

SECTION 329353 – RAIN GARDENS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section.

1.2 SUMMARY

- A. This section includes the furnishing of all materials and installation of rain gardens.
- B. Related Sections include the following:
 - 1. Division 31 Section 312300-EARTHWORK
 - 2. Division 33 Section 334000-STORM DRAINAGE

1.3 REFERENCES

- A. Except as herein specified or as indicated on the Drawings, the work of this section shall comply with the following:
 - 1. American Joint Committee on Horticultural Nomenclature (AJCHN): Standardized Plant Names.
 - 2. ANSI Z60.1: American Standard for Nursery Stock.
 - 3. AASHTO M278: Standard Specification for Class PS46 Polyvinyl Chloride (PVC) Pipe.
 - 4. ASTM:
 - a. D422-63: Standard Test Method for Particle-Size Analysis of Soils.
 - b. D4972-01: Standard Test Method for pH of Soils.
 - c. D3350-06: Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
 - d. F405-05: Standard Specification for Corrugated Polyethylene (PE) Pipe and Fittings.
 - e. F667-06: Standard Specification for Large Diameter Corrugated Polyethylene Pipe and Fittings.

1.4 DEFINITIONS

- A. Sharp Sand: Angular, not rounded, soil particles, 0.05 to 2 millimeters in diameter. Beach sand is not sharp sand.
- B. B&B: Ball and burlap vegetation.

1.5 SUBMITTALS

- A. Product Data: Shipping list (packing slip) for plant material.
- B. Quality Assurance/Control Submittals:
 - 1. Compost Certification: Laboratory analysis must be completed to verify that the utilized compost satisfies the compost criteria noted in Article 2.1 B. Engineer/Landscape Architect will determine the compost sampling rate.
 - 2. Topsoil sieve and hydrometer analysis following ASTM D422 to determine USDA soil textural classification. Engineer/Landscape Architect will determine the topsoil sampling rate.
- C. Schedule for Planting Operations: Notify the Engineer/Landscape Architect at least 7 working days prior to the start of planting operations.

1.6 DELIVERY, STORAGE AND HANDLING

- A. If plants cannot be planted immediately upon delivery, properly protect them in a manner acceptable to the Engineer/Landscape Architect.

1.7 WARRANTY

- A. Repair damage resulting from erosion.
- B. Plant Warranty: Warranty trees, shrubs, and perennials for a period of 1 year after date Substantial Completion against defects, including death and unsatisfactory growth, except for defects resulting from neglect by Owner, abuse, or damage by others or unusual phenomena or incidents which are beyond Contractor's control.
- C. Replacements:
 - 1. Remove trees, shrubs, or other plants found to be dead or in unhealthy condition during guarantee period and replace with new.
 - 2. Make replacements during the growing season following the end of the warranty period.
 - 3. Furnish and plant replacements which comply with this section.
 - 4. Replace trees, shrubs, and perennials which are in doubtful condition at end of warranty period unless, in the opinion of Engineer/Landscape Architect, it is satisfactory to extend warranty period for a full growing season.

5. Engineer/Landscape Architect will make inspection at end of extended warranty period, if any, to determine acceptance or rejection.
6. Only 1 replacement will be required at end of warranty period, except for losses or replacements due to failure to comply with specified requirements.
7. Repair damage to other plants or lawns during plant replacements at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

Note If soil mix and plant material is provided by MSU, delete the following:

A. Rain Garden Soil Mix:

1. [Composed of 70% compost and 30% sharp sand.] [Composed of 50 to 60% sharp sand, 20 to 30% topsoil, and 20 to 30% compost.]
2. Uniform mix, free of stones, stumps, roots or other similar objects larger than 2 inches, excluding mulch.
3. No other materials or substances that may be harmful to plant growth or prove a hindrance to the planting or maintenance operations shall be mixed or dumped within the rain garden area.

B. Compost:

1. Well-composted, stable and weed-free organic material, free of deleterious substances.
2. Acidity: Between 5.5 and 7.5, in accordance with ASTM D4972.
3. Carbon to Nitrogen Ratio: Between 30:1 and 35:1.
4. Moisture Content: 35 to 55% by weight.
5. 100 percent passing through a 1-inch sieve.
6. Organic matter content at least 50% of dry weight.

C. Sand: Clean sharp sand, maximum size 3/8-inch, loss by washing (% passing 200 sieve) less than 10%.

D. Topsoil:

1. Sandy loam, loamy sand or loam texture according to USDA textural triangle with less than 5% clay content.
2. Free of stones or other materials 2 inches or larger in diameter in any direction and free of extraneous materials harmful to plant growth.
3. pH range of 5.5 to 7.

