COFFERDAM

(no.)
CODE 803

Source: Kane-DuPage Soil and Water Conservation District

DEFINITION

A cofferdam is a temporary structure within a waterway or body of water designed to provide a dry work area for temporary construction activities and contain disturbed soil and/or suspended sediment.

PURPOSE

The purpose of this practice is to allow work to be performed in a waterway or body of water while minimizing turbidity and sedimentation in adjacent and/or downstream areas.

CONDITIONS WHERE PRACTICE APPLIES

This practice is to be used as a temporary measure whenever work will be conducted in a waterway (stream, river, or other linear feature that conveys water) or body of water (lake, pond, or other impoundment). Water is either intercepted upstream and discharged downstream or diverted around the work site. Cofferdams may also be utilized in areas to allow work to be performed in otherwise unsuitable conditions.

Typical activities requiring the use of cofferdams include: shoreline stabilization of a water body; installation or replacement of a culvert, bridge, pier, or abutment; open-cutting for the installation of utilities; and stream restoration projects.

For the purposes of this standard, the term full cofferdam will refer to a cofferdam that blocks the entire base flow of water in a linear waterway and partial cofferdam will refer to a cofferdam that only blocks a portion of the base flow.

For situations in waterways where a full cofferdam is needed, please refer to practice standard **TEMPORARY DIVERSION 976** for temporary diversion practices.

For a full cofferdam in a perennial stream, Standard Drawing **TEMPORARY STREAM DIVERSION – DIVERSION CHANNEL 676DC** may be used for temporary diversion practices.

For a full cofferdam in an intermittent stream, Standard Drawing **TEMPORARY STREAM DIVERSION – DIVERSION CHANNEL 676DC**, Standard Drawing **TEMPORARY STREAM DIVERSION – PIPE DIVERSION 676PD** or Standard Drawing **TEMPORARY STREAM DIVERSION – BYPASS PUMP 676BP** may be used for temporary diversion practices.

This practice standard should not take the place of an engineered sheet pile cofferdam. Cofferdams designed utilizing this standard may necessitate review by an Illinois licensed engineer, depending on the size and scale of the cofferdam.

CRITERIA

General

Cofferdams must be constructed of non-erodible materials such as stone, metal, geosynthetics, or other products as approved by the responsible reviewing authority. The cofferdam materials shall be free of potential pollutants such as soil, silt, sand, clay, grease, or oil. Any substance used to assemble or maintain cofferdams shall be nontoxic and non-hazardous. Any material used to minimize seepage underneath diversion structures, such as grout, shall be non-toxic, non-hazardous, and as close to neutral pH (7) as possible.

The exterior of vehicles and equipment that will be within the coffered area shall be maintained free of grease, oil, fuel, and residues. Stationary equipment such as motors, pumps, etc. located within the work area or adjacent to a water body shall be positioned over drip pans or other confinement area. All equipment shall be stored outside of the floodplain when not in use to avoid inundation during a high water event.

The term “low-flow conditions” used within this standard refers to flow at or below the ordinary high water mark (OHWM). The OHWM refers to a clear line developed by typical fluctuations in water levels. To avoid or minimize impacts, construction in a linear water feature shall be scheduled during seasonal or temporary periods of low- or no-flow conditions. Scheduling shall also consider seasonal releases of water from dams, water demands due to crop irrigation, and timed to minimize impacts on fish and other aquatic life. Cofferdams shall not be used across a stream bed at times when fish passage/spawing is of concern, unless properly mitigated.

Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. Disturbed areas shall be stabilized with the appropriate vegetation or other stabilization measures upon the completion of work or during periods of inactivity.

Excavated material or spoils resulting from the activity shall be removed from the coffered area as soon as possible and shall not remain overnight.

Waterways with a cobble bottom should be restored following the completion of work.

When installing a cofferdam in a linear water feature, every effort shall be made to block only a portion of the waterway by using a partial cofferdam. The reason for using a partial cofferdam is to maintain stream flow and allow the movement of aquatic life during construction. Blocking the entire flow shall only be done when absolutely necessary.

Sequencing

Prior to the commencement of instream activities, all appropriate soil erosion and sediment control measures shall be properly installed.

No construction equipment shall enter standing or flowing water. If equipment must access the work area through water, a non-erodible causeway must be constructed.

Cofferdams used in linear water features shall provide for emergency overflow at the center of the cofferdam to prevent erosion along the banks. The overflow system shall include an energy dissipating surface and must not contribute to, or cause, erosion of the stream.

