

**CITY OF COLUMBUS, OHIO  
DEPARTMENT OF PUBLIC UTILITIES**

**SUPPLEMENTAL SPECIFICATION 1602  
EARTHWORK FOR GREEN INFRASTRUCTURE PROJECTS**

**DATED MARCH 31, 2017**

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## **EARTHWORK FOR GREEN INFRASTRUCTURE PROJECTS**

**1602.01 Description.** Excavate and prepare the subgrade for bioretention facilities and other green infrastructure installations in a manner that does not compact subgrade or reduce infiltration capacity of subgrade.

### **1602.02 Applicable Standards**

- A. ASTM (current standards)
  - 1. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))
- B. City of Columbus CMSC (current standards)
  - 1. Section 203: Roadway Excavation and Embankment
  - 2. Section 613: Flowable Controlled Density Fill
  - 3. SS 1601: Site Activity Plan
  - 4. SS 1604: Bioretention Soils for Green Infrastructure Projects
  - 5. SS 1610: Underdrains and Aggregates for Green Infrastructure Facilities

### **1602.03 Submittals**

- A. Contractor shall submit to the Engineer at the preconstruction meeting the following information:
  - 1. As part of SS 1601 Site Activity Plan, contractor shall provide a description of the equipment and methods used to excavate the green infrastructure facility and backfill with specified materials in a manner that does not compact the subgrade or backfill materials. For the purposes of this Section, a green infrastructure facility is any area that is designed to capture, retain, and/or temporarily detain the runoff to the existing conveyance system. This includes but is not limited to regional bioretention facilities, bioretention curb bumpouts, and right-of-way bioretention swales.

### **1602.04 Summary of Work**

- A. General
  - 1. Furnish all labor, materials, equipment and incidentals required and perform all excavation work and grading; place and compact backfill and fill; and dispose of unsuitable, waste and surplus materials.
  - 2. Earthwork associated with areas outside of the green infrastructure facility shall be in accordance with the respective Section of the CMSC (such as Section 203 for Roadway Excavation and Embankment) or as otherwise indicated on the drawings.
  - 3. Green infrastructure earthwork includes excavation, subgrade preparation, installation of clay berms/barriers, filling and backfilling.
  - 4. Construction equipment shall not be permitted within the footprint of a green infrastructure facility before, during, or after any earthwork activities unless approved by the Engineer.

5. Where equipment is approved by the Engineer to be placed or operated within the footprint of a green infrastructure installation, the equipment shall only be permitted on areas that are unexcavated using a boom and bucket-type excavator to perform the excavation of the facility.
  - a. All equipment permitted within the footprint shall be low ground-contact equipment. Low ground-contact pressure equipment includes equipment with wide or high-flotation tires (34 to 72 inches wide), dual tires inflated to approximately 6 psi, equipment with bogey systems, or low-pressure tracked machinery with a minimum of 27-inch wide tracks. Weight of any equipment used shall be less than 10 tons per axle.
  - b. Use of equipment with narrow tracks or narrow tires, rubber tires with large lugs, or high pressure tires that will cause excessive compaction shall not be used.
6. Contractor shall be solely responsible for determining the means and methods for meeting these requirements to prevent compaction of the soils within the green infrastructure facility footprint including side slopes for all earthwork activities.
7. The green infrastructure facility footprint includes the entire area, including the side slopes that are to be backfilled, planted and maintained as part of the green infrastructure facility.

B. Excavation

1. All excavation areas designated for green infrastructure facilities shall be field marked prior to commencing excavation.
2. If excavation support is required due to project conditions or approved for use in lieu of open excavation, furnish, install, monitor and maintain excavation support (e.g., shoring, sheeting, bracing, trench boxes, etc.) as required by Federal, State or local laws, ordinances, regulations and safety requirements.
3. Excavation supports shall be carefully removed in such manner so as not to endanger the Work or other adjacent structures, utilities, property, or green infrastructure facilities.
4. Excavation within 1.0-foot vertically above final subgrade elevation shall not be permitted if the project site soil is frozen or has been subjected to greater than 0.25-inches of precipitation within the previous 48 hours, or unless otherwise approved by the Engineer.
5. After excavation, if any equipment has been placed or operated within the footprint of the green infrastructure facility with permission from the Engineer, the footprint shall be tilled using a soil tilling machine, at the expense of the Contractor. Tilling shall be performed to re-fracture the soil profile to a depth of no less than 12 inches. Alternative methods for re-fracturing must approved by the Engineer.
6. Excavated sides and bottom of green infrastructure facility shall be scarified 2-3 inches with the teeth of an excavator or other tools to promote infiltration.

