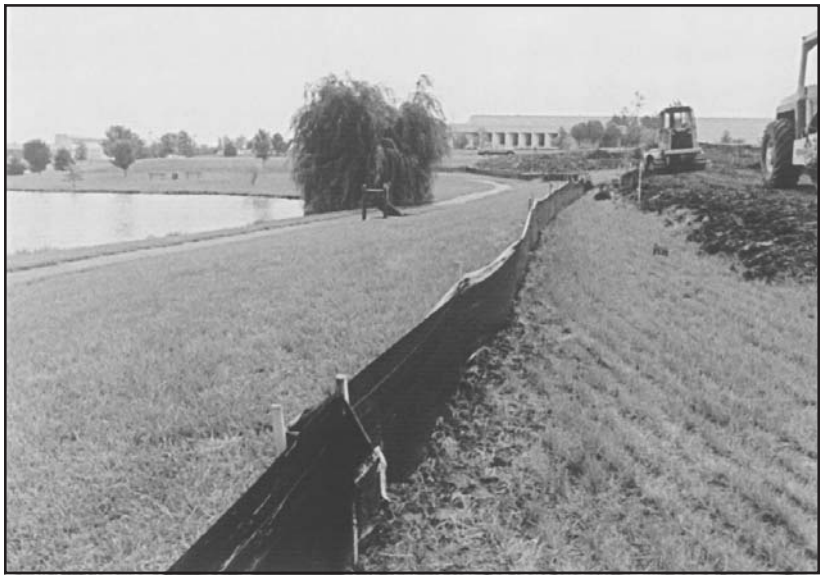
Sediment Fence

Practice Description

A temporary sediment barrier consisting of a geotextile fabric which is attached to supporting posts and trenched into the ground. Sediment-laden runoff ponds uphill from the sediment fence and runoff is temporarily stored to allow sediment to settle out of the water.

This practice applies where sheet erosion occurs on small disturbed areas. Sediment fences are intended to intercept and detain small amounts of sediment from disturbed areas in order to prevent sediment from leaving the site. Sediment fences can also prevent sheet erosion by decreasing the velocity of the runoff.



A properly installed sediment fence slows water flow long enough for the sediment to settle out.

C. Rahm, NRCS. Platte Co.

Recommended Minimum Requirements

Prior to start of construction, sediment fences should be designed by a qualified professional. Plans and specifications should be referred to by field personnel throughout the construction process.

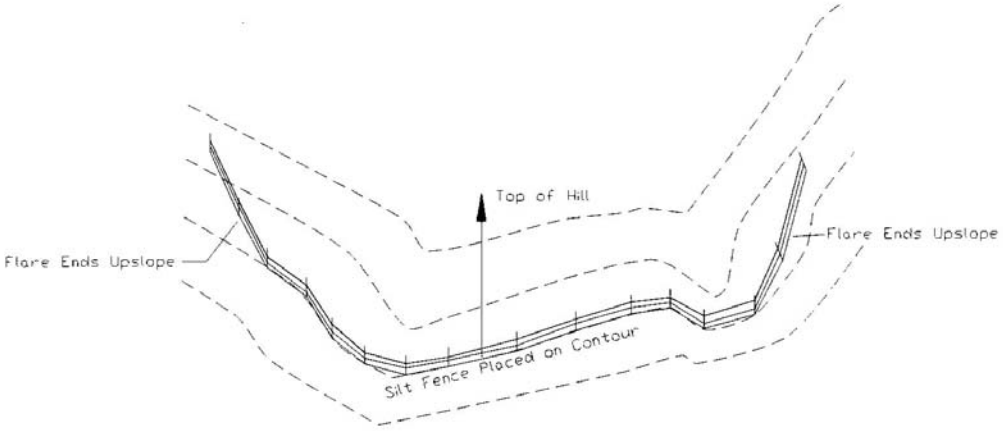
- **Drainage Area:** Limited to 1/4 acre per 100 feet of fence. Area is further restricted by slope steepness as shown in Table 5.16.

- **Location:** Fence should be built on a nearly level grade and at least 10 feet from the toe of the slope to provide a broad shallow sediment pool. Install on the contour, where fence can intercept runoff as a sheet flow; not located crossing channels, waterways or other concentrated flow paths; not attached to existing trees.

- **Length:** Maximum of 600 feet; flare ends of fence uphill to temporarily impound water as shown in Figure 5.33a.

Table 5.16 Typical Land Slope and Distance for Sediment Fence

Land Slope (%)	Maximum Slope Distance * above Fence (feet)
less than 2	100
2 to 5	75
5 to 10	50
greater than 10	*



* Follow manufacturers' recommendations for proper spacing.

Figure 5.33a Placement of Sediment Fence

- **Spacing of Support Posts:** 10 feet maximum for fence supported by wire; 6 feet maximum for high strength fabric without supportive wire backing

- **Trench:** Bottom 1 foot of fence must be buried minimum of 6 inches deep.

- **Impounded Water Height:** Depth of impounded water should not exceed 1.5 feet at any point along the fence.

- **Support Posts:** 4-inch diameter wood or 1.33 lb/linear foot steel, buried or driven to a depth of 24 inches with support wire; 2-inch square wood or 1.0 lb/linear foot steel without support wire. Steel posts should have projections for fastening fabric.

Table 5.17 Example Specifications for Sediment Fence Fabric

Physical Property	Minimum Requirement
Filtering Efficiency	85%
Tensile strength at 20% (maximum) elongation:	
Standard strength	30 lb/linear inch
High strength	50 lb/linear inch

Source: Adapted from North Carolina Field Manual, 1991

- **Support Wire:** Wire fence (14-gauge with 6-inch mesh), necessary if standard strength fabric is used

- **Reinforced, Stabilized Outlets:** Should be located to limit water depth to 1.5 feet measured at lowest point along crest line.
  Crest Height: 1 foot maximum
  Width of splash pad: 5 feet maximum
  Length of splash pad: 5 feet minimum
  Supports: 4 foot spacing

- **Synthetic Geotextile Fabric:** Conforming to specifications in Table 5.17 and containing ultraviolet light inhibitors and stabilizers. Minimum design life of 6 months.

