SECTION 32 91 14
BIORETENTION SOIL
Construction Specification

PART 1 GENERAL

1.1 PURPOSE:

A. Specifications for furnishing, placing, and compacting bioretention soils as indicated.

B. Related Sections:

1. Division 31 – Earthwork
2. Section 32 80 00 – Irrigation
3. Section 32 91 13 – Soil Preparation and Finish Grading
4. Section 32 92 00 – Lawns and Grasses
5. Section 32 93 00 – Trees, Shrubs, Ornamental Grasses and Ground Covers
6. Section 32 94 00 – Planting Accessories
7. Section 32 97 00 – Landscape Maintenance
8. Section 33 40 50 – Landscape Drainage

C. San Mateo County Community College District is strongly committed to promoting sustainability throughout their campus projects. Section 01 81 13 Sustainability of the Design Standard provides guidelines and recommendations for implementing sustainability strategies. Where relevant, specific sustainability criteria is noted in this section; however, each project team should review and cross reference that front section while developing the specific project and its documentation. Each discipline shall confirm that specific performance and manufacturer information provided in the specification section is in alignment with code requirements, LEED criteria, and any other goals for sustainability.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

B. ASTM D422 – Standard Test Method for Particle-Size Analysis of Soils

C. ASTM D1557 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort

D. ASTM D2434 – Standard Test Method for Permeability of Granular Soils (Constant Head)

E. ASTM D5268 – Standard Specification for Topsoil Used for Landscaping Purposes

1.3 GENERAL REQUIREMENTS

A. Bioretention soil shall achieve a long-term, in-place infiltration rate of at least 5 inches per hour. Bioretention soil shall also support vigorous plant growth.

B. Bioretention Soil shall be a mixture of topsoil or fine sand, and compost, measured on a volume basis.

1. Mix A – Topsoil Blend
2. 10%-20% Topsoil
3. 50%-60% Fine Sand
4. 30%-40% Compost
5. Mix B – Fine Sand Blend
6. 60%-70% Fine Sand
7. 30%-40% Compost

1.4 SUBMITTALS

A. The contractor must submit to the District for approval:

1. A sample of mixed bioretention soil.
2. Certification from the soil supplier or an accredited laboratory that the Bioretention Soil meets the requirements of this guideline specification.
3. Grain size analysis results of the fine sand component performed in accordance with ASTM D 422, Standard Test Method for Particle Size Analysis of Soils.
4. Quality analysis results for compost performed in accordance with Seal of Testing Assurance (STA) standards, as specified in Section 1.4.
5. Organic content test results of mixed Bioretention Soil. Organic content test shall be performed in accordance with by Testing Methods for the Examination of Compost and Composting (TMECC) 05.07A, “Loss-On-Ignition Organic Matter Method”.
6. A description of the equipment and methods used to mix the sand and compost to produce Bioretention Soil.
7. Provide the following information about the testing laboratory(ies) name of laboratory(ies) including:
    a. Contact person(s)
    b. Address(es)
    c. Phone contact(s)
    d. E-mail address(es)
    e. Qualifications of laboratory(ies), and personnel including date of current certification by STA, ASTM, or approved equal

PART 2 PRODUCTS

2.1 SAND FOR BIORETENTION SOIL

A. General.

1. Sand shall be free of wood, waste, coating such as clay, stone dust, carbonate, etc., or any other deleterious material. All aggregate passing the No. 200 sieve size shall be non-plastic.

B. Sand for Bioretention Soil Texture.

1. Sand for Bioretention Soils shall be analyzed by an accredited lab using #200, #100, #40, #30, #16, #8, #4, and 3/8 inch sieves (ASTM D 422 or as approved by University), and meet the following gradation:

Sieve Size	Percentage Passing (by weight)	
	Min	*Max*
3/8 Inch	100	100
No. 4	90	100
No. 8	70	100
No. 16	40	95
No. 30	15	70
No. 40	5	55
No. 100	0	15
No. 200	0	5

2. Note all sands complying with ASTM C33 for fine aggregate comply with the above gradation requirements.

2.2 TOPSOIL FOR BIORETENTION SOIL

A. General

1. Topsoil shall be free of wood, waste, or any other deleterious material.

B. Topsoil for Bioretention Soil Texture

1. The overall topsoil texture shall be loamy sand as analyzed by an accredited laboratory. The overall dry weight percentages shall be 60-90% sand, with less than 20% passing than the #200 sieve and less than 5% clay of the total weight with no gravel.

