Buffer Zone (BZ)

Practice Description

A buffer zone is a strip of plants adjacent to land-disturbing sites or bordering streams, lakes, and wetlands which provides streambank stability, reduces scour erosion, reduces storm runoff velocities and filters sediment in stormwater. This practice applies on construction sites and other disturbed areas that can support vegetation and can be particularly effective on floodplains, next to wetlands, along stream banks and on steep, unstable slopes.

Typical Components of the Practice

- Preservation and Protection of Existing Vegetation
- Site Preparation
- Soil Amendments (lime and fertilizer)
- Planting Desired Vegetation
- Mulching

Installation (Preservation)

Prior to start of construction, buffer zones should be designed by a qualified design professional. Plans and specifications should be referred to by field personnel throughout the installation process.

Preserve vegetation on designated areas shown in plan. In the absence of a plan, maintain a buffer of existing vegetation with a minimum width for shoreline or

stream bank protection of at least 35 feet. Local ordinances may require a wider buffer. Narrower buffer zones may be sufficient on steep slopes that are narrower than 35 feet.

Installation (Plantings)

Prior to start of construction, buffer zones should be designed by a qualified design professional. Plans and specifications should be referred to by field personnel throughout the installation process.

Site Preparation

Install planned measures such as silt fences and diversions before grading and seedbed preparation. In the absence of a plan and before grading and seedbed preparation, install other necessary measures which may include silt fences and diversions. Clear area of clods, rocks, etc. that would interfere with seedbed preparation; smooth the area before the soil amendments are applied and firm the soil after the soil amendments are applied.

Soil Amendments (lime and fertilizer)

Apply lime and fertilizer according to the plan or by soil test recommendations. In the absence of a plan or soil test recommendations, apply agricultural limestone at the rate of 2 tons per acre (90 lbs per 1000 ft^2.) and 10-10-10 fertilizer at the rate of 1000 lbs per acre (25 lbs per 1000 ft^2.). Apply ground agricultural limestone unless a soil test shows pH of 6.0 or greater. Incorporate amendments to a depth of 4” to 6” with a disk or chisel plow.

Planting Desired Vegetation

Plant desired vegetation according to the design plan. In the absence of a plan use installation guidelines for Permanent Seeding, Tree Planting on Disturbed Areas, Shrub, Vine and Groundcover Planting.

Mulching

Spread mulch according to guidelines in the Mulching practice.

Common Problems

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

- Soil compaction can prevent adequate plant growth. Compaction should be addressed during site preparation.
- Design specifications for plants (variety, seeding/planting dates) and mulch cannot be met; substitutions may be required. Unapproved substitutions could lead to failure.

Problems that require remedial actions:

- Erosion, washout and poor plant establishment – repair eroded surface, reseed, reapply mulch and anchor.
- Mulch is lost to wind or stormwater runoff – reapply mulch and anchor.

Maintenance

Replant trees, grass, shrubs or vines where needed to maintain adequate cover for erosion control. Maintain grass plantings with periodic applications of fertilizer and mowing.

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Channel Stabilization (CS)

Practice Description

Channel stabilization is stabilizing a channel, either natural or artificial, in which water flows with a free surface. The purpose of this practice is to establish a non-erosive channel. This practice applies to the stabilization of open channels and existing streams or ditches with drainage areas less than one square mile. Methods of channel stabilization include rock riprap lining, concrete lining and grade stabilization structures.

Typical Components of the Practice

- Scheduling
- Site Preparation
- Installation
- Rock Riprap Lining
- Concrete Lining
- Erosion Control
- Safety
- Construction Verification

Construction

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

Consider the following guidance as construction proceeds.

Scheduling

Schedule installation during a period that includes the planting season or establishment period for the species that will be used for the adjoining Streambank Protection. In addition, use local weather forecasts to avoid installation activities during rain events that can potentially create abnormal flows and flooding.

Site Preparation

Follow all local, state and federal government regulations on stream modifications.

Determine exact location of all underground activities.

Remove trees, brush, stumps and other objectionable materials according to the design plan. Where possible, vegetation will be left standing and stumps will not be removed.