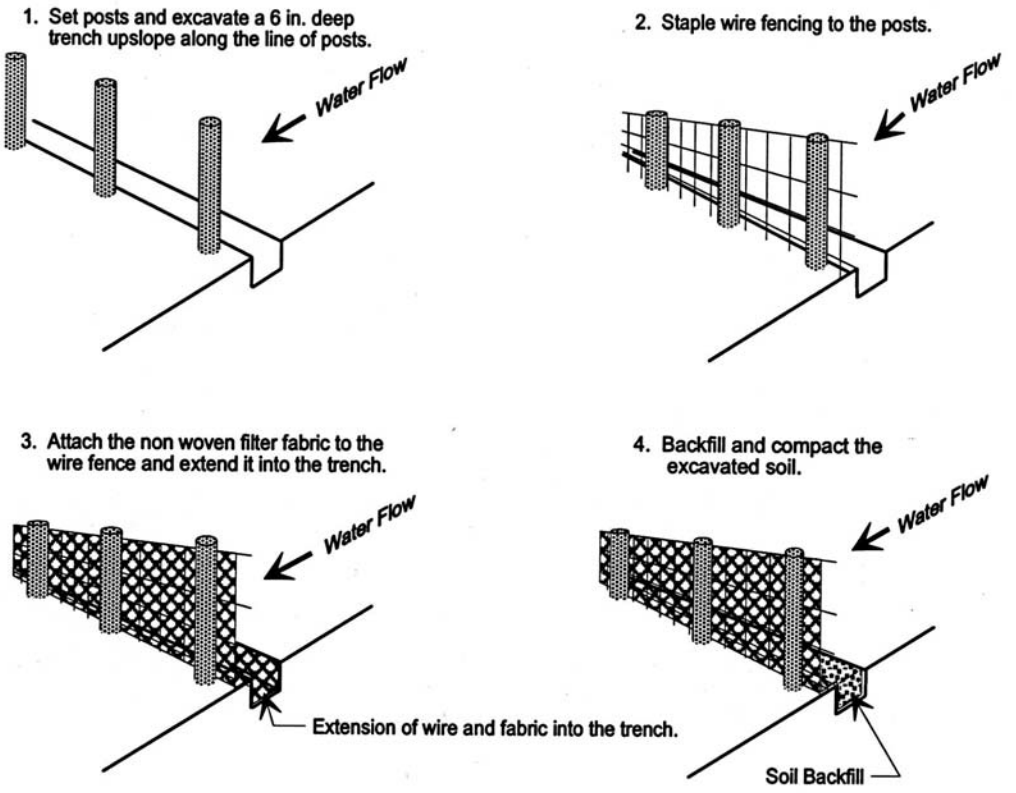


Figure 5.33 Installation of Sediment Fence

Construction

Site Preparation

Determine exact location of underground utilities.

Grade alignment of fence as needed to provide broad, nearly level area upstream of fence.

Fence Installation

Dig a trench at least 6 inches deep along the fence alignment as shown in Figure 5.33.

Drive posts at least 24 inches into the ground on the downslope side of the trench. Space posts a maximum of 10 feet if fence is supported by wire, or 6 feet if high strength fabric and no support fence is used.

Fasten support wire fence to upslope side of posts, extending 6 inches into the trench as shown in Figure 5.33.

Attach continuous length of fabric to upslope side of fence posts. Try to minimize the number of joints. Avoid joints at low points in the fence line. Where joints are necessary, fasten fabric securely to support posts and overlap to the next post.

Place the bottom 1 foot of fabric in the 6-inch deep trench (minimum), lapping toward the upslope side. Backfill with compacted earth or gravel as shown in Figure 5.34.

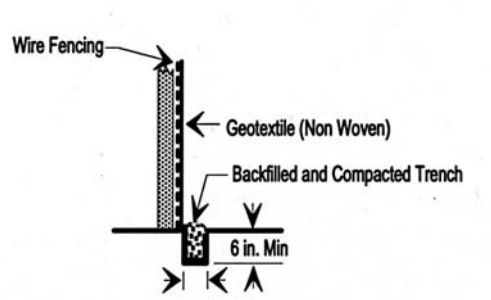


Figure 5.34 Detail of Sediment Fence Installation

To reduce maintenance, excavate a shallow sediment storage area in the upslope side of the fence. Provide good access in areas of heavy sedimentation for clean out and maintenance.

Reinforced Stabilized Outlet Installation

Allow for safe bypass of storm flow to prevent overtopping failure of fence.

Set outlet elevation so that water depth cannot exceed 1.5 feet at the lowest point along the fence.

Drive posts securely at least 24 inches into the ground, at a spacing of 4 feet. Install a horizontal brace between the support posts to serve as an overflow weir and to support the top of the fabric.

Immediately downslope of the fabric, excavate foundation for splashpad a minimum of 5 feet wide, 5 feet long and 1 foot deep. Place 1 foot of riprap in the excavated foundation. The surface of the riprap should be flush with the undisturbed ground (no outfall).

Erosion Control

Stabilize disturbed areas in accordance with vegetation plan.

Construction Verification

Check finished grades and dimensions of the sediment fence. Check materials for compliance with specifications.

Troubleshooting

Consult with registered design professional if any of the following occur:

- Variations in topography on site indicate sediment fence will not function as intended; changes in plan may be needed.
- Design specifications for filter fabric, support posts, support fence, gravel or riprap cannot be met; substitutions may be required. Unapproved substitutions could lead to failure.

Maintenance

Inspect sediment fences at least once a week and after each rainfall. Make any required repairs immediately.

Should the fabric of a sediment fence collapse, tear, decompose or become ineffective, replace it promptly.

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 damaging or undermining the fence during cleanout.

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.

Common Problems

Drainage area too large or too much sediment accumulation allowed before cleanout; results in overtopping, sagging or collapse of fence. Increase sediment storage capacity upslope of fence or remove accumulation more frequently—repair fence.

Approach too steep; results in collapse of fence due to high velocity or undercutting of fence—reduce slope of approach area, or consult with registered design professional.

Fence not adequately supported; results in sagging or collapse of fence—add additional supports.

Bottom of fence not buried properly, results in undercutting of fence—reinstall fence using proper method of trenching.

Fence installed across drainageway; results in sagging, collapse or undercutting of fence—relocate fence away from drainageway.

Sediment Fence

Straw Bale Sediment Trap

Practice Description

A temporary catch basis consisting of a row or more of entrenched and anchored straw bales.

This practice applies downstream of small disturbed areas that are subject to sheet erosion or in minor swales with less than 2 acres of drainage area. The purpose is to intercept and detain small amounts of sediment in order to prevent sediment from leaving the construction site.

K. Grimes, SWCD. St. Charles Co.

Straw bale sediment traps are not suitable for drainage areas larger than two acres. A rock dam or a sediment basin would have been a better choice for erosion and sediment control on this site.

Recommended Minimum Requirements

Prior to start of construction, straw bale sediment traps should be designed by a qualified professional. Plans and specifications should be referred to by field personnel throughout the construction process. The straw bale sediment trap should be built according to planned grades and dimensions.

