Final Draft of Standard

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6.65 POROUS BAFFLES

Definition

Porous barrier constructed of coir fiber material or equal installed within a temporary sediment trap, skimmer basin, or sediment basin to distribute flow of construction runoff cross sectionally so the velocity and energy of construction runoff can be reduced to enhance the settling of sediment prior to discharge.

Purpose

Sediment traps and basins are designed to temporarily impound construction stormwater runoff and allow sediment to settle before the stormwater is discharged. Unfortunately, they are not very efficient due to high turbulence and “short-circuiting” flows which allows stormwater to flow to the outlet with little interaction or obstruction. Porous baffles improve the rate of sediment retention within the basin or trap by distributing the flow and reducing energy.

Conditions Where Practice Applies

The practice of using porous baffles should be used in any temporary sediment trap, skimmer basin, or temporary sediment basin.

Planning Considerations

Porous baffles effectively spread the flow across the entire width of a sediment basin or trap. Water flows through the porous baffle material, but energy is slowed sufficiently to reduce flow, causing it to spread across the entire width of the basin. (Figure 6.65a). This reduction in energy allows for an increase in sediment deposition and retention.

The baffle material should be 700 g/m^2 coir erosion mat (Figure 6.65d) or equal. A 9-gauge high tension wire connecting the steel support posts prevents sagging of the material.

Porous Baffles need to be installed correctly to ensure reduction in stormwater energy flowing through the basin. Refer to Figure 6.65b and the following key points:

- The Porous Baffle material does not require trenching or burying but does need to be secured at the bottom and sides using wire staples.

- Most of the sediment will accumulate in the first bay, so this should be readily accessible for maintenance.
- The ends of the Porous Baffle should extend to the basin interior side slopes in a level or slightly elevated manner to avoid allowing pooled or impounded water to flow around.

Design Criteria

The *Temporary Sediment Trap* or *Temporary Sediment Basin* should be sized using the appropriate design criteria. Three Porous Baffles should be placed in Sediment Basins or Skimmer Basins that are 20 feet or greater in length. Basins less than 20 feet in length should utilize two Porous Baffles.

When three Porous Baffles are utilized, the percent of surface area for each section of the baffles is as follows:

- Inlet Zone: ¼ length of basin or trap
- First Cell: ¼ length of basin or trap
- Second Cell: ¼ length of basin or trap
- Outlet Zone: ¼ length of basin or trap

Construct Porous Baffles up the sides of the trap or basin interior side slopes so water does not flow around the baffle. Most of the sediment will be captured in the first section. Smaller particle size sediment are often captured in the latter sections. Be sure to maintain access to the trap or basin for maintenance and sediment removal. The orientation of the Porous Baffles can be adjusted to meet the shape of the basin or trap. The intent is for construction stormwater runoff to enter the basin or trap as far away from the spillway or weir section as possible and flow through three porous baffles prior to discharge through the spillway or skimmer apparatus (unless basin length is 20 feet or less). Placing porous baffles in a chevron n or arc pattern is allowable as long as proper spacing between each baffle is maintained.

The design life of porous baffle material is typically 6-12 months but may be limited if material becomes damaged or clogged.

