DPS | Montgomery County
Department of Permitting Services

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RAIN GARDEN (RG)

Effective October 6, 2012

The Rain Garden methods described in the following section are based on the rain garden design found in Chapter 5 of the Maryland Storm Water Design Manual and the ESD Process & Computations Supplement dated July 2010. Where deemed appropriate, the design specifications have been modified by the Montgomery County Department of Permitting Services (DPS).

A. Facility Description

A Rain Garden is a shallow, excavated landscape feature that temporarily holds runoff and slowly filters it through a soil bed. Principal components of the system include: a) surface planting with shrubs, grasses, and flowers, b) a surface mulch layer, and c) a planting media layer. The facilities should be well landscaped to enhance their function and appearance.

B. System Design Considerations

1. Applicability

The Rain Garden device is appropriate for new and redevelopment applications. Rain Gardens can be used as primary or secondary practices on residential, commercial, industrial, or institutional sites. Currently, rain garden devices are not permitted in residential cul-de-sac islands due to fire truck access concerns. Rain Gardens should be used to treat runoff from small drainage areas. The total drainage area to a Rain Garden serving a single lot in a residential subdivision shall be 2,000 square feet or less. The maximum total drainage area to a Rain Garden for all other applications shall be 10,000 square feet.

Rain Gardens should not be located in areas that may result in damage to mature trees, or where existing slopes exceed 15 percent.

2. Conveyance

Runoff shall enter, flow through, and exit the facility in a non-erosive manner. Energy dissipation shall be provided for downspout discharges using a plunge area, rocks, splash blocks, stone dams, etc. Runoff shall enter a rain garden at the surface through grass swales and/or a gravel bed. For moderately sloped applications, a series of rain gardens can be used as “scalloped” terraces to convey water in a non erosive fashion. Rain gardens may not be constructed on slopes of 15% or greater.

3. Soil Suitability

Provide soils information to support the use of Rain Gardens. Acceptable methods include a) soil typing, b) drawdown testing, and c) infiltration testing. Infiltration testing is required for drainage areas exceeding 2,000 sf. If the measured infiltration rate is less than 0.52 in/hr, the design must demonstrate that the facility will dewater in 48 hours or less. In no case may a rate of greater than 0.52 in/hr be used to compute facility depth. See “Soil Testing Guidelines for Stormwater Management Practices”. Rain Gardens are not appropriate for use where fill exceeds 2-feet in depth.

4. Setbacks

Rain Garden practices shall be located at least 30 feet from water supply wells and 25 feet from septic systems. Practices should be located down gradient and setback at least 10 feet from building foundations.

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C. Specifications and Details

1. Sizing

The facility shall be sized to capture and store 100% of the calculated treatment volume. A minimum of 2" and maximum of 6" of surface ponding must be provided above the facility. The surface area (A_f) of a rain garden practice shall be at least 2% of the contributing drainage area. Planting media shall be between 6 and 12 inches deep. Mulch layer shall be approximately 3 inches deep on all exposed planting media. The total storage provided in the facility shall be computed as the storage provided in the temporary ponding area and the storage provided in the planting media layer. Computations shall account for the porosity (n = 0.40) of the planting media. Storage provided in excess of that required to treat the runoff for the 1 year, 24-hour design storm shall not be counted towards the total ESDv provided.

To the extent possible, facilities should have irregular outlines to blend naturally into the environment. Rectangular is not natural.

2. Inflow Design Criteria

Runoff shall enter the rain garden facility in a non-erosive manner (less than 2 fps for a 1-year storm event). Inflow may be through depressed curbs with wheel stops, curb cuts, level spreaders, bubblers, or conveyed directly using downspouts, covered drains, catch basins, overland flow, or other acceptable conveyance methods. Particular care must be taken to prevent erosion of the surface mulch layer.

3. Overflow Design Criteria

A safe non-erosive overflow must be provided. The overflow should be non structural where possible. If a structural overflow device is needed, a yard inlet or dome cap inlet may be used. The overflow invert of the inlet must be set at the design storage level. Safe conveyance of the developed 10-year storm through the facility must be demonstrated.

