POND Construction

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Did You Know?

- Alabama is the only state without any safe dams legislation.
- Alabama has a very inadequate dams inventory and doesn’t know where most dams are in the event of an emergency.
- As long as a landowner satisfies the COE for wetlands and ADEM for construction, they can build a pond without any design, construction, or maintenance requirements.
- Would you like to live below an Alabama dam?
Pond Nomenclature
Pond Nomenclature

Top Width

Side Slope

x

1
Pond Nomenclature

Berm
Pond Nomenclature

- Cut-off (core) Trench
- “Relatively” Impermeable Layer
Pond Nomenclature

- Embankment
- Core
- Shell
Pond Nomenclature

Principal Spillway

Riser Pipe

Barrel Pipe
Pond Nomenclature

- Trash Rack
- Valve
- Anti-seep collars
Diaphragm Drain

Cut-off trench located just up stream
FILTER DIAPHRAGM
Filter Diaphragm flooding with water for compaction
Pond Nomenclature

Concrete Ballast
Pond Nomenclature

Emergency Spillway Crest (level section) Elevation

Storage Vs

Permanent Pool or Inlet Elevation
Pond Nomenclature

Maximum height of water through spillway

Freeboard

Hp

Maximum height of water through spillway
Pond Hazard Classification

- “a” - low hazard.
  - A dam in a rural area.
  - No loss of life potential.
  - Failure may damage farm buildings, agricultural land or country roads.
Pond Hazard Classification

- “b” - medium hazard.
- A dam in a predominately rural area.
- No loss of life potential.
- Failure may damage isolated homes, main highways, railroads and interrupt public utilities.
Pond Hazard Classification

- “c” - high hazard.
- Failure may cause loss of life.
- Serious damage to homes, industrial buildings, public utilities, main highways, or railroads.
• Deepen shorelines on all catfish ponds and other ponds as needed to at least 3 feet to avoid submerged aquatic vegetation problems.

• If shoreline aquatic vegetation is desired, parts of the shoreline can be left < 3 feet deep.

• Always estimate shoreline deepening yardage because excess may need to be spoiled.

• Shorelines can be shaped to be curvilinear to enhance the aesthetics of the pond.
Estimating shoreline deepening.

\[ \frac{(12 - 8) \times 1.5 \times 43560}{27} = 9,680 \text{ yd}^3 \]
Erosion and Sediment Control

**Definition**
During the construction of a pond, significant sediment loads can enter a stream system if the proper erosion control techniques and construction sequences are not utilized during construction. After construction, a pond provides excellent sediment control for the upstream drainage area.

**Erosion and Sediment Control Practices**
Disturb the least amount of land for the least amount of construction. The area or adjacent to the pond site should remain clean. This can be accomplished several ways. The barrel pipe can often be installed at a location away from the natural ditch. If so, the foundation, installation, and backfill work associated with the barrel pipe should be the first item completed on the site. The clean water in the ditch should then be diverted through the pipe while the remainder of the embankment work is completed. Diversions should be used when possible to divert clean runoff water away from any disturbed areas like the pool, emergency spillway, or borrow area.
Disturb the least amount of land for the least amount of time.

- Construct the pond without delay.
- Disturb the pool area only after the embankment can serve as a sediment basin.
- Expand the borrow area only as needed.
Divert clean water

- Install barrel pipe away from natural ditch so the clean water can be diverted through the pipe during construction.
- Use diversions to divert clean runoff water from disturbed areas.
Stop sediment at its source.

- Soil exposed for periods of more than one week without on-going construction should be mulched.
- Remove mulch when resuming work.
Control sediment

- Leave the valve barely open so the pond will act as an sediment basin.
- Shape borrow areas to retain runoff.
- Install silt fences and brush windrows where needed.
- Leave at least 20 ft of vegetation around the ditch in the pond. Clear this area last.
Establish permanent vegetation

- Vegetate as soon as final grading is completed.
- Use temporary seeding and mulching until permanent seeding dates can be met.
O & M

for erosion and sediment control

- Inspect site after rainfall events of 3/4 inch or more.
- Repair areas that have eroded.
- Remove and properly dispose of sediment accumulations.
Sequence of construction for erosion and sediment control

- Clear the work area immediately adjacent to the barrel pipe location.
- Excavate the cut off underneath the barrel pipe location.
- Expose a small borrow area while controlling potential sediment from leaving the site.
- Backfill the cutoff underneath the barrel pipe location.
Sequence of construction for erosion and sediment control

- Install the barrel pipe and anti-seep collars or filter and drainage diaphragm.
- Backfill the barrel pipe (minimum of 2 feet over the pipe).
- Install the valve, riser pipe, and trash rack.
- Install riser ballast.
- Divert the drainage ditch in the pond bottom to the valve inlet.
Sequence of construction for erosion and sediment control

• Clear the remainder of the embankment footprint.
• Place brush windrows as sediment barriers on the contour below cleared areas.
• Place silt fence barriers where necessary.
• Excavate the remainder of the cutoff on both sides of the barrel pipe.
Sequence of construction for erosion and sediment control

- Expose more borrow area as earth fill is required.
- Backfill the below-ground core.
- Begin above-ground core and embankment earth fill placement.
- Leave the valve cracked open to allow for storm water detention.
- Clear the pool area as needed while maintaining a 20-foot vegetative strip next to the drainage ditch.
Sequence of construction for erosion and sediment control

- Complete embankment earth fill placement and excavation of emergency spillway.
- Close the valve.
- Clear the 20-foot vegetative strip next to the drainage ditch if needed.
- Remove all silt fences and brush windrows. Remove and/or spread silt accumulations.
Sequence of construction for erosion and sediment control

- Vegetate the site.
- Inspect vegetation and make repairs as needed after the first few rain events.

