

SECTION 02911 - PLANTING SOIL FOR MODULAR TREE CELLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Furnishing and installation of Planting Soil within the modular tree cell system.

- B. Related Sections:

- 1. Section 02216 "Modular Tree Cells"
- 2. Section 02520 "PCC Sidewalks and Driveways"
- 3. Section 02630 "Unit Pavers"
- 4. Section 02720 "Drainage"
- 5. Section 02725 "Subsurface Infiltration Bed"
- 6. Section 02930 "Exterior Plants"

1.3 DEFINITIONS

- A. Planting Soil: Soil, of a variety of textures, defined in this section, intended to fill the frames and other planting spaces to support the growth of trees and other plants.
- B. Modular Tree Cells: Plastic structural cellular system with post, beams and decks designed to be filled with planting soil for tree rooting and/or be used for water storage and support vehicle loaded pavements.
- C. Tree: A perennial woody plant with one or several trunks and a distinct crown and intended to become large enough to shade people and or vehicles.

1.4 SUBMITTALS

- A. Prior to ordering materials, the Contractor shall provide submittals required in this section to the Engineer/Owner for review and approval.
- B. Product Data: For each type of product, submit manufacture's product literature with technical data sufficient to demonstrate that the product meets these specifications.
- C. Material Certificates: Submit material certificates for all natural and bulk material indicating that the material meets the requirements of the specification to the Engineer for approval.

D. Samples for Verification: Submit samples of each product and material where required by the specification to the Engineer for approval. Label samples to indicate product, specification number, characteristics, and locations in the Work. Samples will be reviewed for appearance only. Compliance with all other requirements is the exclusive responsibility of the contractor. Delivered materials shall closely match the samples.

1. Submit two gallon samples of all topsoil, sand, soil additive products, and planting mixes in this section. The number of samples shall be as required for each material.

- a. Samples should be labeled to include the location of the source of the material.
- b. Samples of all topsoil, sand, soil additive products, planting soil and planting mix shall be submitted at the same time as the particle size and physical analysis of that material.
- c. Planting mixes shall be labeled as to the percentage of each component in the mix.

2. Submit soil test analysis report for each sample of topsoil, planting soil and planting mix from an approved soil-testing laboratory.

- a. The soil testing laboratory shall be approved by the Engineer in advance. The testing lab shall be a member of the Soil Science Society of America's, North American Proficiency Testing Program (NAPT), and have a minimum of 5 years experience with the test protocols of the United States Golf Association - Green Section.
- b. Provide a particle size analysis including the following gradient of mineral content:

<u>USDA Designation</u>	<u>Size in mm.</u>
Gravel	+2mm
Very Coarse Sand	1-2 mm
Coarse Sand	0.5 -1 mm
Medium Sand	0.25-0.5 mm
Fine Sand	0.1-0.25 mm
Very Fine Sand	0.05-0.1 mm
Silt	0.002-0.05 mm
Clay	minus 0.002 mm

c. Provide a chemical analysis including the following:

pH and Buffer pH

Percent organic content by oven dried weight.

Nutrient levels by parts per million including nitrogen, phosphorus, potassium magnesium, manganese, iron, zinc and calcium. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the planting mix.

Soluble salt by electrical conductivity of a 1:2 soil water sample measured in Milliohm per cm.

Cation Exchange Capacity (CEC).

Chemical analysis shall include recommendations from the soils laboratory as to ranges of each element appropriate for the types of plants to be grown in the soil.

- d. Provide a physical analysis of each planting mix to include the following test results:

Water permeability with the sample compacted to 80% and 85% maximum proctor density utilizing proctor test (ASTM D 698-91). Test results shall indicate bulk density of oven dry sample at 80% and 85% expressed in grams per cubic centimeter.

For bioretention soil, also provide soil infiltration rate in inches per hour before and after installation using standard acceptable practices such as a double ring infiltrometer..

- e. All testing will be at the expense of the Contractor. The Engineer may request additional Planting mix test on different mix component ratios in order to attain results that more closely meet the mix requirements.
- 3. Submit the manufacturer's particle size analysis for all sand and gravel to the Engineer for approval. Provide the manufacturer's Fines Modulus Index for each sand source.
 - 4. Submit the manufacturer's particle size analysis, pH and certificate of length of composting period for all pine bark and other organic materials to the Engineer for approval.

