Toronto Green Roof Construction Standard

REPORT FROM THE CHAIR

Report Introduction

At its meeting of November 23, 2008, the City of Toronto Planning and Growth Management Committee considered a report from the Chief Building Official and Chief Planner with a content summary of the proposed Green Roof By-law. That report recommended that Toronto Building conduct a focussed public consultation on the draft Toronto Green Roof Construction Standard (TGRCS).

By-law to Require and Govern the Construction of Green Roofs in Toronto
http://www.toronto.ca/legdocs/mmis/2008/pg/bgrd/backgroundfile-16784.pdf
Draft Toronto Green Roof Construction Standard
http://www.toronto.ca/legdocs/mmis/2008/pg/bgrd/backgroundfile-17247.pdf

The Technical Advisory Group (TAG) was given the mandate by the Chief Building Official to review the stakeholder comments received during the November/December 2008 consultation on the TGRCS and recommend amendments to the draft standard to the Chief Building Official. The TAG was asked to consider the following matters in making recommendations for consideration by the Chief Building Official:

1. policy directions from City Council related to requiring and constructing green roofs;

2. the City's Green Roof strategy as expressed in the document "Making Green Roofs Happen",

3. consultations with stakeholders from government, industry, and the community at large;

4. technical viability of existing or proposed standards for Green Roofs;

5. consistency of the Green Roof standards with objectives of the building code;

6. impacts of the Green Roof standard on the interests of stakeholders and the economic feasibility of the recommendation; and

7. the enforceability of the recommendation if implemented as part of the Green Roof standard.

Technical Advisory Group Membership

The Members of the TAG (Technical Advisory Group) were appointed by the Chief Building Official (CBO) upon nomination to represent various sectors including: design sector, material and component manufacturers, construction sector, research sector, building officials, building regulatory sector and the green roof industry. Members were appointed based on their expert knowledge and professional qualification concerning green roof technology and familiarity with building regulations.

Attending Members

Name	Company (Organization)
Hitesh Doshi (Chair)	Ryerson University
Lou Ampas	Cool Earth Architecture (Ontario Association of Architects)
Gregory Cook, P.Eng.	Cook Consulting Engineers Limited (Ontario Society for Professional Engineers)
Steve Daniels	Tridel (Building Industry and Land Development Institute)
Ken Hale	Greenland Consulting Engineers (Ontario Association of Landscape Architects)
Jim Hong	City of Toronto, Toronto Building
Monica Kuhn	(Monica E. Kuhn, Architect Inc.) Green Roofs For Healthy Cities
Dan Mitta	Ministry of Municipal Affairs and Housing
Steven Peck	Green Roofs for Healthy Cities
Lyle Scott	Minto (Building Industry and Land Development Institute)

Technical Consultants

Douglas Webber	Halsall Associates Inc.
Susana Saiz Alcazar	Halsall Associates Inc.

Chair's Report

To assist the TAG in supporting its discussions, the Chief Building Official appointed Professor Hitesh Doshi, Professor, Ryerson University, as the Chair. Ms. Monica Kuhn served as the Chair during the meeting on January 14, 2009 in the absence of Professor Doshi. The TAG met to consider stakeholder comments and review the TGRCS for 4 full-day meetings (December 11, 2008; January 14, 2009; February 19, 2009 and March 23, 2009). Toronto Water staff were invited to attend one of the meetings to answer questions on the Wet Weather Flow Master Plan. In addition, members of the TAG met with the City Planning Staff involved with the green roof By-law to provide input related to the

connection between the proposed requirements for green roofs on certain types of new buildings and the Toronto Green Roof Construction Standard (TGRCS).

The TAG worked with Halsall Associates, the Technical Consultants for Toronto Building, who formulated the initial TGRCS, to make recommended amendments to the standard over the course of the four meetings.

This report summarizes the significant recommendations. The mandate of the TAG was to focus on the TGRCS. However the Chair, in consort with the TAG, determined that many recommendations in the TGRCS needed to be contextualized and documented. In that regard the additional comments have been provided for consideration.

