Illinois Urban Manual- Cofferdam Standard

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- For the past 10 -15 years Soil & Water Conservation Districts in Illinois have become more & more involved in a very dynamic environment with Soil Erosion & Sediment Control on Construction Sites.

Illinois Urban Manual- Cofferdam Standard

- Many SWCDs' had agreements with U.S. Army Corps, and later IEPA, to perform erosion & sediment control inspections, so we were engaged in assessing the performance of SE/SC practices.

Illinois Urban Manual- Cofferdam Standard

NPDES Phase I & II driving new product introduction and advances in technology.

For SWCD tech staff doing plan reviews and/or inspections, there was a need for an IUM that was regularly updated.

Illinois Urban Manual-Cofferdam Standard

NRCS would no longer update the IUM after the 2002 revision.

Need technical backing when working with the private sector through manufacturers, suppliers, consultants, contractors, etc.

Illinois Urban Manual- Cofferdam Standard

Multiple products became available serving similar functions, i.e. inlet protection, ditch checks, etc.

Specialized commercial products for use as cofferdams were being introduced. Practice with potential for significant environmental impacts.

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.

Illinois Urban Manual- Cofferdam Standard

Standard developed for multiple types of Cofferdams, not individual products/practices.

Important to allow for other types of Cofferdam designs

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.

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 **IUM-676DC TEMPORARY STREAM DIVERSION – DIVERSION CHANNEL** may be used for temporary diversion practices.

For a full cofferdam in an intermittent stream, Standard Drawing **IUM-676DC TEMPORARY STREAM DIVERSION – DIVERSION CHANNEL**, Standard Drawing **IUM-676PD TEMPORARY STREAM DIVERSION – PIPE DIVERSION** or Standard Drawing **IUM-676BP TEMPORARY STREAM DIVERSION – BYPASS PUMP** 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 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 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.

Illinois Urban Manual- Cofferdam Standard

Illinois Urban Manual- Cofferdam Standard

the coffered area can begin. As the water level is lowered, the sump pit can be installed to complete the dewatering process.
For the installation of a bladder or A-frame system, manufacturer specification shall be followed.

For the installation of a steel sheet cofferdam, the sheets should be driven in using a backhoe to pound the sheets in place or the use of a vibrating mechanism to slide the sheets in place. The use of interlocking sheets is preferred. Where interlocking sheets are not used, other methods, such as an impermeable fabric, shall be utilized to create a seal.

For the installation of a stone and impermeable barrier cofferdam, the fabric shall be applied in the water and held in place by workers or large stones. The fabric must be placed so that it can be wrapped over the stone from the outside of the coffered area, inward. A backhoe will then dump the stone on the fabric. The fabric can then be pulled over the stone towards the future work area and held in place with additional stone or sandbags. This will create an impermeable barrier.

5. USE AND MAINTENANCE

Following cofferdam installation, the work area shall be completely dewatered for each use in order to work under dry conditions. Pumping of water may be required throughout the construction activities in order to maintain dry conditions. Water may be permitted to fill in the work area during times of inactivity. 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 SEDMIMENT 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. Other maintenance requirements of practice standard IUM-803 (Cofferdam) shall be followed. The cofferdam shall be inspected daily for integrity and functionality with repairs made as necessary.

6. REMOVAL AND STABILIZATION

All temporary materials must be removed after the completion of construction activities. Prior to cofferdam removal, the work area up to the OHWM must be

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

Illinois Urban Manual- Cofferdam Standard

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 in-stream 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

Illinois Urban Manual-Cofferdam Standard

Dewatering practices with Cofferdam