

## DIVISION 4

### EARTHWORK FOR UTILITIES

#### 4-1 GENERAL

##### A. Definitions

- 1) Backfill: Backfill required for refilling a cut, trench or other excavation areas shall consist of, in this Section only, as material that meets the product requirements of Structural Fill as defined in *Division 3 - Earthwork*.
- 2) Lift: A layer (or course) of soil placed on top of subgrade or a previously prepared or placed soil in a fill or backfill.
- 3) Unsatisfactory Material: Unsatisfactory material shall consist of in-situ soil or other material which meets the product requirement of Unsatisfactory Fill as defined in Division 3, *Earthwork*. Unsatisfactory material shall also be defined as material which contains refuse, frozen material, large rocks, debris, soluble particles, and other material which could damage the pipe or cause the backfill not to compact.
- 4) Unstable Material: Material in the trench bottom which lacks firmness to maintain alignment and prevent joints from separating in the pipe, conduit, or appurtenant structure during backfilling. This may be material otherwise identified as satisfactory which has been disturbed or saturated.
- 5) Subgrade: The bottom of aggregate base materials under structures, utilities, and pavements. In areas where aggregate base materials are not specified, "subgrade" shall mean the bottom of the topsoil or surface treatment, whichever is lower.

B. The Contractor shall provide all labor, materials, equipment and services necessary for executing all earthwork for utilities. The Contractor is responsible for all excavation, compaction, furnishing and installing backfill material, and all other related items as shown on the drawings and/or as specified herein.

C. Work shall consist of the installation of storm drain pipes and any other site utilities required to complete the facility per the Specifications and Contract Drawings. Work shall include excavation, protection of trench, erosion and sediment control, subgrade preparation, utility bedding, backfill, compaction, and surface restoration or finishing.

D. Related work included in these Specifications but not included in this Section consists of the following:

- 1) Earthwork provided under Division 3.

E. Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Perform work adjacent to existing utilities as indicated in accordance with procedures outlined by utility company. Excavation made with power-driven equipment is not permitted within two feet of known utilities or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the utility company. Report damage to utility lines or subsurface construction immediately to the utility company.

- F. Related Documents: The general provisions of the Contract, the Anne Arundel County Standard Specifications for Construction (latest edition) and all applicable supplements and addenda pertaining thereto apply to this Section.

#### **4-2 PRODUCTS**

- A. Soil material proposed as pipe bedding (as backfill) shall be free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, organic materials, ice, or other deleterious and objectionable materials.

#### **4-3 EXECUTION**

- A. Plan for and provide the structures, equipment, and construction for the collection and disposal of surface and subsurface water encountered in the course of construction. Drainage and dewatering necessary for completion of the work specified is considered to be incidental to the construction. The Contractor shall include all costs for equipment, labor and incidentals in the respective Bid Item associated with each aspect of the work. No additional cost will be paid by the Owner or Owner's Representative for drainage and/or dewatering activities. The Contractor shall conduct the activities subject to approval of the Owner or Owner's Representative. The Contractor will be required to conduct the drainage and/or dewatering activities as necessary to control the release of sediment from the project site.
- B. Surface water shall be directed away from excavation and construction sites so as to prevent erosion and undermining of foundations. Diversion ditches, dikes and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site and the area immediately surrounding the site and affecting operations at the site shall be continually and effectively drained.
- C. Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or dewatering trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in-situ material. While the excavation is open, the water level shall be maintained continuously, at least 2 feet below the working level.
- D. Perform dewatering operations as recommended and/or required by the Contractor's or Owner's Geotechnical Engineer. The Contractor shall maintain a back-up pump and system on-site available for immediate use.
- E. Strip suitable soil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Material unsuitable for use as topsoil and backfilling shall be wasted at an approved, off-site, legal location at the Contractor's expense. Locate topsoil so that the material can be used readily for the finished grading. Where sufficient existing topsoil conforming to the material requirements is not available on site, provide borrow materials suitable for use as topsoil. Protect topsoil with erosion control measures and keep in segregated piles until needed.
- F. The Contractor is to excavate trenches to the widths indicated on the construction plans and minimize the damage to existing tree roots during construction. Notify the Owner or Owner's Representative immediately in writing if it becomes necessary to remove hard,

unstable, or otherwise unsatisfactory material to a depth or width greater than indicated. Make trench sides as nearly vertical as practicable except where sloping of sides is allowed. Sides of trenches shall not be sloped from the bottom of the trench up to the elevation of the top of the pipe. Blasting will not be permitted. Overexcavate soft, weak, or wet excavations as directed by the Owner or Owner's Representative. Use bedding material placed in 4-inch maximum layers to refill overdepths to the proper grade. Grade bottom of trenches accurately to provide uniform bearing and support for each section of pipe on undisturbed soil, or bedding material as indicated or specified at every point along its entire length except for portions where it is necessary to excavate for bell holes and for making proper joints. Dig bell holes and depressions for joints after trench has been graded. Dimension of bell holes shall be only 1/2 inch greater than length, width, and depth of bell as required for properly making the particular type of joint to ensure that the bell does not bear on the bottom of the excavation. Trench dimensions shall be as indicated or specified.

