

## 02838 RAIN GARDEN GREEN INFRASTRUCTURE STRATEGY

[NTS: This specification is intended to be used as part of the Milwaukee Metropolitan Sewerage District's Green Solutions Program for implementation of green infrastructure strategies into Contract Documents by local municipalities or other entities. The specification is also intended to be used in conjunction with the Green Infrastructure Sizing Calculator and the Green Infrastructure Typical Details developed for the Green Solutions Program. The specification is considered to be a technical guidance document to assist users with the design of green infrastructure strategies. It is the responsibility of the local municipality or design engineer to make revisions to the specification as needed for specific design projects. It is recommended the documents are reviewed by a licensed professional engineer before releasing for construction. Note that the specification was last updated by the District in 2016.]

### A. SCOPE

This Section covers the work necessary to furnish and install rain garden green infrastructure strategies, including the engineered soil media layer, surface mulch layer or coconut fiber mat, and energy dissipation stone.

#### 1. GENERAL

[NTS: Update language of this Section as necessary based on applicable references to front-end specifications.]

See CONDITIONS OF THE CONTRACT, and Division 1, GENERAL REQUIREMENTS, which contain information and requirements that apply to the work specified herein and are mandatory for this project.

#### 2. RELATED WORK

[NTS: The list below may not be fully inclusive depending upon the specifics of each individual project. Update language of this Section as necessary based on applicable references to other technical specification sections.]

The applicable requirements, materials and workmanship specified in the following Sections are included by reference in this Section. The list below is from the Wisconsin Department of Transportation (WisDOT) Standards and Specifications for Highway and Structure Construction, latest edition.

Section 201 Clearing and Grubbing  
Section 205 Roadway and Drainage Excavation  
Section 627 Mulching  
Section 628 Erosion Control  
Section 630 Seeding  
Section 631 Sodding

The following specification as developed for the Milwaukee Metropolitan Sewerage

District's Green Solutions Program may also include related work.

## Section 02840 Exterior Plants (Native Landscaping and Stormwater Trees)

### 3. SUBMITTALS

#### a. SUBMITTALS REQUIRED PRIOR TO BID OPENING

Prebid approval of materials is not required. Suppliers and products have been identified as a means of establishing quality, but not for purposes of limiting competition.

#### b. SUBMITTALS DURING CONSTRUCTION

[NTS: Update language of this Section as necessary based on applicable references to front-end specifications.]

Submittals during construction shall be made in accordance with Section 01300 in Division 1, GENERAL REQUIREMENTS. In addition, the following specific information shall be provided:

1. **CONTRACTOR's Qualifications:** CONTRACTOR shall submit information showing conformance with qualification requirements listed in specifications. Submit CONTRACTOR Qualifications to OWNER for review prior Notice to Proceed.
2. **Engineered Soil Media Mixture Analysis:** CONTRACTOR shall submit soil analysis by a qualified soil-testing laboratory showing conformance with engineered soil media mixture specifications. Submit soil analysis to OWNER for review and approval prior to installation.
3. **Engineered Soil Media Infiltration Test:** CONTRACTOR shall conduct and submit results of an on-site infiltration test of the engineered soil media to ensure conformance with saturated hydraulic conductivity criteria. Using 5 cubic yards of the prepared engineered soil media, CONTRACTOR shall place the material on site at the proper location and depth, allow for proper settlement of the engineered soil media, and conduct an infiltration test using a double-ring infiltrometer in accordance with ASTM D3385. Submit infiltration test results to OWNER for review and approval prior to installation of the remaining engineered soil media.
4. **Surface Mulch:** CONTRACTOR shall submit 1/2 lb. of mulch sample placed in labeled plastic bag as well as shop drawings of materials showing conformance with specifications. Submit sample and shop drawings to OWNER for review and approval prior to

installation.

5. Energy Dissipation Stone: CONTRACTOR shall submit sieve analysis by a qualified testing laboratory showing conformance with specifications. Submit sieve analysis to OWNER for review and approval prior to installation.

#### 4. DEPARTURES FROM PLANS AND SPECIFICATIONS

Submit in writing to the OWNER for review, details of any proposed departures from these Contract Documents, and the reasons therefor. Submit such requests as soon as practicable after the Notice to Proceed. Make no such departures without prior written acceptance of the OWNER.