- **Drainage Area:**
  Areas subject to sheet erosion: 1/4 acre per 100 feet of barrier
  Minor swales: less than 2 acres
  Area is further restricted by slope steepness as shown in Table 5.18

- **Bale size:** 14-inch x 18-inch x 36-inch
- **Anchors:** Two 36-inch long (minimum) 2- x 2-inch hardwood stakes driven through each bale

Table 5.18 Maximum Land Slope and Distance above Straw Bale Sediment Traps

Land Slope (%)	Maximum Slope Distance above Straw Bale Sediment Trap (feet)
less than 2	100
2 to 5	75
5 to 10	50
10 to 20	25
greater than 20	15

Source: Adapted from North Carolina Field Manual, 1991

- **Slopes:** 2:1 above the barrier; with maximum slope length of 100 feet for 2% or flatter slopes (see Table 5.18)
- **Effective Life:** Less than 3 months
- **Location:** On nearly level ground; at least 10 feet from toe of slope. The barrier should follow the land contour as closely as possible. Not in live streams or in swales where there is the possibility of a washout. Not in areas where rock or another hard surface prevents the full and uniform anchoring of the barrier.

Construction

Site Preparation

Determine exact location of underground utilities.

Grade alignment of barrier as needed to provide broad, nearly level area upstream of barrier.

Grading

Excavate a trench at least 4 inches deep, a bale's width, and long enough that the end bales are somewhat upslope of the sediment pool (Fig. 5.35).

Place each bale end to end in the trench so the bindings are oriented around the sides rather than top and bottom (Fig. 5.36).

Anchor the bales by driving two 36-inch long 2- x 2-inch hardwood stakes through each bale until nearly flush with the top. Drive the first stake toward the previously laid bale to force the bales together.

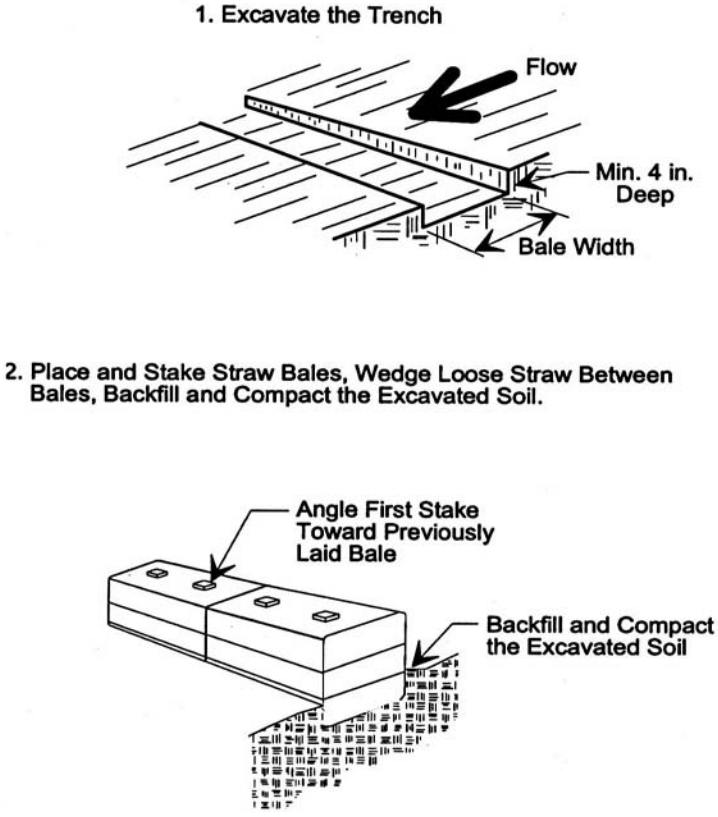


Figure 5.35 Installation of Straw Bales

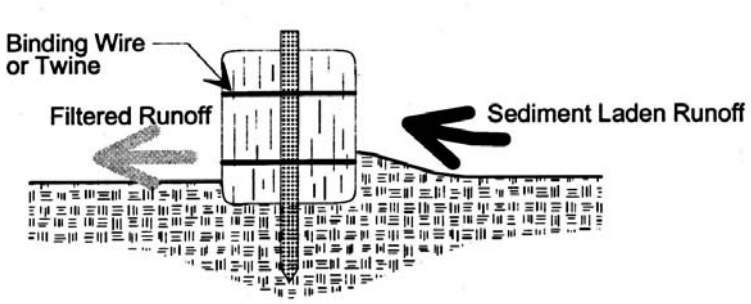


Figure 5.36 Straw Bale Alignment

Wedge loose straw into any gaps between the bales to prevent sediment-laden water from running through.

Backfill and compact the excavated soil against the bales to ground level on the downslope side and to 4 inches above ground level on the upslope side.

Erosion Control

Stabilize disturbed areas in accordance with vegetation plan.

Construction Verification

Check finished grades and dimensions of the straw bale sediment trap.

Check materials for compliance with specifications.

Troubleshooting

Consult with registered design professional if the following occurs:

- Variations in topography on site indicate sediment fence will not function as intended; changes in plan may be needed.

Maintenance

Inspect straw bale barriers after each storm event and remove any sediment deposits promptly, taking care not to undermine the entrenched bales.

Inspect periodically for deterioration or damage from construction activities. Repair damaged barrier immediately.

After the contributing drainage area has been stabilized, remove all straw bales and sediment, bring the disturbed area to grade and stabilize.

Common Problems

Barrier terminates at an elevation below the top of the temporary pool or at an unstabilized area, is located on too steep a slope or was placed in an area of concentrated flow; results in erosion under or around end of bales—correct problem by regrading or stabilization; if straw bale barrier is in area of concentrated flow, use different method of sedimentation control.

Storage capacity is inadequate, no provision was made for safe bypass of storm flow, or the drainage area is too large; resulting in overtopping of barrier—increase storage capacity or provide stabilized outlet for large capacity storm bypass (see *Outlet Installation* in *Sediment Fence*).

Bales are not removed after area has been stabilized—remove in a timely manner.

Bales were not entrenched at least 4 inches and/or backfilled with compacted soil; resulting in undercutting of barrier—reinstall barrier using proper installation methods.

Bales not adequately staked; resulting in collapse or dislodging of barrier—reinstall barrier using proper installation methods.

Too much sediment allowed to accumulate between clean outs; resulting in collapse or dislodging of barrier—remove accumulated sediment more frequently and after every major storm.

Straw Bale Sediment Trap

Rock Dam

Practice Description

A stone embankment designed to capture sediment on the construction site and prevent off-site sedimentation in streams, lakes and drainageways.

This practice can be used as an alternative to a standard sediment basin for locations with a drainage area of 20 acres or less. It may be preferable to standard sediment basins for sites where an earthen embankment would be difficult to construct.

Rock dams can provide sediment control in drainageways.

DEHNR. North Carolina

Recommended Minimum Requirements

Prior to start of construction, rock dams should be designed by a registered design professional. Plans and specifications should be referred to by field personnel throughout the construction process. The rock dam should be built according to planned grades and dimensions.

- **Drainage Area:** 20 acres or less
- **Dam Height:** Limited to 8 feet
- **Design Life:** 3 years or less

- **Basin Requirements:** Provide large surface area for high trapping efficiency; sediment storage capacity of 1800 feet^3/acre disturbed (see Fig. 5.37).

