

Embankment Pond Renovation

Alabama Guide Sheet No. AL 378C



DEFINITION

Old embankment ponds often require renovation to restore the embankment and appurtenances to a safe, functioning, condition. Typical problems encountered on old ponds include deteriorated or non-functional pipe systems, erosion on the embankment, trees on the embankment, excess sediment in the pool, and sparse vegetation on the embankment and auxiliary spillway. Some ponds may need to have the pipe system replaced which involves an expensive excavation of the embankment. Other pond sites may be able to have a siphon system installed over the embankment and the old pipe system filled with flowable fill (cementitious product). This Guide Sheet focuses on renovation of the pipe system. Refer to Alabama NRCS Conservation Practice Standard, Pond - Code 378, for guidance on the proper design and condition for embankment slopes, auxiliary spillways, and vegetation.

CONSTRUCTION

Pipe Replacement

The total replacement of a pipe through a pond embankment is often the best solution for pipe system renovation. The standard riser and barrel pipe configuration has proven to be the most hydraulically efficient and generally requires less operation and maintenance compared to other systems that have been used in Alabama.

To replace the pipe, the pond must first be drained to an elevation below the planned pipe elevation. The excavation for the pipe replacement must extend to a stable and firm foundation beneath the existing pipe, be wide enough at the bottom to accommodate construction equipment, and have side slopes of 1.5H:1V or flatter (preferably 3:1). Bypassing of normal stream flows and storm flows during construction is a major consideration

for pipe replacement. The new pipe system with appurtenances and backfill must be constructed according to Alabama NRCS Conservation Practice Standard, Pond - Code 378 and Guide Sheet, Pond Construction, AL378. NRCS can provide guidance on pipe sizes and materials needed for the job.

Pipe Slip-Lining

The process of placing a smooth-lined pipe inside of the older pipe is called "slip-lining". This process requires a formal engineering investigation and design. Specialized contractors must perform this work so that the new pipe is correctly installed and the annular space between the two pipes properly filled with grout.

Siphon System

For some renovated ponds, a new siphon system can replace the hydraulic function of the old riser and barrel pipe system. When a siphon is planned, it should be designed and installed before the old system is decommissioned (filled). NRCS can provide assistance on the design of the siphon system. A major advantage of installing a siphon in an existing pond is that it can often be done without completely draining the pond. Therefore, the impact of storm flows during construction is usually not as severe because less excavation is needed to install a siphon than is needed for conventional pipe replacement.

Siphon systems look like an inverted "V" over the dam starting in the pool, extending over the top of the dam buried just below the surface at the permanent water elevation, and continuing down the back slope of the dam to a stable outlet. Siphons when properly designed and constructed are self-priming and hydraulically efficient. When the water has drained down to the normal pool elevation after a storm event, a vent pipe will "break" the siphon action. Vent pipes must be

properly designed, constructed, and maintained in order for the siphon system to function.

Siphon systems constructed in north Alabama should have an anti-drain vent constructed to ensure that the pond does not accidentally drain should the vent pipe freeze during siphoning action.

Flowable Fill Concrete

During the pond renovation process old pipe systems that are left in the dam must be made non-functional and safe for leaving in the dam. The old pipe must be completely sealed so that it does not provide a path for water to flow through the dam. This can most easily be accomplished by filling the pipe system with what is referred to as "flowable fill" or Controlled Low-Strength Material (CLSM). Flowable fill is a cementitious product that flows easily. When properly batched with the right ingredients and installed correctly, it can provide the positive cut-off required of the old pipe system.

The pond surface should be lowered below the crest of the existing riser to ensure that water will not be flowing through the pipe during placement of the flowable fill. Before placement of the flowable fill, the old pipe must be prepared. If it appears that the old pipe contains significant deposits of sediment or debris, cleaning by high-pressure washing may be advisable. The outlet end of the pipe must be plugged so that the flowable fill will not escape. An engineer should be consulted for procedures to plug the outlet end of a severely rusted pipe. An air vent at the outlet end of the pipe must be provided to ensure an air pocket does not form when the flowable fill is placed. The air vent can be a small hole on the top of the outlet pipe that can easily be plugged when the air has escaped and flowable fill begins to exit from the hole. If the riser pipe would leak during installation of the flowable fill and is of such condition that it cannot be used for this purpose, it should be removed and replaced with a stand pipe (minimum diameter of 6 inches) connected in a water-tight manner to the barrel pipe.

Flowable fill should be funneled into the riser pipe at a fast rate and of sufficient quantity so that it will completely fill the pipe barrel and extend at least 5 feet up the riser pipe before the flowable fill sets up. The mixture may be placed using chutes, buckets, or pumps

depending on accessibility to the riser. The quantity of flowable fill must be calculated so that adequate volume is readily available during the pipe filling process.

In order to obtain the right characteristics of flowable fill, it is important to get the right ingredients. Design mixes differ and should be verified with the local supplier. A typical cubic yard mix should contain:

50 – 100 lbs of cement
250 – 300 lbs of fly ash (types C or F)
2600 – 2900 lbs of fine aggregate (sand)
60 – 70 gallons of water

Flowable fill that is correctly batched, mixed, and placed should completely fill the old pipe system. After the material has cured, the riser pipe can be removed if desired.

OPERATION AND MAINTENANCE

Routine maintenance on the pond will include mowing and fertilizing the vegetation on the dam and spillway; preventing trees and brush from growing on the dam and spillway; repairing any erosion in the spillway; removing debris from the trashrack; controlling muskrats or beavers that bore into the dam; limiting livestock access to the pond; and fertilizing or liming the pond as necessary for fish production.

A siphon system should be routinely inspected to ensure the vent pipe is unclogged.

Any seepage that develops in or around the old pipe system outlet should be investigated by a professional to determine any corrective measures that may be needed.

All disturbed areas associated with the pond renovation should be properly seeded and mulched according to Alabama NRCS Conservation Practice Standard, Critical Area Planting - Code 342.

REFERENCES

Alabama NRCS Conservation Practice Standards
Critical Area Planting - Code 342
Pond - Code 378

NRCS AL Guide Sheet
AL 378 - Pond Construction

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