- G. Shore and sheet excavations as necessary and required by local requirements and/or OSHA with various member sizes arranged to prevent injury to persons and damage to structures. Arrange shoring and sheeting to preclude injurious caving during removal. Obtain approval from the Owner or Owner's Representative prior to removing shoring, sheeting, or bracing in excavations adjacent to on-grade slabs, foundations, or other structural elements.
- H. Construct backfill in two operations (initial and final) as indicated and specified in this Section. Hand place initial backfill in 8-inch maximum loose lifts to one foot above pipe unless otherwise specified. Ensure that initially placed material is mechanically tamped firmly under pipe haunches. Bring up evenly on each side and along the full length of the pipe. Ensure that no damage is done to the utility or its protective coating. Place the remainder of the backfill in 8-inch maximum loose lifts unless otherwise specified. Each layer shall be thoroughly compacted for the full trench width and under, around and over the pipe. Mechanical tampers shall exert a pressure of not less than 250 foot pounds per square foot of area of tamping face. When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Compact each loose lift before placing the next lift. Do not backfill in freezing weather or where the material in the trench is already frozen or is muddy, except as authorized. Where settlements greater than the tolerance allowed herein for grading occur in trenches and pits due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation. Coordinate backfilling with testing of utilities. Testing for the utility piping shall be complete before final backfilling.
- I. Use hand-operated, plate-type, vibratory, or other suitable mechanical tampers in areas not accessible to larger rollers or compactors. Avoid damaging pipes and protective pipe coatings. Compact material in accordance with the following unless otherwise specified. If necessary, alter, change, or modify selected equipment or compaction methods to meet specified compaction requirements.
  - 1) Compact material in subcuts or overexcavations to minimum of 95 percent of the Modified Proctor maximum dry density per ASTM D-1557. In soft, weak, or wet soils, tamp refill material to consolidate as directed by the Owner or Owner's Representative.
  - 2) For stone and backfill, compact to minimum of 95 percent of the Modified Proctor maximum dry density per ASTM D-1557.

- 3) Compact initial backfill material surrounding pipes to minimum of 95 percent of the Modified Proctor maximum dry density per ASTM D-1557. Compact remainder of the backfill similarly.
- J. Test bedding and backfill for conformance to specified requirements. Test bedding and backfill for moisture-density relations in accordance with ASTM D 1557. Perform at least one of each of the required tests for each material provided. Perform sufficiently in advance of construction so as not to delay work. Provide additional tests as specified above for each change of source. Perform density and moisture tests in randomly selected locations and in accordance with ASTM D 1556 as follows:
- 1) Bedding and Backfill in Trenches: One test per 100 linear feet in each lift.
  - 2) Appurtenance Structures: One test per 250 square feet or fraction thereof in each lift.
  - 3) Where ASTM D 2922 and ASTM D 3017 are used to test field compaction densities, verify test results by performing at least one test per day using ASTM D 1556 at a location already tested in accordance with ASTM D 2922. Perform at least one additional test using ASTM D 1556 for every ten tests performed with a nuclear device, at locations checked in accordance with ASTM D 2922.
- K. Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, or any other damage. Repair and reestablish damaged or eroded grades and slopes and restore surface construction prior to acceptance. Protect existing streams, ditches, and non-tidal wetland areas from water-borne soil as indicated on the contract drawings
- L. Bring trenches to grade per pipe trench detail indicated on the Contract Drawings using material excavated from the trench except for pipe bedding material. Compaction in trenches excavated with a trenching device shall be performed with equipment capable of compacting the soils within the trench to 92 percent of the maximum dry density in accordance with AASHTO T-180.
- M. Finish to grades indicated within one-tenth of a foot. Provide topsoil in areas to be seeded as indicated. Grade areas to drain water away from structures. Grade areas that are to remain but have been disturbed by the Contractor's operations.
- N. All excess excavated waste materials, including unsatisfactory excavated material, organic vegetation material, roots, greenery, trash and debris shall not be utilized as fill on-site and shall be disposed of off-site by the Contractor at an approved off-site disposal facility secured by the Contractor. The cost for disposing of materials off-site shall be included in the respective bid item governing the specific portion of the work.
- O. Dispose of excavated material so that it will not obstruct the flow of runoff, streams, endanger a partly finished structure, impair the efficiency or appearance of any facilities, or be detrimental to the completed work.
- P. Clear areas to receive topsoil for the finished surface of materials that would interfere with planting and maintenance operations. Scarify subgrade to a depth of 2 inches. Do not place topsoil when the subgrade is frozen, extremely wet or dry, or in other conditions detrimental to seeding, planting, or grading.

#### **4-4 MEASUREMENT**

- A. Base Bid Payment Items: All items of work in this Section, excluding the Unit Price Items listed below shall not be measured for payment since their cost shall be included in the lump sum price bid.
- B. Contingent Payment Items: Contingent Select Backfill/Borrow Using Graded Aggregate Base: Select Backfill/Borrow using Graded Aggregate Base shall be measured by the cubic yard and shall include all costs for furnishing, placement and compaction. This item will be measured and paid for on the basis of cubic yard in place.

END OF SECTION