CITY OF COLUMBUS, OHIO
DEPARTMENT OF PUBLIC UTILITIES

SUPPLEMENTAL SPECIFICATION 1604
BIORETENTION SOILS FOR GREEN INFRASTRUCTURE PROJECTS

DATED ~~FEBRUARY 2, 2018~~JANUARY 10, 2020

BIORETENTION SOILS FOR GREEN INFRASTRUCTURE PROJECTS

1604.01 Description. This Section summarizes the material and installation requirements for the supply and placement of bioretention soils, mulches, bed edging and commissioning of bioretention areas.

1604.02 Applicable Standards

A. Ohio Department of Natural Resources (ODNR)
   1. Rainwater and Land Development Manual

B. ASTM (current standards)
   1. ASTM C33: Standard Specifications for Concrete Aggregate
   2. ASTM ~~D1557~~D4253: Standard Test Methods for ~~Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3(2,700 kN-m/m3))~~Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
   3. ASTM D2974: Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
   4. ASTM D4972: Standard Test Method for pH of Soils
   5. ASTM D5268: Standard Specification for Topsoil Used for Landscaping Purposes

C. AASHTO (current standards)
   1. AASHTO T88: Standard Method of Test for Particle Size Analysis of Soils

D. City of Columbus CMSC (current standards)
   1. Section 106: Control of Materials
   2. Section 659: Seeding and Mulching
   3. SS 1602: Earthwork for Green Infrastructure

1604.03 Submittals

A. Name, address, phone, and contact for each laboratory used to test and/or certify materials.

B. A description of the equipment and methods used to mix the aggregate, planting soil, and compost to produce the bioretention soil media.

C. At least 1 month prior to installation of any materials, the Contractor shall submit to the Engineer the following:

   1. Bioretention Soil Mixture

      a. Five (5) gallon sample of soil mixture.

      b. List of material source(s).

      c. Supplier's soil mix and mulch report

      d. Soil Analysis including:
         1) Soil pH
         2) Soil Texture

3) Soil Nutrients (phosphorous, potassium, calcium, magnesium, iron, manganese, zinc, and copper)
4) Content (percent clay, organic material, etc.) per AASHTO T88

e. Laboratory certification stating that the material(s) meet the requirements of this Specification.

2. Mulch

a. List of material source(s).

b. Certification of mulch material used, stating that the material(s) meet the requirements of this Specification.

3. Sand

a. List of material source(s).

b. Laboratory certification stating that the material(s) meet the requirements of this Specification.

4. Topsoil

a. List of material source(s).

b. Laboratory certification stating that the material(s) meet the requirements of the Specification.

5. Edging

a. Manufacturer's literature for material

b. Name, address and contact information of manufacturer and supplier.

D. Documentation that the Contractor has the qualifications as required in ~~CMSC~~SS 1604.05.

1604.04 Summary of Work

A. Materials

1. Bioretention Soil Mixture

a. Texture Class: Texture of planting soil shall conform to the classification within the USDA triangle for Loamy Sand or Sand. Planting soil shall be a mixture of sand, silt, and clay particles as required to meet the classification but having no less than 80% and no more than 90% sand, and no greater than 10% clay considering only the mineral fraction of the soil. The gradation of the planting soil mix shall be determined by a qualified laboratory using the USDA Soil Survey Laboratory Manual.

b. Organic Material: Organic content of planting soil shall have a range of two to five percent by weight (2.0 - 5.0%) as determined by loss on ignition (ASTM D2974). To adjust organic content, planting soil may be amended, prior to placing and final grading, with the addition of organic compost (per CMSC 659.06).

~~1) Com-Til Compost from DOSD's Compost Facility is acceptable for use in bioretention facilities if the mix meets the other criteria for texture, organic content, pH, phosphorus, and conductivity.~~

c. Sand: Sand shall be clean natural sand per ASTM C33 for fine aggregates having a fineness modulus (FM) of 2.5 to 3.1 and a coefficient of uniformity between 2.5 and 4.1.

d. Topsoil: Topsoil shall be free of clay clumps, stones, cinders, concrete, brick, ~~roods~~roots, litter, plastics, metals, or other deleterious materials in accordance with ASTM D5268. The soil shall be free of herbicides, petroleum based materials, or noxious weeds.

e. pH Range: The pH of the bioretention soil mixture shall have a range of 5.8 to 8.0 (ASTM D4972).

f. Phosphorus: Phosphorus of the planting media shall fall between 15 and 60 mg/kg (ppm) as determined by the Mehlich III test. Phosphorus levels provided in bioretention soil mixtures placed in watersheds where a TMDL for phosphorus is specified by the Ohio Environment Protection Agency shall be in accordance with the ODNR's Rainwater and Land Development Manual, current version. If only a portion of the bioretention facility(ies) are located within a watershed subject to a phosphorus TMDL, all soil supplied shall meet the more stringent requirement for phosphorus.

g. Salts/ Soluble Salts/Electrical Conductivity: Soluble salts shall be less than 2.0 mmhos/cm (dS/m), typically as measured by 1:2 soil-water ratio basic soil salinity testing or Maximum 500 ppm concentration of soluble salts.