E. Plant Material:

1. Plugs and Containerized Stock:
 - a. Potted native plant plugs shall be provided in GT38 (or equivalent) single-form factor plug trays. The plug tray shall be configured to grow plugs at least 2-1/4 inches in diameter by 4-1/2 inches deep.
 - b. Plants shall be inoculated with a broad-spectrum mycorrhizal fungi mix.
 - c. Leguminous species shall be inoculated with the proper strain of nitrogen-fixing bacteria.
 - d. Shipped product shall be accompanied by a packing slip that clearly lists shipped species by scientific and common name, the number of each species, and the total number of boxes shipped.
 - e. Plants shall be in a hydrated and healthy state at time of delivery.
 - f. Plants shall have well developed root systems filling the soil but not overly root bound.
 - g. Plant tops shall be well developed, healthy, viable, and adequately hardened off for outdoor planting.
2. Bare Root Stock:
 - a. Well rooted, with roots packed in moist straw or peat moss.
 - b. Bare root trees shall have a minimum caliper of 0.5 inch and minimum height of 5 feet.
 - c. Bare root shrubs shall have a minimum height and spread of 2 feet, and a minimum of 3 canes per plant.
 - d. Stored on site in a manner that will prevent root hairs from drying out.
3. Origin of Plant Material:
 - a. Local genotypes are preferred.
 - b. Obtained from source located in the same EPA Level III Ecoregion as the Project site.
 - c. Plantings may include nursery cultivars selected for site conditions, provided that no plants are identified as invasive or prohibited species by the Department of Natural Resources or local extension service.
 - d. Plants shall be grown under climatic conditions similar to those of the location of the Project for a minimum of 2 years.
4. Approved Suppliers:

- a. [].
- b. [].

Note List approved plant material suppliers.

- c. Unlisted firms must be pre-approved by Engineer/Landscape Architect.
- 5. Plant Substitution: Plant material may be substituted due to a lack of availability only after approval from the Engineer/Landscape Architect. Contact Engineer/Landscape Architect immediately if a particular species is unavailable.

F. Underdrain:

- 1. Polyethylene (PE) Pipe:
 - a. ASTM D3350; AASHTO M278.
 - b. 3-inch to 6-inch Diameter: ASTM F405.
 - c. 8-inch to 24-inch Diameter: ASTM F667.
- 2. Types:
 - a. As indicated on the Drawings.
 - b. Manufacturer: Hancor; ADS; or equal.
- 3. Gasketed Snap Coupler Joints:
 - a. Integral bell.
 - b. Minimum Pull Apart Strength: 400 pounds.
 - c. AASHTO M294.
 - d. Manufacturers: Hancor or ADS.
 - e. Fittings: ASTM D3350.

Note Engineer/Landscape Architect size pipe diameter and indicate on the Drawings.

G. Underdrain Gravel Blanket: [1-inch to 1-1/2-inch double washed stone.] [1/4-inch to 1/2-inch washed river run pea gravel.]

Note Engineer/Landscape Architect choose stone size.

H. Non-woven Geotextile Fabric:

- 1. Manufacturer: Propex Fabrics, Inc. 4547; or equal.
- 2. Minimum Weight: 3.5 ounces/square yard.
- 3. Minimum Coefficient of Permeability: 0.02 cm/second/square foot (28 inches/hour/square foot).
- 4. Apparent Opening Size (AOS): 70 to 120 U.S. Standard Sieve Size.

I. Mulch:

1. Shredded bark from mixed hardwood species.
2. 60% or particles shall range between 1 and 3 inches in length; remaining 40% shall be less than 1-inch in length.
3. Width of Particles: 1-1/2-inch maximum.
4. Well aged (at least 6 months old).
5. Uniform texture free of sawdust, foreign materials, and artificially introduced chemical compounds that would be detrimental to plant or animal life.
6. Suitability of material and size shall be determined by Engineer/Landscape Architect using visual inspection.

Note Choose one of the following: 1) Aluminum, 2) Steel, 3) Plastic, or 4) Timber, or distinguish on the Drawings or in the Specification where different types of edging are required. The maintenance strip standard detail does not call out the type of edging material..

J. Edging:

1. Aluminum:
 - a. Manufacturer: Permaloc Corporation, Holland, MI; or equal.
 - b. 1/8-inch x 4-inch mill finish.
 - c. 16 feet long sections.
 - d. 4-line stakes, 1 splicer stake per section.
 - e. Line Stakes: 12-1/2 inches long.
 - f. Splicer Stakes: 14 inches long.
2. Steel:
 - a. Manufacturer: Joseph T. Ryerson & Son, Inc., Chicago, IL; or equal.
 - b. 3/6-inch x 4-inch stock green finish.
 - c. 16 feet long sections with interlocking end joints.
 - d. Linestakes at 30 inches on center.
 - e. 2 stakes at each joint.
 - f. Stakes: 18 inches long.
3. Plastic:
 - a. Manufacturer: Valley View Specialties, Crestwood, IL; or equal.
 - b. Black diamond bed divider, 5-inch width.
 - c. 16 feet long sections with interlocking end joints.
 - d. 4 line stakes, 1 connector per section.
 - e. Provide blank diamond angle connectors as required by layout.
4. Timber/Level Spreader:
 - a. [6-inch x 6-inch, pressure treated, landscape timber.] [8-inch x 8-inch, pressure treated, landscape timber.]

