

**NATURAL RESOURCES CONSERVATION SERVICE
MARYLAND
CONSERVATION PRACTICE CONSTRUCTION SPECIFICATION
EMBANKMENT POND, CODE 378**

1. SCOPE

This specification covers the construction of an embankment pond. The work shall consist of furnishing all materials, labor, and equipment necessary for constructing the embankment pond, including all appurtenances, in accordance with construction drawings and specifications.

2. SAFETY

It is the responsibility of the landowner and contractor to determine if there are buried or overhead utilities in the vicinity of the proposed work. The contractor is required to call the Maryland One Call System (811). They shall follow proper procedures to ensure that the utilities are not jeopardized, and that equipment operators and others will not be injured during construction operations. They will conduct all work and operations in accordance with the proper safety codes for the types of construction being performed with regard to the safety of all persons and property.

The Natural Resources Conservation Service (NRCS) makes no representation on the existence or non-existence of any utilities. Absence of utilities on the drawings is not assurance that no utilities are present at the site.

3. CONSTRUCTION OPERATIONS

NRCS should be notified at least 72 hours before the start of construction operations.

Construction operations shall be carried out in such a manner and sequence that erosion and air and water contamination are minimized and held within legal limits.

4. PERMITS

The owner will be responsible to obtain all permits required to construct and operate the embankment pond. All required permits must be obtained prior to the start of construction.

5. 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 shown on the plans or as specified in Section 16.

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 one 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. All burning shall conform to Maryland laws and regulations. All noncombustible materials cleared and grubbed from these areas shall be removed from the site or buried with a minimum cover of 2 feet.

Topsoil. Topsoil, when available, will be stockpiled at locations as shown on the drawings for use on the embankment, auxiliary spillway and other disturbed areas to facilitate establishment of vegetative cover.

6. FOUNDATION PREPARATION

The foundation area for the embankment shall be cleared of all trees, stumps, roots, brush, boulders over one-half of compacted fill layer thickness in diameter, sod, and debris. All channel banks and sharp breaks shall be sloped to no steeper than one horizontal to one vertical (1H:1V). All material 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.

7. EXCAVATION

Excavation and Backfill of Cutoff Trench. The cutoff trench shall be excavated to the depths, bottom width and side slopes (minimum one horizontal to one vertical) shown on the plans. All standing water shall be removed from the trench and it shall be backfilled using thin uncompacted layers (maximum 8 inches) 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 one horizontal to one vertical (1H:1V). All water shall be removed from the channels and 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.

Suitable excavated material shall be used in fills. Excess excavated material or unsuitable material shall be disposed of in designated spoil areas.

8. EARTHFILL

Selecting, Placing and Spreading of Material. The fill material shall be free of all sod, roots, frozen soil, stones over one-half of compacted fill layer thickness in diameter, and other objectionable material. Materials for the core of the embankment and cut off trench shall conform to Unified Soil Classification GC, SC, CH, or CL and must have at least 30% passing the #200 sieve. Consideration may be given to the use of other materials in the embankment if designed by a geotechnical engineer. Such special designs must have construction supervised by a geotechnical engineer.

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 not exceeding 8 inches in uncompacted thickness. Special attention will be given to compaction in the cutoff trench where it joins the abutment slopes. These layers shall be of approximately uniform elevation and shall extend over the entire area of the fill. Each layer shall be thoroughly compacted by at least three complete passes of the construction equipment over the entire surface area of each layer after the layer has been spread to the lift thickness. Special compaction equipment shall be used when the required compaction cannot be obtained by routing of the construction equipment.

Backfill adjacent to pipes or structures shall be of the type and quality conforming to that specified for the adjoining fill material. The fill shall be placed in horizontal layers not to exceed four inches in thickness and compacted by hand tampers or other manually directed compaction equipment. The material needs to fill completely all spaces under and adjacent to the pipe. At no time during the backfilling operation shall driven equipment be allowed to operate closer than four feet, measured horizontally, to any part of a structure. Under no circumstances shall equipment be driven over any part of a concrete structure or pipe, unless there is a compacted fill of 24" or greater over the structure or pipe.

Unless otherwise specified, earthfill shall be compacted to a minimum of 95% of the maximum dry density and within +/- 2% of optimum moisture content of ASTM D 1557 Modified Proctor Method.

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.

Drainfill 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 drain at least 1 foot above the adjacent earthfill.

Selected drainfill and backfill material shall be placed around structures, pipe conduits, and antiseep collars 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 a range to:

- prevent the bulking or dilatancy of the material under the action of the hauling or compaction equipment
- prevent adherence of the fill material to the equipment
- ensure the crushing and blending of the soil clods and aggregation into a homogeneous mass
- for fine grained soils, 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.

Cutoff Trench. The cutoff trench shall be excavated into existing grades along or parallel to the centerline of the embankment as shown on the plans. The bottom width of the trench shall be governed by the equipment used for excavation, with the minimum width being four feet. The depth shall be at least four feet below existing grade or as shown on the plans. The side slopes of the trench shall be 1H to 1V or flatter. The backfill shall be compacted with construction equipment, rollers, or hand tampers to assure maximum density and minimum permeability.

Core of Embankment. The core shall be parallel to the centerline of the embankment as shown on the plans. The top width of the core shall be a minimum of four feet. The height shall extend up to at least the 10-year water elevation or as shown on the plans. The side slopes shall be 1H to 1V or flatter. The core shall be compacted with construction equipment, rollers, or hand tampers to assure maximum density and minimum permeability. In addition, the core shall be placed concurrently with the outer shell of the embankment.

