

Construction Specification 447—Wave Berm Construction

1. Scope

The work consists of constructing a wave berm. The work also includes mobilizing and demobilizing appropriate equipment, site preparation, excavation, earthfill, rock placement and site restoration.

2. Mobilization and Demobilization

Mobilization shall include all activities and associated costs for transportation of contractor's personnel, equipment and operating supplies to the site and premiums paid for performance and payment bonds including coinsurance and reinsurance agreements as applicable.

Demobilization shall include all activities and costs for transportation of personnel, equipment, and supplies not required or included in the contract from the site. The demobilization shall include but not be limited to, removal and disposal of all trash, debris, equipment, parts, supplies and all other such items.

3. Pollution Control

Pollution control shall consist of installing measures or performing work to control erosion and minimize the production of sediment and other pollutants to water and air from construction activities.

The contractor shall be responsible for obtaining all required permits and developing all required plans necessary to comply with local, state, and federal regulations regarding erosion and sediment control, stormwater management, and water quality.

All erosion and sediment control measures are to be placed prior to, or as the first step in clearing, grading, or other land-disturbing activities. If pollution control measures are damaged by a run-off producing event, necessary repairs shall be made immediately. The measure and works shall include, but are not limited to the following:

Staging of earthwork activities – The excavation and moving of soil materials shall be scheduled to minimize the size of areas disturbed and unprotected from erosion for the shortest reasonable time.

Seeding – Seeding to protect disturbed areas shall occur as soon as reasonably possible following completion of the earthwork activity.

Mulching – Mulching to provide temporary protection of the soil surface from erosion.

Diversion – Diversions to direct water from work areas and to collect water from work areas should be constructed concurrent with excavation activities. These are temporary measures and shall be removed and the area restored to near original condition.

Sediment filters – Straw bale filters or geotextile sediment fences shall be installed to trap sediment from areas of limited runoff. Sediment filters shall be properly anchored to prevent erosion under or around them. These filters are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures

are installed.

Temporary soil stockpiles – Temporary soil stockpiles shall be stabilized with temporary mulching or protected with sediment trapping measures.

Dust abatement – Dust created by project activities shall be minimized by proper ground cover or application of water to dirt surfaces, if necessary.

Chemical pollution – The contractor shall take all necessary precautions to minimize the potential for chemical pollution of the site and existing streams. All equipment lubricating materials, hydraulic fluids, and transmission fluids drained from any equipment shall be captured in acceptable containers and shall be disposed of off-site in an approved location in accordance with local laws and regulations.

4. Clearing and Grubbing

Clearing and grubbing shall consist of the removal and disposal of trees, snags, logs, brush, stumps, shrubs and rubbish from the designated areas. The limits of the area(s) to be cleared and grubbed will be marked with stakes, flags, or other suitable methods by the contractor and approved by the owner. Trees to be left standing and uninjured will be designated by special markings placed on the trunk about 6 feet above ground surface. Any damages resulting from the contractor's operations or neglect shall be repaired by the contractor.

All trees not marked for preservation and all snags, logs, brush, stumps, shrubs, rubbish, and similar materials shall be cleared from within the limits of the designated areas. Unless otherwise specified, all stumps, roots, and root clusters that have a diameter of 1 inch or larger shall be grubbed out to a depth of at least 1 foot below the ground surface, unless otherwise specified.

All materials cleared and grubbed from the designated areas shall become property of the contractor and shall be removed from the site and disposed of in accordance with all applicable federal, state and local regulations. Burning shall be allowed as defined in Section 14. If burning is permitted, any portions of the material not completely combusted, including all ashes, shall be removed from the site and disposed of in accordance with all applicable federal, state, and local regulations.

5. Survey

The contractor is responsible for assuring that wave berm construction is completed according to line and grade shown on drawings.

6. Excavation

Excavation shall consist of all excavation activities required for placement of the filter drain materials, pipes and appurtenances as required by the drawings and specifications.

