

DIVISION 2 – SITE WORK

SECTION 02200

EARTHWORK

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Protection, modification and/or installation of utilities as site work progresses paying particular attention to grade changes and any necessary staging of work.
- B. Cutting, filling and grading to required lines, dimensions, contours and proposed elevations for proposed improvements.
- C. Scarifying, compaction, drying and removal of unsuitable material to ensure proper preparation of areas for fills or proposed improvements.

1.02 RELATED SECTIONS

- A. Section 02100 - Site Preparation
- B. Section 02223 - Excavation, Backfill and Compaction for Pavement
- C. Section 02227 - Aggregate Materials
- D. Construction Drawings

1.03 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM) latest edition.
 - D 422 Method for Particle Size Analysis of Soils
 - D 698 Test for Moisture-Density Relations of Soils Using 5.5 lb. (2.5 kg) Rammer and 12-inch (304.8 mm) Drop (Standard Proctor)
 - D 1556 Test for Density of soil in Place by the Sand Cone Method
 - D 1557 Test for Moisture-Density Relations of Soils Using 10-lb (4.5 Kg) Rammer and 18-inch (457 mm) Drop (Modified Proctor)
 - D 1559 Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
 - D 2167 Test for Density of Soil in Place by the Rubber Balloon Method
 - D 2216 Laboratory Determination of Moisture content of Soil
 - D 2487 Classification of Soils for Engineering Purposes
 - D 2922 Tests for Density of Soil and Soil- Aggregate in Place by Nuclear Methods (Shallow Depth)
 - D 3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 - D 4318 Test for Plastic Limit, Liquid Limit, and Plasticity Index of Soils
 - C 25 Chemical Analysis of Limestone, Quicklime and Hydrate Lime
 - C 110 Physical Testing for Quicklime and Hydrated Lime, Wet Sieve Method
 - C 618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
 - C 977 Quicklime and Hydrated Lime for Soil Stabilization
- B. American Association of State Highway and Transportation Officials (AASHTO) latest edition T 88 Mechanical Analysis of Soils

1.04 QUALITY ASSURANCE

- A. Independent Testing Laboratory selected and paid by Contractor, shall be retained to perform construction testing on site. Frequency of tests will be as follows:
 - 1. In cut areas: Not less than one compaction test for every 5,000 square feet.

2. In fill areas: Same rate of testing for each 8" lift (measured loose).
- B. If compaction requirements are not complied with at any time during construction process, remove and re-compact deficient areas until proper compaction is obtained at no additional expense to owner.
 - C. The following tests shall be performed on each type of on-site or imported soil material used as compacted fill as part of construction testing requirements.
 1. Moisture and Density Relationship: ASTM D 698 or ASTM D1557.
 2. Mechanical Analysis: AASHTO T-88
 3. Plasticity Index: ASTM D 4318
 - D. Field density tests for in-place materials shall be performed according to one of the following standards as part of construction testing requirements.
 1. Sand-Cone Method: ASTM D 1556
 2. Balloon Method: ASTM D 2167
 3. Nuclear Method: ASTM D 2922 (Method B-Direct Transmission)
 - E. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results. Owner, architect, and contractor shall be provided with copies of reports within 96 hours of time test was performed. In event that any test performed fails to meet these Specifications, owner and contractor shall be notified immediately by independent testing laboratory.
 - F. All costs related to retesting due to failures shall be paid for by the contractor at no additional expense to owner. Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that is deemed necessary. Contractor shall provide free access to site for testing activities.
- 1.05 SUBMITTALS
- A. Submit a sample of each type of off-site fill materials that is to be used at the site in an air tight, 10 lb container for the testing laboratory.
 - B. Submit the name of each material supplier and specific type and source of each material. Any change in source throughout the job requires approval of the owner or engineer.
 - C. For use of fabrics or geogrids, a sample and "cut sheet" shall be submitted for approval by the Owner.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Excavated and re-used material for subsoil fill as specified herein (outside limits of building pads only).
- B. Aggregate fill as specified in Section 02227.
- C. Imported select material – silty-clayey sands (SM-SC), low plasticity sand clays (CL) or clayey sands (SC) having a liquid limit less than 40 and a plasticity index between 8 and 20.
- D. Topsoil fill as specified in Section 02100.
- E. Acceptable stabilization fabrics and Geogrids:
 1. Amoco Propex 2006
 2. Beltech Style 980