Rock Riprap. Rock riprap shall meet the requirements of Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials, Section 311.

Geotextile shall be placed under all riprap and shall meet the requirements of Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials, Section 921.09, Class C.

9. PIPE CONDUIT INSTALLATION

The pipe conduit barrel shall be placed on a firm uniform foundation to the lines and grades shown on the plans. Selected backfill material shall be placed around the barrel and its component parts in layers not exceeding 4 inches in loose lift thickness. Each successive layer shall be thoroughly compacted by hand or power tampers. Heavy equipment shall not cross over the pipe conduit barrel until 2 feet of hand compacted material has been placed over the pipe.

Materials. All of the component parts of the principal spillway conduit including barrel, riser, trash rack or deep-water release, anti-seep collars, support posts, braces and hardware for mounting shall be of the quality specified and constructed as shown on the plans.

Concrete. The work shall consist of furnishing, forming, placing, finishing and curing Portland cement concrete.

When concrete is used for footings under risers, anti-seep collars, and bedding for reinforced concrete pipe barrels, the mixture shall be not less than six bags per cubic 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 pounds cement (1 bag), 6 gallons. water, 170 pounds clean dry sand, 315 pounds dry gravel. Smaller batches, 1 part cement, 2 parts sand, and 3 parts gravel, and water at the rate of 1 gallon per 16 pounds 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.

Unless otherwise specified, concrete compressive strength shall be at least 3000 psi at 28 days. The mix shall be in accordance with ASTM C 94 and this specification. When requested by the Technician, the supplier shall furnish design mix and cylinder break test data. Coarse aggregate shall be maximum size of 1-1/2 inches per designations of ASTM C 33. Air entrainment conforming to the requirements of ASTM C 260, shall be used. The air content shall be 5 percent.

Pre-Bedding. The strength of lightweight, flexible PVC and corrugated steel and aluminum pipe is highly dependent on the bedding and backfill. 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 embankment is built. The bottom of the bedding trench will be shaped as a minimum to fit the lower one third (120°) of the pipe. Proper inspection of the installation is essential, especially during the bedding of the conduit and backfilling adjacent to the conduit and anti-seep collars. All other requirements for installation of plastic pipe will be in accordance with Maryland NRCS conservation practice standard Subsurface Drains, Code 606.

A concrete cradle or bedding is needed for concrete pipe to ensure a firm foundation and good alignment of the conduit. Concrete cradle shall extend up the sides of the pipe at least 50% of its outside diameter with minimum thickness of 6 inches. Where a concrete cradle is not needed for structural reasons, the use of flowable fill is recommended in accordance with

Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials, Section 313. Gravel bedding is not permitted.

Principal Spillways, Trash Racks and Fittings. The pipe and pipe connecting bands shall conform with the plans or as specified in Section 16 of this specification.

Antiseep collars or filter diaphragms are to be of materials compatible with the pipe. Metal antiseep collars, when specified, shall be of at least 12 gage or thicker metal, be galvanized or be painted with two coats of coal tar epoxy at a dry film thickness of 8 mils per coat. All welds shall be cleaned and coated as above. Filter diaphragms shall be in accordance with NRCS NEH 628, Chapter 45 Filter Diaphragms.

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

10. VEGETATION

The embankment, spillway, borrow areas and other non-impounded areas disturbed during construction will be sodded or seeded and mulched immediately after construction. A perennial vegetation filter strip at least 50 feet 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.

Vegetation will be in accordance with NRCS NEH 642 Construction Specification 6, Seeding, Sprigging and Mulching or Section 16 of this specification. Any stockpiled topsoil shall be spread prior to vegetating.

In the event conditions do not permit the establishment of permanent vegetation, temporary vegetation or mulching shall be used until conditions are favorable for permanent vegetation.

11. POLLUTION CONTROL

Construction operations shall be carried out so that erosion and sediment are controlled during construction, 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.

12. WORKMANSHIP

Construction shall be performed to the neat lines and grades specified by the design and as shown on the engineering plans.

All construction shall be performed in a workmanlike manner, and the job site shall have a neat appearance when finished.

13. BASIS OF ACCEPTANCE

The acceptability of this practice shall be determined by quality assurance inspections to ensure compliance with all the provisions of this specification and construction drawings. Construction shall be approved by an NRCS employee with appropriate engineering job approval authority or Technical Service Providers.

Any modifications to the plans and specifications or changes shall be approved by the responsible NRCS employee before construction begins and any modification or changes needed during construction will be approved before installed.

14. CERTIFICATION AND GUARANTEE

The installing contractor shall certify that the construction complies with the requirements of this standard. A written guarantee that protects the owner against defective workmanship and materials for not less than one (1) year shall be furnished to the landowner. The written guarantee shall identify the manufacturer's specifications of the materials/appurtenances used. Copies shall be provided to NRCS. Owners who install their own materials/appurtenances shall furnish NRCS with records that show the manufacturer's specifications of the materials/appurtenances used.

15. MEASUREMENT AND PAYMENT

Method 1—For items of work for which specific unit prices are established in the contract, pond is measured to units specified in the items of work and construction details. Payment is made for the total unit at the contract unit price. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Method 2—For items of work for which specific lump sum prices are established in the contract, payment is made at the contract lump sum price. Such payment shall constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

All Methods—The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary.

16. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details therefor are: