



**Devens Enterprise Commission**  
**POLICY for CONSTRUCTION of VEGETATED ROOFS**  
**Amended**  
**January 31, 2012**

**(1) Purpose:** To create a DEC Vegetated (Green) Roof Construction Standard that sets out minimum requirements for the construction and maintenance of green roofs.

**(2) Requirements:**

- (a) A designer of a vegetated roof shall apply the measures described in this policy.
- (b) Adherence to the Mandatory Provisions is considered an acceptable solution for the design and construction of a vegetated roof.
- (c) A vegetated roof designed to the DEC Vegetated Roof Construction Standard may be constructed on both combustible and non-combustible buildings.
- (d) A member of the vegetated roof design and construction team shall be an accredited Green Roof Professional (GRP) with knowledge of vegetated roof design, installation and maintenance procedures and best practices.

**(3) Mandatory Provisions.** The following standards shall be met in the design and construction of a vegetated (green) roof:

- (a) Assembly. A vegetated roof assembly shall, at a minimum, consist of:
  - 1. a root repellent system (Root repellent mat shall not include herbicide or copper sulfate inhibitors. Data sheet shall be submitted 30 days prior to construction for approval. Root repellent is NOT required if the waterproofing membrane has been tested and passed either the FLL Root Resistant Procedure or ANSI/GRHC/SPRI VR-1 2011 Procedure for Investigating Root Resistant Penetration on Vegetative Roofs.) ;
  - 2. a drainage system;
  - 3. a filtering layer;
  - 4. a growing medium;
  - 5. plants;
  - 6. waterproof membrane.
- (b) Gravity loads:
  - 1. The applicant shall calculate vegetated (green) roof gravity loads following the protocol provided by the ASTM standard: "ASTM E2397.05 – Standard Practice for Determination of Dead Loads and Live Loads Associated with Green Roofs Systems."
  - 2. The density of the growing media shall be determined:
    - a. In accordance with "ASTM E2397.05 – Standard Test Method for Maximum Media Density for Dead Load Analysis of Green Roof Systems"; or alternatively
    - b. The designer may use an un-factored, saturated density of the growing media of 3.9 inches (1344 lbs./ft. or 2,000 kg/m).
- (c) Slope Stability. All roofs with slopes in excess of 10 degrees (17%) that support vegetated (green) roof assemblies shall incorporate anti-shear measures.
- (d) Parapet height and/or overflow scupper locations.
  - 1. Parapets and scuppers shall be specified in the design, as required, to limit retained rain water loads to within structural limits in the event of obstructed internal drains.
  - 2. The referenced point for the overflow scupper height must be clearly indicated to avoid the possibility of confusing the overflow scupper height as being measured above the finished

green surface or other layer above the waterproofing resulting in higher water load than accounted for by the design as indicated in the sketch below.

