CONSTRUCTION SPECIFICATIONS
NATURAL RESOURCES CONSERVATION SERVICE
EMBANKMENT PONDS

1. SCOPE

This item shall consist of the clearing, excavation, backfill, concrete, and other appurtenances required for
the construction of the embankment and the disposal of all cleared and excavated materials for the water
impoundment. Construction operations shall be carried out in such a manner that erosion, air, water, and
noise pollution will be minimized and held within legal limits as established by state regulations.

2. CLEARING AND GRUBBING

Pond Area

All trees and brush shall be cut as flush with the ground as practicable, and all such trees, brush, logs, and
other debris shall be removed from the pond site. Clearing shall be performed around the shoreline as
specified.

Spillway and Borrow Areas

On areas from which fill materials are to be obtained, all trees, brush, logs, roots, and other debris larger
than 1 inch in diameter shall be removed.

The Embankment Site

All trees, brush, and other debris shall be removed from the area on which fill is to be placed. All stumps
and roots 1 inch in diameter and larger should be removed from the fill site to a depth of 12 inches.

Disposal of Cleared and Grubbed Material

All combustible material cleared and grubbed, from the site, shall be disposed of by burning, burying at
approved locations or removing from the site and stacking. All burning shall conform to Alabama laws and
regulations. All non-combustible materials cleared and grubbed from these areas shall be removed from
the site or buried with a minimum cover of 2 feet. Topsoil, when available, should be stockpiled at a
convenient location for use on the embankment, auxiliary spillway, and other disturbed areas to facilitate
establishment of vegetative cover.

3. FOUNDATION PREPARATION

Surface Treatment

The foundation area shall be cleared of all trees, stumps, roots, brush, boulders, sod, and debris. All
channel banks and sharp breaks shall be sloped to no steeper than 1:1. All topsoil containing excessive
amounts of organic matter shall be removed. The surface of the foundation area will be thoroughly
scarified before placement of the embankment material.
**Surface Soil**

Surface soils excavated from the foundation area and surface soils saved from the auxiliary spillway and borrow areas shall be placed on the dam, auxiliary spillway, and borrow areas to facilitate establishment of vegetation.

4. **EXCAVATION**

**Excavation and Backfill of Cutoff Trench**

The cutoff trench shall be excavated to the depths, bottom width and side slopes shown on the plans. All standing water shall be removed from the trench and it shall be backfilled using thin layers (maximum 8 in.) to the ground surface with suitable material by the same methods herein prescribed for **EMBANKMENT CONSTRUCTION**.

**Excavation and Backfill of Stream Channels**

Existing stream channels crossing the foundation area shall be deepened and widened as necessary to remove all stones, gravel, sand, sediment, stumps, roots, organic matter, and other objectionable material and to accommodate compaction equipment. Side slopes shall be constructed no steeper than 1:1. All water shall be removed from the channels, and they shall be backfilled in the same manner as prescribed for the cutoff trench.

**Spillway and Borrow Excavation**

The completed spillway excavation shall conform as nearly to the lines, grades, bottom width, and side slopes shown on the plans as skillful operation of the excavating equipment will permit. The channel bottom shall be constructed transversely level and the side slopes uniform. All borrow areas outside the pool area shall be graded and constructed in such a manner that they are well drained and protected from erosion by the use of diversions or other conservation measures. Side slopes of borrow areas shall be constructed in such condition that establishment of vegetation, mowing, and maintenance operations will be facilitated.

Excavation in borrow areas within the permanent pool area shall be graded in such a manner that they are well drained and will provide the minimum specified depth of water at the normal water level. When specified, shoreline treatment shall be performed by cut or fill to develop the desired depth of flooded area around the normal pool.