Following cofferdam installation, the work area shall be completely dewatered in order to work under dry conditions. Pumping of water may be required throughout the construction activities in order to maintain dry conditions. Practice standards **DEWATERING 813** and **SUMP PIT 950** may be utilized in order to achieve dry conditions.

Water pumped from the work area shall be filtered to ensure that the discharge results in no visible increase in suspended solids or turbidity in the water that is surrounding the work area. The quality of discharge water shall meet all applicable local, state, or federal regulations, whichever is most restrictive. Methods for cleaning water discharged from the work area include: Practice Standards **PORTABLE SEDIMENT TANK 895**, **TEMPORARY SEDIMENT TRAP 960**, or **POLYACRYLAMIDE FOR SEDIMENT CONTROL 894**, or other approved methods such as sediment dewatering bags.

All water pumped from, or diverted around, the work area shall be discharged on an energy dissipating surface and must not contribute to, or cause, erosion of the stream.

All temporary materials must be removed after the completion of construction activities. Prior to cofferdam removal, the work area must be stabilized with appropriate vegetative and/or structural practices in accordance with plan details and specifications and be stable enough to accept flows, as determined by the responsible reviewing authority.

The downstream cofferdam shall be removed first followed immediately by the removal of the upstream cofferdam.

Design

The diversion or bypass flow shall be sized to safely convey the 2-year peak flow, at a minimum. The cofferdam shall be designed to overtop for any events greater than the 2-year peak elevation, unless higher peak flows are being bypassed. It is the responsibility of property owners and those performing work to safely convey flows to prevent damage to off-site properties.

If waterway information is not available, the ordinary high water (OHW) mark can be used as an indicator.

The construction of any cofferdam, within a linear water feature, regardless of duration, shall not cause a significant water level difference upstream or downstream of the project site. Stream velocity below the cofferdam shall be maintained at a rate similar to existing, pre-installation flow conditions above the cofferdam.

Cofferdam – Bladder

Inflatable bladders should only be used in situations where there is a relatively flat base material. Large variations in the base elevation will result in an improper seal, which will allow water seepage. Bladder cofferdams are appropriate for both full and partial cofferdam situations.

Inflatable bladder cofferdams shall be constructed in accordance with manufacturer specifications. The specific sizing, installation requirements, maintenance, allowable flow velocities and other pertinent information shall follow manufacturer specifications. All cofferdams must be duel-chambered to avoid rolling.

Cofferdam – A-frame

A-frame cofferdams should only be used in situations where there is a relatively flat base material. Large variations in the base elevation will result in an improper seal, which will allow water seepage. A-frame cofferdams are appropriate for both full and partial cofferdam situations.

A-frame cofferdams shall be constructed in accordance with manufacturer specifications. The specific sizing, installation requirements, maintenance, allowable flow velocities and other pertinent information shall follow manufacturer specifications.

Cofferdam – Stone and Impermeable Barrier

Stone and impermeable barrier cofferdams should only be used in intermittent streams of lower flow velocity. These cofferdams may be used in partial cofferdam situations in higher velocity linear water features and water bodies.

This cofferdam method could be a possible option in areas where underground electrical and gas lines may be present. It may also be a good option for areas with an uneven, stone, or bedrock base material.

To install a stone impermeable barrier cofferdam, first place the impermeable barrier on the bottom of the water feature. The barrier should extend out past the edge of the future cofferdam a sufficient length so that it can be pulled back over the rip rap after it has been installed. This will create a seamless

barrier on the water side with the opening seam on the work area side. After the barrier is pulled over the rip rap, it will likely be necessary to hold the impermeable barrier in place with rip rap or sandbags.

Rip rap should be sized appropriately to ensure that the cofferdam is able to withstand design flows.

Cofferdam – Steel Sheet

Steel sheet cofferdams are different from sheet pile cofferdams. Sheet pile cofferdams are considered to be engineered structures, where steel sheet cofferdams may not be. Steel sheet cofferdams are not recommended for partial cofferdams used in larger waterways or bodies of water.

Steel sheet cofferdams are appropriate for both full and partial cofferdam situations. Steel sheet cofferdams should not be used in areas where underground electrical and gas lines may be present. Overhead wires located above the potential cofferdam location may also limit the use of this method. In areas with stone or bedrock base materials, the use of steel sheet for cofferdams may be difficult or impractical.