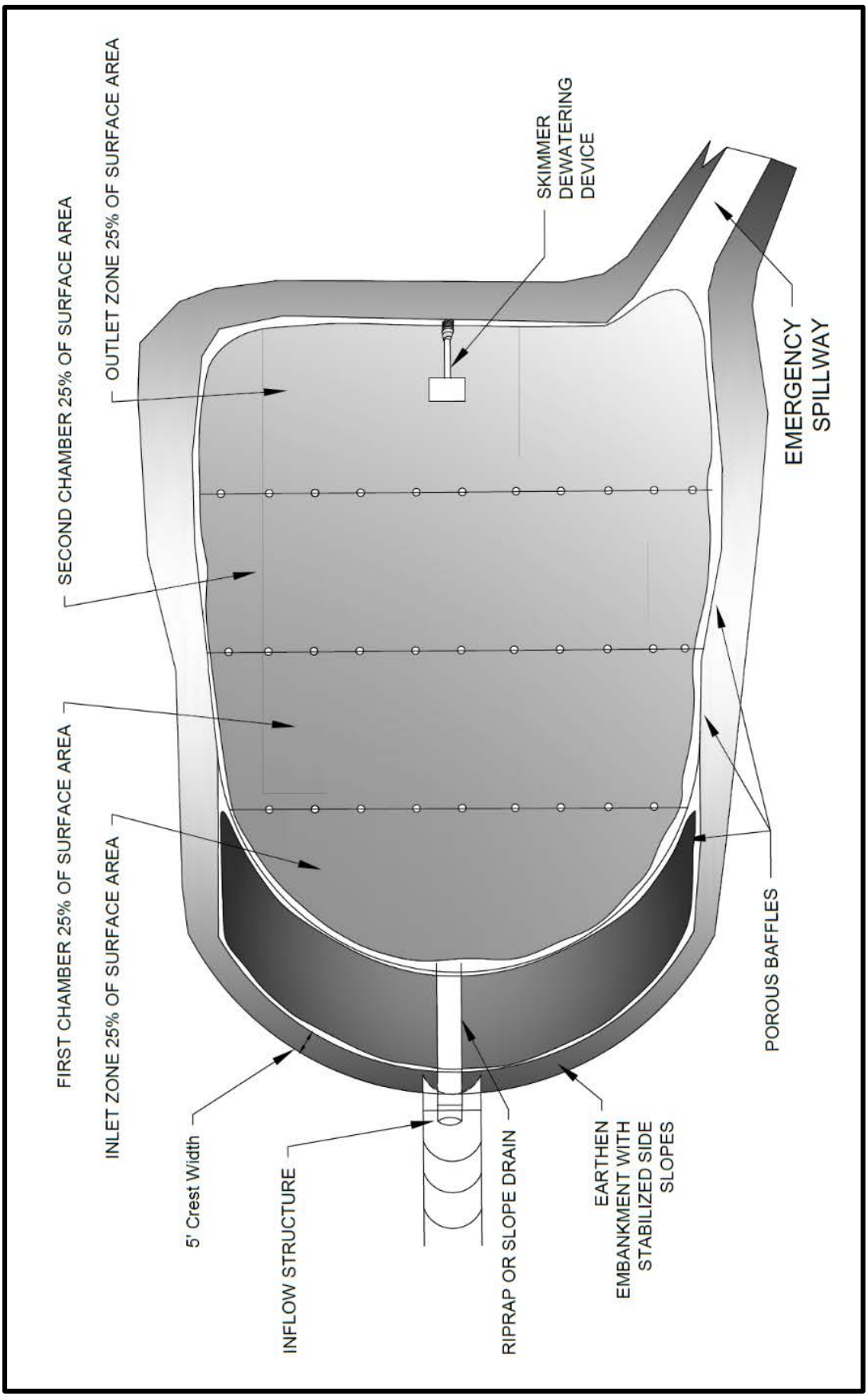
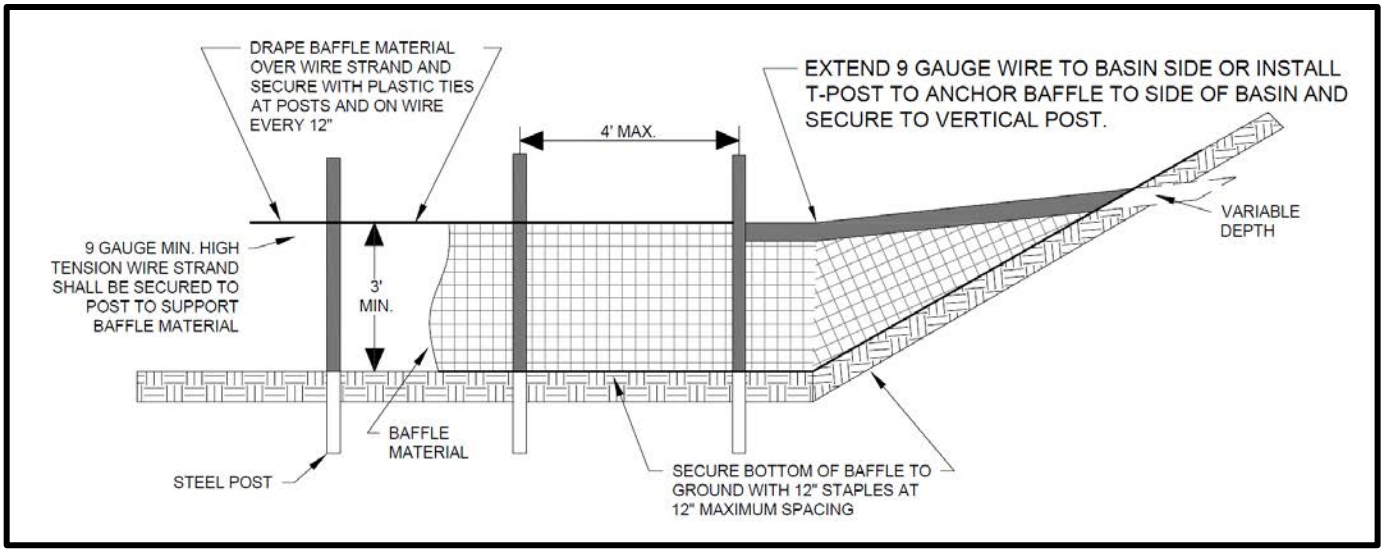