Excavations shall comply with OSHA Construction Industry Standards (29CFR Part 1926) Subpart P, Excavations, Trenching, and Shoring. All excavations shall be completed and maintained in a safe and stable condition throughout the total construction phase. Structure and trench excavations shall be completed to the specified elevations and to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work. Excavations outside the lines and limits shown on the drawings or

specified herein required to meet safety requirements shall be the responsibility of the contractor in constructing and maintaining a safe and stable excavation.

Unless otherwise specified, excavation for and subsequent installation of each drain line shall begin at the outlet end and progress upstream.

The contractor shall utilize the necessary equipment to ensure the proper installation and excavation of the filter drain and appurtenances.

Excavation beyond the specified lines and grades shall be corrected by filling the resulting voids with approved, compacted earthfill. The exception to this is that if the earth is to become the subgrade for riprap, rockfill, sand or gravel bedding, or drainfill, the voids may be filled with material conforming to the specifications for the riprap, rockfill, bedding, or drainfill. Before correcting an overexcavation condition, the contractor shall review the planned corrective action with the owner and obtain approval of the corrective measures.

All surplus or unsuitable excavated materials are designated as waste and shall be spread evenly over the excavation footprint.

7. Earthfill

Earthfill is composed of natural earth materials that can be placed and compacted by construction equipment operated in a conventional manner and shall consist of all earthfill activities required for the wave berm construction.

Material- All fill material shall be obtained from required excavations and designated borrow areas. Fill material shall contain no frozen soil, sod, brush, roots, or other perishable material. Rock particles larger than 6 inches shall be removed prior to compaction of the backfill. The type of material used in the various fills shall be Class A.

Foundation Preparation- Foundations for earthfill shall be stripped to remove vegetation and other unsuitable material or shall be excavated as specified. Except as otherwise specified, earth foundation surfaces shall be graded to remove surface irregularities and shall be scarified parallel to the axis of the fill or otherwise acceptably scored and loosened to a minimum depth of 2 inches. The moisture content of the loosened material shall be controlled as specified for the earthfill, and the surface material of the foundation shall be compacted and bonded with the first layer of earthfill as specified for subsequent layers of earthfill.

Earth abutment surfaces shall be free of loose, uncompacted earth in excess of 2 inches in depth normal to the slope and shall be at such a moisture content that the earthfill can be compacted against them to produce a good bond between the fill and the abutments.

Rock foundation and abutment surfaces shall be cleared of all loose material by hand or other effective means and shall be free of standing water when fill is placed upon them. Occasional rock outcrops in earth foundations for earthfill, except in dams and other structures designed to restrain the movement of water, shall not require special treatment if they do not interfere with compaction of the foundation and initial layers of the fill or the bond between the foundation and the fill.

Foundation and abutment surfaces shall be no steeper than one horizontal to one vertical unless

otherwise specified. Test pits or other cavities shall be filled with compacted earthfill conforming to the specifications for the earthfill to be placed upon the foundation.

Placement- Earthfill shall not be placed until the required excavation and foundation preparation have been completed and the foundation has been inspected and approved by the engineer. Earthfill shall not be placed upon a frozen surface nor shall snow, ice, or frozen material be incorporated in the earthfill matrix.

Earthfill shall be placed in approximately horizontal layers. The thickness of each layer before compaction shall not exceed nine inches. Materials placed by dumping in piles or windrows shall be spread uniformly to not more than nine inches before being compacted.

Earthfill and earth backfill in dams, levees, and other structures designed to restrain the movement of water shall be placed to meet the following additional requirements:

- (a) The distribution of materials throughout each zone shall be essentially uniform, and the earthfill shall be free from lenses, pockets, streaks, or layers of material differing substantially in texture, moisture content, or gradation from the surrounding material. Zone earthfills shall be constructed concurrently unless otherwise specified.
- (b) The surface of each layer shall be scarified parallel to the axis of the fill to a depth of not less than 2 inches before the next layer is placed.
- (c) The top surface of embankments shall be maintained approximately level during construction with two exceptions: A crown or cross-slope of about 2 percent shall be maintained to ensure effective drainage, or as otherwise specified for drainfill or sectional zones.
- (d) Dam embankments shall be constructed in continuous layers from abutment to abutment except where openings to facilitate construction or to allow the passage of streamflow during construction are specifically authorized in the contract.
- (e) Embankments built at different levels as described under (c) or (d) above shall be constructed so that the slope of the bonding surfaces between embankment in place and embankment to be placed is not steeper than 3 feet horizontal to 1 foot vertical. The bonding surface of the embankment in place shall be stripped of all material not meeting the requirements of this specification and shall be scarified, moistened, and recompacted when the new earthfill is placed against it. This ensures a good bond with the new earthfill and obtains the specified moisture content and density at the contact of the in-place and new earthfills.

