

ITEM 613.0106 11 M – STRUCTURAL SOIL MIX

DESCRIPTION

Under this item the Contractor shall furnish, mix and place a Structural Soil Mix with Hydrogel on Geotextile Separation in the locations shown on the plans.

MATERIALS

Structural Soil Mix shall conform with “CU Soil”, as patented by Cornell University, Patent #5,849,069. The product shall be obtained from a licensed producer and proof of such licensing shall be submitted to the Route 9A Landscape Architect prior to delivery to the site. Licensed providers include:

- East Coast Mine, Quogue, NY
- Tully Environmental Co. d/b/a Evergreen Recycling of Corona, NY
- Ascape Landscape, New City, NY

Structural Soil shall have the following composition:

1. The Structural Soil Mix shall have a moisture content of 10% (AASHTO T-99 optimum moisture).
2. The pH of the material shall be between 5.5 and 6.0
3. Gradation

The structural soil material shall consist of three components mixed in the following proportions by weight:

- Crushed Stone: 100 parts
 - Clay Loam: 20 parts
 - Hydrogel: 0.03 parts
- A. Crushed Stone shall be granite or sandstone (no limestone shall be used) and shall be narrowly graded from 19 mm to 38 mm, highly angular with no fines and in the following proportions:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
38mm	90 to 100
25mm	20 to 55
20mm	10

Contractor shall submit representative samples of crushed stone to a Testing Laboratory approved by the Route 9A Landscape Architect. Following testing, Contractor shall submit a sealed 10 kilogram bag of crushed stone with a test report from the Testing Laboratory to the Route 9A Landscape Architect for approval. The testing report shall include the following tests and recommendations:

- 1) Particle size
- 2) Losses and rodded unit weight
- 3) Bulk specific gravity

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- 4) Soundness
- 5) Absorbance
- 6) Stone dimensions as per ASTM D4791 for crushed stone

B. Clay Loam shall meet the following requirements:

- 1) Not less than 25% or more than 30% of the clay loam by weight shall be sand. 100% of the sand fraction shall pass the 2 mm sieve and 100% shall be retained by the 50 µm sieve.
- 2) Not less than 20% or more than 40% of the clay loam by weight shall be silt. The particle size distribution for the silt shall be 2 µm to 50 µm.
- 3) Not less than 25% or more than 40% of the clay loam by weight shall be clay. The particle size distribution for the clay shall include all particles smaller than 2 µm.
- 4) Not less than 2.75% or more than 5% of the clay loam by weight shall be decayed organic matter (humus) as determined by ASTM F-1647. If organic amendments are needed to obtain the specific organic matter content of the topsoil, the organic matter source shall be peat, composted leaves (leaf mold) or other approved organic amendments. Peat shall be sphagnum peat having ash content not exceeding 15%, as determined by ASTM D-2974. Leaf mold must be substantially free of sticks, stones, roots, plastic, glass, metal and other debris. One-hundred (100%) percent of the leaf mold must pass a 12.50 mm screen. The leaf mold chemical analysis shall conform to the following:
 - a) The soluble salt content (conductivity) must be less than 150 MHOS per cubic meter for a 1:5 leaf mold to water ratio.
 - b) The pH shall not exceed 6.8.
 - c) The carbon/nitrogen ratio shall fall between 12:1 and 25:1.
 - d) A fertility analysis (nitrate, phosphate, potassium, calcium and magnesium levels) must be provided for each batch of leaf mold as well as a trace nutrient content analysis with the following requirements:

TRACE NUTRIENT CONTENT

	<u>ACETATE EXTRACT</u>	<u>HCL EXTRACT</u>
Iron	0.5-5 ppm	≥ 5 ppm
Manganese	0.5-8 ppm	≤ 15.4 ppm
Molybdenum	0.5-1 ppm	≥ 1 ppm
Zinc	0.1-1 ppm	≥ 4.4 ppm
Aluminum	0.1-2 ppm	≥ 2 ppm
Boron	0.1-1 ppm	≥ 1.7 ppm
Copper	0.1-1 ppm	≥ 1 ppm

- 5) The Contractor shall submit representative samples to a Soil/Plant Testing Laboratory acceptable to the Route 9A Landscape Architect. Contractor shall submit a sealed 10 kilogram bag of clay loam with a test report from the Testing Laboratory to the Route 9A Landscape Architect for approval. The Contractor, as directed by the Route 9A Landscape Architect following review of the testing agency report shall correct deficiencies in the Clay

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Loam prior to mixing of the Structural Soil Mix proportions. Testing reports shall include the following tests and recommendations:

- a) Particle size analysis of the clay loam as determined by ASTM F-1632 shall be performed and compared to the USDA Soil Classification System.
- b) Percent (%) organic matter shall be determined by Loss on Ignition.
- c) Saturated hydraulic conductivity shall be tested and reported in mm per hour.
- d) Total porosity, capillary porosity and aeration porosity shall be measured.
- e) Chemical analysis shall be undertaken for Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, cation exchange capacity, base saturation, percentages micro-nutrients, soluble salts and acidity (pH).
- f) Soil analysis tests shall show recommendations for soil additives or fertilizers to correct soil deficiencies as necessary.