Steel sheet shall be driven into the base material a sufficient distance to avoid undercutting. Steel sheets shall be able to create a fully enclosed work area.

Impermeable Barrier Material

The impermeable barrier used in this standard should consist of one of the following materials:

1) rubber liner with a thickness of at least 45 mil. This material elongates up to 100% and has good UV resistance. A solvent weld is necessary to affix material into larger sections.

2) polypropylene liner with a thickness of at least 40 mil. This material elongates up to 80%. A heat gun is necessary to weld pieces together. Fabric puncturing may be a concern for this material.

3) polyvinyl chloride (PVC) liner with a thickness of at least 40 mil. High elongation properties but not UV stable. A solvent weld is necessary to affix material into larger sections.

CONSIDERATIONS

This standard describes four typical cofferdam types, but others are possible. Alternative cofferdams should be designed based on the general criteria of this standard and adapted to meet the requirements of similar cofferdam types. As an example, rather than stone for the stone and impermeable barrier cofferdam, alternative fillers may be used, such as sand bags or gravel bags. In addition, the up- and downstream cofferdam types can be different.

Cofferdams are temporary and should not be left for long periods of time. Additional considerations should be incorporated for long-term cofferdam usage such as issues with ice flow or aquatic life movement. Long-term cofferdams may have to be built to

withstand a less frequent (higher magnitude) storm event.

Any work within a stream may be subject to the rules and regulations of the U.S. Army Corps of Engineers. A permit may also be required from the Illinois Department of Natural Resources and Illinois Environmental Protection Agency.

Additional requirements may apply in areas where state or federally threatened or endangered species are present or other species of local interest.

Prior to the installation or removal of a cofferdam, a SILT CURTAIN 917 may be installed to contain turbid water and allow suspended solids resulting from the installation of the cofferdam to settle out. Silt curtains should never be placed across stream flow as they may reduce flow and catch debris. The curtains should be placed parallel to flow or the shoreline to contain sedimentation that may occur during the installation of the cofferdam.

The use of sandbags as a seal for areas of seepage from the cofferdam is permissible. Sandbags must only be placed within the cofferdam when utilized for this purpose.

Cofferdams can be used in a variety of situations and as such, require a variety of different practices based on the individual site conditions and work to be performed. All other appropriate cofferdam methods not listed in this standard should be designed by an engineer and constructed to meet the requirements of the local, state, or federal regulations, whichever is more stringent.

When using a partial cofferdam, the potential for scour of the open portion of channel should be considered.

PLANS AND SPECIFICATIONS

Plans and specifications for cofferdams shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. The following items shall be included in the plans:

1) The location of the cofferdam
2) Cofferdam type
3) Normal water elevation
4) Installation, inspection, and maintenance schedules with the responsible party identified
5) The 2-year peak flow and elevation values

Standard drawings **IUM-503AF – A-Frame Cofferdam**, **IUM-503AP – A-Frame Partial Cofferdam**, **IUM503BF – Bladder Cofferdam**, **IUM503BP – Bladder Partial Cofferdam**, **IUM-503RF – Rock Cofferdam**, **IUM503RP – Rock Partial Cofferdam**, or **IUM-503SS – Steel Sheet Cofferdam** may be used as the plan sheet.

OPERATION AND MAINTENANCE

Because the potential for washout is high, the cofferdam shall be monitored daily and must not be left unattended for longer than 24 hours. Weather reports should be observed. If a storm event is expected, the site shall be stabilized in preparation as appropriate. All repairs shall be made immediately to prevent further damage to the installation.

Regularly inspect cofferdams for leaks or other deficiencies. Sandbags used within the cofferdam, if applicable, must be removed by hand to prevent breakage.

All disturbed soil within the coffered area shall be returned to original condition with all possible efforts made to retain the existing soil profile prior to the removal of the dams.

The side slopes shall be reseeded and stabilized with an appropriate erosion control blanket and the substrate shall be restored to preconstruction conditions. Stabilization of all remaining disturbed areas shall be initiated immediately following the removal of the cofferdams. In no instance shall areas adjacent to water features be left disturbed overnight.

REFERENCES

Tennessee Department of Environment and Conservation, Division of Water Pollution Control. Stream Diversion Channel – SDC. Tennessee Erosion and Sediment Control Handbook, Second Edition, March 2002.

Delaware Department of Natural Resources & Environmental Control – Division of Soil & Water Conservation, Delaware Erosion and Sediment Control Handbook, June 2005.

January 2013

urbst803.doc