

CONSTRUCTION LAYOUT AND OVERSIGHT FOR PONDS

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Pond Design Training

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WHAT IS CONSTRUCTION LAYOUT?

- ▶ Clearly and adequately staking of planned features to transmit the information in the design from the drawing to the ground.
- ▶ This helps both the landowner and the contractor to visualize the dam and pool area.
- ▶ It provides lines, grades and elevations for construction

WHAT DO YOU NEED TO KNOW?

- ▶ Location and elevation of the Temporary or Permanent Benchmark(s)
- ▶ Location of the planned embankment
- ▶ Planned Top of Dam Elevation
- ▶ Auxiliary Spillway Elevation
- ▶ Normal Pool Elevation
- ▶ Principal Spillway type and location

WHAT DO YOU NEED TO KNOW?

- ▶ Survey notes are critical
 - ▶ Regardless of the survey method notes and descriptions play a major role in design and construction layout.
 - ▶ Include the description and location of the benchmark (e.g.-16P nail in 18" Oak on NW side of site; assumed elevation of 500-ft). It is always a good idea to have a second benchmark in a discreet location.

WHAT DO YOU NEED TO KNOW?

- Location of the centerline of the dam. What's the top width?
- If stakes were set to for the centerline of the dam during the survey, what can you measure from if the stakes are gone or look like they may have been moved?

WHAT TO STAKEOUT OR FLAG

- Stake or flag the clearing limits including the foot print of the dam, the auxiliary spillway, the pool area (planned normal water line) and any additional borrow areas. This keeps a natural buffer area around the construction site. If erosion control measures are needed, they should be located and installed prior to clearing the rest of the site.
- Make sure the location of the auxiliary spillway is clear to the contractor. Over excavation in auxiliary spillway is unacceptable and will likely require relocation of the control section as it must be in natural ground (or virgin material).

WHAT TO STAKEOUT

- Stake the centerline of the dam including the cut/fill depths
 - Stationing and off-sets should be discussed with the contractor prior to staking. You want enough to make sure everything is in the correct location but not so many that it is confusing or overly complicated. Stationing should be frequent enough to be able to establish the toe slopes on the up and downstream sides.
 - Stake where the principal spillway goes through the dam...yes it will probably have to be done but you want to make sure that area is properly prepared.

WHAT TO STAKEOUT

How do you determine what the footprint will be?

- Once you've located the centerline and put in cut/fill stakes at each station, take the amount of fill at each location and multiple by the side slope then add $\frac{1}{2}$ the top width. For example, if the fill is 15-ft, the side slope is 3:1 and the top width is 12-ft. Measure perpendicular to the dam out $[(15 \times 3) + (12/2)] = 51$ -ft.

WHAT TO STAKEOUT

The normal water level or pool is typically flagged using the existing topography and a level. Calculated the grade rod for normal pool by subtracting the planned elevation from the Height of Instrument (HI). Then move around the pool area and flag several points where you find that rod reading.

WHAT TO STAKEOUT

- What about the core/cutoff trench?
 - It follows the centerline of the dam and is typically 8-ft wide but should be indicated on the drawings and in the core specification.
 - You will not be able to put cut depths on the stakes because that has to be determined during excavation to ensure that you reach a good foundation. The minimum depth will be indicated in the design but is usually 3-ft and has 1:1 side slopes.

KEY POINTS FOR STAKEOUT

Know your planned elevations

- Top of Dam (constructed and settled)
- Auxiliary Spillway control section
- Principal Spillway / Normal Water Level
- BENCHMARK
- Planned side slopes

Communicate with the Contractor so that you can use staking practices that they prefer and so that they are clear about what locations and notations are intended to mean.

QUESTIONS ON STAKEOUT?

Note that all this information is available in USDA NRCS Ponds-
Planning, Design, Construction, Agricultural Handbook Number 590

POND CONSTRUCTION

- Pre-construction Conference with the Landowner, Contractor, Approving Engineer/Party, and primary Inspector. This is mandatory and all parties must be present.
 - Review the design and what has been staked out. Key points to review are the planned borrow areas, the quality of fill material and compaction method for the core wall and cut off trench, type of principal spillway including the size and pipe material, location and dimensions of the auxiliary spillway, anti-seep collar or drainage diaphragm if required.
 - Any special site conditions to be aware of during construction such as shallow or fractured rock in the pool area that would limit excavation or need to be resealed should it be uncovered.

CLEARING & GRUBBING

The foot print of the dam should be cleared and grubbed well. Make sure to clean surfaces that will be supporting the structure and will need to adhere/bond to the fill material placed over it. This includes removing the sod, boulders and topsoil from the entire area.

The pool area needs to be cleared but the degree of grubbing can vary with the use for the water. For example, micro-irrigation supplies need to be clear to reduce clogging of filters and prevent clogging of the lines and openings.