#### 5. SHOP DRAWINGS, MATERIAL REVIEW AND SAMPLES

- a. Engineered Soil Media Mixture Analysis
- b. Engineered Soil Media Infiltration Test
- c. Surface Mulch or Coconut Fiber Mat
- d. Energy Dissipation Stone

#### 6. CONTRACTOR QUALIFICATIONS

The CONTRACTOR shall have five years' experience (minimum) and shall have completed green infrastructure work similar in material, design, and extent to that indicated for this Project. CONTRACTOR must provide five or more successful installations of green infrastructure projects.

#### 7. TOLERANCES

Tolerances for rain garden green infrastructure strategy construction and materials shall conform to the requirements hereinafter specified. The finished surface elevation of the rain garden green infrastructure strategy shall be within 0.10 feet (+/-) of the finished surface elevation as specified in the drawings.

### B. MATERIALS

#### 1. GENERAL

All rain garden green infrastructure strategies shall meet the requirements of the following specifications. The OWNER reserves the right to take samples of materials whenever deemed necessary.

#### 2. ENGINEERED SOIL MEDIA

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The engineered soil media shall conform to the following specifications:

- a. The engineered soil media mixture shall consist of a mixture of 70% to 85% sand and 15% to 30% compost. The percentages are based on volume. Special attention should be given to plant selection when the percentage of sand exceeds 75%.
- b. The sand component of the engineered soil media shall meet one of the following gradation requirements:
  1. USDA Coarse Sand (.02 - .04 inches).
  2. ASTM C33 (Fine Aggregate Concrete Sand).
  3. Wisconsin Standards and Specifications for Highway and Structure Construction, Section 501.2.5.3.4. (Fine Aggregate Concrete Sand) latest edition, or an equivalent as approved by the OWNER. The sand shall meet the following gradation requirements:

Sieve Size	Percent Passing by Weight
3/8-inch	100
No. 4	90 to 100
No. 16	45 to 85
No. 50	5 to 30
No. 100	0 to 10

The preferred sand component consists of mostly SiO<sub>2</sub>, but sand consisting of dolomite or calcium carbonate may also be used. Manufactured sand or stone dust is not allowed. The sand shall be washed and drained to remove clay and silt particles prior to mixing.

- c. The compost component of the engineered soil media shall meet the requirements of Wisconsin Department of Natural Resources Specification S100, Compost, as follows:
  1. Particle Size – 98% of the compost shall pass through a 0.75-inch screen.
  2. Physical Contaminants – Less than 1% combined glass, metal and plastic.
  3. Organic Matter/Ash Content – At least 40% organic matter; less than 60% ash content.
  4. Carbon to Nitrogen Ratio – 10-20:1 C:N ratio.
  5. pH – Between 6 and 8.
  6. Soluble Salt – Electrical conductivity below 10 dS m<sup>-1</sup> (mmhos cm<sup>-1</sup>)
  7. Moisture Content – Between 35% and 50% by weight.
  8. Maturity – The compost shall be resistant to further decomposition and free of compounds, such as ammonia and organic acids, in

- concentrations toxic to plant growth.
9. Residual Seeds & Pathogens – Pathogens and noxious seeds shall be minimized.
  10. Pathogens – The compost shall meet the Class A requirements for pathogens as specified in s. NR 204.07(6)(a), Wis. Adm. Code.
  11. Other Chemical Contaminants – The compost shall meet the high quality pollutant concentrations as specified in s. NR 204.07(5)(c), Wis. Adm. Code.
- d. The engineered soil media mixture shall be free of rocks, stumps, roots, brush or other material over 1 inch in diameter. No other materials shall be mixed with the planting soil that may be harmful to plant growth or prove a hindrance to planting or maintenance.
  - e. The engineered soil media mixture shall have a pH between 5.5 and 8.0.
  - f. The engineered soil media mixture shall have adequate nutrient content to meet plant growth requirements.
  - g. The saturated hydraulic conductivity of the engineered soil media mixture shall be 6 to 10 inches per hour tested in accordance with ASTM F1815. The total porosity shall be 35% to 55% and the moisture holding capacity shall be 15% to 25%. Conduct infiltration test to ensure soil mix meets the saturated hydraulic conductivity criteria.

### 3. SURFACE MULCH LAYER / COCONUT FIBER MAT

Shredded hardwood mulch or chips, aged a minimum of 12 months, or a Class II erosion control mat (blanket) made of coconut fibers shall be placed on the surface of the rain garden area. The shredded hardwood mulch or chips shall be 2 to 3 inches in depth and the mat shall be overlapped, and anchored with hardwood stakes (6 inches or longer to hold the mat to the media). The use of an erosion control mat shall also be placed over the hardwood mulch to prevent the mulch from floating, at least until dense vegetation is established. The mulch shall be free of foreign material, including other plant material.