Spoil material resulting from clearing and grubbing should be disposed of according to the design plan.

The foundation for structures should be cleared of all undesirable materials prior to the installation of the structures.

Installation

Channels may be stabilized by using one or more of the following methods:

Rock Riprap Lining

Where excavation is required, channels will be excavated from one side leaving vegetation on the opposite side.

Excavation should be at the locations and grades shown on the drawings.

Spoil material resulting from channel excavation should be disposed of according to the design plan.

If required by the plans, place geotextile fabric or a granular filter as a bedding material for the riprap. Install riprap of the specified gradation to the lines and

grades shown in the design plan. Ensure that the subgrade for the filter and riprap follows the required lines and grades shown in the plan.

Riprap may be placed by equipment. Care should be taken to avoid punching or tearing of the filter cloth during placement of rock. Repair any damage by removing the riprap and placing another piece of filter cloth over the damaged area. All connecting joints should overlap a minimum of 1.5 feet so that the upstream piece of fabric lies on top of the downstream piece of fabric. If the damage is extensive, replace the entire filter cloth.

Installation usually includes some bank shaping. If bank shaping is included, follow details in the design plan and refer to the construction guidelines in Streambank Protection practice.

Concrete Lining

Where excavation is required, channels will be excavated from one side leaving vegetation on the opposite side.

Excavation should be at the locations and grades shown on the drawings.

Spoil material resulting from channel excavation should be disposed of according to the design plan.

Install concrete lining using concrete of the specified design strength according to the lines and grades in the design plan.

Installation of concrete linings usually includes some bank shaping. If bank shaping is included, follow details in the design plan and refer to the construction guidelines in Streambank Protection practice.

Place filter material and weep holes according to the plans. Place concrete according to ACI standards. Concrete on sloping surfaces should be placed from the bottom of the slope toward the top, at the required thickness, and with good vibration.

As required by the design plan, install expansion joints at the locations shown in the plan.

As required by the design plan, install welded wire fabric in the concrete forms before placing concrete.

Divert flow around the concrete lining until the concrete has reached 75% of its design strength (usually 7 days after concrete placement).

Grade Stabilization Structures

Where excavation is required, channels will be excavated from one side leaving vegetation on the opposite side.

Excavation should be at the locations and grades shown on the drawings.

Spoil material resulting from clearing, grubbing and channel excavation should be disposed of according to the design plan.

Install the structure to the lines and grades shown in the design plan.

If earthfill is required, install according to the design plan and refer to the construction guidelines for Sediment Basin embankments.

If rock riprap is required, install according to the design plan refer to the installation requirements listed earlier for Riprap-lined Swale.

Other products used, including concrete, masonry, steel, aluminum or treated wood should be installed according to details in the design plan. Installation usually includes some bank shaping. If bank shaping is included, follow details in the design plan and refer to the construction guidelines in the Streambank Protection practice.

Erosion Control

Seeding, fertilizing and mulching of the disturbed areas should be done immediately after construction and conform to the guidelines in the design plan. If vegetation establishment specifications are not included in the design plan see the appropriate practice Permanent or Temporary Seeding in Volume I for guidelines. If planting needs to be deferred until the next planting season the disturbed areas should be protected with mulch *(see Mulching practice if details are not included in the design plan)*.

Safety

Store all construction materials well away from the stream. Consider weather forecasts when determining risks of damage by flooding.

Equipment used to construct channel stabilization measures should be free of leaks of fuel and hydraulic fluids to prevent contamination of surface waters. Operation of equipment in the stream should be minimized. At the completion of each workday, move all construction equipment away from the stream to prevent damage to equipment by flooding. Consider weather forecasts when determining risks of flooding.

The following precautions should be taken:

- Exercise caution on steep slopes.
- Fence area and post warning signs if trespassing is likely.

- All equipment used for practice installation should be free of leaks of gas, oil, and hydraulic fluid. Measures should be in place to prevent accidental spills from entering the stream.

- Equipment should not be operated within flowing water in the stream.

Construction Verification

Check material and finished grades to determine if job meet specifications in the design plan.

