

SECTION 31 00 00
EARTHWORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Grading
- B. Excavation
- C. Backfilling
- D. Compaction
- E. Remove and Replace Topsoil
- F. Dressing of Shoulders and Banks
- G. Stone Drainage Filter
- H. Water Control
- I. Testing

1.02 RELATED SECTIONS

- A. Section 01 45 00 – Quality Control
- B. Section 01 45 23 – Testing and Inspecting Services
- C. Section 31 10 00 – Site Clearing

1.03 REFERENCES

- A. ASTM D 448 – Sizes of Aggregate for Road and Bridge Construction.
- B. ASTM D 1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort.
- C. ASTM D 2487 – Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- D. ASTM D 6938 – In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- E. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- F. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.

1.04 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Procedures for submittals.

- B. Materials Source: Submit gradation analysis, proctor results, and soil classification for all borrow material.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with State of South Carolina standards, SCDOT, and GSWA.

1.06 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).
- B. In place density tests in accordance with ASTM D 6938.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. The testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours' notice prior to taking any of the tests.
- E. Testing shall be Contractor's responsibility and performed at Contractor's expense by a commercial testing laboratory operating in accordance with subparagraph C above.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Borrow shall consist of sand or sand-clay soils capable of being readily shaped and compacted to the required densities, and shall be reasonably free of roots, trash, rock larger than 2 inches, and other deleterious material.
- B. All soils used for structural fills shall have a PI (plastic index) of less than 10, and a LL (liquid limit) of less than 30. Fill soils shall be dried or wetted to appropriate moisture contents prior to compaction. Additionally, fill soils used for the top 2 feet of fill beneath roads and parking lots shall have no more than 15% passing the # 200 sieve.
- C. Contractor shall furnish all borrow material.
- D. Contractor shall be responsible for and bear all expenses in developing borrow sources including securing necessary permits, drying the material, haul roads, clearing, grubbing, excavating the pits, placing, compaction and restoration of pits and haul roads to a condition satisfactory to property owners and in compliance with applicable federal, state, and local laws and regulations.

2.02 SOURCE QUALITY CONTROL

- A. If tests indicate materials do not meet specified requirements, change material and retest.
- B. Provide materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.01 TOPSOIL

- A. Contractor shall strip topsoil and stockpile on site at a location determined by the Owner at the Contractor's expense.
- B. Topsoil shall be placed to a depth of 4 inches over all disturbed or proposed landscaped areas.
- C. Topsoil shall be provided at Contractor's expense if it is not available from site.
- D. Any remaining topsoil will be hauled off site at the Contractors expense.
- E. Do not excavate wet topsoil.

3.02 EXCAVATION

- A. Suitable excavation material shall be transported to and placed in fill areas within limits of the work.
- B. Unsuitable material encountered in areas to be paved and under building pads, shall be excavated 2 feet below final grade and replaced with suitable material from site or borrow excavations. Contractor shall notify Engineer if more than 2 feet of excavation is needed to replace unsuitable material.
- C. Unsuitable material shall be disposed of off-site at the disposal site indicated in the plans and suitable surplus excavation material not required for fill may be disposed of in the stockpile area on-site as noted in the plans.
- D. Proper drainage, including sediment and erosion control, shall be maintained at all times. Methods shall be in accordance with the National Pollutant Discharge Elimination System standards and other local, state, and federal regulations.
- E. Unsuitable materials as stated herein are defined as highly plastic clay soils, of the CH and MH designation, border line soils of the SC-CH description, and organic soils of the OL and OH description based on the Unified Soils Classification System. Further, any soils for the top two feet of pavement subbase shall have no more than 15% passing the # 200 sieve.

3.03 GROUND SURFACE PREPARATION FOR FILL

- A. All vegetation, roots, brush, heavy sods, heavy growth of grass, decayed vegetable matter, rubbish, and other unsuitable material within the areas to be filled shall be stripped and removed prior to beginning the fill operation.
- B. Sloped ground surfaces steeper than 1 vertical to 4 horizontal, on which fill is to be placed shall be plowed, stepped, or benched, or broken up as directed, in such a manner where fill material will bond with the existing surface.
- C. Surfaces on which fill is to be placed and compacted shall be wetted or dried as may be required to obtain the specified compaction.

