

CONSTRUCTION SPECIFICATIONS

NATURAL RESOURCES CONSERVATION SERVICE

GRADE STABILIZATION STRUCTURE

1. SCOPE

This item shall consist of the clearing, excavation, backfill, concrete, sand, aggregate, rock riprap, geotextile, pipe, and other appurtenances required for the construction of the Grade Stabilization Structure and the disposal of all cleared and excavated materials.

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 or local regulations (see Section 10. Pollution Control)

2. CLEARING AND GRUBBING

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

The structure 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 shall 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 two (2) feet. Topsoil, where available, should be stockpiled in a convenient location for use on the embankment, emergency 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. The surface layer of soils will be salvaged from the foundation, emergency spillway, and borrow areas and stockpiled. The salvaged material will be spread over the completed structure and spillway area to facilitate the 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 inches) to ground surface with suitable material by the same methods hereinafter prescribed for "embankments 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 left 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 left transversely level and the side slopes uniform. All borrow areas shall be graded and left 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 left in such condition that establishment of vegetation, mowing, and maintenance operations will be facilitated.

5. EMBANKMENT CONSTRUCTION

Selecting, Placing, and Spreading of Material - The material placed in the fill shall be free of all sod, roots, frozen soil, stones more than 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 and the fill shall be brought up in approximately horizontal layers not exceeding 8 inches in thickness.

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 compaction equipment shall be used when the required compaction cannot be obtained by routing of the construction equipment.

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.

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:

- I. Prevent the bulking or dilatence of the material under the action of the hauling or compaction equipment,
- II. Prevent adherence of the fill material to the equipment, and
- III. Ensure the crushing and blending of the soil clods and aggregation into a homogenous mass.

Fill material moisture is considered satisfactory when a sample molded in the hand will retain its shape. The material is too wet for placement if water escapes from the sample when hand rolled and too dry when the sample falls apart.

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 foundation to the lines and grades shown on the plans. The strength of lightweight, flexible PVC, corrugated steel and aluminum pipe is highly dependent on the bedding and backfill (See Engineering Technical Note ENG AL-10 for full details). It must be carefully jointed together, bedded, and backfilled. The backfill to be used in the vicinity of the pipe should be the most impervious fine grained material available and have proper moisture content to assure good compaction around the conduit. The pipe conduit should be cambered to prevent breaking or joint separation when the dam is built. That is, the pipe should be laid essentially level to centerline of dam, then laid essentially straight to the exit end elevation. Then when the earthfill load is applied over the pipe, the pipe will flatten to a smooth uniform grade and tighten the joint. Flexible bedding should be used to avoid stress concentrations in the pipe as it deflects. The bottom of the bedding trench will be shaped as a minimum to fit the lower 120° of the pipe.

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

Seepage control along pipes - Sand filter diaphragms with a graded filter outlet shall be installed according to dimension and gradations shown on the drawings and as follows:

- Filter diaphragm sand shall be placed uniformly in layers not to exceed 8 inches thick before compaction. Each layer shall be thoroughly wetted immediately prior to compaction.
- Each layer of sand shall be compacted by a minimum of two passes of a vibratory plate compactor weighing at least 160 pounds. The compactor shall have a minimum centrifugal force of 2,450 pounds at a vibrating frequency of no less than 5,000 cycles per minute (or by a minimum of two passes of a vibratory smooth wheeled roller weighing at least 325 pounds with a centrifugal force of 2,250 pounds at a vibrating frequency of no less than 4,500 cycles per minute).
- The sand shall be placed to avoid segregation of particle sizes and to ensure the continuity and integrity of all zones. No foreign material shall be allowed to become intermixed with or otherwise contaminate the drainfill.
- Traffic shall not be permitted to crossover filter zones at random. Equipment crossovers shall be maintained, and the number and location of such crossovers shall be established and approved before the beginning of diaphragm placement.
- Each crossover shall be cleaned of all contaminating material and shall be inspected and approved by the engineer before the placement of additional drain fill material.
- Any damage to the foundation surface or the trench sides or bottom occurring during placement of sand filter shall be repaired before the sand filter zone placement is continued.
- The upper surface of the sand filter zone constructed concurrently with adjacent zones of earthfill shall be maintained at a minimum elevation of 1 foot above the upper surface of adjacent earthfill.