5. **EMBANKMENT CONSTRUCTION**

**Selecting, Placing, and Compaction of Material**

The material placed in the fill shall be free of all sod, roots, frozen soil, stones over 6 inches in diameter, and other objectionable material. The placing and spreading of the fill material shall be started at the lowest point of the foundation (cutoff trench) and the fill shall be brought up in approximately horizontal layers. These layers shall be of approximately uniform elevation and shall extend over the entire area of the fill. The construction equipment shall be operated over the area of each layer in a manner that will result in the specified compaction of the fill material. Special attention will be given to compaction in the cutoff trench where it joins the abutment slopes.

The distribution and gradation of materials throughout the fill shall be such that there will be no lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material. Where it is necessary to use material of varying texture and gradation, the more impervious material shall be placed in the upstream and center portions of the fill.
The following procedures are the minimum requirements for fill placement and compaction:

- The maximum uncompacted layer thickness shall be 8 inches.
- For dams having an effective height less than 20 feet compaction shall be accomplished by traversing every point on each layer a minimum of 3 times with construction/earth-moving equipment having lugged pneumatic tires.
- For dams having an effective height 20 feet and greater, compaction shall be accomplished by the use of a “sheepfoot” or tamping type roller. Each layer shall be rolled a minimum of 6 times, or until the feet “walk out” of the layer.

Other compaction requirements or methods will be as specified.

Drainfill shall be kept from being contaminated by adjacent soil materials during placement by either placing it in a cleanly excavated trench, by keeping the drain at least 1 ft. above the adjacent earthfill, or by methods approved by the engineer. Drainfill shall be compacted as shown on the drawings.

Selected drainfill and backfill material shall be placed around structures, and pipe conduits at about the same rate on all sides to prevent damage from unequal loading.

**Moisture Control**

The moisture content of fill material shall be such that the specified compaction can be obtained with the equipment used. The moisture content of the fill shall be maintained within the limits to:

1. prevent the bulking or dilatence of the material under the action of the hauling or compaction equipment,
2. prevent adherence of the fill material to the equipment,
3. ensure the crushing and blending of the soil clods and aggregation into a homogeneous mass, and
4. contain adequate moisture so that a sample can be hand molded.

The completed fill shall conform as nearly to the lines and grades, top width, and side slopes shown on the plans as skillful operation of the construction equipment will permit.

**6. PIPE CONDUIT INSTALLATION**

The pipe conduit barrel shall be placed on a firm uniform foundation to the lines and grades shown on the plans. The conduit should be cambered to prevent joint separation as settlement occurs. The pipe should be laid essentially level to the centerline of the dam, then with a uniform grade to the outlet end. Deflection at any joint should not exceed the manufacturer’s recommendations. Camber at the centerline of the dam should be equal to or greater than the anticipated settlement at the pipe elevation. Generally it is better to distribute the total vertical pipe deflection over the middle one-third of the conduit rather than at a single joint.

**Materials**

All of the component parts of the conduit including barrel, riser, trashrack, or deep water release, support posts or brace and hardware for mounting shall be as specified on the plans and shall be attached in a workmanlike manner.
Concrete

The work shall consist of furnishing, forming, placing, finishing, and curing Portland cement concrete as required in the construction of the work.

When concrete is used for footings under risers and bedding for reinforced concrete pipe barrels, the mixture shall be not less than five bags per yard. The consistency of the concrete shall be such as to allow the concrete to be worked into place without segregation or excessive laitance.

The components of the mix shall be as follows: A standard known brand, Type I Portland cement, washed sand, and gravel. Clean water shall be used in the mix. [Suggested ratio in mix: 94 lbs. cement (1 bag), 6 gals. water, 170 lbs. clean dry sand, 315 lbs. dry gravel. Smaller batches, 1 part cement, 2 parts sand, and 3 parts gravel, and water at the rate of 1 gal. per 16 lbs. of cement].

Concrete shall not be placed when the atmospheric temperature may be expected to fall below 40°F at the time concrete is delivered and placed at the work site nor when it is expected to exceed 90°F during placement. All exposed surfaces of concrete shall be protected from the direct rays of the sun for at least the first seven days. All concrete shall be cured by keeping it continuously moist for at least seven days after being placed or by spraying with two coats of curing compound when other concrete will not be bonded to the concrete surface. Concrete shall not be exposed to freezing temperature during the curing period.