- **Spillway capacity:** Peak runoff from 10-year, 24-hour duration or design storm, with maximum flow depth of 1 foot and minimum freeboard of 1 foot (length of dam may serve as spillway)

- **Embankment:** Top Width: 6 feet minimum
  Sideslopes: 2.5:1 or flatter upstream; 3:1 or flatter downstream or where vehicles must cross

- **Abutments:** Abutments should be uniformly graded at a slope of 2.5:1 or flatter. The abutments should be protected by riprap extending up the slope to a stable grade (at least 1 foot above the maximum level of spillway discharge).

- **Outlet:** The outlet should be protected by a riprap apron, installed at zero grade with a thickness of at least 1.5 feet, a length equal to the height of the dam or greater length as needed to prevent erosion.

- **Rock:** Well graded, hard, angular, durable stone with a d_{50} of 9 inches minimum

- **Filter:** High strength geotextile covering the entire foundation and abutment area

- **Drainage:** Through 1 foot thick layer of 1/2 - to 3/4-inch gravel covering the upstream face of the dam

- **Location:** So that basin intercepts runoff primarily from disturbed areas, is accessible for periodic sediment removal and does not interfere with construction activities

Construction

Site Preparation

Determine exact location of underground utilities.

Follow all state and local requirements on impoundment sites.

Divert runoff from undisturbed areas away from the rock dam and basin area.

Excavate the foundation for the apron, using it as a temporary sediment basin during construction of the dam.

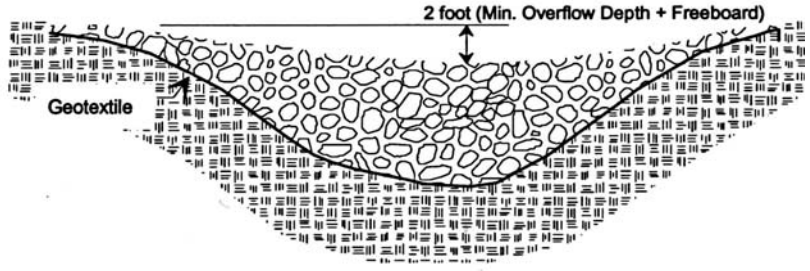


Figure 5.37 Head-on View of Rock Dam, Filter Fabric and Abutments

Clear and grub the area under the dam, removing and properly disposing of all root material, brush and other debris.

Grade the earth abutments no steeper than 2.5:1; 3:1 where vehicles must cross.

Smooth the dam foundation.

Dam and Basin Construction

Cover the entire foundation, including both earth abutments, with filter fabric, making sure the upstream strips overlap the downstream strips at least 1 foot and the upslope end is keyed in (see Fig. 5.38).

Construct the dam to planned dimensions.

Once the dam is in place, clear the sediment basin area properly disposing of the cleared material.

Set a marker stake to indicate the clean out elevation (i.e., point at which the basin is 50% full of sediment).

Divert construction site runoff flow into the upper end of the basin using temporary diversions.

Stabilize all disturbed areas except the lower half of the basin.

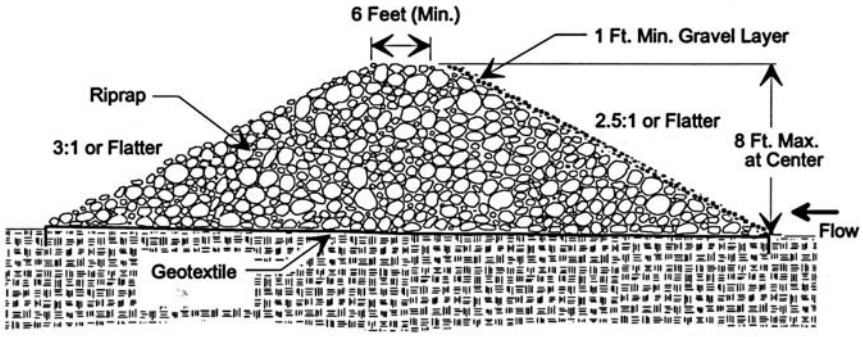


Figure 5.38 Cross Section of Rock Dam Embankment

Safety

Because rock dam sediment basins impound water they should be considered potentially hazardous. The following precautions should be taken:

- Avoid steep slopes; both cut and fill slopes should be 2.5:1 or flatter; 3:1 where maintained with tractor or other equipment.
- Fence area and post warning signs if trespassing is likely.

Construction Verification

Check finished grades and dimensions of the rock dam. Check materials for compliance with specifications.

Troubleshooting

Consult with registered design professional if the following occurs:

- Variations in topography on site indicate rock dam will not function as intended; changes in plan may be needed.

Maintenance

Inspect the rock dam and basin after each storm event.

Remove sediment when it accumulates to half the design volume.

Check the dam and abutments for erosion, piping or rock displacement and repair immediately.

If the basin does not drain between storms, replace the stone on the upstream face of the dam.

Once the construction site has become permanently stabilized, remove the structure and any unstable sediment. Smooth the basin site to blend with the surrounding area and stabilize. All water and sediment should be removed from the basin prior to dam removal. Sediment should be placed in designated disposal areas and not allowed to flow into streams or drainageways during structure removal.

Common Problems

Filter material not properly installed; results in piping and failure of dam—reconstruct dam using proper method to install filter.

Stone size is too small or embankment slope is too steep; results in displacement of rock—replace stone with larger size or reduce slope.

Apron was not extended to stable grade; results in erosion of downstream area—repair erosion and extend apron.

Rock is not high enough on abutment; results in erosion of abutments during spillway flow—extend rock higher on abutment.

Drainage area is too large; results in sediment being carried through the spillway or accumulation of excess sediment between clean outs—divert runoff from undisturbed areas away from the basin, enlarge basin and clean out basin more frequently; or consult the professional designer for other alternatives.

Layer of gravel aggregate on the upstream face is not thick enough or is too coarse to restrict flow through the dam; results in sediment loss through the dam—replace gravel aggregate with material having proper gradation to provide filtration.

Rock Dam

Filter Strip

Practice Description

A wide belt of vegetation designed to provide infiltration, intercept sediment and other pollutants, and reduce stormwater flow and velocity. Filter strips are similar to grassed swales except that they are designed to accept only overland sheet flow. They cannot treat high velocity flows. Surface runoff must be evenly distributed across the filter strip. Once a channel forms in the filter strip, it is no longer effective.

Filter strips can consist of grass, woody vegetation or other erosion resistant plants. They can be used in conjunction with infiltration basins, infiltration trenches or alongside streams to filter sediment from runoff.

N. Klopfenstein, NRCS. St. Charles Co.

Filter strips slow surface runoff, reduce sedimentation and help filter pollutants. Depending on the choice of plant materials, they can be low maintenance areas (mow once or twice a year) or provide habitat for wildlife.

