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01092026
Erosion Prevention and Sediment Control Handbook**

Chapter 3 - Erosion Prevention and Sediment Control Plans

3.1 Purpose

EPSC measures are designed to reduce, capture, store, and treat sediment laden runoff from construction sites and are commonly categorized by their purpose. Some of the categories include erosion prevention, runoff velocity control, and sediment control, all of which will be discussed further in Chapter 4. EPSC measures are most effective when implemented from a set of design plans that include the placement, size, quantities, and detailed drawings for each of the proposed EPSC measures.

The first and most important step in erosion prevention and sediment control is minimizing soil disturbance and preserving the existing vegetative cover. Well-planned projects avoid and minimize adverse impacts, and where disturbance is necessary, the least impactful construction processes are chosen. Final stabilization should be implemented as soon as possible.

EPSC plans must be site specific due to the unique combination of features present at each construction site. Site specific features may include confined or narrow areas, depth to ground water table, depth to bedrock, slopes, soil textures and classifications, proximity to receiving waters, etc. When creating EPSC plans, site specific knowledge is paramount in preventing sediment laden discharges from the construction site, a universally important process for protecting receiving waters.

3.1.1 System Approach Design

Due to the unique constraints of every construction site, typical EPSC measures may not be feasible to implement; therefore, multiple, less constrictive measures can be paired in series to promote stormwater treatment. That is, a system of EPSC measures may be as effective or more effective in combatting the export of sediment than a single, more resource-intensive measure. Subsequently, designers and developers may consider implementing a system of less constricting measures to obtain the same expected result as the more intensive EPSC measure(s). This concept is known as treatment trains of EPSC measures. This systems approach can be used as treatment equivalency to replace a sediment basin or sediment trap. For example, on most construction sites, a sediment basin would likely remove the largest quantity (or mass) of sediment, but it may be infeasible to implement on some construction sites due to site constraints. Thus, designers can implement a treatment train of multiple, less extensive measures (e.g., rock check dams, silt fence, and sediment traps), to achieve the same treatment as a sediment basin. Designers and developers are referred to the chapter entitled "Equivalency and Treatment Trains" of this manual (Section 5) to better understand this process.



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3.2 Erosion Prevention and Sediment Control Stages

EPSC measures must be implemented in a timing that parallels construction. For example, it would be illogical to implement pollution prevention measures when construction is near completion just as it would not be practical to implement erosion prevention measures (such as erosion control blankets) before soil is exposed during the initial phases of construction. Therefore, EPSC measures are to be shown in three stages: initial, interim, and final to provide effective management of onsite sediment.

All EPSC measures are to be located within the limits of disturbance. Offset the limits of disturbance from the proposed grading limits to ensure sufficient working room for construction of slopes and placement of EPSC measures.

For sites under five acres of disturbance, a single plan sheet may adequately address all three EPSC stages. For example, a water line installation may have a single EPSC plan sheet that provides design information for the initial, interim, and final stages. If the entire alignment of the proposed pipeline does not fit on one sheet, then multiple sheets must be provided for the EPSC plans, but multiple sheets may not be needed for each stage. Multiple sheets would be required to show the EPSC plans for the entire project area not for each separate stage since all three stages can be addressed on the sheet for that segment. In this example, the initial and interim stages may have the same proposed perimeter controls and may be indicated with a note: “Initial and interim EPSC measures are the same. Replace and repair EPSC measures as needed.” An additional note to address the final stage could state “For the final stage, grade back to preconstruction contours and stabilize with seed and mulch.” These notes would provide sufficient EPSC plan information on a single sheet for a defined area on the construction site of a water line installation.

3.2.1 Initial Stage

The initial EPSC stage shall establish perimeter controls to protect existing drainage features, outfalls, water resources, and offsite property. Initial stage EPSC measures must be in place prior to any earth-disturbing activities to prevent sediment from leaving the construction site. All measures must be inspected and maintained throughout the entire construction period.