2. Mulch: If the bioretention cell is not vegetated with turf grasses, a minimum 3 inch layer of ~~coarse shredded hardwood~~triple shredded mulch shall be placed around plants and over the planting soil. Mulch shall be organic wood material free of mold, dirt, sawdust, chipped or shredded manufactured boards or chemically treated wood. Mulch shall be natural, undyed.

   a. Size: maximum 3 inch and minimum ½ inch size and

   b. pH: 5.5 to 7.2;

   c. Salinity: less than 3.0 millimhos per centimeter (mS/cm);

   d. Carbon: Nitrogen Ratio: less than 36:1.

   e. Water all mulch with fine spray immediately following installation to minimize mulch flotation.

3. Edging

   a. Steel edging: Shall be 3/16 inch x 4 inch black coated steel with preformed slots at 30 inch intervals to accommodate 15 inch steel stakes. Edging shall be supplied in minimum 10-foot lengths.

   b. Other edging: Contractor shall submit product data for proposed edging material to City and Engineer for review and approval.

B. Project Conditions

1. Contractor shall coordinate with all trades and subcontractors to prevent vehicle travel across areas delineated for bioretention cell(s), including the phase of the project before initial grading of the bioretention cell(s) has begun.

2. Contractor shall not handle, move, or work soil when saturated or frozen.

C. Placement of Bioretention Soil

1. Placement of bioretention soil within the facility footprint shall be in accordance with SS1602.04.A.

2. Do not place any muddy, wet or frozen soil mixes.

3. Place and spread soil mix over the approved subgrade. Do not place on subgrades where standing water is present.

4. Place and spread soil mix over subgrade in 8-inch to 12-inch lifts. Lifts shall be lightly watered to encourage settling. Lightly scarify previously placed surfaces prior to placing subsequent lifts with the teeth of a bucket or other means approved by the Engineer. Mechanical compaction of the soil is not permitted. Maximum compaction of soil shall be no more than 85% density per ASTM ~~D1557~~D4253.

5. The pre-mixed soil shall have a moisture content before placement that is low enough to prevent clumping and compaction during placement. If the soil becomes contaminated during the construction of the cell, the contaminated material shall be removed and replaced with uncontaminated material at no additional cost to the City.

D. Grading

1. The soil shall be allowed to settle at least 24 hours prior to installation of mulch and/or plant materials.

2. After settlement has occurred, add bioretention soil to maintain finished grades. Final grade shall be sloped in accordance with the design drawings. Protect placed soil mixes from construction activity with snow fencing or by other acceptable methods until the facility is commissioned.

~~2.~~3. If basins are to remain fallow during the winter months, in lieu of mulching, straw matting shall be installed over the bioretention soil. Straw matting shall be as per CMSC 712.11, Temporary Erosion Control Mats Materials, Type B, C or E.

~~3.~~4. Once grading is complete, add mulch to the entire bioretention cell(s) to a uniform thickness 3 inches or as designated on the Drawings. Mulching shall be complete within 24-hours after final grading to reduce the potential of silt accumulation on the surface.

E. Edging

1. Edging shall be installed in locations shown on the plans in accordance with manufacturer's installation instructions to prevent encroachment of turf grass.

2. Top of edging material shall be 1 inch above finished grade.

F. Commissioning

1. A bioretention cell is considered complete when the cell is constructed with the designed subsurface and surface features (including plants, mulch, sod, edging, and underdrain systems) and is free of any trash or debris.

2. The Engineer shall review the bioretention cell for verification that the cell is complete and ready to receive stormwater. The Engineer shall also verify and that the tributary area is stabilized and permanent erosion and sediment control devices are established. If deemed complete and ready for operation, the Engineer shall provide written approval following substantial completion.

3. Once the Engineer has provided written approval for operation, the bioretention cell shall be put into service.

4. After the bioretention cell is put into service, the temporary erosion and sediment control devices within the tributary area to the bioretention cell shall be removed.

1604.05 Quality Assurance

A. Installer qualifications

1. Work shall be performed by a qualified landscape installer whose work has resulted in the successful installation of planting soils and establishment of plantings, with a minimum of two references for completed green infrastructure projects (specifically bioretention cells), and with employees skilled in the landscape trade, and specifically skilled in bioretention cell installation and soil/mulch placement.

B. Soil Testing Laboratory Qualifications

1. The laboratory shall be an independent laboratory, recognized by the City of Columbus, or a laboratory which is part of the Ohio State University. It is the responsibility of the Contractor to submit materials to the testing laboratory, and deliver the results to the Engineer.

C. Sampling and Testing

1. Pre-placement of Bioretention Soil

a. Sampling and testing of the bioretention soil shall occur prior to delivery of the soil mixture to the site. The Contractor shall provide the Engineer with a five (5) gallon sample of the soil per every 100 cubic yards supplied and certifications stating that the materials meet the requirements of this Specification.

b. Materials shall not be delivered to the site and work cannot proceed until the Sample and Certification have been submitted and accepted.

c. Cost for all pre-placement sampling and testing shall be the responsibility of the Contractor.

d. The City reserves the right to conduct independent sampling and testing in accordance with the provisions in CMSC 106, Control of Materials, at the expense of the City.

1604.06 Method of Measurement. The City will measure bioretention soil and mulch by the cubic feet of material installed and accepted. The City will measure bed edging by linear feet installed and accepted. The cost for commissioning, sampling, and testing shall be distributed among in the unit cost of the materials.

1604.07 Basis of Payment

The City will pay for accepted quantities at contract price as follows.

Item	Unit	Description
1604	Cubic Feet	Bioretention Soil
1604	Cubic Feet	Bioretention Mulch
1604	Linear Feet	Edging, PVC/Steel