1.5 SOIL INSTALLATION MOCK UP AND COMPACTION EVALUATION

- A. Prior to the installation of planting soil within the modular tree cells, construct a mock up of the complete installation at the site. The installation of the mock up shall be in the presence of the Engineer.
- B. The modular tree cell mock up shall be as described in Specification Section 02216 Modular Tree Cells.

1.6 SCHEDULING

- A. General: Prior to the start of Work, prepare a detailed schedule of the work for coordination with other trades.
- B. Schedule all utility installations prior to beginning work in this section.
- C. Where possible, schedule the installation of planting soil within the modular tree cells immediately after the installation of the modular tree cell frames. Protect installed modular tree cells from damage in the event that work must occur over or adjacent to the completed modular tree cells.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Soil within the modular tree cells shall be installed by the same contractor who is installing the modular tree cells. See Specification Section 02216 Modular Tree Cells for installer qualifications.

1.8 PERMITS AND CODE COMPLIANCE

- A. Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary permits/approvals from all such authorities.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, if applicable. Protect materials from deterioration during delivery and while on the project site.
- B. Bulk Materials: Do not deliver or place backfill, soils and soil amendments in frozen, wet, or muddy conditions.
 - 1. Do not dump or store bulk materials near structures, utilities, sidewalks, pavements, and other facilities, or on existing trees, turf areas or plants.
 - 2. Provide protection including tarps, plastic and or matting between all bulk materials and any finished surfaces sufficient to protect the finish material.
- C. Provide erosion-control measures to prevent erosion or displacement of bulk materials and discharge of soil-bearing water runoff or airborne dust to adjacent properties, water conveyance systems, and walkways. Provide additional sediment control to retain excavated material, backfill, soil amendments and planting mix within the project limits as needed.
- D. Protect modular tree cells from damage during installation of planting soil.

1.10 PROJECT CONDITIONS

- A. During the installation of Planting Soil within the modular tree cells comply with all project conditions in Specification Section 02216 - Modular Tree Cells
- B. Weather Limitations: Do not proceed with work when subgrades, soils and planting soils are in a wet, muddy or frozen condition.

1.11 PROJECT WORK

- A. Coordinate installation with all other work that may impact the completion of the work.

1.12 PRECONSTRUCTION MEETING

- A. Prior to the start of the installation of Planting Soil within the modular tree cells, meet at the site with the Engineer, general contractor and the modular tree cells installer to review installation layout, procedures, means and methods.

PART 2 - PRODUCTS

2.1 TOPSOIL (FOR USE AS A BASE IN A PLANTING SOIL MIX)

- A. Fertile, friable, loamy soil, containing 1.5 to 5 percent by dry weight organic matter; free from subsoil, refuse, roots, heavy or stiff clay, stones larger than 1 inch, noxious seeds, sticks, brush, litter, and other deleterious substances; suitable for the germination of seeds and the support of vegetative growth. The pH value shall be between 5.5 and 7.5. Soil shall be harvested at a single source from the O and or A horizons of the soil profile. Soil source location and extent of area suitable for harvest shall be approved by the Engineer.
- B. Soil Texture: Loam, Sandy loam, sandy clay loam, with clay content between 20 and 35% and silt content between 15 and 30%. Gravel and stone content shall be less than 10% by weight.
- C. Provide a minimum of 3 soil tests from samples obtained throughout the source stockpile that represent the range of the soil available at the source.
- D. Provide a two gallon sample from each top soil source with soil testing results. The sample shall be a mixture of the random samples taken around the source stockpile or field.

