Toronto Green Roof Construction Standard

Purpose of Toronto Green Roof Construction Standard: relation to Ontario Building Code.

A. The purpose of the Toronto Green Roof Construction Standard is to set out minimum requirements for the construction and maintenance of green roofs. The design and construction of a green roof shall meet the City's minimum requirements for green roof construction while also meeting the Ontario Building Code (OBC) requirements. The Toronto Green Roof Construction Standard does not replace or alter any existing OBC requirements, or define a singular code-compliant green roof design.

B. A designer of a green roof shall apply the measures described in this article with reference to the principles governing the OBC requirements related to each measure.

C. This article is considered an acceptable solution for the design and construction of a green roof in addition to the acceptable solutions contained in parts 3 to 12, Division B, of the OBC. Designs shall meet the OBC objectives to demonstrate compliance with the OBC; however a design that complies with the provisions of § 492-9 shall be deemed to comply to such objectives.

D. A green roof designed to the Toronto Green Roof Construction Standard may be constructed on both combustible and non-combustible buildings.

Toronto Green Roof Construction Standard: mandatory provisions.

The following standards shall be met in the design and construction of a green roof:

A. Green roof assembly.

A green roof assembly shall, as a minimum, consist of a root repellent system, a drainage system, a filtering layer, a growing medium and plants, and shall be installed on a waterproof membrane of an applicable roof.

B. Gravity loads.

(1) The applicant shall calculate 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 Roof Systems."

(2) The density of the growing media shall be determined:

(a) In accordance with "ASTM E2399.05 - 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 2,000 kg/m3.

(3) The applicant shall include design loads definition as part of the "Green Roof Declaration" form which shall be required as part of an application for building permit.

C. Slope stability.

All roofs with slopes in excess of 10º (17 percent) that support 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) Analysis shall be done in conformance with OBC Division B 4.1.6.4.(4).(3).

(3) The referenced point for the overflow scuppers 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 wind uplift pressures 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 0.5 metres.

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G. Occupancy and safety.

The applicant shall state, in a green roof declaration form and the green roof application, the use of the roof and whether or not it will be accessible to the public.

H. Waterproofing.

(1) The design and construction shall include the installation of a root barrier in all vegetated roofing systems.

(2) Immediately prior to installation of the green 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;

and a report documenting a successful test, signed by an architect or engineer, shall be provided to the Chief Building Official.

I. Drainage.

(1) The design hydraulic load shall be evaluated assuming that the green 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 100 millimetres; 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 minimum 100 millimetres.

L. Plant selection.

(1) Vegetation on a green roof shall not include any noxious weeds as defined in Ontario Regulation 1096 under the Weed Control Act, 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 no less than 80 percent of the vegetated roof.

(3) 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 325/m2;

(b) That cuttings shall be distributed not less than 12kg/100m2; and

(c) Either that pre-grown plugs shall be installed not less than 11/m2 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 green roof.

N. Maintenance plan.

(1) The applicant shall develop a maintenance plan for the green roof as per

CSA-S478-95 "Guideline on Durability in Buildings" which shall define programs of routine maintenance and inspection sufficient to ensure that the green roof components perform their required functions for the duration of their design service lives.
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 green roof.

(4) The maintenance plan shall be submitted with the application for a permit for a green roof.