SPECIAL PROVISIONS
FOR
ENGINEERED PLANTING SOIL

Monona County
STPN-175-1(87)--2J-67

Effective Date
June 21, 2022

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

150888a.01 DESCRIPTION.

A. Description.
All Engineered Planting Soil (Structural Soil) and related items on the contract documents.

B. Samples and Submittals.

1. Submit the locations of all source fields for clay loam.

2. Submit soil test analysis reports for each sample of Structural Soil from an approved soil-testing laboratory. The rest results shall report the following:

3. The soil testing laboratory shall be approved by the Engineer. The testing laboratory for particle size and chemical analysis may be a public agricultural extension service agency or agricultural experiment station.

4. Submit a bulk density of the sample and particle size analysis including the following gradient of mineral content:

USDA Designation	Size in mm
3”	+76mm
2 1/2”	63-76mm
2”	50-63mm
1 ½”	37-50mm
1”	52-37mm
¾”	19-25mm
Fine Gravel	2-19mm
Sand	0.05-2mm
Silt	0.002-0.05mm
Clay	minus 0.002

5. Sieve analysis shall be performed and compared to United States Department of Agriculture (USDA) Soil Classification System. Sieve analysis shall be done by a combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D422 after destruction of organic matter by hydrogen peroxide.

6. Submit a chemical analysis, performed in accordance with current Association of Official Agricultural Chemists (AOAC) Standards, including the following:
   - pH and Buffer pH.
   - Percent organic matter as determined by the loss of ignition of oven dried samples. Test samples shall be oven dried to a constant weight at a temperature of 230 °F, ± 9 °F.
   - Analysis for nutrient levels by parts per million including nitrate nitrogen, ammonium nitrogen, phosphorus, potassium, magnesium, manganese, iron, zinc, calcium and extractable aluminum. Nutrient test shall include the testing laboratory recommendations for supplemental addition to the soil as calculated by the amount of material to be added per volume of soil for the type of plants to be grown in the soil.
   - Analysis for levels of toxic elements and compounds including arsenic, boron, cadmium, chromium, copper, lead, mercury, molybdenum, nickle, zinc and PCB. Test results shall be cited in milligrams per kilogram.
   - Soluble salt by electrical conductivity of a 1:2 soil/water sample measured in Millimho per cm.
   - Cation Exchage Capacity (CEC).
   - Carbon/Nitrogen Ratio.
   - Submit five point minimum moisture density curve AASHTO T 99 test results for each Structural Soil sample without removing oversized aggregate.
   - Submit California Bearing Ratio test results for each Structural Soil sample compacted to peak standard density. The soaked CBR shall equal or exceed a value of 50.
   - Submit measured dry-weight percentage of stone in the mixture.

7. All testing and analysis shall be at the expense of the Contractor.

8. Submit shop drawings for HYDROGEL.

9. Submit shop drawings of filter fabric.

C. Delivery, Storage, and Handling.

1. Do not deliver or place soils in frozen, wet, or muddy conditions. Material shall be delivered at or near optimum compaction moisture content as determined by AASHTO T 99 (ASTM D 698). Do not deliver or place materials in an excessively moist condition (beyond 2 percent above optimum compaction moisture content as determined by AASHTO T 99 (ASTM D 698).

2. Protect soils and mixes from absorbing excess water and from erosion at all times. Do not store materials unprotected from large rainfall events. Do not allow excess water to enter site prior to compaction. If water is introduced into the material after grading, allow material to drain or aerate to optimum compaction moisture content.

D. Examination of Conditions.

1. All areas to receive Structural Soil shall be inspected by the Contractor before starting work and all defects such as incorrect grading, compaction and inadequate drainage etc. shall be reported to the Engineer prior to beginning this work.

2. The Contractor shall be responsible for judging the full extent of work requirements involved, including but not limited to the potential need for temporary storage and staging of soils,

including moving soil stock piles at the site to accommodate scheduling of other work and the need to protect installed soils from compaction, erosion and contamination.

150888a.02 MATERIALS.

A. Clay Loam.

1. Clay Loam shall be a “loam” based on the “USDA classification system” as determined by mechanical analysis (ASTM D-422) and it shall be of uniform composition, without admixture of subsoil. It shall be free of stones greater than 1/2 inch, lumps, plants and their roots, debris and other extraneous matter over one inch in diameter or less of smaller pieces of the same materials as determined by the Engineer. It shall not contain toxic substances harmful to plant growth. It shall be obtained from naturally well-drained areas, which have never been stripped of topsoil before and have a history of satisfactory vegetative growth. Clay Loam shall contain not less than 2% or more than 5% organic matter as determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 °F., ± 9 °F.

2. Mechanical analysis for a Loam/Clay Loam shall be as follows:

Textural Class	% of total weight
Gravel	less than 5%
Sand	20-45%
Silt	20-50%
Clay	20-40%

3. Chemical analysis: Meet of be amended to meet the following criteria.
- pH between 5.5 to 6.5
- Percent organic matter 2-5% by dry weight.
- Nutrient levels as required by the testing laboratory recommendations for the type of plants to be grown in the soil.
- Toxic elements and compounds below the U.S. EPA Standards for Exceptional Quality sludge or local standard; whichever is more stringent.
- Soluble salt less than 1.0 Millimho per cm.
- Cation Exchange Capacity (CEC) greater than 10
- Carbon/Nitrogen Ration less than 33:1.
- No topsoil shall come from USDA – classified prime farmland.