Control of Moisture Content- During placement and compaction of earthfill and earth backfill, the moisture content of the material being placed shall be maintained within the specified range. The application of water to the earthfill material shall be accomplished at the borrow areas insofar as practicable. Water may be applied by sprinkling the material after placement on the earthfill, if necessary. Uniform moisture distribution shall be obtained by disking.

Material that is too wet when deposited on the earthfill shall either be removed or be dried to the specified moisture content prior to compaction.

If the top surface of the preceding layer of compacted earthfill or a foundation or abutment surface in the zone of contact with the earthfill becomes too dry to permit suitable bond, it shall either be removed or scarified and moistened by sprinkling to an acceptable moisture content

before placement of the next layer of earthfill.

Compaction- Earthfill—Earthfill shall be compacted according to the following requirements for the class of compaction specified:

Class A compaction—Each layer of earthfill shall be compacted as necessary to provide the density of the earthfill matrix not less than the minimum density specified in Section 10 or identified on the drawings. The earthfill matrix is defined as the portion of the earthfill material finer than the maximum particle size allowed in the reference compaction test method specified (ASTM D698 or ASTM D1557).

Reworking or removal and replacement of defective earthfill- Earthfill placed at densities lower than the specified minimum density or at moisture contents outside the specified acceptable range of moisture content or otherwise not conforming to the requirements of the specifications shall be reworked to meet the requirements or removed and replaced by acceptable earthfill. The replacement earthfill and the foundation, abutment, and earthfill surfaces upon which it is placed shall conform to all requirements of this specification for foundation preparation, approval, placement, moisture control, and compaction.

8. Removal of Water

Dewatering work consists of the removal of surface water and ground water as necessary to construct the wave berm. It shall include: (1) constructing, installing, building, and maintaining all necessary temporary water containment facilities, channels and diversions; (2) furnishing, installing, and operating all necessary pumps, piping, and other facilities and equipment; and (3) removing all such temporary works and equipment after their intended function is no longer required.

The contractor shall install, maintain, and operate all channels, sumps, and all other temporary diversion and protective works needed to divert water from the filter drain bed. Unless otherwise specified and/or approved, the diversion outlet shall be into the same drainageway that the water would have reached before being diverted.

Removal of water from the construction site shall be accomplished so that erosion and the transporting of sediment and other pollutants are minimized. Dewatering activities shall be accomplished in a manner that the water table water quality is not altered. Dewatering activities shall not conflict with the requirements of Section 3, Pollution Control.

When temporary works are no longer needed, the contractor shall remove and return the area to a condition similar to that which existed before construction.

9. Topsoiling

Topsoil shall be salvaged from designated earth surfaces that will be disturbed by construction activities. After designated sites have been cleared and grubbed, the topsoil shall be removed from the areas and stockpiled at locations acceptable to the owner.

Topsoil shall consist of friable surface soil reasonably free of grass, roots, weeds, sticks, rocks, or other unsuitable material.

Spreading shall not be conducted when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to uniform spreading operations. Surfaces designated to

receive a topsoil application shall be lightly scarified just before the spreading operation.

Stripping topsoil will consist of removing a minimum of 9 inches from areas to be disturbed within the work limits. All stripped topsoil that is not directly placed on disturbed areas shall be temporarily stockpiled within the work limits of the project. The stockpile area shall be protected from erosion in accordance with the Pollution Control Section.

All removed topsoil shall be spread on disturbed areas to a relatively uniform thickness. A minimum of 6 inches of topsoil shall be spread on the earthen surfaces of the finished wave berm and cut area of the auxiliary spillway.