3.2.2 Interim Stage

The interim EPSC stage shall display the proposed measures that are to be in place during grading operations. During this stage, drainage patterns, outfall locations, and erosion potential can change with site grading. This may require interim substages to address changes in site hydrology and sediment loss. As more soil is exposed throughout construction, redundancy of measures can further decrease sediment loss. Ultimately, the



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objectives for this stage are to show additional measures can be used to prevent (or how modifications to existing measures can be used to continue to prevent) sediment from migrating offsite, despite earth disturbing activities altering site conditions.

3.2.3 Final Stage

Activities in the final stage include final grading, topsoil installation, and slope and ditch stabilization. Per the CGP, stabilization must occur within 14 days of temporarily or permanently ceased construction activities, or within seven days if slopes are greater than 35% (TDEC). Remove temporary EPSC measures from the plan sheets; only show the permanent measures.

3.3 Site Planning and Preparation

Site planning and preparation requires a site visit to assess pre-construction conditions. Notable features to assess include soil types and classifications, drainage patterns, existing vegetation, existing structures, existing pipe sizes, and topography. Planning documentation should indicate if soils are highly erodible or contaminated as well as the location of discharge points, steep slopes and slope lengths, and natural features requiring protection. Documenting these features is known as fingerprinting a site and the process is critical to ensure no damage to natural waterways or wetlands result from construction.

3.3.1 Outfalls

In the CGP, the terms “outfall” and “point source” are synonymous and are defined as any discrete conveyance that discharges runoff as concentrated flow into waters of the state, offsite locations, or storm sewer systems (TDEC). All outfalls must be clearly marked on plan sheets, thereby also identifying inspection locations at which to gauge the effectiveness of EPSC measures. All outfalls have an associated drainage area. Drainage areas may include offsite drainage as well as a portion or all of the disturbed area. Per the CGP, offsite drainage must be included in outfall drainage areas since runoff following a flow path through the construction area can transport sediment and further erode soils from the disturbed area. Therefore, all runoff created within or routed through the limits of disturbance requires treatment. Planners must ensure selected EPSC measures have the capacity to retain, store, and treat the associated runoff from each drainage area before discharged via an outfall.

Outfalls can be challenging to identify. Outfalls are not exclusively defined as a point of hydrologic analysis, but also where construction site inspections must occur. Several complexities and common issues arise when identifying outfalls on a construction site:

- Identify where run-on enters the limits of disturbance as inflow, not an outfall. The inflow drainage area must be included in the total drainage area for the properly



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identified outfall, unless a structure is in place to divert the unpolluted water around the limits of disturbance;

- If a construction site is adjacent to a stream, do not identify outfalls within the stream but place them on the bank of the stream; and
- When disturbance is limited to a subsection of a property, identify the outfall where concentrated flow is discharged from the limits of disturbance, not the downstream property line. The one exception to this is if the downstream property line and downstream subsection's limit of the disturbance overlap.

When outfalls are placed in a stream or outside of the disturbed area, the associated drainage area includes runoff from upstream tributaries and undisturbed sections of the property. By misidentifying the outfall, design of all EPSC measures would be required to include this additional runoff volume in their storage capacity. Outfalls are important to identify correctly, as they are the most downstream inspection point for each drainage area. This is where the inspector can gauge the effectiveness of all EPSC measures within each drainage area at preventing sediment loss.

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3.3.2 Best Management Practices for Work Near Streams

Construction on and around streambanks results in removed and degraded vegetation and soil disturbance, thereby impairing streambank stability. Soil particles are dislodged from the bare soil when heavy machinery and equipment disrupt the soil structure. Streambank destabilization and highly erosive flows during storms subject the stream to excessive sediment inputs and habitat loss. Protecting and stabilizing streambanks from active construction is critical to preserve the land and ecosystem structure. Further, it is important to plan locations where heavy machinery can access or cross the stream if needed for construction purposes. When physical alterations to a stream or its banks are necessary, an ARAP (Chapter 0400-40-04) is required. Additionally, work that would involve discharge of dredged or fill material below the ordinary high-water mark of jurisdictional streams, could require written authorization from USACE under Section 404 of the Clean Water Act (refer to Section 1.3.2 of this manual for further details). Several EPSC measures are included in this handbook as guidance when working in or around streams. Coverage under the CGP does not infer coverage under an ARAP or any other potentially necessary permit.