4. Planting Media

Planting media shall conform to MDE specifications described in the MDE 2000 Maryland Stormwater Design Manual, Appendix B.4, Section B.4.C. As an alternative, MCDPS Micro-Bioretention facility planting media specifications may be used. The planting media specifications must be placed on the design plans.

5. Mulch

The mulch layer is an important part of the rain garden device. Much of the pollutant removal capacity of the rain garden system is within the mulch layer. The surface mulch layer will consist of standard double shredded aged hardwood mulch. The mulch should be applied uniformly to a depth of approximately 3 inches. Yearly replenishing may be necessary. Pine bark is not acceptable.

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6. Plant Materials

Plants, through their pollutant uptake and evapo-transpiration of stormwater runoff, play a key role in the overall effectiveness of the rain garden device. The use of native plants is encouraged, but they may not be appropriate in all situations. While no hard planting rule exists, the plants should be a mix of trees, shrubs and herbaceous materials. Because of the relatively shallow depth of the planting media, it is preferable to plant the surface of the facility with herbaceous materials only. Trees and shrubs should be planted at the perimeter of the facility. The number and type of tree and shrub plantings for the system may vary, especially where aesthetics or other considerations such as screening or shading are critical to site development. The planting design should anticipate that the mature canopy of trees and shrubs, together with the areas planted with herbaceous materials, should cover at least 85% of the rain garden practice. Trees shall be a minimum of 1 1/2 inch caliper, shrubs shall be a minimum of 2 gallon size, herbaceous flowering perennials shall be a minimum 1 quart size, and grasses and grass-like perennials shall be a minimum size of 2 inch plugs. All plantings shall be in accordance with the Montgomery County landscape guidelines. All landscape plans must be sealed by a registered landscape architect. Since the plants are an integral part of the rain garden system, no changes to the approved landscape plan will be allowed unless an alternate plant list, prepared by a registered landscape architect, has been approved by DPS prior to installation. Since plant availability can change, DPS suggests including an alternate plant list on the landscaping plans. Turf grass is not acceptable in Rain Gardens.

Rain Garden Sizing Example

A Rain Garden is being designed to treat the runoff from a downspout. The target ESD_V for the overall project has already been determined. The total drainage area to the facility is 1,500 square feet of roof area.

Calculate the maximum volume that can be stored in the facility:

ESDv(MAX) = [(Pe) (Rv) (A)]/12
= [(2.6")(0.95)(1,500sf)]/12
= 309 cf
P_e = Max of 2.6"

Rv = 0.05 + (.009 x I)
= 0.05 + (.009*100) = 0.95
I = 100% roof area

Calculate the minimum volume that must be stored in the facility:

ESDv(MIN) = [(Pe) (Rv) (A)]/12
= [(1.0")(0.95)(1,500sf)]/12
= 119 cf

Rv = 0.05 + (.009 x I)
= 0.05 + (.009*100) = 0.95

To calculate the ESDv provided by this facility we will assume a ponding depth of 0.5' and a 12" thick media layer. The porosity for the media layer is n = 0.40. Assume the area of the filter bed (Af) is 150 sf.

- ESDv=Storage volume + storage in filter media (note: to be conservative the volume contained in the 3:1 side slope area was not included)

  = (150 sf*0.5') + [0.4*(150 sf*1.0')] =135 cf

Since the proposed ESDv is smaller than the ESDv (Max) and larger than the ESDv (MIN), the facility is acceptable. The surface area of the facility can be increased so that a max ESDv of 309 cf is attained. In this case a filter area of 343 sf will produce an ESDv of 309 cf which is acceptable and will yield a Pe of 2.6" for this drainage area which is greater than the 1" min, and equal to the 2.6" max.

3. Lastly the filter area must be checked to verify that it is not less than 2% of the facility drainage area.
   - Af%=(135 sf/1,050 sf)*100 = 9% Therefore this design is acceptable.

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