Common Problems

Variations in site conditions indicate practice will not function as intended: changes in plan may be needed.

Design specifications for materials cannot be met; substitution may be required. Unapproved substitutions could result in failure of the practice.

Maintenance

All structures should be maintained in an "as built" condition.

Check the stream channel at the construction site after each major event until the job is considered mature and a success.

Structural damage caused by storm events should be repaired as soon as possible to prevent further damage to the structure or erosion of the streambank.

Unwanted brush or excessive sediment that will impede flow should be removed in order to maintain design conditions.

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Stream Diversion Channel (SDC)

Practice Description

A stream diversion channel is a temporary practice to convey stream flow in an environmentally safe manner around a construction site while a permanent structure or conveyance is being installed in the stream channel.

Typical Components of the Practice

- Site Preparation
- Erosion and Sediment Control
- Excavation
- Lining Placement
- Stream Diversion
- Construction Verification

Construction

Prior to the start of construction, stream diversion channels are required to be designed by a qualified design engineer registered in the State of Alabama. In-stream projects of this nature are subject to the rules and regulations of the U. S. Army Corps of Engineers for in-stream modifications (Clean Water Act Section 404 permit) and if applicable, ADEM CWA Section 401 water quality certification. The stream diversion channel should be planned and installed in such a manner and time (dry season) that the impact to fisheries and the aquatic environment is minimized. A pictorial representation of a stream diversion channel is shown in Figure SDC-1. If a temporary stream crossing (TSC) is required for access, it should be constructed either up or downstream of the temporary diversion channel.

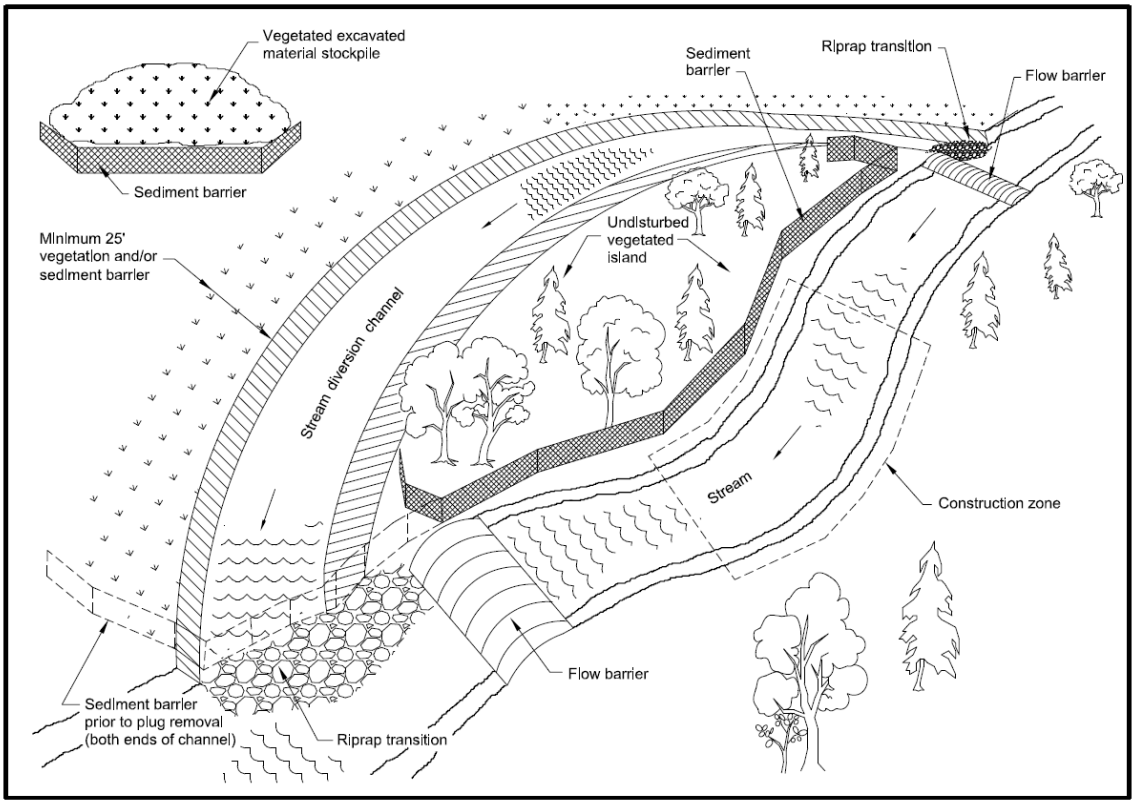

Figure SDC – 1: Typical Stream Diversion Channel Layout.