The most common stabilization measure is riprap, which is large angular rock that resists erosion due to its size, weight, and interlocking nature when set in place. Riprap gradations are differentiated by the size of stone. In Tennessee, Class A-1, B, and C are most common and have median stone dimensions (D_{50}) of nine, 15, and 20 inches, respectively. However, stone dimensions within each gradation can range from the upper size in the lower gradation to the lower size in the higher gradation. These ranges in size help fill void spaces between interlocking stones. Less common gradations may be considered for use when necessary and with proper approval from the design engineer. In addition to riprap gradation, riprap can also be classified by type: conventional, soil filled, and void-filled.

Conventional riprap is plain angular rock. Due to growing environmental concerns, minimize the use of this type where possible. Conventional riprap is most ideal where vegetation is not planned such as under bridges and pipe outfalls (MHFD 2024a; TDOT). Due to larger void spaces, conventional riprap requires placement of bedding material or geotextile fabrics between the stone and natural subgrade to prevent piping. Soil riprap is two-thirds conventional riprap filled with one-third native (top)soil, a combination which reduces void spaces. Soil riprap may include an added, uppermost layer of topsoil, providing a medium for vegetation. The combination of vegetation and riprap eliminates the need for an underlying geotextile. Soil riprap is ideal for bioengineered streambank protection, swales, and buried emergency spillways (MHFD, 2024a). Void-filled riprap is a mix of conventional riprap, cobbles, gravels, sands, and soils which creates a dense, void-filled composition that keeps flowing water above the surface and prevents erosion. Void-filled riprap mimics natural riffle-rock material and is ideal in continuous streamflow applications (MHFD, 2024b).



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3.3.3 Protected Areas

Prior to and during construction, it is crucial to have a visual delineation around natural areas and features such as streams, wetlands, ponds, cemeteries, historically significant sites, sinkholes, etc. Visual demarcation helps to prevent environmental or historical damage as well as to preserve ecosystems and areas of concern. Section 3.3.3 is specifically in reference to non-permitted impacts to waterbodies and other natural features; permitted impacts to waterbodies should be covered by an ARAP or other necessary permit (Section 1.3.2). These natural areas can play a vital role in filtering pollutants, reducing erosion, and maintaining water quality. By safeguarding them, construction activities can minimize ecological degradation and maintain the integrity of the surrounding ecosystem, which is more cost effective than replacing or repairing the areas if destroyed or degraded.

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3.3.4 Construction Exit

A designated construction exit is necessary to minimize the movement of sediment offsite. This specific measure focuses on preventing the spread of sediment by ensuring vehicles leaving the site are not tracking excess mud, dirt, or sediment before entering public roadways. Unlike other EPSC measures that treat runoff, prevent pollution, or stabilize soil, construction exits are unique because they are a distinct component of overall site management and a public safety feature. Large clumps of sediment on the road and dried mud from equipment tires can dislodge at high speeds, impacting other motorists.

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3.4 Pollution Prevention

Pollution prevention practices are good housekeeping practices that reduce pollution potential. Practices in this category are essential to minimize the release of harmful substances such as trash, debris, construction waste, chemicals, sediments, etc. into the environment. By implementing these measures, construction sites can protect local ecosystems, safeguard water quality, and ensure compliance with environmental regulations.

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3.5 Construction Sequencing and Phasing

A description of all construction activities must be documented in the SWPPP and on the EPSC plans. The sequence of all soil disturbing activities are to be included in these documents. Construction sequencing is specific to each project that coordinates the timing of land disturbing activities, installation of EPSC measures, stabilization measures, and permanent stormwater management controls. Though not required, phasing is recommended on all construction sites regardless of size as it can be an effective measure for minimizing disturbance, erosion potential, and sedimentation. Site developers are encouraged to limit the total disturbed area to less than 50 acres at a given time. After a portion of construction is complete and stabilization measures have been implemented, developers can begin construction activities in other onsite locations to maintain a disturbance of less than 50 acres.

