

SECTION 02260**EMBANKMENT****02260.01 GENERAL****A. Description**

1. Embankment shall be formed of suitable material obtained from General, Structure, Borrow, Trench, and other excavations included in the Project, and it shall be placed, processed and compacted to the lines and grades shown on the Plans and in accordance with the Contract Documents.
2. In addition to the requirements contained herein, all embankment construction shall be in compliance with Subtitle 20 of the Anne Arundel County Code, "Grading and Sediment Control".

B. Related Work Included Elsewhere

1. Protection of the Environment; Section 01500.
2. General Excavation; Section 02210.
3. Structure Excavation; Section 02220.
4. Borrow Excavation; Section 02240.
5. Trench Excavation; Section 02250.
6. Tamped Fill; Section 02265.

C. Quality Assurance

1. Materials

All embankment materials will be subject to test by the Engineer to determine the material's compliance with these Specifications. When specific material tests are called for in the referenced standards and specifications, the Engineer will have the option of requiring that any or all of these tests be performed for materials furnished for a specific project. When testing is required, it will be specified herein or in the "Special Provisions".

2. Field Tests

- a. The County will arrange for all in-place moisture/density testing on the Project. The Engineer shall determine the number of samples to be taken and the frequency of tests required to confirm compliance with the Specifications.

The Contractor shall assist the Engineer in obtaining samples and shall provide smooth surface for conducting moisture/density tests. The contractor will not be entitled to any claim for additional compensation due to the testing requirements specified herein.

The method for testing materials shall be in accordance with the requirements of AASHTO T 180, Method C or D as directed by the Engineer.

The Contractor shall provide a cement concrete compaction block having dimensions 18 x 18 x 9 inches and weighing not less than 200 pounds. One 18 x 18-inch working face shall have a level broomed surface.

- b. At the start of embankment construction, the Contractor shall demonstrate to the Engineer that the compaction density specified in Section 02260.03 can be attained by the compaction equipment and methods the Contractor intends to use. Once the method and equipment has been approved, no substitutions will be permitted without the Engineer's approval.
- c. Should testing determine that the required density is not being met, or the material is outside the specified moisture range, the Contractor shall, without additional compensation re-excavate, re-work, and/or re-compact the particular layer or section until the required density and moisture are attained.

D. Submittals**1. Materials Tests**

Material test results shall be submitted for all materials furnished from other than a licensed commercial operating supplier. The tests shall demonstrate that the material meets all the requirements specified herein.

2. Certificates of Compliance

Certificates of compliance shall be submitted in accordance with the "General Provisions" for materials furnished from a licensed commercial operating supplier. The certificates shall state that the material meets the requirements specified herein.

02260.02 MATERIALS**A. Material Furnished by the County**

The County will not furnish any materials for embankment construction except as is available on the site within the limits as designated on the Plans by sections, gradelines, and/or contour lines.

B. Contractor's Options

The Contractor may use suitable materials obtained from general, structure, borrow, trench, and other excavations for the construction of embankments.

C. Detailed Material Requirements

Material for fills or backfills may be from on-site excavations (if of proper quality) or from borrow sources. The material shall be free from vegetative matter, organic material, sludge, grit, trash, muck, roots, logs, stumps or frozen material and other deleterious substances. Except as otherwise specified or approved, the material shall not contain rocks or lumps larger than six inches in greatest dimension. The material shall not contain mica in quantities, which, in the judgment of the Engineer are sufficient to affect compaction characteristics. Materials having a maximum dry density of less than 100 pounds per cubic foot (AASHTO T 180) shall not be used unless specifically approved in writing by the Engineer. Cinders, ashes, rubble and construction debris shall not be used in the work.

Suitable material is any material meeting the quality requirements specified above and which is not frozen and which has a suitable moisture content.

Unsuitable material is any material not meeting all the requirements for suitable material.

02260.03 EXECUTION**A. General****1. Embankment Foundation**

Prior to the construction of any embankment, the foundation upon which it is to be built shall be properly prepared. Debris, root mat, muck, and other material, which in the judgment of the Engineer will not adequately support the embankment, shall be removed to the depth specified by the Engineer. Sod and topsoil may also be ordered to be removed by the Engineer. The removal of material will be measured and paid for as Class 1 or Class 1-A Excavation, in accordance with Section 02210.03.