Site Preparation

Determine exact location of underground utilities.

Maintain vegetation around the stream until the stream diversion channel has been fully completed including vegetation. Clear only enough of the stream diversion channel area for the next day's work.

The centerline of the stream diversion channel should be established in the plans or by the responsible engineer. Slope and grade stakes should be established for use during excavation.

Erosion and Sediment Control

Sediment barrier or other sediment control practices to protect the stream from the construction of the diversion channel should be installed prior to any land disturbance. The stock pile for excavated material should be located well away from the work area with sediment control practices installed prior to placement of stockpiled materials. All construction areas should be seeded and mulched as soon as work is complete. Maintain a minimum 25 ft. vegetated grass filter around the stream diversion channel.

Excavation

A 25 foot undisturbed plug should be left at the exit and entrance of the stream diversion channel until the diversion channel itself has been finished. The stream diversion channel should be excavated according to the dimensions and grade shown in the construction plans beginning at the downstream end next to the plug and continue in an upstream direction. The grade of the stream diversion channel should be uniform and continuous in order to tie into the existing stream bottom elevations without any over falls that would create turbulence. Construction equipment should not be allowed to operate in flowing waters. Construction equipment should be well maintained to prevent drip/leaks of oil, hydraulic fluid, etc. Water that collects in the stream diversion channel excavation should be pumped as necessary to a settling basin prior to its discharge. The excavated material should be hauled to the stockpile location.

Lining Placement

Different lining materials can be specified for the stream diversion channel. Install the selected linings according to the construction specifications.

When rolled products like polyethylene film or geotextile fabric are specified for use as a channel lining, the product should be placed so that one width of material will cover the entire channel bottom and slopes while also providing enough material for a minimum 6 inch anchorage at the top of the bank. The upstream end of the material shall be buried at least 2 feet from top of bank to top of bank with additional trench anchorages of at least 1 ft. x 1 ft. at 50 foot intervals. Upstream sections of material shall overlap downstream sections by at least 2 feet and occur at a trench anchorage location. Polyethylene film shall be at least 6 mil thick and be capable of maintaining strength against the effects of ultraviolet light for a period of at least 60 days.

Pre-manufactured products like turf reinforcement mats (TRM), flexible concrete linings, and other similar products shall be designed and installed according to the manufacturer's recommendations.

Block sod shall be covered with erosion control netting and staked at minimal 3 ft. x 3 ft. spacing and also at the upstream edge of each piece of sod.

Generally, non-woven geotextile fabric is used underneath riprap linings. Additional protection such as riprap may be needed at the entrance and exit portion of the stream diversion channel to ensure scour does not occur in the existing stream bed or bank.

Stream Diversion

After the lining between the upstream and downstream plugs have been installed, the downstream plug should be removed first and the transition installation completed. Next, the upstream plug should be removed and the transition installation completed. Finally, the stream flow should be diverted into the stream diversion channel using an upstream flow barrier as specified in the plans and in such a manner to minimize sediment delivery into the stream. Allow time

for the stream to drain so that aquatic organisms have an opportunity to move or migrate downstream. The downstream flow barrier, if required, can then be installed so that work can commence for the installation of the permanent structure.

Construction Verification

Check finished grades and cross sections throughout the length of the stream diversion channel.

Verify the stream diversion channel cross section dimensions at several locations to confirm plan specifications.

Common Problems

Consult with a qualified design professional if any of the following occur:

- The topography of the site does not allow the practice to function as intended and changes in the plan are needed.
- The design specifications for materials cannot be met and substitutions may be necessary. Unapproved substitutions could result in an unstable diversion channel.