While the initial, interim, and final stages of EPSC plans are a form of sequencing, notes detailing sequencing of activities are required. The sequencing notes on the EPSC plans provide a more detailed, order of construction activities and demonstrate compliance with the CGP by detailing that perimeter controls such as silt fence and a construction exit (and/or other necessary EPSC measures) are in place before land disturbing activities occur. When changes in construction activities must occur, amend the sequence schedule in advance to maintain management control.

The following demonstrates an example of basic construction sequencing:

1. Install construction exits, delineate buffers zones, and designate laydown yards;
2. Install temporary EPSC perimeter measures, including sediment traps, sediment basins, silt fence, etc.;
3. Perform onsite clearing and grubbing;
4. Excavate and grade the site;
5. Throughout grading and as drainage patterns change, install appropriate EPSC measures such as, check dams, outlet protection, wattles, silt fence, etc. Continue to maintain existing measures;
6. Implement final stabilization of disturbed soil; and
7. Remove all temporary EPSC measures once permanent stabilization has been established.

If phasing is proposed to minimize disturbance or limit the amount of area disturbed at a given time, notes detailing the phasing are required. For example, when a conveyance runs through a construction site, construction phasing can be used to show how offsite water will remain unpolluted by implementing a diversion or bypass. In this case, specify that a diversion channel will be constructed and stabilized to divert water around the construction.



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The diversion reduces the drainage area of the outfall and in turn the volume of stormwater requiring treatment, as detailed in Section 3.3.1. Another example would be placing pipes such that stormwater passes through the construction site without exposure to disturbed soils. When planning to phase the project in order to disturb less than 50 acres at a given time, a construction sequence is required for each phase. While beneficial, sequencing alone does not demonstrate compliance with the CGP. To demonstrate compliance, construction details must be provided in the narrative, notes, and drawings of the EPSC plans and SWPPP. When water features are to be impacted within project limits, notes and sequencing can provide detail to the reviewer that the permitted conditions are acknowledged and met.

The following are generalized examples of sequencing notes for construction activities impacting waters of the state.

Stream Bank Construction Sequencing Example

Such as riprap placement, other revetment, placement or repair of structures, etc. (Figure 3-A)

1. Provide minimal clearing to stream for equipment access;
2. Place EPSC measures;
3. Place instream diversion. Instream diversions can be constructed of sandbags, jersey barrier, conventional riprap, sheet piling, or other materials (Figure 3-A);
4. Pump out water inside of diversion, continue to pump the water out as needed;
5. Repair bank or repair intake structure or bridge pier;
6. Remove instream diversion;
7. Apply permanent stabilization measures to disturbed areas; and
8. Remove EPSC measures once disturbed soils are stabilized.

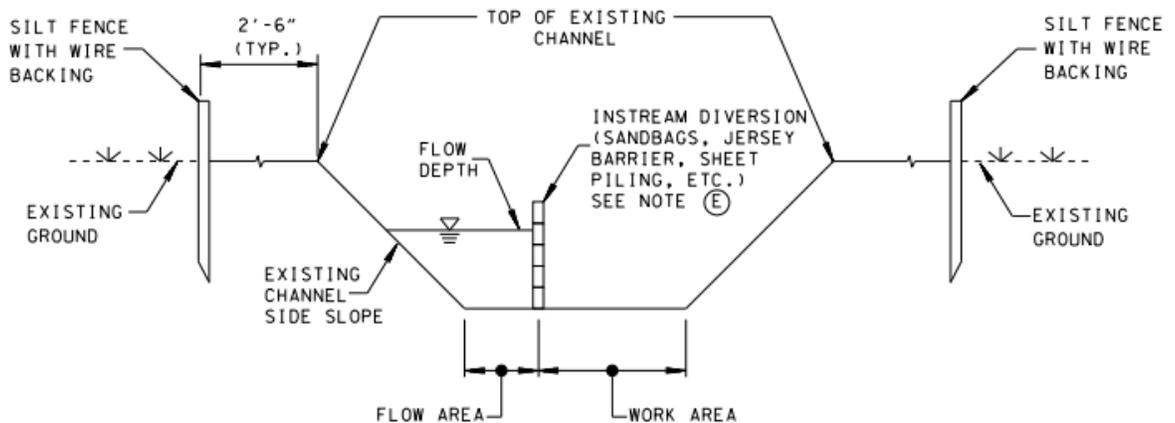


Figure 3-A: Instream diversion details. Source: TDOT - EC-STR-30.