Figure 6.65a, *Porous baffles in a sediment basin. The flow is distributed evenly across the basin to reduce flow rates and energy, resulting in greater sediment retention*



*If the temporary sediment basin will be converted to a permanent stormwater basin of greater depth, the baffle heigh should be based on the pool depth during use as a temporary sediment basin.

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

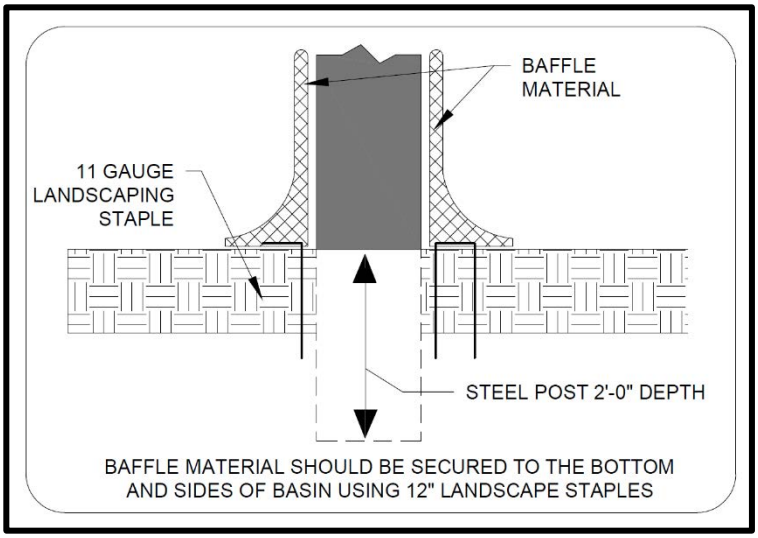


Figure 6.65b, *Porous Baffle detail and cross section of a porous baffle in a sediment basin*

Figure 6.65c, *Example of porous baffles installed in skimmer basins*

Figure 6.65d, *Close-up of a porous baffle made of 700 g/m^2 coir erosion blanket*

Coir Fiber Baffle Material Property Requirements	
Thickness	0.30 in. minimum
Tensile Strength (Wet)	900 x 680 lb/ft minimum
Elongation (Wet)	69% x 34% maximum
Flow Velocity	10-12 ft/sec
Weight	20 oz/SY (680 g/m^2) minimum
Minimum Width	6.5 feet
Open Area	50% maximum

Table 6.65a, *Specifications for Porous Baffle Material*

Construction Specifications

Materials

1. Use matting made of 100% coconut fiber (coir) twine woven into high strength matrix with the properties shown in Table 6.65a.
2. Staples should be made of 0.125 inch diameter new steel wire formed into a ‘U’ shape not less than 12 inches in length with a throat of 1 inch in width. The staples anchor the porous baffles into the sides and bottom of the trap or basin.
3. Ensure that steel posts for porous baffles are of a sufficient height to support baffles at desired height. Posts should be approximately 1-3/8” wide

measured parallel to the fence, and have a minimum weight of 1.25 lb./linear ft. The posts must be equipped with an anchor plate having a minimum area of 14.0 square inches and be of the self-fastener angle steel type to have a means of retaining wire and porous baffle material in the desired position without displacement.