B. Fertilizer.

1. Commercial fertilizer complying with County, State and United States fertilizer laws. Deliver fertilizer in original unopened containers, which shall bear the manufacturer’s certificate of compliance covering analysis, which shall be furnished to the Engineer. Fertilizer shall be formulated for mixing into the soil and be certified by the manufacturer to provide controlled release of nitrogen continuously for a period of no less than 9 months and no more than 12 months.

2. Fertilizer percentages of weight of ingredients and application rates shall be as recommended by the soil testing results.

C. Sulfur.

1. Sulfur shall be commercial granular, 96% pure sulfur, delivered in containers with the name of the manufacturer, material and analysis appearing in the container.

2. Sulfur used to lower soil pH above 6.5 shall be ferrous sulfate formulation.

D. Lime.
Agricultural limestone containing a minimum of 85% carbonates. Minimum gradation: 100% passing No. 10 mesh sieve, 98% passing No. 20 mesh sieve, 55% passing No. 60 mesh sieve and 40% passing No. 100 mesh sieve.

E. Hyrdogel.
Hydrogel shall be a potassium propenoate-propenamide copolymer planting gell.

F. Structural Soil.
A uniformly blended mixture of Clay Loam and Hydrogel, mixed to the following proportion:

MATERIAL	UNIT OF WEIGHT
Loam	as determined by the test of the mix
Hydrogel	0.03 units dry weight
Total moisture	AASHTO T-99 optimum moisture

150888a.03 CONSTRUCTION.

A. Soil Mixing And Quality Control Testing.

1. All Structural Soil mixing shall be performed at the Contractor's yard using appropriate soil measuring, mixing and shredding equipment of sufficient capacity and capability to assure proper quality control and consistent mix ratios. Portable mixing equipment may be used.

2. Maintain adequate moisture content during the mixing process. Soils and mix components shall easily shred and break down without clumping. Soil clods shall easily break down into a fine crumbly texture. Soils shall not be overly wet or dry. The contractor shall measure and monitor the amount of soil moisture at the mixing site periodically during the mixing process.

3. A mixing prodedure for front-end loader shall be as follows:
- **a.** On a flat asphalt or concrete paved surface, spread proportional amount of clay loam according to the mix design. Spread over the clay loam a proporation amount of the dry hydrogel.
- **b.** Blend the entire amount by turning, using a front-end loader or other suitable equipment until a consistent blend is produced.
- **c.** Add moisture gradually and evenly during the blending and turning operation as required to achieve the required moisture content. Delay applications of moisture for 10 minutes prior to successive applications. Once established, mixing should produce a material within 1% of the optimum moisture level for compaction.

4. Another mixing operation procedure may be used as an alternate.

5. Add soil amendments to alter soil fertility including fertilizers and pH adjustment at the time of mixing at the rates recommended by the soil test.

B. Site Preparation.

1. Excavate within the planters a depth of 15 inches from the top of the 6 inch curb. Do not over excavated compacted sub-grades of adjacent pavement or structures.

2. Clear the excavation of all construction debris, rubble and any foreign material. In the event that fuels, oils, concrete washout silts or other material harmful to plants have been spiled into the sub-grade material, excavate the soil sufficiently to remove the harmful material. Fill any over excavation with approved fill and compact to the required sub-grade compaction.

3. Do not proceed with the installation of Structural Soil until all utility work in the area has been installed.

4. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use ½ inch plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.

5. Clean up all trash and any soil or dirt spilled on any paved surface

6. Any damage to the paving or architectural work caused by the Contractor shall be repaired at no cost to the Contracting Authority.

7. Maintain all silt sediment control devices required by applicable regulations. Provide adequate methods to assure that trucks and other equipment do not track soil from the site onto adjacent property and the public right of way.

C. Installation Of Structural Soil Material.

1. Install Structural Soil in 6 inch lifts and compact each lift to 90% of modified proctor.

2. Compact all material from a standard AASHTO compaction curve (AASHTO T 99). No compaction shall occur when moisture content exceeds maximum as listed herein. Delay compaction 24 hours if moisture content exceeds maximum allowable and protect Structural Soil during delays in compaction with plastic or plywood as directed by Engineer.

3. Bring Structural Soil to 3 inches below the top of the 6 inch curb. Protect the Structural Soil material from contamination by toxic materials, trash, debris, water containtin cement, clay, silt or materials what will alter the particle size distribution of the mix with plastic or plywood as directed by the Engineer.

150888a.04 METHOD OF MEASUREMENT.

Cubic yards as determined in the field by the engineer.

150888a.05 BASIS OF PAYMENT.

A. Per cubic yard.

B. Payment is full compensation for:

- Performing laboratory testing, mixing, fertilizer, and supplying the structural soil material.
- Preparing the site for installation of the structural soil material.
- Installation of the structural soil material.