Recommended Minimum Requirements

Prior to start of construction, filter strips should be designed by a qualified professional. Plans and specifications should be referred to by field personnel throughout the construction process. The filter strip should be built according to planned alignment, grade and cross section.

- **Drainage Area:** Less than 5 acres
- **Location:** Adjacent to low or medium density residential areas on gently sloping ground (less than 15%), with length of strip running along the contour
- **Vegetation:** A mix of erosion resistant plants that form a dense mat and effectively bind the soil (see *Permanent Seeding*)
- **Slope:** Uniform, even and relatively flat (5% or less) with a level spreading device (level lip, weir, etc.) across the top edge of the filter strip
- **Minimum Width:** Should conform to those in Table 5.19
- **Minimum Length:** At least as long as the contributing runoff area, but no less than 50 feet plus 4 feet for each one percent increase in slope

Table 5.19 Minimum Width of Filter Strip

Slope of Land (%)	Width of Filter Strip For Grassed Areas (ft)	Width of Filter Strip For Forested Areas (ft)
0	10	25
2	12	29
4	14	33
6	16	37
8	18	41
10	20	45
15	25	55

Construction

Site Preparation

Natural wooded strips may be preferred to grass strips. At the start of development, fence off any undisturbed wooded strips to be preserved. Avoid storing debris from clearing and grubbing, and other construction waste material in wooded strips during construction.

If a grass filter strip is constructed, clear and grub the filter strip area before the impervious area is completed.

Grading

If the adjacent area does not have a level edge, grade a level swale adjacent to the top edge of the filter strip. The swale should discharge to the filter strip along a level edge. The swale will serve as a level spreader to distribute runoff evenly to the filter strip.

Line the swale with rock or other erosion resistance material.

Sod or seed, mulch and fertilize the filter strip area.

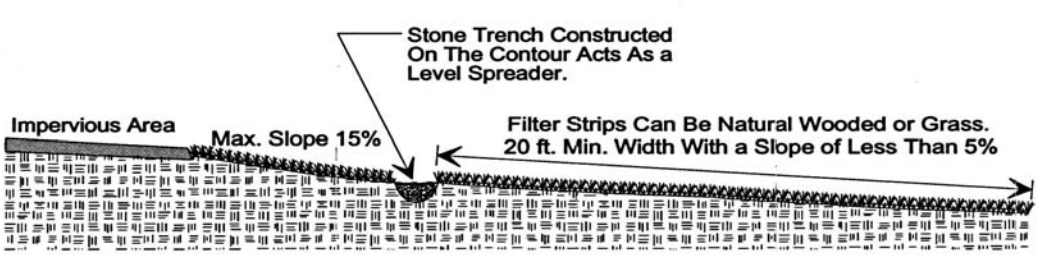


Figure 5.39 Filter Strip

If the filter strip is used to trap sediment during construction, the top edge should be regraded and reseeded following construction. This will remove sediment trapped during construction and prolong the effective use of the filter strip.

Erosion Control

Minimize the size of all disturbed areas and stabilize as soon as each phase of construction is complete.

Use temporary diversions to prevent surface runoff from being transported to the filter strip unless it is used to trap sediment during construction.

Direct all overland flow to the filter strip or the level spreading swale at low velocities.

Safety

- Store all construction materials and waste material well away from the filter strip.
- If utility lines are buried beneath the filter strip, do not perform final grading until all trench settlement has taken place. Follow all local, state and federal guidelines in constructing utility trenches. Overhead utility lines should be located at least 20 feet from the top edge of the filter strip.
- Provide temporary fencing and warning signs until vegetation is established.
- Provide an uncontrolled means of draining the construction site.

Construction Verification

Check the finished grades and configuration of all earthwork, level spreaders and diversions.

Troubleshooting

Consult with design professional if any of the following occur:

- Variations in topography on site indicate filter strip will not function as intended.
- Design specifications for fill, rock, sod, seed, mulch or fertilizer cannot be met; substitution may be required. Unapproved substitutions could lead to the filter strip not operating as designed.

Maintenance

Check for eroded channels in the filter strip after every storm event. Fix eroded areas and reseed, mulch and fertilize the affected area.

Apply a complete fertilizer annually until the desired density of vegetation is obtained. Thereafter, apply fertilizer in accordance with soil test recommendations.

Protect new plantings from livestock or wildlife.

Mow grass strips to a height of 6 to 12 inches two to three times a year to suppress weeds and woody vegetation unless natural, woody vegetation is planned.

Repair foot paths and traffic ruts.

Common Problems

Erosion of filter strip; caused by inadequate vegetation, too great a length of overland flow, too great a slope or high flow rates due to a drainage area greater than 5 acres—repair erosion damage and reevaluate erosion protection measures.

Ponding within the filter strip; caused by settlement of soil in utility trenches or settlement of fill—fill low areas and regrade to provide proper drainage.

Diversion of flow around filter strip; caused by uneven slope at top of filter strip, debris clogging the trench at top of filter strip or the diversion of flow from the impervious area—remove debris and regrade as needed to provide proper drainage.

Reduction in flow across filter strip; caused by sediment and debris clogging upper end of filter strip—replace clogged portion of filter strip.

Filter Strip

Temporary Sediment Trap

Practice Description

A temporary ponding basin formed by an embankment or excavation to capture sediment. The purpose of a temporary sediment trap is to hold sediment-laden runoff, trapping the sediment. This practice protects receiving streams, lakes, drainage systems and adjacent property during construction activities. Temporary sediment traps apply wherever sediment-laden runoff is discharged, such as outlets of diversions, channels, stormwater conduits and slope drains. It is not intended to be a permanent structure.

DEHNR. North Carolina

A temporary sediment trap can control sediment in small drainageways, then be removed once the disturbed areas are stabilized.

Recommended Minimum Requirements

Prior to start of construction, sediment traps should be designed by a registered design professional. Plans and specifications should be referred to by field personnel throughout the construction process. The sediment traps should be built according to planned grades and dimensions.

- **Drainage Area:** Less than 5 acres in size. If the drainage area is larger, construct a sediment basin (see *Sediment Basin*).
- **Structure life:** Limited to 2 years

- **Sediment storage:** A minimum of 1800 feet^3 per disturbed acre

- **Embankment:**
  Dam Height: Less than 5 feet
  Top Width: At least 5 feet
  Fill Slopes: 2.5:1 or flatter
  Settlement: 10% or less
  Fill Material: Locally available soil; machine compacted in 8-inch lifts; moist when compacted; free of organic material, tree roots and waste material

- **Spillway:** A rock-lined open channel spillway should be constructed in the embankment to safely pass stormwater runoff. As an option, a perforated outlet riser can be used as the principal spillway.
  Capacity: Sufficient to safely pass runoff from the 2-year frequency, 24-hour duration or design storm event
  Bottom Width: At least 5 feet
  Crest: A minimum of 18 inches lower than the top of the embankment
  Outlet: Include an apron at least 5 feet long to dissipate energy
  Filter: Geotextile should be placed between the embankment soil and the rock in the spillway section.