4. Use 9-gauge high tension wire for supporting porous baffle material.
5. Alternative porous baffle material may be allowed if circumstances dictate. The Designer will be required to provide supporting specifications for approval prior to installation.

Construction

1. Install the basin or trap so the bottom is level front to back and side to side.
2. Install the porous baffle immediately upon excavation of the basin or trap.
3. Install steel posts to a depth of 24 inches and spaced a maximum of 4 feet apart.
4. Install three rows of porous baffles between the inlet and outlet discharge point. Basins less than 20 feet in length may use 2 porous baffles.
5. Attach a 9-gauge high tension wire strand to the steel posts at a maximum heigh of 6 inches above the basin spillway elevation and a minimum of 2 inches below the surrounding embankment with plastic ties or wire fasteners to prevent sagging. If the temporary sediment basin or trap will be converted to a permanent stormwater basin of a greater depth, the baffle height should be based on the pool depth during use as a temporary sediment basin or trap.
6. Extend porous baffle to the side of the basin using steel T-posts or similar to anchor baffle to the side slope of the basin or trap and secure as shown in Figure 6.65b.
7. Drape the porous baffle material over the wire strand and anchor the material to the sides and floor of the basin or trap with 12 inch wire staples, approximately 1 foot apart, along the bottom and side slopes.
8. Do not splice the porous baffle material but use a continuous piece across the basin.
9. Adjustments may be required in the stapling requirements to fit individual site conditions.

Maintenance

Inspect porous baffles at least once a week and after each rainfall. Make any required repairs immediately as efficiency of basin or trap is reduced if porous baffles are not functioning as intended.

Be sure to maintain access to the porous baffles. Should the porous baffle material 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 porous baffles.

Take care to avoid damaging the porous baffles during cleanout and replace if damaged during cleanout operations. Sediment depth should never exceed half the designed storage depth. Utilizing an indicator stake within the basin or trap is a good aid in determining when a basin or trap is half full.

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

References

Sediment Traps and Barriers
6.60, Temporary Sediment Trap
6.61, Sediment Basins
6.62, Sediment Fence
6.64, Skimmer Sediment Basin

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

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

CTC Edits to Original Standard

Revise and Proceed

POROUS BAFFLES

6.65

Definition Porous barrier constructed of coir fiber material or equal installed within a temporary sediment trap, skimmer basin, or sediment basin to distribute flow of construction runoff cross sectionally so the velocity and ~~turbulence~~energy of the construction runoff can be reduced to enhance ~~facilitate~~ the settling of sediment _____ _____prior to _____discharge.

Purpose

Sediment traps and basins are designed to temporarily impound construction stormwater runoff and allow sediment to settle before the stormwater is discharged. Unfortunately, they are not very efficient due to high turbulence and "short-circuiting" flows which allows stormwater to flow to the outlet with little interaction or obstruction. Porous baffles improve the rate of sediment retention within the basin or trap by distributing the flow and reducing ~~turbulence~~ energy. ~~This process improves sediment retention.~~

Conditions Where Practice Applies

The~~is~~ practice of using porous baffles should be used in any temporary sediment trap, skimmer basin, or temporary sediment basin.

Planning Considerations

Porous baffles effectively spread the flow across the entire width of a sediment basin or trap. Water flows through the porous baffle material, but energy is slowed sufficiently to reduce flow, causing it to spread across the entire width of the basin. (Figure 6.65a). This reduction in energy~~In addition, the turbulence is also greatly reduced. This combination~~allows for an increase~~s~~ in sediment deposition and retention.

~~The installation should be similar to a sediment fence (Figure 6.65b).~~ The baffle material should be 700 g/m^2 coir erosion mat (Figure 6.65c) or equal. A 9-gauge high tension wire connecting the steel support posts prevents sagging of the material.