- b. Minimum Length: 8 feet.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Rope off the rain garden areas to prevent heavy equipment from compacting the underlying soil before the site is graded.

3.2 INSTALLATION

- A. Excavation and Backfilling:

- 1. Excavate rain garden surfaces as indicated on the Drawings, using light earth-moving equipment or by excavating from the perimeter of the excavated area. Appropriate equipment includes wide track or marsh track equipment, or light equipment with turf-type tires. No heavy equipment will be allowed on the bottom of the rain garden.
- 2. Remove excavated materials from the rain garden site.
- 3. Thoroughly and deeply scarify subsoil in the excavated rain garden before placing soil mix or topsoil. Scarification may be completed with a toothed backhoe or other appropriate equipment.
- 4. Improve infiltration by tilling or ripping clay subsoil to a minimum 12-inch depth. Remove ponded water at the bottom of the excavation before tilling or ripping. Soil shall be friable before tilling.

Note This may be accomplished with solid-tine cultivation equipment, chisel plow, ripper, subsoiler or other appropriate equipment. Heavy clay subsoil may be broken up with an air jet, obtained through a septic contractor.

- B. Backfill:

- 1. Backfill with rain garden soil mix, avoiding compaction with heavy equipment.
- 2. Protect backfilled rain garden from compaction with 4-foot high snow fencing along perimeter boundary. If soil compaction occurs, remove and replace the soil at no additional cost to the Owner.

- C. Planting:

- 1. Times:
 - a. Plugs and Containerized Perennials: Plant from May 1 to July 1, without irrigation; until mid-September, with irrigation.
 - b. Bare Root Stock: Early spring, after the ground thaws and before plant dormancy breaks (late February through April).

- c. Trees and Shrubs, Containers and B&B: Between March 1 and June 1, and from October 1 until the soil becomes frozen.
2. Rates and Techniques:
 - a. Plugs, Bare Root Stock, Containerized and B&B: At densities and rates indicated on the Drawings.
 - b. Store delivered plants in a staging area that protects plants from drying winds and direct sunlight. Water plant material sufficiently to maintain root moisture throughout the planting operation.
 - c. Plant immediately after preparation of bed.
 - d. Follow the approved planting plan with respect to plant spacing and plant size. Insert plant tags next to the plants to aid in future identification during garden maintenance (weeding).
 - e. Do not fertilize the planting bed.
 - f. Spread 3 inches of shredded hardwood mulch throughout the rain garden after planting, being careful to not cover the plants with mulch.
 - g. Water the plants immediately after planting.
 - h. Do not plant during stormy weather when excessive precipitation may result in washing plant material away from its intended location.

3.3 MAINTENANCE

- A. Do not fertilize.
- B. Irrigation:
 1. Water daily for 2 weeks. Water sufficiently to ensure that plants receive a total of 1-inch of water per week (including from natural precipitation).
 2. After 2 weeks, provide 1 deep watering per week.
 3. During weeks when rainfall has been sufficient for plant establishment, suspend watering at the discretion of the Engineer/Landscape Architect.
 4. Water shall be free of substances harmful to seed germination.
 5. Hoses or other methods of delivery and transportation shall be furnished by the Contractor.
 6. Upon approval of the Engineer/Landscape Architect, water may be used from an on-site body of water.

- C. Weed Control:
1. Hand weed the planting bed weekly.
 2. Spot treat aggressive weeds, such as Canada thistle and spotted knapweed, with appropriate herbicides, following the manufacturer's guidelines.
- D. Inspection: Engineer/Landscape Architect will inspect planted areas at the end of the first growing season for signs of erosion and bare areas.

Note Rain Garden Plan should contain dimensions, slopes, spot elevations, edging type, edging detail, and planting plan (plant list). The planting plan should contain plant names (scientific and common), quantities, sizes, and spacing.

Rain gardens constructed on clay or compacted soil must contain an underdrain system and/or overflow structure. These are required if infiltration through native subsoil is less than 0.5-inch/hour. Variations of rain garden details are provided for the Specifier. One should be selected based on the soil properties.

Rain gardens must be excavated 1 to 4 feet deep (2.5 feet is recommended) and backfilled with an engineered soil mix. .

END OF SECTION 329353