The report from the Chair of the City of Toronto Green Roof Technical Advisory Group (TAG) follows, highlighting some significant discussions by the group and the major recommendations of the TAG for amendments to the TGRCS and matters for inclusion in any supplementary guidelines.

The report is included as Attachment 2 to the March 27, 2009 report “By-law to Require and Govern the Construction of Green Roofs in Toronto” from the Chief Building Official and Executive Director, Toronto Building and Chief Planner and Executive Director, City Planning to the City of Toronto Planning and Growth Management Committee for consideration at its meeting of April 14, 2009

Chair`s Introduction to Key Recommendations

The City of Toronto needs to be applauded in taking a leadership role in the development of standards related to Green Roof in support of the By-law that will require their implementation on buildings in Toronto. Although the Technical Advisory Group (TAG) was charged with the responsibility to make recommendations regarding the Toronto Green Roof Construction Standard (TGRCS) it was evident throughout the deliberations that the TGRCS could not stand in isolation to the By-law requirements. The members of the TAG worked diligently to develop consensus around the technical requirements in the TGRCS. They were guided by the experience and interests of the various stakeholders that formed the membership of the TAG. There were some requirements that needed very little deliberations and others that need significant deliberations. Often in the latter situation there were stakeholder opinions that were at odds with each other. At the end and with the technical guidance from Halsall and Associates and process related input from the City staff the TAG was able to make recommendations on which there was general agreement.

It is important that in addition to the recommendations that were made by the TAG key components of the deliberations and discussions that happened in the TAG meetings be shared. The following provides the key recommendations along with additional information related to these recommendations that were discussed and that the TAG felt important to share.

It has been by distinct pleasure to be the Chair of the TAG and to guide such important stakeholder input into the formulation of the requirements. I would also like to thank each and every member of the TAG who so diligently contributed their time and expertise in this important task. I would also like to thank the City staff who facilitated all aspects of the meetings and in particular Dylan Aster for his timely and meticulous communication of the deliberations of the TAG.

Hitesh Doshi
Chair
Green Roof Technical Advisory Group

Key Recommendations

Introduction Section of Standard

TAG members noted at several points that the introduction to the draft standard contained useful information and provided a context to the purpose of the standard and its relationship to the requirements of the Ontario Building Code that apply to the remainder of the building.

R1. The Toronto Green Roof Construction Standard (TGRCS) should contain an introduction, or preamble to provide some context of the relationship between the TGRCS and the Ontario Building Code to requirements of the standard.

R2. The standard should include a statement that a green roof system, designed to the TGRCS may be constructed on both combustible and non-combustible buildings.

Definitions and Green Roof Components

There were no stakeholder concerns with this section. The TAG agreed that the definition of "green roof" should be amended for the purpose of the standard. The TAG discussed the significant role of the root barrier in managing risks to the long term durability of the green roof. The group agreed that the standard should also include a requirement for root barriers as part of a definition of a "green roof assembly", or elsewhere in the standard.

R3. The definition of "green roof" should be amended to accurately reflect the type of green roof intended for regulation by the TGRCS and be consistent with the definition used to require green roofs as the part of any By-law by the City.

R4. The standard should require the inclusion of a root barrier as part of the green roof assembly.

Structural

The TAG considered the stakeholder comments on the TGRCS structural provisions and noted strong stakeholder support for requiring professional design review in this area. The TAG considered comments suggesting that there may be a limited number of labs able to provide testing to the standard required (ASTM E2397.05) for designers to use in calculating the dead load of the green roof. Some on the TAG identified that access to testing facilities should not be a problem for manufacturers of green roof systems. The TAG agreed that

designers should be provided with a default load value in addition to the ASTM methodology.

R5. To assist designers, the TGRCS should include a default value for determining the maximum density of the growing medium in the structural design of the green roof to assist designers in calculating the loads of the green roof.

Wind Uplift

The TAG discussed the matter of wind uplift requirements during its initial review of the standard and revisited the matter at its final meeting. The City's technical consultant advised that the draft standard contains requirements for wind uplift to be addressed in the design, as there are presently no standards for this issue.