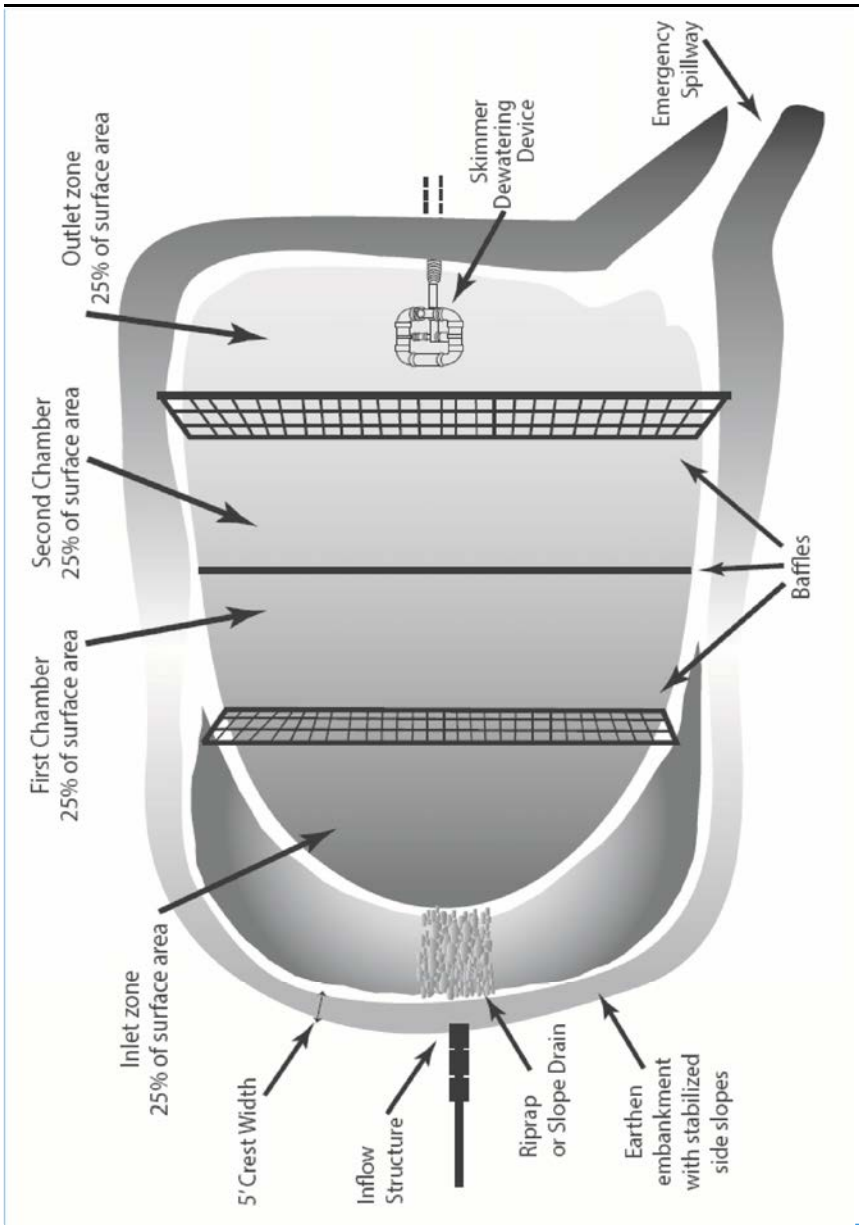


Figure 6.65a Porous baffles in a sediment basin. The flow is distributed evenly across the basin to reduce flow rates and turbulence, resulting in greater sediment retention.

Commented [dp1]: add porous ahead of word Baffles in drawing.
Consider removing the drawing that resembles Faircloth device.
Suggest removal of Emergency Spillway on drawing.
Consider cross sectional drawing from NCDOT.