CLEARING AND GRUBBING

If stumping in the pool area especially near the embankment, check to see if roots extend into pervious material that the resultant holes would cause excessive seepage. If so, they have to be filled with suitable material and compacted.

The clearing debris needs to be properly disposed of and any relevant permits (i.e. a burning permit). On-site burial, away from the embankment, is acceptable but requires 2-ft of cover material.

Topsoil should be stockpiled to use on the surface of the embankment to help provide a media for grass.

NOW WE'RE READY TO START: FOUNDATION PREPARATION

The cutoff trench is critical in the foundation preparation. It needs to be excavated to an impervious surface and prepared to receive the core material. It has to be wide enough for the approved method of compaction. For example, if the core is to be compacted with a pan, the cutoff trench has to be wide enough for the pan to pass in multiple tracks so that it is compacted thoroughly across the width.

The stream channel also needs to be excavated through the embankment and backfilled and compacted with approved soil material.

CONSTRUCTION CHECKS

After the cutoff trench has been excavated, it must be surveyed to record the actual length, width and depth. See the NRCS Standard Note Keeping

Now we are ready to start up with the fill material. Be sure to read the construction specifications to determine the maximum depth of a soil layer for to compaction. It is typically 9-inches of soil compacted to 6-inches. This is one of the things that should to be determined by the soils investigation.

The best clay on-site should be used for the core wall. Second best used on the front of the dam and least desirable behind the core wall. The entire embankment should come up together after the cutoff trench has been backfilled and compacted to match the adjacent surfaces.

INSTALLATION OF PRINCIPAL SPILLWAY PIPE AND ANTI-SEEP COLLAR

If the principal spillway is a riser/barrel type, what is elevation of the pipe invert and at what slope does the pipe go through the embankment?

Prepare a foundation trench for the pipe by filling approximately 3 inches above grade with compacted material. The foundation area for the pipe shall then be excavated to approximately two (2) inches below the planned invert elevation for the pipe and shaped to conform to the outside diameter of the pipe.

INSTALLATION OF PRINCIPAL SPILLWAY PIPE AND ANTI-SEEP COLLAR

- ▶ Inspect the pipe, size and material must be consistent with plans and specifications.
- ▶ The pipe conduit shall be placed on a firm foundation to the lines and grades shown on the plans.
- ▶ Installation shall be performed in a skillful and workmanlike manner in accordance with manufacturer's recommendations.

All pipe joints must be sealed to prevent air and/or soil from entering



INSTALLATION OF PRINCIPAL SPILLWAY PIPE AND ANTI-SEEP COLLAR

- ▶ Fill adjacent to structures, pipe conduits, anti-seep collars, and drain fill shall be carefully compacted to a density equivalent to that of the surrounding fill by manually directed power tampers or plate vibrators. Fill materials compacted with manually directed power tampers or plate vibrators shall be placed in horizontal layers not to exceed four (4) inches in thickness prior to compaction. Selected backfill material shall be placed around the structures, pipe conduits, and anti-seep collars at about the same rate on all sides to prevent damage from unequal loading. Over compaction that may raise the pipe conduit or make the fill brittle can be just as harmful as under compaction.

INSTALLATION OF PRINCIPAL SPILLWAY PIPE AND ANTI-SEEP COLLAR

- ▶ Anti-seep collars, when used, shall be of materials compatible with that of the pipe and shall be installed so that they are watertight.

Place fill at same rate on each side to prevent damage from unequal loading. With this particular Anti-seep collar unequal loading will break the seal



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DRAINAGE DIAPHRAGM INSTALLATION

- ▶ Drain fill shall be kept from being contaminated by adjacent soil materials during placement by either placing it in a cleanly excavated trench or by keeping the top of the drain fill at least one (1) foot in elevation above adjacent earth fill.
- ▶ Drainage diaphragm should be installed to dimensions on plans/specifications.
- ▶ Make sure the filter material is that specified in the plans.

DRAINAGE DIAPHRAGM INSTALLATION

- ▶ Using a filter and drainage diaphragm has several advantages. One of which is installation.

There is little chance of constructed failure. Construction consist mostly of excavation and backfilling with the filter material at correct locations

CONSTRUCTION CHECKS

As the embankment construction continues, check to ensure that the side slopes are maintaining their planned slope ratio. We don't want a volcano shape when it's finished.

AS-BUILT SURVEY

What do you need to document with the as-built survey?

- Profile and cross-section of the cutoff trench
- Profile and cross-sections of the finished embankment documents side slopes and top width
- Profile and cross-section of the auxiliary spillway
- Elevations of principal spillway inlet, invert and outlet invert

AS-BUILT CERTIFICATIONS

Document:

- the type and size of all conduits
- Type and number of seepage controls
- Adequacy of embankment and spillway seeding
- trash guard for all pipes



In short follow the NRCS Conservation Practice Engineering Note keeping Pond Code 378