During our discussions, the green roof industry representative advised that the Single Ply Roofing Industry (SPRI) and Green Roofs for Healthy Cities are in the process of developing a "Wind Design Standard for Vegetative Roofing Systems" targeted for completion in mid-2009. The group was interested in the development of the standard, and suggested that it be reviewed for applicability to Toronto once complete. Staff advised the By-law could not reference an incomplete standard.

In the absence of the standard, the group requested that the City's technical consultant prepare additional language and provide an alternative path for designers to consider wind uplift in green roof design. The consultant presented the revised requirements for wind uplift at the final meeting of the TAG. The green roof industry representative noted that the requirement may be overly restrictive and that the draft SPRI standard should be referenced in Toronto's green roof By-law. The rest of the group identified wind uplift as a significant concern that needs to be addressed in the TGRCS. In the absence of the final SPRI standard, the consultant's proposed compliance path was appropriate until such time as the SPRI standard was complete.

R6. The draft wind uplift requirements should be included with a best practices guide and the standard should be amended to require 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.

R7. The Chief Building Official should reconvene the TAG following completion of the SPRI/ANSI wind uplift standard to review the standard for applicability to Toronto and potential updating of the Toronto Green Roof Construction Standard.

Fire Safety

Similar to wind uplift, the TAG considered the matter of fire safety at two of its meetings. As the draft TGRC identifies, there is no widely accepted testing method developed for Green Roofs. However, the green roof industry representative noted that SPRI is also developing a fire standard.

The importance of maintenance programs for green roofs was raised initially during the discussion of fire safety and fire spread was considered to be more of an issue than fire penetration into the building. The group agreed that the requirement for vegetation height to be kept to a 0.9 meter height was thought to be arbitrary and overly restrictive. The group discussed potential fire safety differences between different vegetation types in considering recommended amendments to the standard.

R8. The Chief Building Official should reconvene the TAG following completion of the SPRI/ANSI fire safety standard to review the standard for applicability to Toronto, compatibility with the requirements of the Ontario Building Code and potential updating of the Toronto Green Roof Construction Standard. In the interim, the TGRCS should contain requirements for breaks in vegetation to mitigate fire spread.

Occupancy/Safety

The TAG reviewed the stakeholder comments on this section noting the strong opposition to the proposed requirement for a 2m non-vegetated border zone on non-occupied roofs. There was agreement that in order to appropriately determine the Ontario Building Code requirements associated with the occupancy of the green roof, the use of the roof should be included on a green roof declaration form at permit application.

R9. The proposed requirement for a 2m non-vegetated border zone on non-occupied roofs should be removed from the TGRCS.

Waterproofing

The TAG discussed whether leakage testing should be included as a requirement of the standard, or as a recommended best practice. A rationale for requiring leakage testing was that the cost of repairing a leak after the installation of the green roof may be significant. Consumers may not be aware that in the green roof industry it is common practice to include leak detection.

The management of a construction project and the timing of a leakage test was raised as a potential concern by some members of the group in discussing whether the TAG would recommend requiring the test. After consideration of the

matter, City staff advised that this issue could be addressed by establishing that the inspection of the roof occur prior to planting of vegetation.

R10. The standard should include a requirement for some form of mandatory leak detection test if it does not otherwise impact construction scheduling.

Maintenance and Durability

The TAG considered if and how the TGRCS should address the durability of green roofs. The Ontario Building Code contains a Canadian Standards Association (CSA) standard reference to durability. The TAG discussed how the CSA durability standard would apply to the TGRCS. As such, the group discussed whether it was appropriate to recommend a minimum service life for membranes. Durability was agreed to be a matter that could be addressed through a maintenance plan requirement.

With reference to the construction of condominiums, the development industry representatives noted that guidance and assistance on future costs of green roofs are needed. This was another area of discussion in which the group agreed that a maintenance plan would benefit owners of green roofs and assist in ensuring their durability due to appropriate maintenance measures.

R11. The TGRCS should contain a requirement for some form of maintenance plan as part of the building permit application to construct a green roof. To assist applicants, the standard should include the components of an appropriate maintenance plan.