Maintenance

Inspect the stream diversion channel at regular intervals and especially after storm events, check for lining displacement, erosion of the lining, and erosion at the transition areas.

Repair damaged lining and erosion promptly.

Once the permanent structure has been completed, flow can be diverted into the new conveyance structure and the stream diversion channel decommissioned. The decommissioning should occur in such a manner to minimize erosion and sediment runoff into the stream system. Lining materials should be recycled or disposed of properly.

Streambank Protection (SP)

Practice Description

Streambank protection is the stabilization of the side slopes of a stream. Streambank protection can be vegetative, structural or a combined method (bioengineering) where live plant material is incorporated into a structure. Vegetative protection is the least costly and the most compatible with natural stream characteristics. Additional protection is required when hydrologic conditions have been greatly altered and stream velocities are excessively high. Streambank protection is often necessary in areas where development has occurred in the upstream watershed and full channel flow occurs several times a year.

Typical Components of the Practice

- Vegetative Measures
  - Scheduling
  - Site Preparation
  - Installation
  - Erosion Control
  - Safety
  - Inspection

- Structural Measures
  - Scheduling
  - Site Preparation
  - Installation
  - Construction Verification

Vegetative Measures – Installation

Prior to start of construction, streambank protection, for each unique channel reach, should be designed by a qualified design professional and/or an interdisciplinary team. Plans and specifications should be referred to by field personnel throughout the construction process.

Scheduling

Schedule installation during a period that includes the planting season or establishment period for the species that is to be established. In addition, use local weather forecasts to avoid installation during rain events that can potentially create wetness and flooding.

Site Preparation

Follow all local, state and federal government regulations on stream modifications. Determine exact location of all underground activities.

Stabilize the channel bottom as specified in the design plan before streambank protection measures are installed.

Installation

Plant live plant materials, cuttings or other forms of plant materials according to the planting plan.

Erosion Control

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

Establish vegetation to stabilize all disturbed areas immediately after construction.

Safety

The following precautions should be taken:

- Exercise caution on steep slopes.
- Fence area and post warning signs if trespassing is likely.

- Store equipment, tools and materials well away from the stream during non-work periods. Consider weather forecasts when determining risks of damage to equipment, tools and materials by flooding.

- All equipment used for practice installation should be free of leaks of gas, oil, and hydraulic fluid. Measures should be in place to prevent accidental spills from entering the stream.

- Equipment should not be operated within flowing water in the stream.

Construction Verification

Check to see that planting and seeding was done in compliance with the design specifications.

Structural Measures - Construction

Prior to start of construction, streambank protection, for each unique channel reach, should be designed by a qualified design professional and/or an interdisciplinary team. Plans and specifications should be referred to by field personnel throughout the construction process.

Scheduling

Schedule installation during a period that is least likely to have flooding and that includes the planting season for the species that are to be established in association with the structural measures.

Site Preparation

Follow all local, state and federal government regulations on stream modifications. Determine exact location of all underground activities.

Stabilize the channel bottom as specified in the design plan before streambank protection measures are installed.

Remove brush and trees only if absolutely necessary to make the site suitable to install the planned measures.

Grade or excavate the areas specified in the design plan, but limit earthmoving to that absolutely necessary to make the site suitable to install the planned measures.

Installation

Riprap

Install riprap of the specified gradation to the lines and grades shown in the design plan. Installation usually includes some bank shaping.

Place geotextile fabric or a granular filter between the riprap and the natural soil and placement of the rock.

Ensure that the subgrade for the filter and riprap follows the required lines and grades shown in the plan. Low areas in the subgrade on undisturbed soil may also be filled by increasing the riprap thickness.

Riprap may be placed by equipment. Care should be taken to avoid punching or tearing of the geotextile fabric cloth during placement of rock. Repair any damage by removing the riprap and placing another piece of filter cloth over the damaged area. All connecting joints should overlap a minimum of 1.5 feet with the upstream edge over the downstream edge. If the damage is extensive, replace the entire geotextile fabric.

Gabions

Install gabions and related materials in accordance with the design plan. Use only durable crushed limestone, dolomite or granite rock. Shale, siltstone and weathered limestone should not be used.