Construction

Locate the temporary sediment trap in an upland area as close to the sediment source as possible, considering soil type, pool area, dam length and spillway conditions.

Site Preparation

Locate all underground utilities before work begins.

Follow all federal, state and local requirements on impoundment sites.

Clear, strip and grub the foundation of the dam to minimum depth of 4 inches, removing all woody vegetation, rocks and other objectionable material. Dispose of trees, limbs, logs and other debris in designated disposal areas.

Divert runoff from all undisturbed areas away from the sediment trap.

Excavate the sediment trap (if necessary), stockpiling any surface soil having high amounts of organic matter for later use.

Embankment

Scarify the base of the embankment before placing fill.

Use fill from predetermined borrow areas. Fill should be clean, stable mineral soil free of organics, roots, woody vegetation, rocks and other debris, and must be wet enough to form a ball without crumbling, yet not so wet that water can be squeezed out.

Compact the fill material in 8-inch continuous layers (maximum) over the length of the dam. (One way is by routing construction equipment over the dam so that each layer is traversed by at least one wheel of the equipment.)

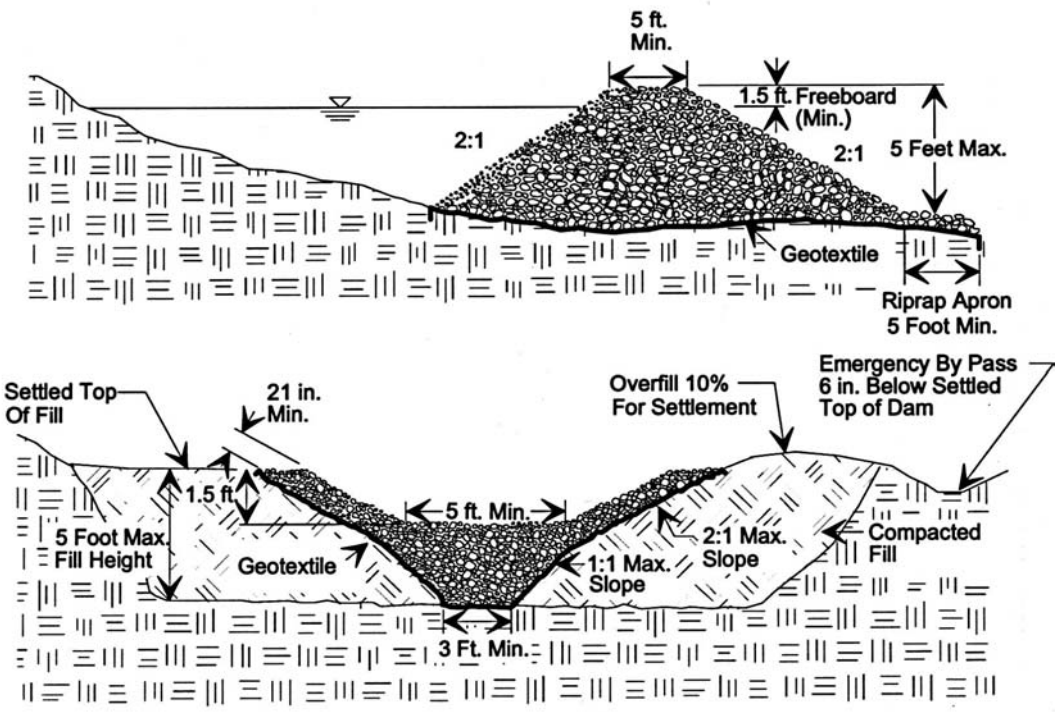


Figure 5.40 Typical Temporary Sediment Trap

Open Channel Spillway

Excavate a trapezoidal outlet section in the compacted embankment.

Install geotextile fabric on the base of the channel, extending it up the sides to the top of the embankment.

Place specified stone to the lines and grades, working smaller stones into voids to achieve a dense mass. The spillway crest should be level with a minimum width of 5 feet.

Construct a stone outlet apron below the toe of the dam on level grade until a stable condition is reached (5 feet minimum).

The base of the stone outlet should be at least 2 feet thick.

Make the edges and end of the stone apron section flush with the surrounding ground.

Cover the inside face of the stone outlet section with a 1-foot layer of well graded stone (2-inch minus).

Set a clean-out measurement stake in the basin at a height equal to one-half the distance from the bottom to the spillway crest.

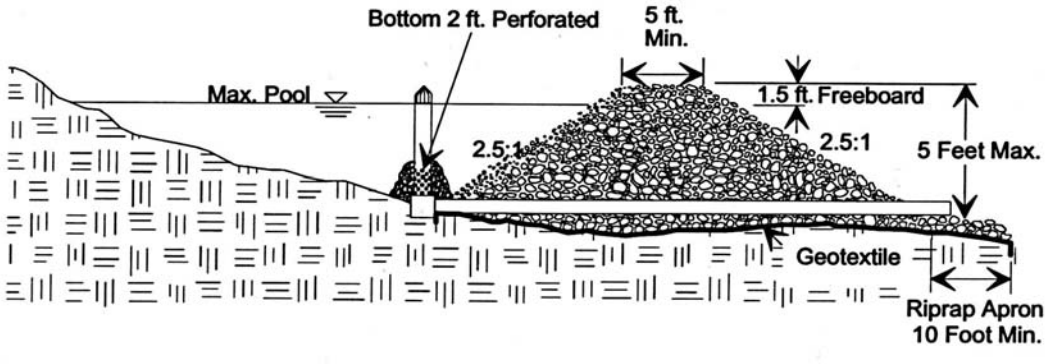


Figure 5.41 Temporary Sediment Trap with Spillway Riser

Optional Spillway Riser Construction

Clear all vegetation and roots from the pipe foundation; prepare the bedding.

Situate the spillway pipe and riser (minimum 18-inch diameter) on a firm, even foundation.

Align the pipe and construct with the bell end of the pipe facing upstream. Place around the barrel a 4-inch layer of moist, clayey, workable soil (not pervious material, such as sand, gravel, or silt), and compact with hand tampers to at least the density of the foundation soil. Don't raise the pipe from the foundation when compacting under the pipe haunches. Connect the pipe to the riser.

Perforate the bottom 2 feet of spillway riser with 1/2 inch diameter holes spaced 3 inches apart (or use a manufactured perforated riser) for draining the sediment trap.

Embed the riser at least 12 inches into concrete. The weight of the concrete should balance the buoyant force acting on the riser.

$$\text{Buoyant Force} = \text{Volume of Riser} \times 62.4 \text{ lbs/ft}^3$$

Surround the entire riser with 2 feet of clean uniformly graded stone.

At the pipe outlet, install a riprap apron at least 5 feet wide and 10 feet long. The riprap should be a minimum of 6 inches in diameter (see *Rock Outlets*).

