

Section 3.11 Green Roofs (GR)



Green Roofs or vegetated roofs are alternative roof surfaces that typically consist of waterproofing and drainage materials and an engineered growth media that is designed to support plant growth. Vegetated roofs capture and temporarily store stormwater runoff in the growth media. A portion of the captured stormwater evaporates or is taken up by plants, which helps reduce runoff volumes, peak runoff rates, and pollutant loads on development sites.

This standard is intended for situations where the primary design objective of the vegetated roof is stormwater management. Green Roof installations provide many other environmental benefits such as energy efficiency, air quality improvements, and habitat. There are two different types of vegetated roof systems: intensive vegetated roofs and extensive vegetated roofs. Intensive systems have a deeper growth media layer that ranges from 6 inches to 4 feet thick, which is planted with a wider variety of plants, including trees. By contrast, extensive systems typically have much shallower growing media (2 to 6 inches), which is planted with carefully selected drought tolerant vegetation.

Policies Regarding GR

This standard was developed for the installation of extensive green roof systems. Intensive systems in accordance with the Clearinghouse guidelines are eligible to apply but the incentive payment rate remains the same.

A. Criteria

- Roofs must be 200 square feet or larger. All practices detaining and/or infiltrating runoff must be sized to treat a 1 inch rainfall volume as per the DEQ Stormwater BMP Clearinghouse specifications.
- Plant establishment may be plugs/container; cuttings; seeding; vegetated mats; or modular/tray systems. Native species or mixes that are adapted to the site conditions and intended uses are required. Selected species must have the capacity to achieve adequate density and vigor within an appropriate time frame. Establishment of vegetation generally takes 1 to 2 years.
- Plant species must be considered native “Flora of Virginia.” Only native plants will be allowed in a Green Roof plant list or planting plan. See Helpful Technical References section for publications and websites related to native plants. Invasive or noxious species, as identified by the DCR invasive species list, and/or the USDA noxious weed list are prohibited.

- Species, density/rate of seeding or planting, minimum quality of planting stock and method of establishment shall be specified as part of the application. Only viable, high- quality seed or planting stock that is shallow-rooted, self-sustaining, and tolerant of direct sunlight, drought, wind, and frost should be used. Seeding or planting must be done at a time and in a manner that best ensures survival and growth of the selected species. The planting window extends from the spring to early fall, allowing plants to root thoroughly before the first killing frost. Green Roofs should not be planted in the winter. Temporary irrigation is often necessary during dry months as the roof is established.
- Only the minimum amount of fertilizer necessary to establish vegetation growth shall be utilized (according to soil test report).
- North and east aspects are preferred for survivability of vegetation and reduction of irrigation.
- Green roof designs shall include the following components:
 - Deck layer with adequate structural support
 - Insulation layer
 - Waterproofing layer
 - Drainage layer and system
 - Root barrier (non-woven geotextile fabric or similar)
 - Growth media
 - Plant cover
 - Slope stabilizer (if applicable)
- Roof pitch shall be a minimum of ¼":12" (2%) and no more than 4":12" (33%).
- Longest flow path from top of roof to gutter shall be less than 75 feet.
- Drainage layer shall be a minimum of 1 inch of pea gravel or a mat system.
- Growth media shall have less than 15% organic matter. Compost amendments must be free of detectable levels of pesticides and other hazardous chemicals.
- The participant is responsible for ensuring that the proposed installation and maintenance plan meets all applicable local policies and ordinances.
- Site constraints for construction and design should be identified (HVAC, electrical, roofing materials, pitch/slope, access and process for getting materials on the roof).
- Green Roof structural loads shall comply with Chapter 16 of the latest edition of the International Building Code.
- All material specifications and construction details shall be in accordance with the manufacturer's recommendations and Virginia Stormwater BMP Clearinghouse Design Specification No. 5.

B. Plans and Specifications

- A design plan with a professional seal must be submitted by applicant; or a waiver of liability may be accepted on a case-by-case basis (**Form 5**), and approval by the local Building Office if applicable. The installed practice must be in accordance with the approved design unless changes were pre-approved by the Steering Committee. Information required in the plan includes (see VCAP Submission Checklist for a comprehensive list):
 - Waterproofing specifications.
 - Structural design specifications.
 - Non-woven geotextile fabric specifications.
 - Proposed growth medium depth and composition.
 - Proposed vegetation and seeding/planting rate. Plant list can include the common plant name but must include the scientific name. Vegetables, herbs, and annual plants are not allowed in the landscape plan.
 - Drainage system specifications.
 - Drainage and overflow system details.

- Irrigation considerations (permanent or temporary watering systems, hose bib connections, etc.).
- A statement regarding compliance with any permitting requirements or local codes.
- Other information as requested by the local District.
- Certification by a Licensed Professional may be required by the District to verify practice installation.

C. Operation and Maintenance

- Maintenance inspections shall be conducted a minimum of twice annually by the landowner, or a designated sub-contracted agent of the landowner.
- Maintenance will follow guidelines on the Virginia Stormwater BMP Clearinghouse Design Specification No. 5.
- Maintenance will include all components of the practice including vegetation, soil media, drainage system and structural integrity.
- Applying fertilizer after vegetation has been established is prohibited as one of the purposes of VCAP is to reduce sources of nutrient pollution.

D. Cost Share Rates/Incentives

- See **District Guide to VCAP** for practice cost-share rates and caps.
- Eligible costs may include: installation (placement of layers and planting), plant material, soil media, drainage system, additional structural support, root barrier material, waterproofing, insulation.

E. Helpful Technical References:

- Virginia Stormwater BMP Clearinghouse, Design Specification No. 5 Vegetated Roof.
- Dunnett, N. and N. Kingsbury. 2004. *Planting Green Roofs and Living Walls*. Timber Press. Portland, Oregon.
- Weiler, S. and K. Scholz-Barth 2009. *Green Roof Systems: A Guide to the Planning, Design, and Construction of Landscapes over Structure*. Wiley Press. New York, NY.
- 2015 International Building Code. July 2015. International Code Council, INC.
- The Green Roof Manual: A Professional Guide to Design, Installation, and Maintenance. By Edmund C. Snodgrass and Linda McIntyre. 2010.