3.04 FILL

- A. Shall be placed in successive horizontal layers 8 inches to 12 inches in loose depth for the full width of the cross-section and compacted as required.

3.05 FINISHED GRADING

- A. All areas covered by the project including excavated and filled sections and adjacent transition areas shall be smooth graded and free from irregular surface changes.
- B. Degree of finish shall be that ordinarily obtainable from either blade-grader or scraper operations, supplemented with hand raking and finishing, except as otherwise specified.
- C. Unpaved areas to within 0.1 feet of elevations shown on the drawings provided such deviation does not create low spots that do not drain.
- D. Paved Areas – Subgrade to within 0.05 feet of the drawing elevations less the compacted thickness of the base and paving.
- E. Ditches and lagoon banks shall be finished graded, dressed, and seeded within 14 calendar days of work to reduce erosion and permit adequate drainage.

3.06 DISPOSAL OF WASTE MATERIAL

- A. All vegetation, roots, brush, sod, broken pavements, curb and gutter, rubbish, and other unsuitable material stripped or removed from limits of construction shall be disposed of by the Contractor. Waste material of an earth or vegetative nature and material removed from the dredge material containment area shall be placed within the disposal site indicated within the General Notes. All other unsuitable material (trash etc.) shall be disposed of in an approved landfill by the contractor.
- B. All suitable material may be placed within the stockpile area noted in the plans. Suitable material is defined as material which can be placed and compacted to the requirements for fill in this section. Heavy silts and clays can be disposed of per section A above.

3.07 PROTECTION

- A. Graded areas shall be protected from traffic, erosion, settlement, or any washing away occurring from any cause prior to acceptance.
- B. Contractor shall be responsible for protection of below grade utilities shown on the drawings or indicated by the Owner at all times during earthwork operations.
- C. Repair or re-establishment of graded areas prior to final acceptance shall be at the Contractors expense.
- D. Site drainage shall be provided and maintained by Contractor during construction until final acceptance of the project. Drainage may be by supplemental ditching, or pumping if necessary, prior to completion of permanent site drainage.

3.08 DRAINAGE

- A. Contractor shall be responsible for providing surface drainage away from all construction areas. This shall include maintenance of any existing ditches or those constructed in the immediate vicinity of the work. Contractor shall provide proper and effective measures to prevent siltation of wetlands, streams, and ditches on both the Owner's property, and those properties downstream.

3.09 FIELD QUALITY CONTROL

- A. Compaction testing shall be performed in accordance with ASTM D 6938. Where tests indicate the backfill does not meet specified requirements, the backfill shall be reworked or removed and replaced, and then retested at the Contractor's expense.
- B. Unpaved areas – at least 90% of maximum laboratory density within 2% optimum moisture content unless otherwise approved by the Engineer.
- C. Paved Areas and Under Structures – top 6 inch layer of subbase to at least 98% of maximum laboratory density within 2% optimum moisture content. Layers below top 6 inches shall be compacted to 95% of maximum laboratory density within 2% optimum moisture content.
- D. Dike Construction – top 12 inch layer of dike to at least 98% of maximum laboratory density within 2% optimum moisture content. Layers below top 12 inches shall be compacted to 95% of maximum laboratory density within 2% optimum moisture content.
- E. Rolling and compaction equipment and methods shall be subject to acceptance by the Engineer. Acceptance in no way relieves Contractor of the responsibility to perform in correct and timely means.
- F. Number of Tests – Under paved areas, no less than one density test per horizontal layer per 5,000 square feet of subbase shall be made. In unpaved areas, no less than one density test per horizontal layer per 10,000 square feet of fill area shall be made. Under curb and gutter, no less than one density test per every 300 linear feet.

3.10 PROOF ROLLING

- A. Shall be required on the subbase of all paved areas and dikes. Proof rolling shall take place after all underground utilities are installed and backfilled. The operation shall consist of rolling the subbase or base with a fully loaded 10– wheeled dump truck. A full load shall consist of 10 to 12 cubic yards of soil or rock. The dump truck shall be capable of traveling at a speed of two to five miles per hour and be in sound mechanical shape with no exhaust leaks or smoking from burning oil. Two complete coverages of the subgrade area are required to verify the subgrade condition.

*****END OF SECTION 31 00 00*****