

## SECTION 02300 - EARTHWORK

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section includes the following:

1. Preparing sub-grades for slabs-on-grade walks, pavements, lawns and grasses.
2. Excavating and backfilling for footings, foundations and curbs.
3. Drainage course for slabs-on-grade.
4. Excavating and backfilling for utility trenches.

#### 1.2 RELATED DOCUMENTS

- A. Construction Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Virginia Erosion and Sedimentation Control Handbook, Latest Edition
- C. Underground Utility Protection Ordinance – Chapter 55 Arlington County Code
- D. Local Governing Authority and Code Requirements – Chapter 57 Arlington County Code
- E. Arlington County DES Construction Standards and Specifications
- F. Virginia Department of Transportation Road and Bridge Specifications
- G. Tree Protection Standards and Fencing Requirements – as contained in Arlington County Landscape Standards, latest edition (CPHD)
- H. Construction Documents

#### 1.3 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns and grasses, and exterior plants.
2. Excavating and backfilling for structures.
3. Subbase course for concrete walks and pavements.
4. Subsurface drainage backfill for trenches.
5. Excavating and backfilling for utility trenches.
6. Excavating and backfilling trenches for buried electrical utilities and pits for buried utility structures.

B. Related Sections include the following:

02230 – Site Clearing, Demolition, and Removals  
02510 – Water Distribution  
02630 – Storm Drainage  
02751 – Concrete Pavement  
02793 – Sand Surfacing  
02870 – Site Furnishings  
02881 – Play Equipment and Structures  
02930 – Exterior Plants  
03300 – Cast In Place Concrete  
05521 – Pipe and Tube Railings

1.4 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

C. Select Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Project Officer. Authorized additional excavation and replacement material will be paid for according to Contract provisions changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Project Officer. Unauthorized excavation, as well as remedial work directed by Project Officer, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

H. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

- I. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

### 1.3 SUBMITTALS

- A. Documented Fill Material Sample: One (1) twenty (20) pound bag sample of each material to be used as fill to the Project Officer ten (10) days prior to commencing fill operations for the Project Officer's approval. By submitting samples of this material, the Contractor agrees and guarantees that the fill material used for construction will conform to the samples supplied. Final acceptance of fill material rests with the Project Officer, whose decision shall be final and binding upon the Contractor. However, acceptance of any material by the Project Officer shall not relieve the Contractor of his responsibility to have the fill material used conform to approved samples and specifications.
- B. Product Data: Submit a sieve analysis and certificate identifying source of soil and attach to each submitted sample bag.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- A. Select Borrow: Material needed in addition to that available from construction operations shall be defined as select borrow.
  - 1. Shall be obtained from approved gravel banks or other approved sources.
  - 2. Shall consist of durable natural granular material or granular aggregates mixed or blended with sand, stone dust, soil, or other filler materials to provide a well-graded mixture meeting the specified requirements.
  - 3. Shall be free from vegetable or organic matter, lumps, or an excessive quantity of clay, or other objectionable foreign substances, but may contain a maximum of ten (10) percent shale by weight.
  - 4. The size and gradation of the material shall range from stone no larger than 3 inches across its maximum dimension to a soil passing a No. 200 sieve. The gradation shall be well-dispersed through the borrow. Dense graded aggregate such as VDOT size 21-A stone may be used as select borrow.
- B. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- C. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- D. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

## 2.2 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 2 Section "Site Clearing."
- C. Protect and maintain erosion and sedimentation controls, which are specified in Division 2 Section "Site Clearing," during earthwork operations.

### 3.2 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
- B. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
- C. If an unacceptable foundation material for structures is encountered, excavate six (6) inches below the bottom of the proposed structure and provide a compacted aggregate base course.

### 3.3 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and sub-grades.
- B. Remove all soft, boggy, clayey, or other objectionable material below the proposed subgrade and refill the area with select borrow material.

### 3.4 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.

- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.

- 1. Clearance: As indicated in the drawings.

- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

- 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material, 4 inches deeper elsewhere, to allow for bedding course.

### 3.5 SUBGRADE INSPECTION

- A. Reconstruct sub-grades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Project Officer, without additional compensation.

### 3.6 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Project Officer.

- 1. Fill unauthorized excavations under other construction or utility pipe as directed by Project Officer.

### 3.7 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

- 1. Stockpile soil materials away from edge of excavations. Do not store within tree protection areas. Cover or otherwise stabilize stockpiles as specified in Division 1 Section "Temporary Erosion and Sediment Control."

### 3.8 UTILITY TRENCH BACKFILL

- A. Place backfill on sub-grades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

- C. Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 3 Section "Cast-in-Place Concrete."
- D. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.
  - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- E. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- F. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

### 3.9 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use satisfactory soil material.
  - 3. Under footings and foundations, use engineered fill.

### 3.10 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

### 3.11 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than six (6) inches in loose depth for material compacted by heavy compaction equipment, and not more than four (4) inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

### 3.12 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish sub-grades to required elevations.

### 3.13 BASE COURSES

- A. Place base course on sub-grades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place base course under pavements as follows:
  1. Shape base course to required crown elevations and cross-slope grades.
  2. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

### 3.14 FIELD QUALITY CONTROL

- A. Testing Agency: If deemed necessary by the Project Officer, Owner may engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test sub-grades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing sub-grades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing sub-grades may be based on a visual comparison of subgrade with tested subgrade when approved by Project Officer.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable.
- E. When testing agency reports that sub-grades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.15 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs prior to or within 60 days of date of Substantial Completion, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### 3.16 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

## PART 4 – MEASUREMENT AND PAYMENT (to be used for calculation of possible change orders).

- 4.1 “Earthwork” shall be measured in Cubic Yards of material, measured in its original position, excavated and disposed of in accordance with the plans and specifications and as directed by the Project Officer.
- 4.2 The unit price bid for “Earthwork” shall include the cost of all labor, materials, equipment and incidental expenses necessary for the excavation, disposal, delivery, placing and compaction of select fill, dewatering, sheeting and shoring, stockpiling and other incidental work and expenses necessary to complete the work in accordance with the plans and specifications to the satisfaction of the Project Officer.

END OF SECTION 02300