Place geotextile fabric or a granular filter between streambank material and gabions. Install gabions and counterforts as indicated in the design plan.

Fabric Formed Revetments

Install revetments according to manufacturer's recommendations. Typically, a site must be cleared and grubbed. Next, the fabric formed revetments are sewn or zipped together at the site to form continuous coverage. Once the fabric is in place, it is pumped full of grout to form a solid, hard and impervious cover.

Reinforced Concrete

Install reinforced concrete according to the design plan. Installation usually includes some bank shaping, placing a filter fabric or a granular filter between the streambank material and the retaining wall or bulkhead, and anchoring.

Anchor the foundation for these structures to a stable, nonerodible base material such as bedrock. Also, water stops should be installed at all joints in concrete retaining walls.

Combined Methods of Streambank Protection (Soil Bioengineering)

Grid pavers, cellular confinement matrices and other appropriate structural measures used with vegetative measures should be designed and installed in accordance with manufacturer's recommendations.

Erosion Control within Soil Bioengineering Applications

Minimize the size of all disturbed areas.

Install vegetative material (stakes, wattles, etc.) according to the design plan and make seedings immediately after construction activities to stabilize all other disturbed areas needing vegetation.

Safety

Store all construction materials well away from the stream. Consider weather forecasts when determining risks of damage by flooding.

At the completion of each workday, move all construction equipment out of and away from the stream to prevent damage to equipment by flooding. Consider weather forecasts when determining risks of flooding.

The following precautions should be taken:

Exercise caution on steep slopes.

Fence area and post warning signs if trespassing is likely.

All equipment used for practice installation should be free of leaks of gas, oil, and hydraulic fluid. Measures should be in place to prevent accidental spills from entering the stream.

Equipment should not be operated within flowing water in the stream.

Construction Verification

Check cross section of the channel, thickness of structural product used and confirm the presence of filter cloth between the product and the streambank.

Check to see that planting and seeding was done in compliance with the design specifications.

Common Problems

Consult with a qualified design professional if any of the following occur:

- Variations in topography on site indicate practice will not function as intended; changes in plan may be needed.
- Design specifications for vegetative or structural protection cannot be met; substitution may be required. Unapproved substitutions could result in erosion damage to the streambank.

Maintenance

Check the streambank for rill and gully erosion after every storm event.

Repair eroded areas with appropriate plantings, structural materials or new plants.
Check the streambank for signs of voids beneath gabions, riprap and concrete. Deterioration of the filter fabric or granular material should be repaired - make needed repairs with similar material.

Protect new plantings from livestock.

Check the streambank for reduction in stream capacity; caused by overgrowth of vegetation on the streambank. Selectively remove overgrown vegetation at regular intervals to maintain capacity and to maintain desired plant communities.

Temporary Stream Crossing (TSC)

Photo courtesy of Steve Taylor, Auburn University Biosystems Engineering

Practice Description

A temporary stream crossing is a short term road crossing constructed over a stream for use by construction traffic to prevent turbidity and streambed disturbance caused by traffic. A temporary stream crossing can be a low water crossing, a culvert crossing, or a bridge with or without embankment approaches. Temporary stream crossings are applicable on construction sites where traffic must cross streams during construction.

Typical Components of the Practice

- Scheduling
- Site Preparation
- Installation and Removal Low Water Crossing
- Culvert Crossing
- Bridge
- Erosion Control
- Safety
- Construction Verification

Construction

Prior to start of construction, a temporary stream crossing should be designed by a qualified design professional. Plans and specifications should be referred to by field personnel throughout the construction process.

Scheduling

Attempt to construct temporary stream crossings during dry periods and relatively low flows to minimize stream disturbance. Use local weather forecasts to avoid installation during rain events that can potentially create turbidity.

Site Preparation

Ensure that all necessary materials are on the site before any work begins. If planned, construct a bypass channel and dewater the construction site before undertaking other work. Refer to plans.

Installation and Removal Low Water Crossing

Excavate the foundation for the temporary crossing according to the design plan and in such a manner that the final finished surface is level with the stream bed.