When anti-seep collars are specified by the design engineer for seepage control along the pipe, they are to be of materials specified, compatible with the pipe, and installed so as to be watertight. The pipe shall be installed in accordance with the manufacturer's instructions and to the lines and grades as shown on the drawings.

Flexible anti-seep collars may be constructed of 6 mil or thicker plastic or rubber sheeting attached to the pipe with stainless steel clamps, waterproof tape, or closet flanges and caulk material to ensure water tightness. The flexible collars will be held in place during installation with wire or light wood framing. Proper inspection of the installation is essential, especially during the bedding of the conduit and backfilling adjacent to the conduit and anti-seep collars.

7. CONCRETE INSTALLATION

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, thrust blocks, bedding for reinforced concrete pipe barrels, and other specified locations, the mixture shall contain not less than five (5) bags of cement 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. Concrete temperature should not exceed 90°F during mixing, delivery, and placing.

All exposed surfaces of concrete shall be protected from the direct rays of the sun for at least the first seven (7) days. All concrete shall be cured by keeping continuously moist for at least seven (7) days after being placed or 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.

8. AGGREGATE, ROCK RIPRAP, AND GEOTEXTILE INSTALLATION

Aggregate and rock riprap shall be of the quality and gradation specified. Installation shall be to the dimensions shown on the drawings. Non-woven geotextile of the class specified shall be installed only at the locations shown on the drawings, held in place with pins as specified or recommended by manufacturer, and shall be protected during installation to ensure no rips or punctures occur.

9. MATERIALS

Principal Spillways, Trash Racks, and Fittings - the pipe and pipe connecting bands shall conform to the following specifications and requirements:

Corrugated Steel Pipe - Federal Specification WW-P-405; helical corrugated or close riveted annular corrugated; asphalt coated; and, watertight connections as specified below:

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

Corrugated Aluminum Alloy Pipe - Federal Specification WW-P-402; lock or welded seam helical corrugated with watertight connections as specified above for corrugated steel pipe.

Steel Pipe - ASTM A 120 standard weight (Schedule 40). Used pipe is satisfactory provided it is wall thickness has not been reduced by corrosion.

Concrete Pipe - AWWA C 300, C 301, C 302, or ASTM C 76 Class II; with joint sealed with rubber gaskets. Requires concrete bedding (Minimum 3 inch thickness) under bottom third of pipe.

Plastic Pipe - Polyvinyl chloride pipe, PVC, 1120 - or PVC 1220, conforming to ASTM D 1785 or ASTM D2241. Smooth-Lined Polyethylene(PE) and High Density Polyethylene (HDPE) conforming to ASTM F 894, AASHTO M 252 or AASHTO M 294.

Bearing piles shall be structural steel H-piles conforming to the requirements of ASTM Specification A 36.

Steel sheet piles shall conform to the requirements of ASTM Specification A 328.

Wood piles shall conform to the requirements of Federal Specification MM-P-371 for the specified types and classes of piles.

Treatment of timber and wood piles shall conform to Federal Specification II-W571.

Rock for riprap shall conform to gradation as shown on the drawings.

Steel bars for concrete reinforcement requiring bends shall be deformed billet-steel bars conforming to ASTM Specification A 615, Grade 40, or Grade 60.

Straight steel bars shall be deformed bars conforming to one of the following specifications:

- o Deformed Billet-Steel Bars for Concrete Reinforcement (Grade 40 or Grade 60) ASTM Designation A 615.

- Rail-Steel Deformed Bars for Concrete Reinforcement (Grade 50 or Grade 60)
ASTM Designation A 616.
- Axle-Steel Deformed Bars for Concrete Reinforcement (Grade 40 or Grade 60)
ASTM Designation A 617.

Welded steel wire fabric reinforcement shall conform to the requirements of ASTM Specification A 185.

10. 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, sediment traps, diversions, mulching, stream crossings, temporary vegetation, fencing, and others may be appropriate to adequately control erosion and sediment during construction.

10. VEGETATION

Vegetation will be established as specified on the plan or according to written recommendations. The embankment, spillway, borrow areas, and other areas disturbed during construction will be topsoiled, fertilized, seeded or planted to adapted perennial close growing cover and mulched to insure establishment.

In some cases temporary vegetation or mulching will need to be used until conditions are favorable for seeding and planting permanent vegetation. Specifications for 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.