### C. Prepare Subgrade

1. Subgrade areas shall not be exposed to surface runoff until contributing drainage areas are stabilized to the satisfaction of the Engineer.
2. Grading shall be performed to the lines and grades shown on the Drawings. All cut and fill slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the Drawings unless otherwise directed by the Engineer.
3. All objectionable material encountered within the limits indicated shall be removed and disposed. In cut areas, all loose or protruding rocks in slopes shall be removed to line or finished grade of the slope. Remove all large clods, lumps, brush, roots, stumps, litter, trash, and other foreign material and stones one-half inch in diameter or larger.
4. Any subgrades or soils polluted by gasoline, oil, plaster, construction debris, unacceptable soils, or other substances which would render material unsuitable for plant growth, shall be removed from the premises whether or not such pollution occurred or existed prior to or during the Contract period. In the event that such material is placed, this material shall be removed and replaced with approved material. All remedial operations associated with soil mixes shall be reviewed and approved by the Engineer.
5. Subgrades shall be completely and continuously drained and dewatered throughout the grading process.
6. Clean subgrade and dispose of all debris prior to placement of aggregates and soil mixes.
7. Mechanically or hand remove all vegetation on subgrade.
8. Protect adjacent pavements, walls, utilities and other construction from damage or staining by any backfill, aggregate, and soil mix placement operations.

### D. Backfilling Procedures

1. Installation of underdrains, where indicated on the Drawings, shall be in accordance with SS 1610 Underdrains and Aggregates for Green Infrastructure Facilities.
2. Placement of bioretention soils, where indicated on the Drawings, shall be in accordance with SS 1604 Bioretention Soils for Green Infrastructure Projects.
3. If at the time of material delivery, it is not possible to place material in its proper section of the Work, it shall be stockpiled in approved areas for later use. No extra payment will be made for the stockpiling or double handling of supplied material.

### E. Clay Barriers and Berms Material and Placement

1. Clay barriers and/or berms between adjacent green infrastructure facilities and other areas, if designated, shall be constructed of USCS Soil Classification of CH, CL, or MH and have permeability no less than  $1 \times 10^{-7}$  cm/sec.
2. Field compact to 95% standard maximum density per ASTM D1557.

F. Access, Sequencing and Scheduling: The Contractor shall notify the Engineer at key times of the operation to allow for material/site observation. Failure to notify could result in the rejection of material and/or work. Provide notice 24 hours in advance of performing the following tasks:

1. Completion of excavation
2. Installation of underdrain/observation wells/clean-outs.
3. Placement of storage layer aggregate or bedding layer
4. Placement of bioretention soil
5. Placement of mulch
6. Placement of edging

**1602.05 Method of Measurement.** The method of measurement for excavation associated with a bioretention facility footprint shall be in accordance with the requirements of CMSC 203.09 and shall be paid under Item 1602. The City will measure Subgrade Preparation as the square yard of surface area of the footprint of the green infrastructure facility.

The City will measure Clay Barriers as the cubic yard of material in the final position, acceptably placed, using the average end area method.

All other items associated with Green Infrastructure Earthwork shall be measured as indicated in other applicable specification sections.

**1602.06 BASIS OF PAYMENT**

The basis of payment for earthwork associated with a bioretention facility footprint including excavation and preparation of subgrade shall be in accordance with the requirements of CMSC 203.10 but paid per Item 1602.

The basis of payment for installation of underdrains in green infrastructure facilities, where indicated on the Drawings, shall be paid for under Item 1610 Underdrains and Aggregates for Green Infrastructure Facilities.

The basis of payment for placement of bioretention soil, where indicated on the Drawings, shall be paid for under Item 1604 Bioretention Soils for Green Infrastructure Projects.

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

Item	Unit	Description
1602	Cubic Yard	Excavation for Green Infrastructure Facilities
1602	Square Yard	Subgrade Preparation for Green Infrastructure Facilities
1602	Cubic Yard	Clay Barrier or Berm for Green Infrastructure Facilities