### 4. ENERGY DISSIPATION STONE

The energy dissipation stone on the surface of the rain garden is intended to dissipate stormwater runoff flow coming directly from downspout disconnections or other points where concentrated flow enters the rain garden. The energy dissipation stone shall be a washed rounded river stone ranging in diameter between 2 and 3 inches, or an equivalent as approved by the OWNER.

## C. WORKMANSHIP

### 1. CONSTRUCTION SITE STABILIZATION

- a. CONTRACTOR shall not construct rain garden strategies until all of the contributing drainage areas are stabilized to the satisfaction of the OWNER. Do not use the rain garden strategies as temporary sediment control facilities during construction. It is the responsibility of the CONTRACTOR to sequence the construction of the rain garden strategies in a manner such to prevent sediment from entering the rain garden as a result of construction activities.
- b. Construction site runoff from disturbed areas shall not be allowed to enter the rain garden areas. CONTRACTOR shall use sediment control measures as necessary to prevent construction site runoff from entering the rain garden areas. Sediment control measures indicated on design drawings are not intended to limit the CONTRACTOR in the manner and techniques to control erosion. It is the responsibility of the CONTRACTOR to control erosion from this site during construction.
- c. Sediment that enters the rain garden areas during construction as a result of construction activities shall be removed by the CONTRACTOR at no cost to the OWNER. In circumstances where, in the opinion of the OWNER, sediment significantly impacts the functionality of the engineered soil media or plantings, these items shall be completely replaced by the CONTRACTOR at no cost to the OWNER.
- d. CONTRACTOR shall not store any equipment or materials within the perimeter of the rain garden engineered soil media area.

## 2. SUITABLE WEATHER

- a. Construction of the rain garden strategies shall be suspended during periods of rainfall or snowmelt. Construction shall remain suspended if ponded water is present or if residual soil moisture contributes significantly to the potential for clumping or other forms of compaction within the rain garden strategies. CONTRACTOR shall inspect and maintain all sediment control measures protecting both the rain garden strategies and the entire project site following periods of rainfall or snowmelt.

## 3. COMPACTION AVOIDANCE

- a. Compaction and smearing of the soils beneath the floor and side slopes of the rain garden area, and compaction of the soils used for backfill in the soil planting bed, shall be minimized. During site development, the area dedicated to the rain garden area shall be cordoned off to prevent access by heavy equipment. Acceptable equipment for constructing the rain garden strategy includes excavation hoes, light equipment with turf type tires, marsh equipment or wide-track loaders.
- b. If compaction occurs at the base of the rain garden strategy, the soil shall be

refracted to a depth of at least 12 inches. If smearing occurs, the smeared areas of the interface shall be corrected by raking or roto-tilling. Refracting shall not be used by CONTRACTOR in lieu of proper compaction avoidance techniques.

4. PLACEMENT AND SETTLING OF ENGINEERED SOIL MIXTURE

a. Placement and Settling of Engineered Soil - The following apply:

1. Prior to placement in the rain garden strategy, the engineered soil mixture shall be premixed and the moisture content shall be low enough to prevent clumping and compaction during placement. OWNER shall review the engineered soil mixture upon completion of premixing and before delivery to the site. No onsite mixing of soils shall be allowed. Only approved tested material shall be delivered to the site.
2. As approved by OWNER, steps may be taken to induce mild settling of the engineered soil bed as needed to prepare a stable planting medium and to stabilize the ponding depth. Vibrating plate-style compactors shall not be used to induce settling.
3. The entire soil planting bed shall be mulched prior to planting vegetation to help prevent compaction of the planting soil during the planting process. Mulch shall be pushed aside for the placement of each plant.

5. NOTIFICATION

- a. CONTRACTOR shall notify OWNER following the excavation of rain garden areas prior to installation of engineered soil media. CONTRACTOR shall only proceed with the installation of the engineered soil media with approval of the OWNER.

D. PAYMENT

Except as noted otherwise hereinafter payment for the work in this Section will be based on the quantities and unit bid prices for each of the individual bid items for the rain garden green infrastructure strategy. Payment will be made at the unit prices stated in the Bid. The unit prices shall constitute full compensation for all labor, equipment, materials, and incidentals necessary for the satisfactory completion of the work.

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