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Culvert Crossing Replacement Sequencing Example

Using a pump around diversion may have similar sequencing for a diversion channel or pipe (Figure 3-B)

1. Place EPSC measures adjacent to stream;
2. Place sandbag berm in stream channel before and after work area;
3. Install pump around diversion, pump and pipe from the upstream side to the downstream;
4. Remove any water from the construction area by pumping into a sediment filter bag located downgradient of the work area;
5. Excavate and remove existing culvert;
6. Replace culvert with a new pipe and backfill. For work in jurisdictional streams, ensure the new pipe allows for passage of normal or high flows to comply with USACE NWP General Condition 9 (Management of Water Flows) and does not restrict aquatic organism passage;
7. Stabilize the inlet and outlet of new crossing;
8. Remove the pump-around diversion and the sandbag berms;
9. Visually inspect the new culvert crossing to see if the pipe is functioning and that no erosion is occurring at the inlet or outlet;
10. Apply permanent stabilization measures to disturbed areas; and
11. Remove EPSC measures once disturbed soils are stabilized.

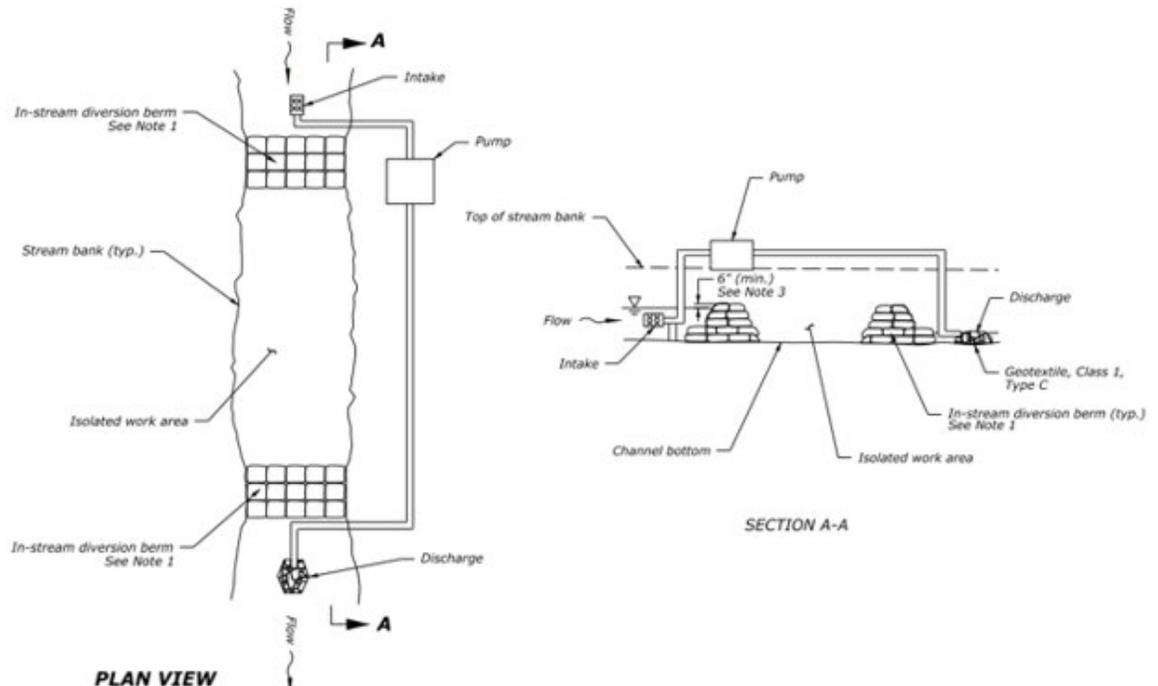


Figure 3-B: Culvert crossing details. Source: FHWA – E628-02 and E628-01 for Diversion Berm.