2. Embankment Over Existing Road

When the embankment is to be superimposed upon any type of existing road, the existing surface, regardless of depth of embankment to be placed thereon, shall be scarified, thoroughly broken up, or removed as shown on the Plans, to a degree as will provide ample bond between the old and new material. The cost of scarifying the existing road surface shall be incidental to the items of Excavation or Borrow. The removal of the existing road surface will be measured and paid for as Class 1 Excavation if the material is removed from within the limits of construction.

3. Test Rolling

When test rolling is specified or before any embankment material is placed, the Engineer may also require that the foundation be tested by being rolled with a pneumatic tired compactor. The cost of the work will not be paid for but will be considered incidental to the excavation items.

4. Frozen Material

No frozen material shall be placed in embankments. Any material which freezes after being placed in the embankment shall be reworked or removed before the next layer is placed. Any frozen material removed from embankments shall be stockpiled outside of construction limits and reserved for future use at a time when its condition is satisfactory to the Engineer at no expense to the County. Any suitable material, which is wasted, shall be replaced by the Contractor with other acceptable material at no expense to the County.

B. Placing and Spreading

1. Placing and Spreading

The material shall be placed in horizontal layers of uniform thickness. Each layer shall be carried across the full width of the embankment. In order to obtain the required density, blending of variable soils may be necessary.

2. Placement Across Water or Unstable Ground

When embankment is to be constructed across open water, liquefied areas or across low swampy ground which will not support the weight of the construction equipment, the first layer of the fill may be constructed by depositing material in a layer no thicker than that required to support the equipment. Subsequent layers shall be placed and processed in accordance with the requirements noted herein for the type of material being placed.

3. Earth Embankments

In earth embankments no layer shall exceed 8 inches in uncompacted thickness, except as noted in the above paragraph.

4. Rock Embankments

In rock embankment the thickness of layers shall be determined by the size of the rock but in no case shall layers exceed 24 inches in thickness. The portion of the embankment less than 6 feet below the subgrade at the profile grade line shall be placed in layers of more than 8 inches in loose thickness, and these layers shall be filled solid and fully choked with spalls, rock dust, or earth so as to reduce voids to a minimum. Each layer shall be filled and compacted before the next layer is placed.

The top of the rock material in any embankment shall be of a uniform surface, determined by connecting with straight lines the points on the typical cross section which are 9 inches below any median ditch invert and 9 inches below the bottom of each pavement edge (not including foundation layers or sub base) and thence sloping downward and outward under the shoulder at the rate of 3/4 inch per foot to the outer slope of the embankment. The remaining upper portion of the embankment, unless otherwise specified, shall be constructed of suitable earth, free from stones that would be retained on a 3-inch sieve, and it shall be processed as described herein.

5. Drainage

A smooth grade having an adequate crown shall be maintained so as to provide drainage at all times.

6. Side Slopes

Side slopes shall be uniformly constructed and maintained at the specified slope ratio throughout the progress of the work.

7. Benching

When the embankment is to be placed and compacted on hillsides, or when new embankment is to be compacted against existing embankments, the slopes on which the embankment is to be placed shall be continuously benched where they are steeper than 4:1 when measured at right angles to the roadway. The benching operation shall be done as the embankment is brought up in layers. Benching shall be of sufficient width to permit operations of placing and compacting equipment but shall have a minimum width of 5 feet. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cut. Material meeting embankment requirements cut from the benches shall be re-compacted along with the new embankment material at the Contractor's expense.

Side-hill benching and embankment construction shall be a continuous operation. Interruption of operation due to unforeseen circumstances shall not be for more than 48 hours. Construction of side-hill fill benches and re-compaction of material cut from benches will not be a separate pay item but will be considered incidental to and included in the prices bid for the various excavation items.

C. Moisture Control

When necessary, each layer before being compacted shall be processed as required in order to bring its moisture content sufficiently close to optimum to make possible its compaction to the required density. The material may be wetted by the application of water or dried by plowing, disking, and aerating. Either process may be carried out either on the embankment or at the source of the material. The moisture content of the soil being compacted shall be considered as being too high to insure compaction when, if after repeated aeration and rolling, the roller picks up excessive material, causes deep rutting, or displaces rather than compacts the material. The

resultant moisture content of embankment material, when finally compacted to required density, shall not be in excess of two percentage points from optimum.

D. Compaction

1. General

Each layer shall be uniformly compacted to the specified density before the new layer is placed and processed. The specified density shall be obtained by rolling with pneumatic tired compaction equipment, grid rollers, three-wheeled power rollers, vibratory, sheepsfoot or tamping rollers, or other approved types of rollers or compaction equipment. Any one or more of these types of equipment shall be used if needed in order to obtain the specified density.