Pipe Bedding

Concrete pipe shall be bedded on concrete. As a minimum, the bedding shall be at least three inches thick and shall encompass the lower 75° of the pipe (or vertically at least one tenth the outside diameter). The bedding may be installed by first shaping a foundation groove to provide the minimum bedding thickness. Then concrete having a consistency stiff enough to support the pipe will be poured or shoveled into the foundation groove. The pipe will then be joined and worked down into the bedding concrete to the specified grade. Bedding concrete immediately underneath the joints may be omitted until the pipe is in its final position to avoid interference with joining. After the pipe is in its final position, the remaining bedding concrete will be placed. No back fill or other disturbance to the pipe will be allowed for at least twelve hours after the bedding concrete is placed. Where concrete bedding is to be formed and poured the pipe will be securely supported on concrete blocks at the specified grade. The dimensions of the bedding will be as shown on the drawings.

Plastic and most metal pipes are flexible and should be bedded on flexible (soil) beddings, bedded to the springline in concrete, or totally encased in concrete. Soil bedding shall consist of a groove or depression formed into the foundation soil and shaped to closely fit the lower 120° of the outside surface of the pipe (or vertically one fifth to one fourth the pipe diameter). The top two inches of the bedding should be loosened to allow the pipe to make complete contact with the soil. The pipe should be uniformly supported along its entire length. All rocks, hard soil clods, and other hard materials that could damage the pipe wall should be removed from the bedding. Shallow depressions shall be formed under pipe bells to prevent bridging and unequal support of the pipe.

Pipe Backfill

Except where the pipe penetrates drainage zones, back fill around the pipe should be of the most impervious fine grained material available. Backfill shall have the proper moisture content to assure good compaction around the pipe. Placement of backfill should be done on both sides of the pipe simultaneously in order to prevent displacement of the pipe. Care should be exercised during placement and compaction of backfill to avoid lateral or vertical movement of the pipe. The pipe may require stabilization by placement of temporary mounds of embedment material at intervals along the pipe or by other suitable means. Compaction within the two foot zone around the pipe should be accomplished by

NRCS, Alabama
October 2011
hand tamping or with manually directed vibratory compactors, impact tampers (jumping jacks) or by other acceptable means. Compaction equipment should not be allowed to contact the pipe to avoid denting, gouging, breaking of the pipe or damage to the pipe coatings.

_Haunching_ is the layer of material that extends from the top of the bedding to the _springline_ (centerline) of the pipe. For pipes 8 inches in diameter and larger, haunching material shall be placed in loose layers not exceeding 4 inches in thickness and compacted to the required density. For pipes smaller than 8 inches the first loose layer of fill shall be placed to the top of the pipe. Care must be exercised to avoid lifting the pipe from the bedding during compaction operations. Subsequent layers of fill shall be placed in loose layers not exceeding 4 inches in thickness until the compacted fill is at or above the top of the pipe. Material above the top of the pipe and up to two feet above the pipe shall be placed in loose layers not exceeding 6 inches in thickness.

The density of the material in the two-foot zone surrounding the pipe should be at least equal to the surrounding machine-compacted fill. Material along the sides of the pipe may be compacted to a higher density than that of the machine-compacted fill to give additional support to the sides of the pipe and reduce pipe deflection.

**Controlled Low Strength Material**

Controlled Low Strength Material (CLSM), also known as _Flowable Fill_, is a low strength concrete that can be used for backfill around the conduit in place of compacted soil. Advantages include elimination of voids around the conduit, increased support for the pipe, and elimination of the problems associated with compacting soil under the pipe haunches. CLSM should be installed in a trench excavated into the soil or in temporary forms. The fill should extend vertically from at least three inches below the pipe to at least the springline of the pipe. The fill should extend laterally at least six inches beyond the sides of the pipe. Where the sides of the CLSM are formed, the sides should be battered toward the pipe at about one inch per foot.