Porous Baffles need to be installed correctly to ensure reduction in stormwater energy flowing through basin.~~in order to fully provide their benefits.~~
Refer to Figure 6.65b and the following key points:

- The porous baffle material does not require trenching or burying but does need to be secured at the bottom and sides using wire staples.
- Most of the sediment will accumulate in the first bay, so this should be readily accessible for maintenance.
- The ends of the ~~Coir Fiber~~Porous Baffle should extend to basin interior side slopes in a level or slightly elevated manner to avoid allowing pooled or impounded water to flow around.

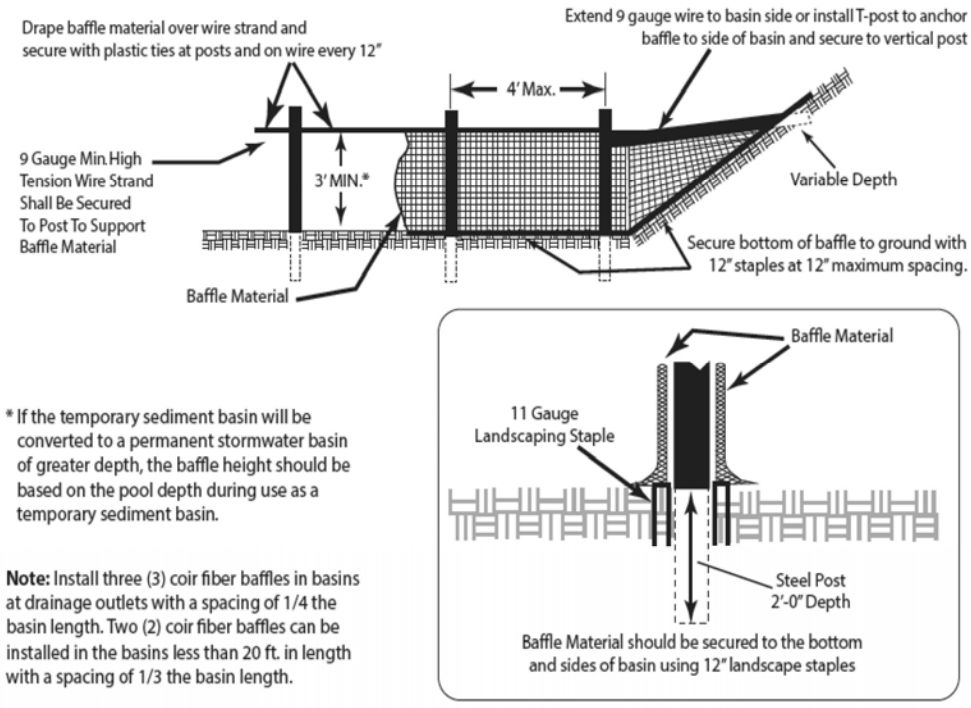


Figure 6.65b Coir Fiber Baffle Detail
Cross section of a porous baffle in a sediment basin.

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Figure 6.65c Example of porous baffles made of 700 g/m^2 coir erosion blanket as viewed from the outlet.

Figure 6.65d Close-up of a porous baffle.

Design Criteria

The temporary sediment trap or temporary sediment basin should be sized using the appropriate design criteria. Three porous baffles should be placed in Sediment Basins or Skimmer Basins that are ~~of~~ 20 feet or greater in length. Basins less than 20 feet in length should utilize two porous baffles.

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- first cell: _____¼ length of basin or trap
- second cell: _____¼ length of basin or trap
- outlet zone: _____¼ length of basin or trap

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lb/linear ft. The posts must be equipped with an anchor plate having a minimum area of 14.0 square inches and be of the self-fastener angle steel type to have a means of retaining wire and porous baffle material in the desired position without displacement.

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Open Area	50% maximum

CONSTRUCTION

1. Install the basin or trap so the bottom is level front to back and side to side.

~~**2.**~~ Install the porous baffle immediately upon excavation of the basin or trap~~s~~.

~~**3.**~~**2.**

~~**4.**~~**3.** Install steel posts to a depth of 24 inches and spaced a maximum of 4 feet apart.

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~~7.~~6. Extend porous baffle to side of basin using steel T-posts or similar to anchor baffle to side slope of basin or trap and secure as shown in Figure 6.65b.

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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.

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