- JOB FINISHED.
Slope staking an embankment

What should be built.

Too Flat

Too Steep
Main keys to good soil compaction:

- Moisture
- Moisture
- Moisture
- Moisture
- Moisture
Keys to good soil compaction

- Soil that is too dry or too wet will not compact properly.
- Soil is too wet when the soil sticks to the equipment, when the soil “pumps” underneath the tires of heavy equipment, or when clods cannot be easily blended with other material.
**Keys to good soil compaction**

- Soil is too dry when it cannot be easily molded in the hand.
- Every square foot of the 8” uncompacted horizontal layer should be traversed with at least two passes of heavy equipment (preferably a sheepsfoot or pneumatic tired equipment).
- The finished surface of the compacted layer should be roughened before the next layer is placed.
• Bulldozer
• Compaction is from the top of the lift only.
• 1-2 psi ground pressure
• POOR Compaction
Compaction Equipment Comparison

- Scraper (Pan)
- Compaction is from the top of the lift only.
- Minimum 2 passes.
- Has the same ground pressure as the air pressure in the tires (30 - 40 psi)
- MARGINAL Compaction
Compaction Equipment Comparison

- Sheepsfoot Roller
- Works from the bottom of the lift up.
- Requires 6 - 10 passes per 9” loose lift.
- Works at 4 - 6 mph.
- 150-300 psi ground pressure.
- Best implement to use for clayey soils.
- GOOD Compaction
Compaction Equipment Comparison

- Vibratory Roller
- Can compact thick lifts in 2 - 3 passes.
- Slow travel speed (1.5 - 3 mph)
- 150 - 300 psi ground pressure plus vibration to help rearrange and compact soil particles.
- GOOD Compaction
Dam on Soft Foundation
Spillway pipe at end of construction
Same pipe after excessive foundation settlement
Organics and surface soil (topsoil) from the embankment footprint, emergency spillway, shoreline deepening, and any borrow area should be stockpiled to utilize in the vegetation establishment process. This material can be spread on the shell of the dam, surface of the finished emergency spillway and over any borrow area to enhance vegetation establishment.
Why do some ponds leak?

- The pond is built in a poor site.
- Inadequate compaction around pipe.
- Cut-off not excavated into impervious material.
- Core is not constructed of good clay.
- Poor compaction.
- Lack of bondage between layers.
- ALL PONDS LEAK TO SOME EXTENT.
All Ponds Leak

Homogeneous fill with good foundation

Phreatic Line

Dry soil

Moist Soil

Saturated soil
All Ponds Leak

Dam built with a clay core.
All Ponds Leak

Dam built with a clay core but inadequate cut-off.

A Solution.
All Ponds Leak

Toe Drain (sand, gravel and pipe)
All Ponds Leak

- Some pond have a good cut-off, core and dam, but leak through the bottom of the pond into a sand layer, gravel pocket, or limestone fracture.
- These must be sealed with bentonite, soil dispersant, or synthetic liner.
- $$$$$$$$$$$$$$$$$$$
What causes leakage at the abutments?

The bottom of the cut-off should always extend up the abutments to at least one foot higher than the permanent water elevation.
Ponds as a water source for cattle

- Ponds should be fenced so cattle do not have uncontrolled access to the pond.
- Install a watering ramp with heavy use protection, or a trough or tank below the dam.
Pond Safety

- Be sure that no buried pipelines or cables cross the proposed pond site.
- Make sure the landowner calls the Alabama Line Location Center at 1-800-292-8525.
- Avoid sites under powerlines. The wires may be within reach of a fishing rod held by someone fishing on the pond.
Pond Safety

- Pond owners may need to protect themselves with liability insurance coverage.
- If the pond is to be used for swimming, guards over pipe openings are required.
- All undesirable trees, stumps, brush, rubbish, junk, and fences that might be hazardous to boating or swimming should be removed.
Pond Safety

- Mark safe swimming areas and place warning signs at all danger points.
- Life saving devices should be properly located to facilitate rescue operations should the need arise.
Pond Cost-Share

- Livestock and irrigation Ponds ONLY.
- Must be “least cost alternative”.
- No cost-share for recreational ponds.
- Generally, no technical assistance for recreational ponds.
Small Livestock Pond

• Excavated Pond - $2,700
Large Livestock Pond - Earthfill

- $5,832
• $2 - $4 / cu.yd. depending on type of irrigation pond.
Sources of information

- http://www.aces.edu/pubs/docs/A/ANR-1114/
Sources of information