- (e) Wind uplift. The applicant shall provide a report, stamped by an engineer, providing that the roof meets ANSI/SPRI RP-14 Wind Design Standards for Vegetative Roofing Systems approved 6/3/2010. The intent of the report is to illustrate that wind uplift pressures are being designed for (including a description of how the pressures were determined), and describing how the design addresses these pressures.
- (f) Fire safety. Where roof penetrations, intersecting walls, parapets, upturns or mechanical equipment are clad with combustible materials the design shall include a vegetation-free border zone abutting such features and the vegetation-free border shall be equal to the vegetation height at maturity but in no case be less than 1.5 ft. (0.5m). The applicant shall provide a report stating how the roof design meets ANSI/SPRI VF-1 External Design Standard for Vegetative Roofs approved 1-29-2010.
- (g) Occupancy and safety. The applicant shall state, in a vegetated roof declaration form and the vegetated roof application, the use of the roof and whether or not it will be accessible to the public.
- (h) Waterproofing.
  - 1. The waterproofing membrane must have been tested and passed either the FLL Root Resistant Procedure or ANSI/GRHC/SPRI VR-1 2011 Procedure for Investigating Root Resistant Penetration on Vegetative Roofs. The waterproofing membrane must have a documented track record in green roof construction with supporting projects in the New England area.
  - 2. 20 Year System Warranty: The green roof assembly including the waterproofing membrane components including insulation, barrier boards, metal edge system, etc. and vegetative overburden including but not limited to water retention mats, trays, and vegetation shall be warranted for a minimum of at least 20 years. Warranty sample shall be submitted and written approval provided by the owner's representative at least 30 days prior to construction.
  - 3. Immediately prior to installation of the vegetated roof, the applicant shall cause to be conducted one of the following leakage testing protocols:
    - a. Flood test;
    - b. Electric field vector mapping;
    - c. Impedance test;
    - d. Infrared (IR) thermal imaging;
    - e. Low voltage testing;
    - f. High voltage testing;
    - g. Moisture sensors;
  - 4. a report documenting a successful test, signed by an architect or engineer, shall be provided to the Building Inspector.
- (i) Drainage.
  - 1. The design hydraulic load shall be evaluated assuming that the vegetated roof system is fully saturated prior to the maximum fifteen-minute rainfall.
  - 2. Positive slope to drain shall be provided at the level of the waterproofing membrane.
  - 3. The system shall permit effective drainage beneath the growth media.
  - 4. Vegetation-free zones shall be provided around all drains.
- (j) Water retention.
  - 1. Water retention mats or equivalent materials shall be employed as required to promote vegetation growth.
  - 2. The drainage layer shall be appropriate for storm water retention and must be selected following "ASTM E2398-05 Standard Test Method for Water Capture and Media Retention of Geo-composite Drain Layers for Green Roof Systems."

- (k) Vegetation Performance. In order to support plant survivability:
1. When structurally possible, the growing media shall be at a minimum 4 inches (10 cm); or
  2. The applicant shall provide a report confirming that the engineered system as designed provides plant survivability comparable to that of an un-irrigated system with growing media at a minimum 4 inches (10 cm).
- (l) Plant selection.
1. Vegetation on a vegetated roof shall not include any invasive species defined in Invasive Plant Atlas of New England, as may be amended from time to time.
  2. The plant selection and design shall be such that within three years of the planting date the selected plants shall cover not less than 80% of the vegetated roof.
  3. The plant material selected shall consist of USDA hardiness zone appropriate native plant and seed material.
  4. Compliance with the plant coverage required in the preceding sentence can be satisfied by a design that will provide one or more of the following:
    - a. That seeds for groundcover plantings shall be sown at a rate not less than 30/ft<sup>2</sup> (325/m<sup>2</sup>);
    - b. That cuttings shall be distributed not less than 12kg/100m<sup>2</sup> (2.5lbs./ft<sup>2</sup>); and
    - c. Either that pre-grown plugs shall be installed not less than 11/m<sup>2</sup> (1/ft<sup>2</sup>) or a report from the designer that describes how the design fulfills this coverage requirement shall be provided with the application.
- (m) Irrigation. Adequate measures shall be provided to permit irrigation necessary to initiate and sustain the vegetation during the service life of the vegetated roof. A secondary water source at roof level is recommended in the event the irrigation system malfunctions and cannot be immediately repaired.
- (n) Maintenance plan.
1. The applicant shall develop a maintenance plan for the vegetated roof which shall define programs of routine maintenance and inspection sufficient to ensure that the vegetated roof components perform their required functions for the duration of their design service lives.
  2. The maintenance plan shall address the requirements of the specified growth media and vegetation for vegetation survival.
  3. The maintenance plan shall address re-planting, in the event that re-planting should become necessary, and assure that complete coverage at canopy level is achieved within three growing seasons and maintained for the service life of the vegetated roof.
  4. The maintenance plan shall address and provide for maintenance worker training. Given the potential turnover in maintenance personnel, the maintenance plan shall incorporate provisions for training all personnel (who will be performing maintenance) about appropriate clothing and footwear, safety practices, plant types (what weeds to pull and what not to pull, what debris needs to be removed, and what can potentially void any warranties, etc).
  5. The maintenance plan shall reference the safety practices to be employed during maintenance, including the location of safety harness tie-downs or anchors in order to assure appropriate worker safety.
  6. The maintenance plan shall be submitted with the application for a building permit for the vegetated roof. It shall cover the first five years and address plant establishment and post establishment periods.