Water Retention and Vegetation Performance

The TAG considered the requirements for water retention and vegetation performance concurrently as growing media was addressed in both areas. During the

Stakeholder feedback was in strong opposition to the requirement that green roofs provide a runoff coefficient of 60% or a 150mm deep growing medium. In developing its recommendation on whether to prescribe a minimum growing medium depth the group considered the challenges with installing 150mm (approx 6”) of media on a wood frame town home.

The group discussed the significant role that the growing media performs in ensuring the viability of the green roof vegetation. Presently 100mm (approx 4”) growth media depth is considered appropriate for Toronto. The TAG also discussed the need for designers to have flexibility in designing a green roof for

the particular context balanced with the need for the standard to support the viability of the green roof vegetation through the growth media.

R12. The TGRCS should support plant survivability by setting a minimum growing media depth when structurally possible, but also allowing designers the flexibility of using an engineered system that provides comparable plant survivability.

In reviewing stakeholder comments, the TAG discussed the intersection between the TGRCS and existing City of Toronto By-laws and studies such as water policy, migratory bird issues and pesticide use.

R13. Any supplementary guidelines to the TGRCS should reference other City By-laws which a green roof designer or the public should be aware of in considering the installation of a green roof.

Plant Selection

The draft TGRCS prescribed that the vegetation be appropriate for use in the green roof application and provided a list of parameters to which the vegetation must comply. The TAG considered stakeholder comments suggesting that these requirements are overly restrictive and agreed they were appropriately best practices. The TAG discussed how the issue of plant choice was considered to be less important than the matter of plant survivability on green roofs. It was agreed that ensuring vegetative cover over a certain period was appropriate for designers to consider.

The Toronto and Region Conservation Authority provided an updated list of native plants suitable for green roofs in Toronto. The TAG reviewed this list and advised that it would be useful in the

R14. The TGRCS should allow designers the flexibility to choose the appropriate vegetation and the supplementary guidelines should provide guidance on considerations for plant choice and include a plant list of Ontario native plants suitable for a green roof in Toronto.

Designers

The plant selection section of the draft TGRCS contained a proposed requirement that the green roof assembly be stamped by a Landscape Architect registered in the Province of Ontario. The group reviewed the strong stakeholder opposition to this proposed requirement. Green roof installers and designers considered this an undue and costly requirement for the TGRCS, especially in its application to smaller scale green roofs in Toronto.

The Ontario Association of Landscape Architects (OALA) member supported this requirement identifying the need for expertise in designing green roofs, especially the vegetative component of the green roof assembly. OALA members, he noted, are already involved in aspects of building design and planning stormwater facilities, parks, open space and streetscapes within the City. The Green Roofs for Healthy Cities members identified that their Green Roof Professional (G.R.P.) Program, launching in 2009, will also allow the public access to people who have an accredited level of expertise in this area.

The group recognized the limitations under the Ontario Building Code and other Acts to require those other than Architects and Engineers to review green roof designs. The TAG agreed, however, that it was essential for the public to be aware that there are Landscape Architects with expertise in green roof assemblies and that there is an emerging Green Roof Professional Program.

R15. The supplementary guideline document should inform the public that they may benefit from consulting with a Landscape Architect experienced in green roof design or a person accredited under the new Green Roof Professional Program prior to the design and installation of their green roof.

Associated Recommendations:

Over the course of the four TAG meetings, the group discussed general issues associated with the development of the TGRCS and the implementation and administration of the standard by the City.

Green roof technology is developing rapidly which may impact the TGRCS and the proposed supplementary guidelines.

R16. The standard and any supplementary materials should be routinely revised to ensure that they are up to date and appropriate to Toronto. The group should meet annually (if necessary) to review any proposed updates to the standard and recommend appropriate changes to the Chief Building Official.

Throughout its review and in considering changes to of the TGRCS the TAG considered how the City would review plans and inspect green roofs under construction. The TAG member representing Toronto Building provided guidance on these matters, based on current City practices.

R17. Toronto Building should use the TAG as a reference group in developing its protocols for implementing the TGRCS

Table of Recommendations

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