2.2 COMPOST

- A. Compost shall be mature, stable, weed free, and produced by aerobic decomposition of organic matter. Compost feedstock shall be yard waste trimmings and/or source-separated municipal solid waste to produce a fugally dominated compost. The product must not contain any visible refuse or other physical contaminants, substances toxic to plants, or over 5% sand, silt, clay or rock material by dry weight. The product shall possess no objectionable odors. The product must meet all applicable USEPA CFR, Title 40, Part 503 Standards for Class A biosolids. The moisture level shall be such that no visible water or dust is produced when handling the material.
- B. Compost shall be dark brown in color, approximately the color of dark chocolate candy (70% chocolate). Black compost and compost the color of milk chocolate shall be rejected.
- C. Compost shall have a strong aerobic (sweet) odor. Compost lacking a strong aerobic odor or which has an anaerobic (sour) odor shall be rejected.
- D. Testing: The results of Compost analysis shall be provided by the Compost supplier. Before delivery of the Compost, the supplier must provide the following documentation:

1. Feedstock percentage in the final Compost product
2. A statement that the Compost meets federal and state health and safety regulations
3. A copy of the lab analysis, less than four months old, performed by a Seal of Testing Assurance Certified Laboratory verifying that the Compost meets the following requirements:.

Physical Requirements for Composted Organic Matter

Parameter	Range	Testing Method
pH	5.5-7.5	TMECC 4.11A
Soluble Salt Concentration	< 4dS/m	TMECC 4.10-A
Moisture	35-55% wet weight basis	
Organic Matter	>35% dry weight basis	TMECC 5.07-A
Carbon to nitrogen ratio	15:1 -30:1	
Particle Size	99% pass through 2 inch screen or smaller; 25% pass through 3/8 inch screen or smaller	TMECC 2.02-B
Maturity Index	6 to 8	Solvita
Physical contaminants (man made inerts)	<1% dry weight basis	TMECC 3.08-A
Chemical contaminants	Meet or exceed US EPA Class A standard, 40 CFR § 503.13, Tables 1 and 3 levels:	
Arsenic	< 41ppm	TMECC 4.06-AS
Cadmium	< 39 ppm	TMECC 4.06-CD
Copper	< 1,500 ppm	TMECC 4.05-CU
Lead	< 300 ppm	TMECC 4.06-PB
Mercury	< 17 ppm	TMECC 4.06-HG
Molybdenum	< 75 ppm	TMECC 4.05-MO
Nickel	< 420 ppm	TMECC 4.06-NI
Selenium	< 100 ppm	TMECC 4.06-SE
Zinc	< 2,800 ppm	TMECC 4.06-ZN
Biological contaminants (pathogens)	Meet or exceed US EPA Class A standard,40 CFR§ 503.32(a) levels:	
Fecal coliform	< 1,000 MPN per gram, dry weight basis	TMECC 7.01
Salmonella	< 3 MPN per 4 grams, dry weight basis	TMECC 7.02

Compost testing methodologies and sampling procedures shall be as provided in Test methods for the Examination of Composting and Compost (TMECC), as published by the US Composting Council.

- E. Provide a two gallon sample with manufacturers literature and material certification that the product meets the requirements.

2.3 COARSE SAND

- A. Coarse concrete sand, ASTM C-33 Fine Aggregate, with a Fines Modulus Index of 2.8 and 3.2.
 - 1. Sands shall be clean, sharp, natural sands free of limestone, shale and slate particles. Sand PH shall be lower than 7.0
 - 2. Provide the following particle size distribution:

<u>Sieve</u>	<u>Percent Passing</u>
3/8" (9.5mm)	100
No 4 (4.75mm)	95-100
No 8 (2.36mm)	80-100
No 16(1.18mm)	50-85
No30 (.60mm)	25-60
No50 (.30mm)	10-30
No100 (.15mm)	2-10

- B. Provide a two gallon sample with manufacturer's literature and material certification that the product meets the requirements.

2.4 PLANTING SOIL MIX FOR MODULAR TREE CELLS

- A. Planting mix of compost and coarse sand mixed to the following proportion.

<u>Material</u>	<u>% by volume</u>
Compost	20%
Coarse Sand	80%

Adjust the ratio of the components to achieve water permeability; minimum 4 inches per hour, when compacted to 80-85% of maximum dry density. Submit multiple mix ratios for permeability testing to establish the correct mix ratio for the bioretention soil mix.

- B. Planting mix shall be thoroughly mixed prior to installation.
- C. Final mix shall have a pH of between 6.0 and 7.5.
- D. Provide one (two gallon) sample of each mix ratio with the required soil test results.

PART 3 - EXECUTION

- A. Install planting soil in modular tree cells and mulch as described in Section 02216 - Modular Tree Cells.

END OF SECTION