

## SECTION 329113 - SOIL PREPARATION

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 00 and Division 01 Specifications Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section includes:
  - 1. Amended topsoil.
  - 2. Planting soil.
- B. Related Requirements:
  - 1. Section 31 10 00 "Site Clearing" for topsoil stripping and stockpiling.
  - 2. Section 32 92 00 "Turf and Grasses" for placing amended topsoil for turf and grasses.
  - 3. Section 32 93 00 "Plants" for placing planting soil for plantings.

## 1.03 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- B. CEC: Cation exchange capacity.
- C. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.
- D. Planting Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
- E. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."
- F. Amended Topsoil: Existing, on-site topsoil that has been modified as specified with soil amendments and fertilizers to produce a soil mixture for lawn growth.
- G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- H. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

- I. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

#### 1.04 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include test data substantiating that products comply with requirements.
  - 2. Material Certificates: For each type of soil amendment and fertilizer before delivery to the site, according to the following:
    - a. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
    - b. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.
- B. Amended Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
- C. Planting Soil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of planting soil.

#### 1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.

#### 1.07 QUALITY ASSURANCE

- A. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

#### 1.08 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction soil analyses on existing, on-site soil.
  - 1. Notify Architect seven days in advance of the dates and times when laboratory samples will be taken.
- B. Preconstruction Soil Analyses: For each unamended existing topsoil to be used for the re-spreading of amended topsoil, perform testing on 3 soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a

qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.

1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

#### 1.09 SOIL-SAMPLING REQUIREMENTS

- A. General: Extract soil samples according to requirements in this article.
- B. Sample Collection and Labeling: Have samples taken and labeled by Contractor in presence of Architect under the direction of the testing agency.
  1. Number and Location of Samples: Minimum of three representative soil samples from varied locations for topsoil to be amended for topsoil purposes.
  2. Procedures and Depth of Samples: According to USDA-NRCS's "Field Book for Describing and Sampling Soils."
  3. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

#### 1.10 TESTING REQUIREMENTS

- A. General: Perform tests on soil samples according to requirements in this article.
- B. Physical Testing:
  1. Soil Texture: Soil-particle, size-distribution analysis by one of the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":
    - a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
    - b. Hydrometer Method: Report percentages of sand, silt, and clay.
- C. Chemical Testing:
  1. Soil pH Level.
  2. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
- D. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
- E. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.
  1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. for 6-inchdepth of soil.
  2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. for 6-inchdepth of soil.

### 1.11 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.
- B. Bulk Materials:
  - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  - 3. Do not move or handle materials when they are wet or frozen.
  - 4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Regional Materials: Soil amendments and fertilizers shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

### 2.02 AMENDED TOPSOIL

- A. Amended Topsoil: Existing, on-site surface soil, with the duff layer, if any, retained; and stockpiled on-site; modified to produce amended topsoil for new lawns. Amend existing, on-site surface soil with soil amendments and fertilizers to meet the following requirements:
  - 1. Loose, friable, natural, fertile soil, free of stones, clay lumps, roots, and foreign or toxic matter.
  - 2. Classified in the "Sandy Loam" portion of the U.S.D.A. Soil Textural Triangle. The fraction passing the #10 sieve shall meet the following mechanical analysis:
    - a. 10 to 20% clay (less than 0.002 mm particle size).
    - b. 50 to 60% sand (2.0 to 0.05 mm particle size).
    - c. 20 to 30% silt (0.05 mm to .002 mm particle size).
  - 3. Contain neither less than 6%, nor more than 15%, organic matter as determined by loss on ignition of samples oven-dried to constant weight at 212° F.
  - 4. Have a pH level of between 6.8 and 7.3.
  - 5. All topsoil shall be screened through a 1" screen.
- B. If amended topsoil test results indicate the soil does not meet the requirements listed above, contractor shall amend the soil further, and retest the soil. Contractor shall repeat this process until the soil meets the specifications.

### 2.03 PLANTING SOIL

- A. Planting Soil: Planting soil shall meet the following requirements:

1. Consists of equal parts (by volume) of the following:
  - a. Topsoil.
  - b. Sharp, clean bedding sand conforming to ASTM C-33.
  - c. Organic Soil Amendment.
2. Mechanically combined by a supplier with at least five years' experience in similar blending work. Contractor must provide Owner's Representative with certification letter from supplier.
3. Final blend from Part 1 above shall be classified in the "Sandy Loam" portion of the U.S.D.A Soil Textural Triangle. For Growing Medium to be classified as "Sandy Loam," that fraction passing the #10 sieve shall meet the following mechanical analysis:
  - a. 50 to 75% sand (2.0 to 0.05 mm particle size).
  - b. 15 to 45% silt (0.05 mm to 0.002 mm particle size).
  - c. 4 to 20% clay (less than 0.002 mm particle size).
4. pH between 6.8 and 7.3.
5. Organic content between 15 and 30%.

#### 2.04 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
  1. Class: T, with a minimum of 99 percent passing through a No. 8 sieve and a minimum of 75 percent passing through a No. 60 sieve.
  2. Class: O, with a minimum of 95 percent passing through a No. 8 sieve and a minimum of 55 percent passing through a No. 60 sieve.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.
- C. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C 33/C 33M.

#### 2.05 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:
  1. Feedstock: Limited to leaves.
  2. Reaction: pH of 5.5 to 8.
  3. Moisture Content: 35 to 55 percent by weight.
  4. Organic-Matter Content: 50 to 60 percent of dry weight.
  5. Particle Size: Minimum of 98 percent passing through a 1/2-inch sieve.

### PART 3 - EXECUTION

#### 3.01 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.

- B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.
- C. Proceed with placement only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

- A. Excavation: Excavate soil from designated area and stockpile until amended.
- B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
- C. Screening: Pass unamended soil through a 1-1/4 inch sieve to remove large materials.

### 3.03 PLACING AND MIXING TOPSOIL OVER EXPOSED SUBGRADE

- A. General: Apply and mix unamended soil with amendments on-site to produce amended topsoil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of 4 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- C. Mixing: Spread unamended soil to total depth indicated on Drawings, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
  - 1. Amendments: Apply soil amendments evenly on surface, and thoroughly blend them with unamended soil to produce amended topsoil.
- D. Compaction: Compact each blended lift of amended topsoil to 85 percent of maximum Standard Proctor density according to ASTM D 698 and tested in-place.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

### 3.04 PLACING PLANTING SOIL OVER EXPOSED SUBGRADE

- A. General: Apply planting soil on-site in its final, blended condition. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of 4 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

- C. Application: Spread planting soil to total depth indicated on Drawings, but not less than required to meet finish grades after natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
  - 1. Lifts: Apply planting soil in lifts not exceeding 8 inches in loose depth for material compacted by compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- D. Compaction: Compact each lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

### 3.05 FIELD QUALITY CONTROL

- A. Soil will be considered defective if it does not pass tests.
- B. Prepare a minimum of 3 test reports for amended topsoil, and planting soil indicating they are in compliance with requirements.
- C. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

### 3.06 PROTECTION

- A. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Parking vehicles or equipment.
  - 3. Vehicle traffic.
  - 4. Foot traffic.
  - 5. Erection of sheds or structures.
  - 6. Impoundment of water.
  - 7. Excavation or other digging unless otherwise indicated.
- B. If amended topsoil, planting soil, or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Architect and replace contaminated planting soil with new planting soil.

### 3.07 CLEANING

- A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.

- B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
  - 1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION 329113