Erosion Control

The size of disturbed areas should be minimized. Establish vegetation and stabilize within 30 days after construction is complete.

Divert sediment-laden water to the upper end of the temporary sediment trap to improve trap effectiveness.

Direct all runoff into the basin at low velocity.

Stabilize all disturbed areas immediately after construction.

Safety

Because temporary sediment traps will likely impound water, the following precautions should be taken:

- Avoid steep slopes; the slopes around the temporary sediment trap should be 2.5:1 or flatter; 3:1 if maintained by tractors or other machinery.
- Fence area and post warning signs if trespassing is likely.

Construction Verification

Check finished grades and dimensions of temporary sediment trap. Check materials for compliance with specifications.

Troubleshooting

Consult with registered design professional if any of the following occur:

- Variations in topography on site indicate sediment trap will not function as intended.
- Design specifications for fill, pipe, seed variety or seeding dates cannot be met; substitutions may be required. Unapproved substitutions could lead to failure.

Maintenance

Inspect the temporary sediment trap after each storm event.

Remove and properly dispose of sediment when it accumulates to one-half the design volume, as indicated by the clean-out stake.

Periodically check the embankment, spillway and outlet apron for erosion damage, settling, seepage or slumping along the toe, and repair immediately.

Replace the spillway gravel facing if it becomes clogged.

Inspect vegetation and reseed if necessary.

Replace any displaced riprap, being careful that no replacement rock is above the design grade.

Remove the temporary sediment trap after the drainage area has been permanently stabilized, inspected and approved. Do so by draining any water, removing the sediment to a designated disposal area, grading the site to blend with the surrounding area; then stabilize.

Common Problems

Inadequate spillway size; results in embankment overtopping and possible failure of the structure—increase size of spillway.

Improper installation of geotextile fabric; results in piping under the sides or bottom of the rock outlet section—remove rock and reinstall fabric properly, then replace rock.

Extensive embankment settling; results in overtopping and possible failure—add additional fill to bring embankment back to design grade.

Rock outlet apron does not extend to stable grade; results in erosion and displacement of rock—extend apron.

Inadequate vegetation or rock size in spillway too small; results in erosion of spillway or embankment slopes—improve vegetation or replace rock with larger size.

Inadequate compaction and/or use of unsuitable soil; resulting in settling of embankment—add fill in settled areas to restore embankment to original grade.

Inadequate compaction due to construction with dry soil; results in structural failure—replace failed material and compact to original grade.

Overly steep slopes; results in slumping failure—repair damage and flatten slope.

Contact slope between stone spillway and earth embankment too steep; resulting in piping failure—flatten slope, then repair piping damage.

Sediment not properly removed; results in inadequate storage capacity—remove sediment on a regular schedule.

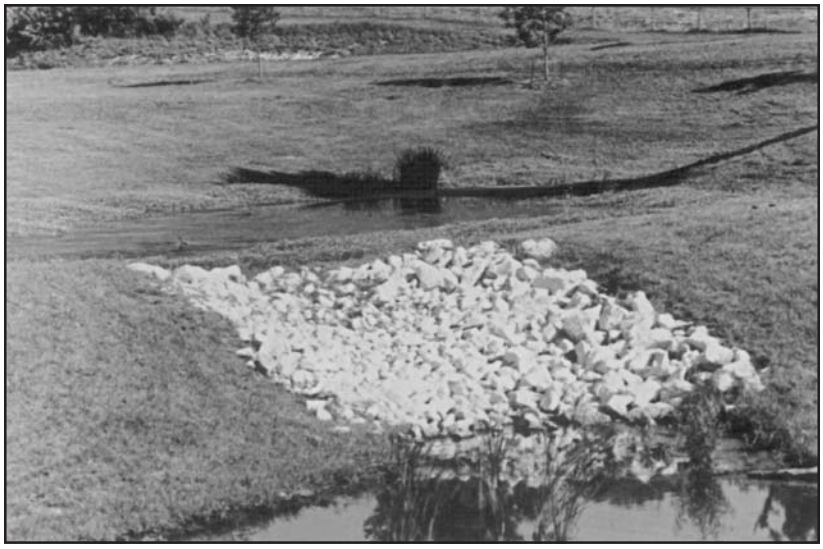
Sediment clogging the gravel on the upstream slope of the riprap; results in safety and/or health hazard from pond water—remove sediment.

Sediment Basin

Practice Description

A barrier or dam with a controlled stormwater release structure formed by constructing an embankment of compacted earth fill across a drainageway.

This practice applies where erosion control measures are insufficient to prevent off-site sedimentation. The purpose of a sediment basin is to detain sediment-laden runoff from disturbed areas in "wet" or "dry" storage long enough for most of the sediment to settle out.



F. Gordon, NRCS. Boone Co.

A sediment basin is suitable for small drainageways and can be used to pretreat sediment-laden water before it enters a permanent pool. A rock chute was used to drop the water to a lower elevation.

Recommended Minimum Requirements

Prior to the start of construction, sediment basins should be designed by a registered design professional. Plans and specifications should be referred to by field personnel throughout the construction process. The sediment basin should be built according to planned grades and dimensions.

- **Dam height:** 10 feet or less
- **Contributing drainage area:** 20 acres or less

- **Structure life:** Limited to 10 years
- **Detention:** At least 24 hours
- **Sediment storage:** Minimum of 1800 feet^3 per disturbed acre
- **Trap efficiency:** The length to width ratio of the basin should be 2:1 or greater; 5:1 is optimal to capture fine sediments. The inlet should be located as far as possible upstream from the outlet.
- **Embankment:**
  Top Width: At least 6 feet
  Side Slopes: 2.5:1 or flatter; 3:1 where maintained by tractor or other equipment
  Settlement: Allow for at least 10%
  Fill material: Stable moist soil compacted in lifts less than 8 inches
- **Anti-seep devices:** Either of the following is recommended:
  - At least two watertight anti-seep collars should be used around the outlet conduit; collars should project 1 to 3 feet from the pipe, or
  - a sand diaphragm (see *Glossary*)
- **Risers:** Should be held in place with an anchor or large foundation, to keep them from becoming buoyant.
- **Emergency Spillway:** Constructed in undisturbed soil in a location that will not erode the dam
  Cross Section: Trapezoidal-shaped with side slopes of 3:1 or flatter
  Control Section: Level, straight and at least 20 feet long. The spillway should have a minimum width of 10 feet.

