

SOIL SPECIFICATION FOR VEGETATED STORMWATER SYSTEMS WITH FULL LINERS, UNDERDRAINS, OR AGGREGATE LAYERS

June 30, 2023

This specification is required for all public facilities with an underdrain or internal water storage layer, for example in fully-lined facilities and infiltration facilities with underdrains or aggregate layers where root access to the native soil is partially or completely impeded. Use in private facilities with these characteristics is recommended but not required.

This specification is a modified version of the 2020 City of Portland Standard Construction Specifications (SCS) - 01040.14(d) Stormwater Facility Blended Soil. Facilities include planters, curb extensions, and basins.

This specification is also known as the "High-fines Soil Blend". It contains more loam than the standard soil blend and is intended to improve soil moisture and plant health during dry periods in systems where plants have limited or no access to the underlying native soils. The blend balances plant needs while maintaining adequate infiltration rates.

01040.14 Topsoil - Furnish topsoil containing no substance detrimental to the growth of plants and that is free of Noxious Weeds and Nuisance Plants. Unsuitable topsoil, or topsoil placed without approval in areas to be planted, may be required to be replaced at no additional cost to the Owner.

(d) Stormwater Facility Blended Soil – Follow the Contract Documents for stormwater facility blended soil. Furnish imported blended soil for vegetated stormwater facilities conforming to the following:

(1) General Composition - Use a blended material incorporating loamy soil, sand, compost, and aged dark fir bark mulch. The material must be 20% compost and 10% dark aged fir bark by volume and meet the other criteria in this specification. The loamy soil must be subsoil taken from at least one (1) foot below grade to reduce the potential for contaminants such as weed seeds.

a. Analysis Requirements for the Blended Material:

Particle Gradation - - A sieve analysis of the blended sand and soil, not including compost and aged dark fir bark, shall be conducted in conformance with ASTM C 117/C 136, AASHTO T 11/T 27, ASTM D 7928/D 1140, or ASTM D 6913. For the percent passing the #200 sieve, the preferred value is in the middle of the range.

Sieve Size	Percent Passing
1 inch	100
# 4	85 -100
# 10	50-100
# 40	30-90
# 100	20-60
# 200	20-30

Acidity - The pH (power of hydrogen) of the blended sand and soil, not including compost and aged dark fir bark, shall be tested and have a pH between five and a half (5.5) to eight (8).

(2) Blended Material General Requirements:

- Loose and easily broken into small pieces.
- Well mixed and homogenous.
- Free of wood pieces, plastic, and other foreign matter.
- Blending shall occur on a clean, hard surface such as asphalt or concrete.
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- Have no visible free water. At the request of the Owner's Representative, a gravimetric soil moisture test shall be conducted in conformance with ASTM D2216 or AASHTO T255/T265. The material shall have a water content of 15-30 percent by weight.

(3) Compost - The compost shall be derived from plant material and provided by a member of the US Composting Council Seal of Testing Assurance (STA) program. See www.compostingcouncil.org for a list of local providers.

The compost shall be the result of the biological degradation and transformation of plant-derived materials under conditions designed to promote aerobic decomposition. The material shall be well composted, free of viable weed seeds, and stable with regard to oxygen consumption and carbon dioxide generation. The compost shall have no visible free water and produce no dust when handled. It shall meet the following criteria, as reported by the US Composting Council STA Compost Technical Data Sheet provided by the vendor.

- 100 percent of the material must pass through a 1/2-inch screen.
- The pH of the material shall be between six (6) min and 8.5 max.
- Manufactured inert material (plastic, concrete, ceramics, metal, etc.) shall be less than 1.0 percent by weight.
- The organic matter content shall be between 30 and 70 percent (dry weight basis).
- Soluble salt content shall be less than 6.0 mmhos/cm.
- Maturity Indicator shall be greater than 80 percent for germination and vigor.
- Stability shall be 'stable' to 'very stable'.
- Carbon/nitrogen (C/N) ratio shall be less than 25:1.
- Trace metals test result = "pass."

(4) Aged Dark Fir Bark Mulch – The fir bark shall be aged dark fir bark ground to medium coarseness (100% passing a 1” screen), aged for at least 6 months. (For use in the soil blend and as surface mulch.)

(5) Submittals - At least 30 working days before soil installation, provide the following:

a. Documentation for the two (2) analyses described in section 01040.14(d)(1)(a) - An accredited laboratory with current certification maintained shall perform particle gradation with calculated coefficient of uniformity and pH. The date of the analyses shall be no more than 90 calendar days prior to the date of the submittal. The report shall include the following information:

- Name and address of the laboratory.
- Phone contact and e-mail address for the laboratory.
- Test data, including the date and name of the test procedure.

b. A compost technical data sheet from the compost vendor - The analysis and report must conform to the sampling and reporting requirements of the US Composting Council Seal of Testing Assurance (STA) program. The analysis shall be performed and reported by an approved independent STA program laboratory and be no more than 90 calendar days prior to the date of the submittal.

c. Two (2) five (5)-gallon buckets of the blended material or as requested by the Owner’s Representative.

d. The location and name of the source of the loamy soil.

e. Stormwater facility blended soil installation – see section 01040.43(c).

(6) **Stormwater Facility Blended Soil Installation** - See 01040.43(e).

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01040.43(g) Stormwater Facility Blended Soil:

(1) **Stormwater Blended Soil Protection from Contaminants** - The material shall be protected from all sources of contamination, including weed seeds, while at the supplier, in conveyance, and at the project site.

(2) **Stormwater Blended Soil Protection at the Site** - protect installed stormwater facility blended soil from foot or equipment traffic and surface water runoff. Install temporary fencing or walkways as needed to keep workers, pedestrians, and equipment out of the installation area. Do not store materials and equipment on top of the installation area.

(3) **Stormwater Blended Soil Hauling and Placement** - Hauling and placement of the blended stormwater soil will not be allowed when the weather is too wet or the ground is frozen or saturated as determined by the Owner’s Representative.

(4) Stormwater Blended Soil Placement - Place blended stormwater soil in loose lifts not to exceed eight (8) inches. Compact each lift with a waterfilled landscape roller. Do not mechanically compact.

(5) Stormwater Blended Soil Erosion Control - Temporary erosion control measures are required until permanent stabilization measures are functional.

(6) Stormwater Blended Soil Gradation Owner Testing of Delivered Material - Samples will be taken on a regular basis and at the discretion of the Owner's Representative for testing to confirm the particle gradation of the material delivered to the construction site conforms with section 01040.14(d)(1)(a) Analysis Requirements for the Blended Material. The sample testing will be provided by the Owner. The Contractor shall provide the sample, which must be a minimum of 5 gallons as delivered to the project site for installation. The sample will be incinerated in conformance with ASTM D2974 to remove the organics, at a temperature of $538 \pm 5^{\circ}\text{C}$, prior to running the washed sieve analysis. If the sample results don't conform with the particle gradation requirements, the Owner's Representative will reject the material or require additional testing to be performed by the Contractor, prior to delivery of more material.

(7) Stormwater Blended Soil Mulch Application - Apply approved mulch (1040.14(d)(4)) Aged Fir Bark Mulch to the surface of the blended soil, at a depth of 2", within 48 hours of placing the blended soil. Avoid stepping on the blended soil or compacting it. Application of the mulch topdressing can only occur after the owner's representative has visual inspected and approved the installation of the blended soil.