Excavate roadways through the abutment approaches (bank) to the crossing according to the design plan.

Place the specified type of geotextile over the width and length of the crossing subgrade and anchor it in place as specified in the plans. Next, place riprap of the specified gradation to the required thickness across the channel. Finally, place a wearing course of gravel or crushed rock of the specified gradation to the required thickness over the riprap.

Remove gravel and excess rock riprap as soon as it is no longer needed. Restore original contours to the channel, leaving rock riprap level with the streambed.

Culvert Crossing

After diverting the stream flow (if planned), excavate the foundation for the culvert. Situate the culvert on a firm, even foundation and keep the culvert parallel to the direction of flow. See Figure TSC-1.

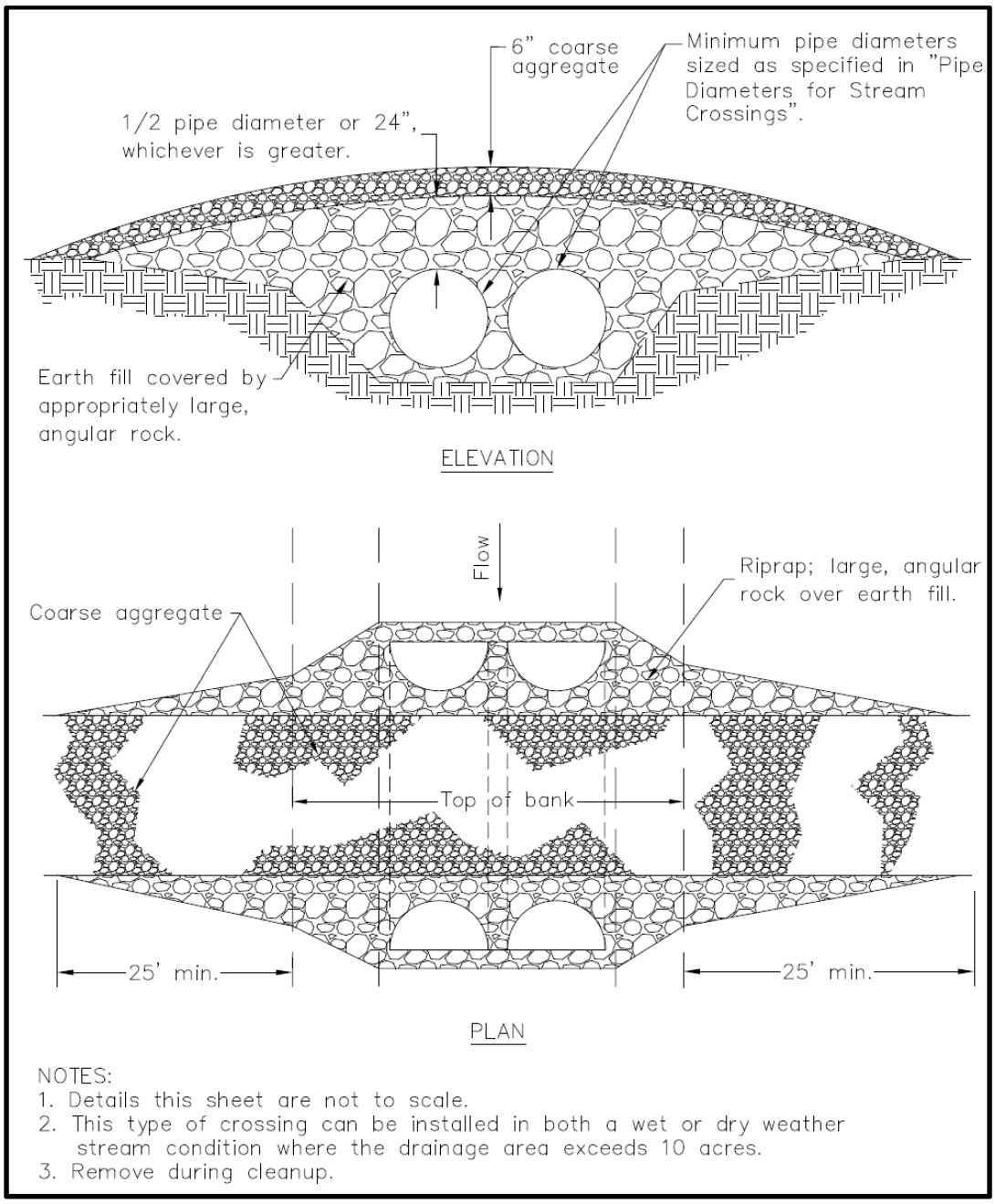

Figure TSC-1 Typical Temporary Culvert Stream Crossing

Place a 4" layer of moist, clayey, workable soil (not pervious material such as sand, gravel or silt) around the culvert. Compact by hand to at least the density of the embankment soil. (Do not raise the culvert from the foundation when compacting under the culvert haunches.) Continue with backfill of the pipe in 4" to 6" uncompacted layers scarifying the surface between each compacted layer. All backfill material within 2 foot of the pipe (beside the pipe and above the pipe) should be compacted with hand tampers only.

Extend the end of the culvert 2 feet beyond the toe of the fill slope. The outlet end of the culvert should be placed on a stable natural streambed. If this is not possible, install a riprap apron at least 5 feet wide and 10 feet long to a stable grade.

All backfill material within 2 foot of a culvert (beside the pipe and above the pipe) should be compacted with hand tampers only. Heavy equipment should not be allowed on top of the culvert until a minimum of 2 feet of hand compacted material is placed.

If an embankment is required, use fill from predetermined borrow areas. It should be clean, stable mineral soil free of roots, woody vegetation, rocks and other debris. It must be wet enough when placed to form a ball without crumbling yet not so wet that water can be squeezed out. Compact the fill material in 6" to 8" continuous layers over the length of the embankment. One way is by routing construction equipment over the embankment so that each layer is traversed by at least one wheel of the equipment. Construct and compact the culvert-crossing embankment to 10% above the design height to allow for settling.

Remove culvert as soon as it is no longer needed and restore streambed to original contour.

Bridge

Excavation