Dumping and rolling areas shall be kept separate, and no lift shall be covered by another until compaction complying with the requirements of this subsection is secured. Hauling and leveling equipment shall be so routed and distributed over each layer of the fill in a manner as to make use of compaction effort afforded thereby.

Rolling shall be done in a longitudinal direction along the embankment and shall generally begin at the outer edges and progress toward the center. The travel paths of traffic and construction equipment shall be kept dispersed over the entire width of the embankment so as to aid in obtaining uniform compaction.

2. Density Requirements

a. Optimum moisture and maximum density will be determined in accordance with AASHTO T 180, Method C or D as directed by the Engineer.

b. In-place density will be determined in accordance with either AASHTO T 191 or T 238.

c. Roadway and Paved Areas

The material shall be compacted to not less than 95% of the maximum density.

d. Non Roadway Areas

Embankment material shall be compacted to not less than 90% of the maximum density unless otherwise specified.

3. Protection of Structures and Utilities During Compaction

Adjacent to structures or utilities and in locations where working space is too restricted to permit the use of rollers, compaction may be obtained by the use of mechanical tampers or vibratory compactors as described under and in accordance

with the terms of Section 02265.03. The material to be compacted shall be selected to meet the requirements of this Section except that rock shall not be used. It shall be spread in layers having a loose depth not in excess of 6 inches and shall be compacted to the specified density.

The Contractor shall be responsible for protecting all structures and utilities from any damage, which might be caused by the type of equipment used, or its method of operation in the handling, processing, or compacting of embankment or backfill material. Particular care shall be exercised in the vicinity of arches, retaining walls, foundation walls, culverts, and utility trenches to assure that no undue strain or movement is produced.

E. Stability of Embankments

The Contractor shall be responsible for the stability of all embankments in the Contract. He shall remove and replace with acceptable material any embankment or portion thereof which has been constructed with unapproved material. The Contractor shall bear the expense of removing and replacing unstable material as well as removing and replacing portions of the embankment, which become unstable or displaced as the result of carelessness or negligence on his part.

Embankment material which may be lost or displaced as a result of natural causes such as storms, cloudbursts, etc., or as a result of unavoidable movement or settlement of the ground or foundation upon which the embankment is constructed shall be replaced by the Contractor with acceptable material from excavation or borrow, etc. No additional compensation will be allowed for the replacement except that the quantity of material required will be paid for at the regular Contract price for the type of material used.

F. Roadway Subgrade

The roadway and paved area subgrade shall be constructed and carefully shaped to the specified cross section after all embankment and backfilling have been substantially completed. Material is to be reserved for use from the sources from which the embankment material is being supplied or may be furnished from borrow if so directed by the Engineer.

After the subgrade in cuts and fills has been finally shaped and brought to the specified cross section, it shall be carefully and thoroughly proof rolled by the use of a 35 ton pneumatic tire roller or approved equal.

In locations where rolling is not feasible, compaction by mechanical tampers or vibratory compactors, in accordance with Section 02265.03, may be required.

The compacting shall cover the entire width of the roadway or paved area. The travel paths of any traffic or construction equipment, which is permitted on the subgrade, shall be kept dispersed so as to aid in obtaining uniform compaction and avoid the displacement of material or formation of ruts. If ruts 2 inches or more in depth are formed, they shall be removed by scarifying, reshaping, and re-compacting the affected subgrade area.

The Contractor shall at all times maintain ditches and drains along the subgrade, which are adequate to keep it thoroughly drained.

The cost of the work shall be included in the prices bid for general excavation items, as the work will not be measured separately; and no additional compensation will be allowed for the work.

No subsequent cover or resurfacing material shall be deposited upon a subgrade when it is frozen nor until it has been checked and approved by the Engineer.

02260.04 METHOD OF MEASUREMENT

Embankment and the work prescribed under this Section will not be measured, unless specifically noted, but will be considered as incidental to and included in the several classes of excavation. The work shall include the formation, sprinkling, compaction, shaping, sloping, trimming, finishing, and maintaining of embankments and all other work incidentals thereto.

When compaction by means of mechanical tampers or vibratory compactors is ordered or permitted by the Engineer, the work will not be measured except when a specific item of Tamped Fill is included in the proposal for this work.

02260.05 BASIS OF PAYMENT

Embankment work will not be paid for directly but will be considered an incidental part of the several classes of excavation.

When compaction by means of mechanical tampers or vibratory compactors is ordered or permitted by the Engineer, the work will not be paid for except as Tamped Fill in cases where a specific item for the work is included in the Proposal.