2.3 COMPOSTED MATERIAL

A. Compost shall be a well decomposed, stable, weed free organic matter source meeting the standards developed by the US Composting Council (USCC). The product shall be certified through the USCC Seal of Testing Assurance (STA) Program (a compost testing and information disclosure program).

1. Compost Quality Analysis Before delivery of the soil, the Contractor shall submit a copy of lab analysis performed by a laboratory that is enrolled in the US Composting Council's Compost Analysis Proficiency (CAP) program and using approved Test Methods for the Evaluation of Composting and Compost (TMECC). The lab report shall verify:

a. Feedstock Materials shall be specified and include one or more of the following: landscape/yard trimmings, grass clippings, food scraps, and agricultural crop residues.

b. Organic Matter Content: 35% - 75% by dry wt.

c. Carbon and Nitrogen Ratio: C:N < 25:1.

d. Maturity/Stability: shall have a dark brown color and a soil-like odor. Compost exhibiting a sour or putrid smell, containing recognizable grass or leaves, or is hot (120F) upon delivery or rewetting is not acceptable. In addition, any one of the following is required to indicate stability:

   1) Oxygen Test < 1.3 O2 /unit TS /hr

   2) Specific oxy. Test < 1.5 O2 / unit BVS

   3) Respiration test < 8 C / unit VS / day

   4) Dewar test < 20 Temp. rise (°C)

   5) Solvita® > 5 Index value

e. Toxicity: any one of the following measures is sufficient to indicate non-toxicity.

   1) NH4- : NO3-N < 3

   2) Ammonium < 500 ppm, dry basis

   3) Seed Germination > 80 % of control

   4) Plant Trials > 80% of control

   5) Solvita® > 5 Index value

f. Nutrient Content: provide analysis detailing nutrient content including N-P-K, Ca, Na, Mg, S, and B.

   1) Total Nitrogen content 0.9% or above preferred.

   2) Boron: Total shall be <80 ppm; Soluble shall be <2.5 ppm

g. Salinity: Must be reported; < 6.0 mmhos/cm

h. pH shall be between 6.5 and 8. May vary with plant species.

i. Particle size: 95% passing a 1/2” screen

j. Bulk density: shall be between 500 and 1100 dry lbs/cubic yard

k. Moisture Content shall be between 30% - 55% of dry solids

l. Inerts: compost shall be relatively free of inert ingredients, including glass, plastic and paper, < 1 % by weight or volume

m. Weed seed/pathogen destruction: provide proof of process to further reduce pathogens (PFRP). For example, turned windrows must reach min. 55C for 15 days with at least 5 turnings during that period.

n. Select Pathogens: Salmonella <3 MPN/4grams of TS, or Coliform Bacteria <10000 MPN/gram

o. Trace Contaminants Metals (Lead, Mercury, Etc.) Product must meet US EPA, 40 CFR 503 regulations

p. Compost Testing. The Contractor will test all compost products within 120 calendar days prior to application. Samples will be taken using the STA sample collection protocol. (The sample collection protocol can be obtained from the U.S. Composting Council, 4250 Veterans Memorial Highway, Suite 275, Holbrook, NY 11741 Phone: 631-737-4931, www.compostingcouncil.org). The sample shall be sent to an independent STA Program approved lab. The Contractor will pay for the test.

PART 3 EXECUTION

3.1 PLACEMENT AND COMPACTION OF BIORETENTION SOILS

A. Place the bioretention soil in 8" to 12" lifts. Lifts are not to be compacted but are placed to reduce the possibility of excessive settlement. Allow time for natural compaction and settlement prior to planting. Bioretention soil may be watered to encourage compaction.

END OF SECTION