If excavation is required, excavate roadways through the abutment approaches (bank) according to the design plan.

Construct the bridge or install a prefabricated structure according to the design plan. A cable should be tied to one corner of the bridge frame with the other end fastened to a secure object to prevent flood flows from carrying the bridge downstream.

Embankment

Use fill from predetermined borrow areas. It should be clean, stable mineral 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.

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

Construct and compact the temporary stream crossing embankment to 10% above the design height to allow for settling.

Erosion Control (all kinds of temporary stream crossings)

Minimize the size of all disturbed areas and vegetate as soon as each phase of construction is complete. Riprap or establish vegetation on the slopes of the

embankment of the temporary stream crossing. Rip-rap should be placed on the entrance slope of culvert systems according to the design plan.

Direct all overland flow at low velocity to the ditches along the approach roads.

Safety

Store all construction materials well away from the stream. Consider weather forecasts when determining risks of damage by flooding.

Equipment used to construct stream crossings should be free of leaks of fuel and hydraulic fluids to prevent contamination of surface waters. Operation of equipment in the stream should be minimized. At the completion of each workday, move all construction equipment away from the stream to prevent damage to equipment by flooding. Consider weather forecasts when determining risks of flooding.

The following precautions should be taken:

- Exercise caution on steep slopes.
- Fence area and post warning signs if trespassing is likely.
- All equipment used for practice installation should be free of leaks of gas, oil, and hydraulic fluid. Measures should be in place to prevent accidental spills from entering the stream.
- Equipment should not be operated within flowing water in the stream.

Construction Verification

Check finished grade and size of culvert. Check to see if culvert is free of obstructions.

Common Problems

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

- Variations in topography on site indicate crossing will not function as intended; changes in plan may be needed.
- Design specifications for fill or conduit cannot be met; substitution may be required. Unapproved substitutions could result in the crossing being washed out.

Maintenance

Inspect the temporary stream crossing for damage to the structure or the vegetation after each storm event.

Repair any damages found during inspections.

Remove debris, trash and other materials that restrict flow from the culvert or bridge.