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Wetland Impact Sequencing Example

Such as access through a wetland, repair of existing utilities through a wetland, etc. (Figure 3-C).

1. Place timber mats for equipment access to wetland;
2. Place any temporary EPSC measures, if needed;
3. Remove and stockpile the first 12 inches of topsoil from the area to be impacted;
4. Excavate to replace utility line, use a trench box if needed;
5. Replace section of line and backfill;
6. Restore area to pre-construction grade with stockpiled topsoil;
7. Permanent vegetative stabilization using native species of all disturbed areas in or near the wetland must be initiated within 14 days of project completion. Non-native, non-invasive annuals may be used as cover crops until native species can be established;
8. Remove all temporary EPSC measures once disturbed soils are stabilized; and
9. Remove timber mats and vegetate any disturbed soil remaining from construction.

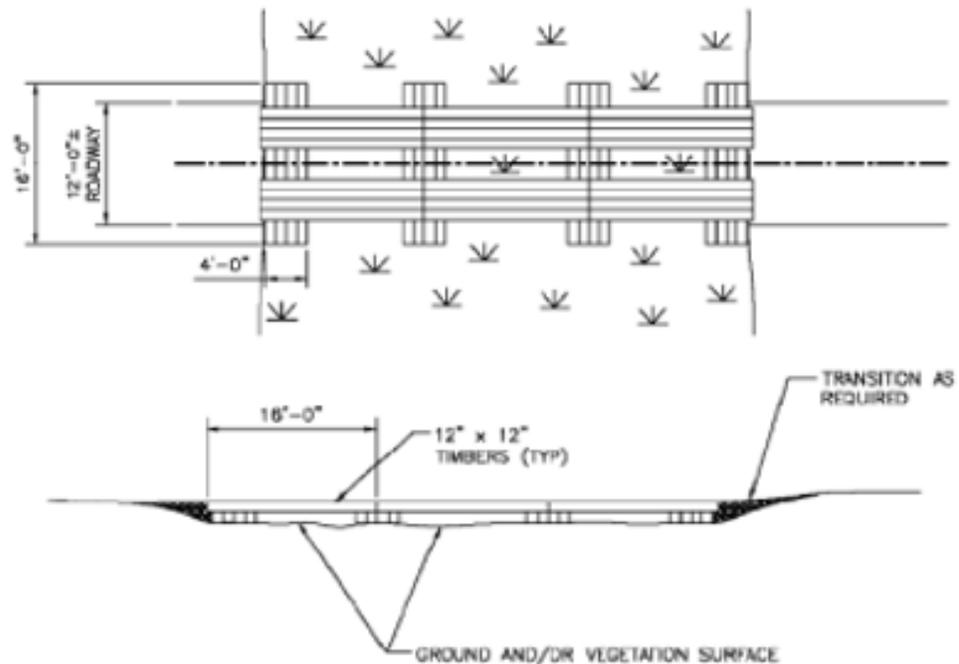


Figure 3-C: Wetland crossing with mats details. Source: USACE (2016).



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Lake Impact Sequencing Example

Such as revetment to a dam, building a bridge pier, work in a marina, etc. (Figure 3-D).

1. Install access road;
2. Place EPSC measures, such as floating turbidity curtains;
3. Place a cofferdam;
4. Pump out the water from behind the cofferdam so that it exposes the bottom of the lake. The water can be pumped to a sediment filter bag on land or behind a floating turbidity curtain to minimize sediment from migrating in the lake;
5. Pump as needed to keep area work area in cofferdam dry;
6. Construct the bridge pier;
7. Remove the cofferdam and access; and
8. Remove EPSC measures.