10. Seeding and Mulching

Liming, fertilizing, seeding, and mulching shall be performed within 5 days from disturbance unless the seedbed cannot be properly prepared due to wetness, snow, or frozen soil or as otherwise directed by the owner.

Lime shall be standard agricultural ground limestone. Fertilizer shall meet the requirements of the applicable Virginia state laws, and shall be in such physical condition to ensure uniform application over the area to be fertilized. Rates of application shall be as specified in Section 14 of this specification.

The seed shall conform to the latest seed laws of the United States and of Virginia. Species, the source of production if native grasses are used, and rate of seeding shall be as specified in Section 14 of this specification.

The entire area to be seeded shall be reasonably smooth and all washes and gullies shall be filled to conform to the desired cross-section before actual seedbed preparation is begun. Scarify subsoil areas perpendicular to water flow before they are filled. After final grading, the required fertilizer (except that applied by hydraulic seeding) and/or lime shall be applied uniformly and incorporated into the top 3 inches of the soil. The seedbed preparation operation shall be suspended when the soil is too wet or too dry.

Seed immediately after preparation of the seedbed. Uniform seed distribution shall be accomplished by drilling, broadcasting or hydraulically seeding. If a hydraulic seeder is used, the seed, fertilizer and mulch may be applied together with water.

The required mulching shall be performed with hydraulic seeding or immediately after seeding. The mulch shall be applied uniformly over the area. The type and rate shall be as specified on the drawings or as shown in Section 14.

The mulch, except for hydraulically placed mulch, shall be anchored. Anchoring of the mulch shall be performed by application of a commercially available tackifier at the rate recommended by the manufacture, a mulch anchoring tool, tandem disk weighted and set nearly straight, track type tractor, or by installation of mulch netting. Mechanical anchoring shall be performed in a manner that creates ridges perpendicular to the flow of water.

11. Payment

Payment shall be made by one lump sum payment at the time of project completion and upon acceptance by the owner.

12. Items of work and construction details

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

A. Bid Item 1, Wave Berm Installation

- 1) This item shall consist of all necessary work to construct the wave berm as shown on the drawings.
- 2) Burning shall not be allowed on this project unless approved by the owner.
- 3) The Contractor is responsible for the dewatering of the lake to levels required for construction prior to beginning construction. The level of water in the lake cannot be lowered at a rate greater than 6 inches per day. Dewatering may begin at any time after the award of the contract with the approval of the Contracting Officer. The dewatering system shall remain in place for the duration of construction and must be capable of managing all flow into excavations and work areas to allow for removal of sediment and construction of wave berm to be done in dry conditions. Excavation required for construction shall be kept free of water during the installation of the wave berm. The water table shall be maintained a minimum of 2 feet below the subgrade during the installation.

- 4) Seeding mix, application rate and planting times shall be:

Kentucky 31 Fescue 108 pounds per acre
(*Festuca arundinacea*)

Seasonal Nurse Crop* 20 pounds per acre

* Varies March through May 15; August 16 through October use
Annual Rye (*Lolium perenne ssp. multiflorum*)
May 16 through August 15 use Foxtail Millet (*Setaria italica*)
November through February use Winter Rye (*Secale cereale*)

- 5) Fertilizer amounts shall be applied uniformly over the area to be seeded at the following rates: N – 50 lbs/acre; P₂O₅ - 120 lbs/acre; K₂O – 90 lbs/acre. The nitrogen shall be 50% slowly Available Nitrogen (SAN). The Water Insoluble Nitrogen (WIN) of 50% shall be stated on the container or bag labels.
- 6) Lime shall be applied uniformly over the area to be seeded at a rate of 2 tons/acre.
- 7) Mulch materials shall be wheat, barley, oat, or rye straw, or fiber mulch commonly used in hydroseeding applications for the mountainous regions of the State of Virginia. Application rates shall be 2.0 tons per acre for straw mulch and 1,500 pounds per acre for fiber mulch. Straw mulch shall be anchored with a mulch crimper.