

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 sediments.

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). 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 situations in waterways where a full cofferdam is needed, please refer to practice standard TEMPORARY STREAM DIVERSION 976 for temporary diversion of the stream channel.

This practice standard shall not take the place of an engineered sheet pile cofferdam.

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.

CRITERIA

General

Cofferdams shall be constructed of non-erodible materials such as stone, metal, geosynthetics, or other approved products. 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 non-toxic 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 water line. 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 is of concern.

Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. Precautions shall be taken to avoid damage to herbaceous and woody vegetation using practice standards such as 984 -TREE AND FOREST ECOSYSTEM PROTECTION, 990-TREE PROTECTION, or 994-TREE PROTECTION AUGERING. Disturbed areas shall be stabilized with the appropriate vegetation or other stabilization measures.

When installing a cofferdam in a linear water feature, every effort shall be made to block only a portion the waterway (partial cofferdam) rather than the entire flow (full cofferdam) in order to maintain normal stream flow and the movement of, and lessen impacts to, aquatic life. Blocking the entire flow and bypass pumping around the work area shall only be done when absolutely necessary.

Sequencing

Prior to the commencement of in-stream activities, all appropriate erosion and sediment control measures shall be properly installed.

No construction equipment shall enter standing or flowing water. If equipment access is required to reach the work area, a causeway must be constructed.

Water is either intercepted upstream and discharged downstream (full cofferdam) or diverted around the work site (partial cofferdam).

Cofferdams used in linear water features shall provide for emergency overflow at the center of the dam to prevent erosion along the banks.

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 sediments to the surrounding water unaffected by construction activities. The quality of discharge water shall meet any 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 (PAM) FOR TURBIDITY REDUCTION AND 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.

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 specifications and be stable enough to accept flows.

When using an upstream and downstream cofferdam, removal of the downstream structure shall occur first.

Design

For in-stream activities occurring for no longer than 72 hours, the cofferdam shall be constructed in such a way that the temporary diversion or bypass flow occurs at or below the ordinary water line.

For in-stream activities occurring for longer than 72 hours, the cofferdam shall be constructed in such a way that the temporary diversion or bypass flow be sized to safely convey the 2-year, 24-hour storm flow, at a minimum.

The cofferdam shall be designed to overtop for any events greater than the 2-year, 24-hour storm event. The cofferdam shall be designed to withstand the erosive forces of the 25-year, 24-hour storm event.

If waterway information is not available, the ordinary high water (OHW) mark can be used as an indicator. In waterways of unknown flow frequency, duration, and volume, cofferdams shall be designed with caution.

Where flood hazard exists, increase the temporary diversion or bypass flow capacity according to the potential damage.

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 (not to exceed 0.1 feet or less if local ordinances are more restrictive). Stream velocity below the cofferdam shall be maintained at a rate similar to existing, pre-installation flow conditions above the cofferdam. Structures shall not be installed without identifying and addressing potential impacts to the stream channel.

Cofferdam – Bladder

Inflatable bladders shall 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.

Inflatable bladder cofferdams are ideal in larger waterways or water bodies. 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 dual-chambered to avoid rolling.

Cofferdam – A-frame

A-frame cofferdams shall 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 ideal for large cofferdams in waterways or large water bodies.

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 – Rock and Liner

Rock and liner cofferdams shall only be used in intermittent tributaries of lower flow velocity. They are appropriate for use as partial cofferdams 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 rock and liner cofferdam, first place the impermeable liner on the bottom of the water feature. The liner 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 liner is pulled over the rip rap, it will likely be necessary to hold the liner in place with rip rap or sandbags.

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

Cofferdam – Steel Sheet

Steel sheet and liner cofferdams should only be used in intermittent waterways. Steel sheet and liner cofferdams are not recommended for partial cofferdams used in larger waterways or bodies of water.

Steel sheet and liner cofferdams shall 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 a minimum of ¼ inch in thickness. 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.

Fabric shall be wrapped around the bottom of the steel sheet and driven into the base material with the steel sheet to ensure a secure seal.

Liner Material – The liners used in this standard shall 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. This material has high elongation properties but is not UV stable. A solvent weld is necessary to affix material into larger sections.

Remove the cofferdam only after accumulated sediment has been removed and disposed of in an approved manner. 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 pre-construction conditions. Stabilization of all remaining disturbed areas shall be initiated immediately following the removal of the cofferdams. In no instance shall areas adjacent water features be left disturbed overnight.

CONSIDERATIONS

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 engineered to withstand a higher-frequency 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.

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, practice standard 917 SILT CURTAIN may be used to contain turbid water and allow suspended sediments resulting from the installation of the cofferdam to settle out. Silt curtains should never

be placed across stream flow, only parallel to the bank, as they may reduce flow and catch debris.

The use of sandbags on the inside wall is recommended to seal areas of minor seepage from the cofferdam.

When using a cofferdam across a stream channel it may be necessary to install one cofferdam upstream and another downstream of the work area to prevent water from entering the work area.

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.

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.

Standard drawings [IUM-503AF COFFERDAM – A-Frame FULL](#), [IUM=503AP COFFERDAM –A-FRAME PARTIAL](#), [IUM-503BF COFFERDAM –BLADDER FULL](#), [IUM-503BP – COFFERDAM - BLADDER PARTIAL](#), [IUM-503RF](#)

COFFERDAM – ROCK FULL, IUM-503RP COFFERDAM – ROCK PARTIAL, or IUM-503SS COFFERDAM – SHEET STEAL 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.

Inspect cofferdams for sediment accumulations and remove sediment when the depth reaches one-third of dam height. Dispose of sediment in an approved area and stabilize the removed sediment with appropriate methods.

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.

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