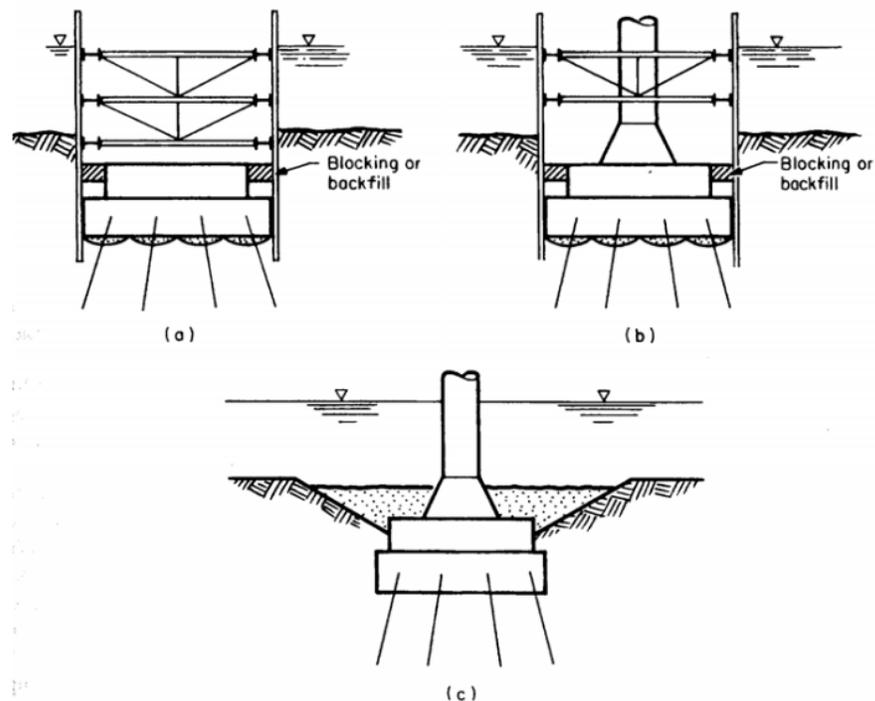


Figure 3-D: Cofferdam construction details. (a). Check blocking, dewater, construct footing block, block between footing and sheet piles. (b) Remove lower bracing, construct pier pedestal, construct pier shaft. (c) Flood cofferdam, pull sheets, remove bracing, backfill. Source: UW Department of Construction Management (2007).



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Channel Restoration Sequence and Implementation Example

Conditions: EPSC measures will be placed onsite prior to any groundwork or soil destabilization and remain in place and maintained during land disturbing activities. The new stream channel shall be excavated and stabilized during low-flow conditions. Temporary flow diversion may be used if necessary. Mulch and seeding shall be installed immediately following channel completion in accordance with accepted plans. Trees shall be installed in the first planting season following channel excavation. Water shall be diverted into the new channel **ONLY** after it is completely stabilized, and **ONLY** during a low-water period.

Channel restoration example sequence:

1. Flag edge of the new channel top of bank prior to clearing. Do not clear large trees in position to shade the new channel. Leave as many native trees and shrubs as possible;
2. Excavate the new channel “in the dry” by leaving areas of undisturbed earth (diversion berms) in place at both ends;
3. Shape channel. Any water collected in the new stream channel during construction shall be filtered prior to discharge;
4. Place topsoil, rolled erosion control products, seed, etc. as specified;
5. Remove diversion berms, beginning with the most downstream. Banks and bottom elevation of the old channel shall transition smoothly into the new channel. The elevations of the new channel at both ends of the relocation shall match the elevations of the old channel;
6. Provide a minimum of 72 hours from initial diversion of flow until alteration/filling of the original stream to allow emigration of semi-aquatic organisms; and
7. Install plantings along stream banks as specified in accepted plans.

References:

- FHWA. FLH Standard Drawings for the FP-24.
- MHFD. (2024a). *Conventional and Soil Riprap Construction Guidance Checklist*.
- MHFD. (2024b). *Void-Filled Riprap Construction Guidance Checklist*.
- TDEC. *Tennessee Construction General Permit*.
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- UM Department of Construction Management. (2007). *CM 420 Temporary Structures: Cofferdams*.
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