When the pipe and CLSM are placed in an excavated trench, the foundation should be firm, in-place natural material or compacted soil fill material. The top of the trench should extend to the top of the planned CLSM section. The pipe should be placed in the trench or forms and supported on bricks or concrete blocks at the specified grade. The pipe must be restrained to prevent it from floating or moving laterally as the CLSM is poured. This may be accomplished by use of screw-in metal anchors with polypropylene rope, by hold-down bracing on the top of the pipe, or by other approved methods. The CLSM may be poured in sections to minimize the uplift force. For large diameter pipes the CLSM may be poured in layers and allowed to set prior to pouring subsequent layers to reduce uplift forces. Wood or other bracing that projects from the finished concrete shall be trimmed flush with the surface of the concrete prior to placing earth fill. The CLSM shall be allowed to cure for at least 24 hours before earth fill is placed over the concrete. Manual compaction of earth fill will be required for a minimum height of two feet above the concrete or top of the pipe, whichever is greater, and for two feet on each side when the CLSM is not placed in a trench.

Materials shall conform to:

- **Cement** – ASTM C 150
- **Fly Ash** – ASTM C 618, Class C or Class F
- **Water** – ASTM C 94
- **Fine Aggregate** – Natural or manufactured sand, or a combination thereof, free from injurious amounts of salt, alkali, vegetable matter or other objectionable material. It is intended that the fine aggregate be fine enough to stay in suspension in the mortar to the extent required for proper flow. The fine aggregate shall conform to the following gradation:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing</th>
</tr>
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<tbody>
<tr>
<td>¾ inch</td>
<td>100</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 – 10</td>
</tr>
</tbody>
</table>
If a flowable mixture cannot be produced, the sand may be rejected.

Admixtures – ASTM C 260 and/or C 494

Mix Design: The following is a suggested mix design. Adjustment of the proportions may be made to achieve proper solid suspension and optimum flowability.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>PROPORTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement Type I</td>
<td>75 – 100 lbs/yd³</td>
</tr>
<tr>
<td>Fly Ash</td>
<td>150 – 600 lbs/yd³</td>
</tr>
<tr>
<td>Water</td>
<td>*</td>
</tr>
<tr>
<td>**Air</td>
<td>5 – 15%</td>
</tr>
<tr>
<td>**28-Day Compressive Strength</td>
<td>Minimum 125 PSI</td>
</tr>
<tr>
<td>**Unit Weight (Wet)</td>
<td>100 – 125 lbs/ft³</td>
</tr>
</tbody>
</table>

* Mix designs shall produce a consistency that will result in a flowable self-leveling product at time of placement.

** The requirements for percent air, compressive strength, and unit weight are for laboratory designs only and are not intended for job site acceptance requirements.

**Principal Spillways, Trash Racks, and Fittings**

The pipe and pipe connecting bands shall conform with the following specifications and requirements:

**Corrugated Steel Pipe.** ASTM A760, 762, 885; helical corrugated or close riveted annular corrugated; asphalt coated; and, watertight connections as specified below:

- Rubber "O" Ring type: all types and diameters of pipe. Flanged Type: for pipe diameters 12 in. and under.
- Conventional Connecting bands: All diameters annular corrugated pipe only. Twelve-inch minimum band width with rods and lugs required.

**Corrugated Aluminum Alloy Pipe.** ASTM B745, 790; lock, or welded seam helical corrugated with watertight connections as specified above for corrugated steel pipe.

**Steel Pipe.** ASTM A53 standard weight (Schedule 40). Used pipe is satisfactory, provided its wall thickness has not been reduced by corrosion.

**Concrete Pipe.** AWWA C300, C301, and C302, or ASTM C76 Class II with joint sealed with rubber gaskets. Requires concrete bedding (minimum 3 in. thickness) under bottom third of pipe.