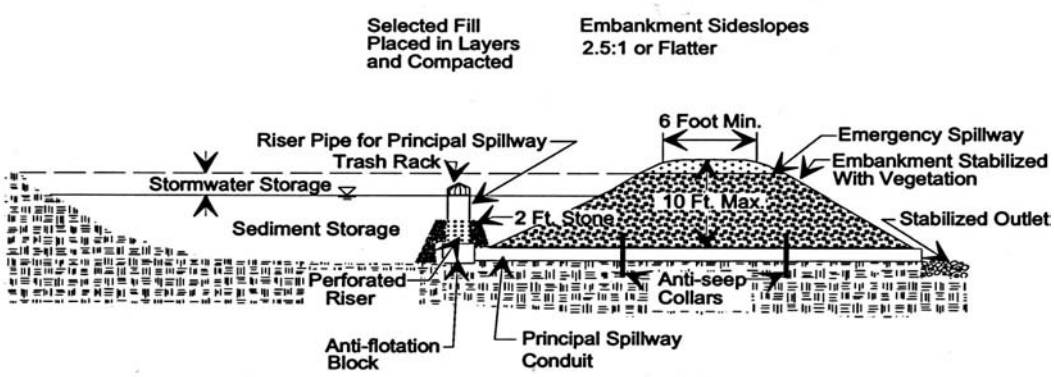


Figure 5.42 Typical Sediment Basin

Construction

Locate the sediment basin as close to the sediment source as possible, considering soil type, pool area, dam length and spillway conditions.

Site Preparation

Locate all utilities at the site.

Follow all federal, state and local requirements on impoundments.

Clear, grub and strip the dam foundation, removing all woody vegetation, rocks and other objectionable material.

Dispose of trees, limbs, logs and other debris in designated disposal areas.

Excavate the foundation (outlet apron first), stockpiling any surface soil having high amounts of organic matter for later use.

Principal Spillway

Clear the sediment pool to facilitate sediment clean out.

Situate the spillway barrel (pipe) and riser on a firm, even foundation. Prepare the pipe bedding.

Place around the barrel a 4-inch layer of moist, clayey, workable soil (not pervious material such as sand, gravel or silt), and compact with hand tampers to at least the density of the foundation soil. (Don't raise the pipe from the foundation when compacting under the pipe haunches.)

Perforate the lower half of the riser with 1/2-inch diameter holes spaced 3 inches apart (or use a manufactured perforated riser).

Embed the riser at least 12 inches into concrete (which serves as an anti-flotation block). The weight of the concrete should balance the buoyant force acting on the riser.

Buoyant Force = Volume of Riser x 62.4 lbs/ft^3

Surround the riser with 2 feet of clean, uniformly graded stone.

Place a steel trash rack around the riser inlet. Trash rack openings should be 4- to 6-inches square.

At the pipe outlet, install a riprap apron at least 5 feet wide and 10 feet long to a stable grade.

Embankment

Scarify the foundation of the dam before placing fill.

Use fill from predetermined borrow areas. It should be clean, stable soil free of roots, woody vegetation, rocks and other debris; and must be wet enough to form a ball without crumbling, yet not so wet that water can be squeezed out.

Place the most permeable soil in the downstream toe and the least permeable in the center portion of the dam.

Compact the fill material in 6- to 8-inch continuous layers over the length of the dam. (One way is by routing construction equipment over the dam so that each layer is traversed by at least one wheel of the equipment.)

Protect the spillway barrel with 2 feet of fill that has been compacted with hand tampers before traversing over the pipe with equipment.

Construct and compact the dam to an elevation 10% above the design height to allow for settling.

Place a reference stake at the sediment clean out elevation (50% of design elevation).

Emergency Spillway

Construct the spillway in undisturbed soil around one end of the embankment, and locate it so that any flow will return to the receiving channel without damaging the embankment.

Stabilize the spillway as soon as grading is complete with vegetation or erosion control blankets; install paving material to finished grade if the spillway is not to be vegetated.

Erosion Control

Minimize the size of all disturbed areas. Vegetate and stabilize as soon as construction is complete.

Divert runoff from undisturbed areas away from the basin.

Use temporary diversions to prevent surface water from running onto disturbed areas.

Divert sediment-laden water to the upper end of the sediment pool to improve trap effectiveness.

Direct all runoff into the basin at a low velocity (channel slope less than 1%).

Vegetate and stabilize all disturbed areas (except the lower one-half of the sediment basin) immediately after construction.

Safety

Because sediment basins that impound water are hazardous:

- Avoid steep slopes; slopes around the sediment basin should be 2.5:1 or flatter; 3:1 where maintained by tractor or other equipment.

- Fence area and post warning signs if trespassing is likely.
- Drain the basin between storm events.

Construction Verification

Check the finished grades and configuration for all earthwork. Check elevations and dimensions of all pipes and structures.

Troubleshooting

Consult with registered design professional if any of the following occur:

- Seepage is encountered during construction; it may be necessary to install drains.
- Variations in topography on site indicate sediment basin will not function as intended.
- Design specifications for fill, pipe, seed variety or seeding dates cannot be met; substitutions may be required. Unapproved substitutions could lead to failure.

Maintenance

Inspect the sediment basin after each storm event.

Remove and properly dispose of sediment when it accumulates to one-half the design volume.

Periodically check the embankment, emergency spillway and outlet for erosion damage, piping, settling, seepage or slumping along the toe or around the barrel and repair immediately.

Remove trash and other debris from the riser, emergency spillway and pool area.

Clean or replace the gravel around the riser if the sediment pool does not drain properly.

Remove the basin after the drainage area has been permanently stabilized, inspected and approved. Do so by draining any water, removing

the sediment to a designated disposal area, smoothing the site to blend with the surrounding area; then stabilize.

Common Problems

Improper compaction, omission of anti-seep collar, leaking pipe joints or use of unsuitable soil; resulting in piping failure along conduit—repair embankment using proper construction methods and materials.

Inadequate vegetation or improper grading and sloping; resulting in erosion of spillway or embankment slopes—repair using proper grades and slopes; establish adequate vegetation promptly.

Lack of trash guard; resulting in the riser and barrel being blocked with debris—remove debris and install trash guard.

Principal and emergency spillway elevations too high relative to top of dam; results in overtopping—repair erosion damage and reevaluate spillway design.

Sediment disposal area not designated on design plans; resulting in improper disposal of accumulated sediment—designate appropriate disposal area on design.

Drainage system clogged by gravel; resulting in safety and/or health hazard from pond water—clean out dewatering system regularly and after major storms.

Principal spillway too small; resulting in frequent operation of emergency spillway and increased erosion potential—install larger principal spillway or supplemental spillway.

Inadequate compaction and/or use of unsuitable soil; resulting in slumping and/or settling of embankment—repair damage with suitable, well compacted material.

Slopes too steep; resulting in slumping failure—flatten slopes.

Inadequate outlet protection; resulting in severe erosion below principal spillway—install adequate outlet protection.

Basin not located properly for access; resulting in difficult and costly maintenance—relocate basin or improve access to site.

Sediment not properly removed; resulting in inadequate storage capacity—remove sediment more frequently and after major storms.

Lack of anti-flotation; resulting in riser damage from uplift—install anti-flotation on riser.