Remove sediment as soon as necessary to provide adequate storage volume for subsequent rains.

When the contributing drainage area has been properly stabilized, remove all materials and any unstable soil, and either remove or dispose of it properly. Bring the disturbed area to proper grade, then smooth and compact it. Appropriately stabilize all bare areas around the inlet.

References: Inlet Protection 6.50, Excavated Drop Inlet Protection (Temporary) 6.51, Hardware Cloth, and Gravel Inlet Protection (Temporary)

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4. If fine stone and gravel are used, keep the slope toward the inlet no steeper than 3:1. Leave a minimum 1-foot wide level zone area between the structure and extend the inlet to prevent gravel from entering inlet. On the slope toward the inlet, use stone 3 inches in diameter or larger. On the slope away from the inlet use 1/2-inch to 3/4-inch gravel (NCDOT #57 washed stone) at a minimum thickness of 1 foot.

Maintenance Inspect the barrier at least once a week and after each rainfall. Make any required repairs immediately.

Remove sediment deposits as necessary to provide adequate storage volume for the next rain and to reduce pressure on the fence. Take care to avoid undermining the fence during cleanup.

Remove all fencing materials and unstable sediment deposits and bring the area to grade and stabilize it after the contributing drainage area has been properly stabilized.

References: ASTM D 4641 - 99, "Standard Specification for Silt Fence Materials" ASTM International. For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

ASTM D 4642 - 03, "Standard Practice for Silt Fence Installation" ASTM International. For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

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Christopher Erosion Control. http://www.tommy-efc.com/ Kentucky Erosion Prevention and Sediment Control Field Manual, 2004.

Rainfall Control Measures 6.20, Temporary Diversions 6.41, Outlet Stabilization Structure Appendix B.5, Estimating Runoff

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7. Extend 9 gauge minimum high tensile wire strand to side of basin or install steel T posts to anchor baffle to side of basin and secure to vertical end posts as shown in Figure 6.65b.

8. Drape the coil fiber mat over the wire strand mounted at a height of 6 inches above the spillway elevation. Secure the coil fiber mat to the wire strand with plastic ties or wire fasteners. Anchor the matting to the sides and floor of the basin with 12 inch staples, approximately 1 ft apart, along the bottom and side slopes of the basin.

9. Do not splice the fabric, but use a continuous piece across the basin.

10. Adjustments may be required in the stapling requirements to fit individual site conditions.

Inspection: Inspect baffles at least once a week and after each rainfall. Make any required repairs immediately.

Be sure to maintain access to the baffles. Should the fabric of a baffle collapse, tear, decompose, or become ineffective, replace it promptly.

Remove sediment deposits when it reaches half full, to provide adequate storage volume for the next rain and to reduce pressure on the baffle. Take care to avoid damaging the baffles during cleanup, and replace if damaged during cleanup operations. Sediment depth should never exceed half the designed storage depth.

After the contributing drainage area has been properly stabilized, remove all baffle materials and unstable sediment deposits, bring the area to grade, and stabilize it.

References: Sediment Traps and Barriers 6.66, Temporary Sediment Trap 6.61, Sediment Basins 6.62, Sediment Fence 6.64, Skimmer Sediment Basin

McLaughlin, Richard, "Soil Fines: Baffles to Improve Sediment Basins." N.C. State University Cooperative Extension Service Fact Sheet AGW-439-59, 2005.

North Carolina Department of Transportation Erosion and Sedimentation Control Special Provisions

Sullivan, Brian, City of High Point Erosion Control Specifications.

Thaxton, C. S., J. Calantoni, and R. A. McLaughlin, 2004. Hydrodynamic assessment of various types of baffles in a sediment detention pond. Transactions of the ASAE, Vol. 47(3): 741-749.

Revisions: 6.723, TOWN OF BOONE; 7.2023, TOWN OF BOONE; 1.2024, ISSUE FOR CONSTRUCTION

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