4. Geotextile Separation shall be as per §207.11M except as follows:

Geotextile shall be synthetic and rotproof.

The fabric shall be:

- AEF 480 HS as manufactured by American Engineering Fabric, Inc.
- 140 NL, as manufactured by Mirafi,
- FX40 HS as manufactured by Carthage Mills
- or approved equal.

5. The Hydrogel/Wetting Agent shall be potassium propenoate-propenamide copolymer hydrogel such as:

- Gelscape, Amereq Corporation, NY
- Soilmoist, JRM Chemical Inc., Cleveland, OH
- Supersorb, Aquatrols Corporation, Cherry Hill, NJ
- or approved equal.

6. Water - Shall comply with ASSHTO T26

CONSTRUCTION DETAILS

Quality Control:

All Structural Soil shall be mixed by a licensed provider using appropriate soil measuring, mixing, and shredding equipment of sufficient capacity and capability to assure proper quality control and consistent mix ratios. Samples of the Structural Soil Mix scheduled to be brought to the site must be approved by the Route 9A Landscape Architect prior to delivery.

Structural Soil shall not be mixed or transported when rain is expected. Structural Soil components and finished mixtures shall be protected from excess water absorption and erosion at all times.

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The sufficient quantities of material shall be mixed in advance of the time needed on site to allow adequate time for quality control testing. Structural Soil shall be stored in piles less than 400 cubic meters, and shall be protected from rain and potential erosion with plastic covering.

Mixing:

The hydrogel is added in a small amount to act as a tackifier, preventing separation of the stone and soil during mixing and installation. Mixing shall be done on a paved surface using front-end loaders. The stone shall be spread in a layer, the dry hydrogel is spread evenly on top and the screened moist clay loam is the top layer. The entire pile is turned and mixed until a uniform blend is produced. During the mixing process, the Contractor shall take two 0.03 cubic meter quality control sample per maximum 400 cubic meters of mixed structural soil. Each sample will be tested by an approved Soil Testing Laboratory. Sealed sample and test results shall be submitted to the Route 9A Landscape Architect for approval. The structural soil is then placed and compacted in 150 mm lifts.

Crushed stone, soil, hydrogel, organic material, water, and any amendments necessary to meet the requirements of this specification shall be mixed prior to placement. Soil and leaf-mold shall be furnished by one supplier each or the same supplier. Changing suppliers during the Contract shall not be permitted. On-site work and off-site mixing shall be performed only during suitable weather conditions. Soil shall not be worked when frozen, excessively wet, or under otherwise unsatisfactory conditions.

Placement:

The soil mix shall not be installed until analyzed and approved by the Route 9A Landscape Architect. When placing structural soil material, it must be free of clods and must be protected from drying out. The mixture must not be over mixed causing the material to become pelletized.

The Contractor shall properly place the filter fabric without holes or tears so it overlaps adjacent pieces by a minimum of 300 mm in the tree pit areas.

Prior to placing pavement over structural soil, the Route 9A Landscape Architect shall check the consistency of the placed Structural Soil against the approved sample supplied by the Contractor. In the event that the material supplied varies significantly from the approved sample, the Route 9A Landscape Architect may request the Contractor test the installed structural soil. Any mix that varies significantly from the approved testing results, as determined by the Route 9A Landscape Architect, shall be removed and new Structural Soil shall be installed that meets the specifications. When the Route 9A Landscape Architect determines density tests are necessary and as required below, the Contractor shall provide any assistance required facilitate such tests. Such assistance shall include, but will not be limited to, excavation and backfill of test holes. This work shall be considered to be incidental. Where placed under pavers, sidewalks, walkways, promenades and bikeways, structural soil mix shall be compacted to a minimum 95% Standard Proctor Maximum Density. Structural soil shall not be placed under roadway pavements, structures, foundations, manholes, handholes, survey monuments and concentrated loads requiring long term uniform support.

Work shall be in accordance with §203-3.01, -3.03, -3.04, -3.09, -3.11, -3.12, and -3.15 of the Standard Specifications.

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METHOD OF MEASUREMENT

The quantity to be paid for will be measured as the number of cubic meters of Structural Soil Mix furnished and installed in accordance with the plans and specifications or as directed by the Route 9A Landscape Architect.

BASIS OF PAYMENT

The unit bid price shall include the cost of furnishing all labor, materials including hydrogel and equipment necessary to complete the work. Geotextile Separation will be paid for under its respective item.

DISAPPROVED BY EI 12-001