3. Contech C300
4. Mirafi 600XContech C300
5. Hanes (Terra Tex) HD

PART 3 – EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours and datum.
- B. Locate and identify existing utilities that are to remain and protect them from damage.
- C. Notify utility companies to remove and/or relocate any utilities that are in conflict with the proposed improvements.
- D. Protect plant life, lawns, fences, existing structures, sidewalks, paving and curbs from excavating equipment and vehicular traffic.
- E. Protect benchmarks, property corners and all other survey monuments from damage or displacement. If a marker needs to be removed it shall be referenced by a licensed land surveyor and replaced, as necessary, by the same.
- F. Remove from site material encountered in grading operations that, in opinion of owner, is unsuitable or undesirable for backfilling, subgrade or foundation purposes. Dispose of in a manner satisfactory to owner. Backfill areas with layers of suitable material and compact as specified.
- G. Prior to placing fill in low areas, such as previously existing ditches, perform following procedures:
 1. Drain water out by gravity with ditch having flow line lower than lowest elevation in low area. If drainage cannot be performed by gravity ditch, use adequate pump to obtain same results.
 2. After drainage of low area is complete, remove mulch, mud, debris, and other unsuitable material by using acceptable equipment and methods that will keep natural soils underlying low areas dry and undisturbed.
 3. If material is found to be unsuitable, all unsuitable material shall be removed from site.

3.02 EXCAVATION FOR FILLING AND GRADING

- A. Classification of Excavation: Contractor by submitting bid acknowledges that he has investigated the site to determine type, quantity, quality, and character of excavation work to be performed. Excavation shall be considered unclassified common excavation.
- B. Perform excavation using capable, well maintained equipment and methods acceptable to owner and governing agencies.
- C. When performing grading operations during periods of wet weather, provide adequate drainage and ground water management to control moisture of soils.
- D. Shore, brace, and drain excavations as necessary to maintain safe, secure, and free of water at all times.
- E. Excavated material is unacceptable as fill within the paving area.

3.03 FILLING AND SUBGRADE PREPARATION

- A. Fill areas to contours and elevations shown with unfrozen materials.
- B. Place fill in continuous lifts specified herein.
- C. Refer to Section 02223 for filling requirements for pavements. Fill under building pads shall be at least 3 feet thick, beginning at 0.5 feet below finished floor elevation.

- D. Areas exposed by excavation or stripping and on which subgrade preparations are to be performed shall be proofrolled to detect any areas of yielding material. Proofrolling shall be accomplished by making a pass with a fully-loaded tandem-axle dump truck, or approved equivalent. Areas of failure shall be excavated and re-compacted as stated above. Care shall be taken to not overload soils; pumping of soft material shall be avoided.
- E. Place geofabric directly on smooth graded native subgrade prior to placement of any fill. Install in accordance with manufacturer's instructions.
- F. Fill materials used in preparation of subgrade shall be placed in lifts or layers not to exceed 8" loose measure and compacted to a minimum density of 95% of optimum density, in accordance with ASTM D 1557, at a moisture content of not less than 1% below and not more than 3% above the optimum moisture content.
- G. Material imported from off-site shall be capable of producing a CBR (California Bearing Ratio) value equal to or above the pavement design subgrade CBR value of 10 as indicated on the Drawings.

3.04 MAINTENANCE OF SUBGRADE

- A. Finished subgrades and subbase shall be verified to ensure proper elevation and conditions for construction above subgrade.
- B. Protect subgrade and subbase from excessive wheel loading during construction, including concrete trucks and dump trucks.
- C. Remove areas of finished subgrade or subbase found to have insufficient compaction density to depth necessary and replace in a manner that will comply with compaction requirements by use of select material. Surface of subgrade or subbase after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

3.05 FINISH GRADING

- A. Grade all areas where finish grade elevations or contours are indicated on Drawings, other than paved areas and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. Finished subgrade surface shall not be more than 0.10 feet above or below established finished subgrade elevation, and all ground surfaces shall vary uniformly between indicated elevations. Finish ditches shall be graded to allow for proper drainage without ponding and in a manner that will minimize erosion potential.
- B. Correct all settlement and eroded areas within one year after date of completion at no additional expense to owner. Bring grades to proper elevation. Replant or replace any grass, shrubs, bushes, or other vegetation that appears dead, dying or disturbed by construction activities. Refer to Section 02270 for slope protection and erosion control.

END OF SECTION 02200