**Plastic Pipe.** Polyvinyl chloride pipe, PVC 1120 or PVC 1220, conforming to ASTM D1785 or ASTM D2241.

**Markings.** Marking on plastic (PVC) pipe verifies product specifications and includes:
a. Manufacturer's name or trademark and product code.

b. Nominal pipe size (6 in.).

c. Material code designation (PVC 1120, 1220).

d. Dimension ratio or Schedule No. (SDR-26, Sch. 40).

e. Pressure rating or pressure class (160 psi).

f. Specification designation (D1785, D2241).

The pipe shall be installed in accordance with the manufacturer’s instructions and to the lines and grades as shown on the drawings.

**Other Materials.** Other materials used in the principal spillway system that are not specified will be as noted in the plans or drawings.

**Inspection of Materials.** All materials used in the fabrication and installation of the principal spillway, trash rack, valves, and other fittings, shall be visually inspected prior to or during their installation to assure quality and integrity of material.

7. **POLLUTION CONTROL**

Construction operations shall be carried out so that erosion and sediment control during construction is addressed, and air and water pollution are minimized. Best Management Practices (BMP) for construction shall be installed and maintained as needed and according to NPDES permit if required. BMP’s consisting of silt fences, hay bale barriers, diversions, mulching, stream crossings, temporary vegetation, fencing, and others may be appropriate to adequately control erosion and sediment during construction. Refer to Alabama Guide Sheet No. AL 378B, Erosion and Sediment Control During Farm Pond Construction.

8. **VEGETATION**

Vegetation will be established as specified in the vegetative plan. The embankment, auxiliary spillway, borrow areas, and other non-impounded area disturbed during construction will be seeded or planted to perennial non-woody vegetation and then mulched. A perennial vegetation filter strip at least 50-ft. wide will be established immediately above the normal waterline of the impoundment area, when adequate vegetation does not exist. This filter strip will be a part of the vegetation process.

Temporary vegetation or mulching will be used after construction is completed until conditions are favorable for seeding and planting permanent vegetation.

Alabama NRCS Conservation Practice Standard, Critical Area Planting - Code 342, will be used for plant selection, seedbed preparation, liming, fertilizing, seeding and mulching for both temporary and permanent vegetation. Treated areas will be fenced when needed to protect the vegetation.
CONSTRUCTION SPECIFICATIONS
NATURAL RESOURCES CONSERVATION SERVICE

EXCAVATED PONDS

1. SCOPE

This item shall consist of the clearing, filling, and/or excavation required for the construction of an excavated pond and the disposal of all cleared and excavated materials for the water impoundment. The construction operations shall be carried out in such a manner that erosion, air, water, and noise pollution will be minimized and held within legal limits as established by State regulations.

2. CLEARING

All trees, brush, and stumps shall be cut as flush with the ground as is practical and removed from the site and spoil areas before excavation is performed. All material cleared from the area shall be disposed of by burning or removing from the site and stacking. All burning shall conform to Alabama laws and regulations.

3. EXCAVATION OR SPOIL

The completed pond, berms and spoil banks (spoil disposal), and waste material shall conform as nearly to lines, dimensions, grades, and slopes shown on the plans or staked on the site as skillful operations of the excavating equipment will permit.

4. POLLUTION CONTROL

Construction operations shall be carried out so that erosion and sediment control during construction is addressed, and air and water pollution are minimized. Best Management Practices (BMP) for construction shall be installed and maintained as needed and according to NPDES permit if required. BMP’s consisting of silt fence, hay bale barriers, diversions, mulching, stream crossing, temporary vegetation, fencing, and others may be appropriate to adequately control erosion and sediment during construction. Refer to Alabama Guide Sheet AL 378B, Erosion and Sediment Control During Farm Pond Construction.

5. VEGETATION

Vegetation will be established as specified in the vegetative plan. The berm, spoil banks, and other disturbed areas will be seeded or planted to perennial, non-woody vegetation and then mulched. A perennial vegetation filter strip at least 50-ft. wide will be established around the excavated pond.

Treated areas will be fenced when needed to protect the vegetation.