



**STAFF REPORT
ACTION REQUIRED**

**By-law to Require and Govern
the Construction of Green Roofs in Toronto**

Date:	March 27, 2009
To:	Planning and Growth Management Committee
From:	Chief Building Official and Executive Director, Toronto Building and Chief Planner and Executive Director, City Planning
Wards:	ALL
Reference Number:	BLD2009PG004

SUMMARY

This report recommends that consideration of the Green Roof By-law be deferred to a public meeting scheduled for the May 6, 2009 meeting of the Planning and Growth Management Committee.

The proposed Toronto Green Roof By-law, enacted under the authority of Section 108 of the City of Toronto Act (COTA) requires green roofs on certain types of new buildings and regulates the design and construction of green roofs in Toronto. Toronto will become the only city in North America with a By-law that both requires green roofs and establishes the construction standards for them.

In October 2008, Toronto Building and City Planning reported on a draft proposal to require green roofs and to provide design requirements for green roofs and recommended a focused public consultation. This report provides an update on the public consultations that took place in November and December 2008 and February 2009. The results of the consultation process are reflected in the content of the draft Green Roof By-law for the City of Toronto and the proposed recommendations for consideration in this report.

RECOMMENDATIONS

The Chief Planner and Executive Director, City Planning Division and the Chief Building Official, Executive Director, Toronto Building recommend that:

1. The Committee defer consideration of the Green Roof By-law to the May 6, 2009 meeting of the Planning and Growth Management Committee.
2. The Committee schedule a public meeting to be held during the May 6, 2009 meeting of the Planning and Growth Management Committee to consider the following recommendations:
 - a. City Council amend the City of Toronto Municipal Code substantially in accordance with the draft bill attached as Attachment 1 to this report, to require the construction of green roofs, such amendment to come into effect on January 31, 2010.
 - b. City Council amend the City of Toronto Municipal Code substantially in accordance with the draft bill attached as Attachment 1 to this report, to govern the construction of green roofs, such amendment to come into effect on January 31, 2010.
 - c. City Council authorize the City Solicitor to make such stylistic and technical changes to the draft bill as may be required, in consultation with the Chief Planner and the Chief Building Official.
 - d. City Council delegate authority to the Chief Planner and Executive Director, City Planning to approve variances to the Green Roof By-law.
 - e. City Council authorize that cash in-lieu of a green roof required under the Green Roof By-law be directed to the Eco-Roof Incentive Program to be used to green roofs on existing buildings.
 - f. City Council request that the Province amend the regulation under the Building Code Act, 1992 to include as applicable law a by-law made under section 108 of the City of Toronto Act, 2006, and that the Province also be requested to make such amendment prior to January 31, 2010 when the by-law contemplated in this report will come into effect.
 - g. City Council request that the Province provide additional money under the funding formula for the construction of new schools in Toronto.
 - h. City Council direct the Chief Planner and Executive Director of City Planning and the Chief Building Official, Executive Director, Toronto

Building to undertake a review of the Toronto Green Roof By-law by January 31, 2012.

- i. City Council direct the Chief Building Official to bring forward any proposed technical updates to the Toronto Green Roof Construction Standard following the American National Standards Institute adoption of fire and wind uplift standards and after consultation with the Technical Advisory Group.
- j. City Council adopt amendments to Chapter 363 of the Municipal Code to clarify that the building permit classification “Re-Roofing with structural work, raise roof structure” would also apply to stand alone modifications to create a green roof, such amendment to come into effect upon adoption of the Toronto Green Roof By-law.
- k. City Council authorize the City Solicitor be authorized to introduce the necessary Bill in Council to give effect thereto.

Implementation Points

City Planning and Toronto Building are proposing that the Green Roof By-law be considered by the Committee at the May 6, 2009 Planning and Growth Management Committee meeting. The deferral is proposed to allow adequate time for the public to consider the content of the report and to set a scheduled time to hear deputations from the public.

The implementation of the Green Roof By-law, as recommended in this report, requires the development of an implementation strategy to educate the public, City staff and the development community on the requirements of the By-law. The implementation strategy will include a communication plan and implementation protocols in preparation for the By-law coming into effect on January 31, 2010.

Training for City staff on green roofs will be included as part of the staff training course for the Toronto Green Standard that is currently under development. The course will target staff involved in the development review process, as well as capital project managers, and be designed to strengthen staff knowledge of sustainable design. Additional technical training materials on the Toronto Green Roof Construction Standard will be developed and delivered to Toronto Building staff.

Financial Impact

The recommendations will have no financial impact beyond what has already been approved in the Toronto Building base budget.

Implementation of the recommendations contained in this report will not require any additional staff in Toronto Building. This report proposes no additional fees or increases to fees for building permits to construct green roofs. Under the 2009 Toronto Building Fee Schedule, the construction of a stand alone green roof is considered “Re-roofing with structural work, raise roof structure”. This 2009 fee is assessed at \$4.82/m². The report proposes to clarify that this classification of building permits would also apply to stand alone modifications to create a green roof.

DECISION HISTORY

Status Update on the Green Roof By-law

At its meeting on January 8 2009, the Planning and Growth Management Committee received a status update report on the public consultations for the Green Roof By-law that were conducted in November and December 2008.

<http://www.toronto.ca/legdocs/mmis/2009/pg/bgrd/backgroundfile-17893.pdf>

Proposed By-law to Require and Govern the Construction of Green Roofs

At its meeting on November 13, 2008, the Planning and Growth Management Committee endorsed a report directing Toronto Building and City Planning to “consult with affected stakeholders about the proposed approach to require and govern the construction of green roofs”. The report also recommended that amendments or additions to the Toronto Green Roof Construction Standard undergo review by the Green Roof Technical Advisory Group prior to consideration by Council.

<http://www.toronto.ca/legdocs/mmis/2008/pg/bgrd/backgroundfile-16784.pdf>

Requiring and Governing the Construction of Green Roofs in Toronto

At its meeting of June 28, 2007, the Planning and Growth Management Committee endorsed the report from the Chief Building Official and Executive Director, Toronto Building recommending that Council proceed with the development of a green roof building standard for the City of Toronto.

<http://www.toronto.ca/legdocs/mmis/2007/pg/bgrd/backgroundfile-4973.pdf>

ISSUE BACKGROUND

Green roofs provide many benefits to the City including reducing the urban heat island effect and energy consumption; improving air quality and stormwater management and creating opportunities for biodiversity and habitat creation and the beautification of the City. The construction of green roofs supports the implementation of city-wide environmental policy objectives of the ‘Climate Change, Clean Air and Sustainable Energy Action Plan’ and the ‘Wet Weather Flow Management Master Plan’. The City’s Official Plan also supports the use of green roofs as an innovative approach to reducing the urban heat island effect in Toronto.

In February, 2006, Toronto City Council adopted Toronto's Green Roof Strategy to encourage the construction of green roofs on City and privately owned buildings through incentives, public education and the development approval process. The Green Roof Strategy called "Making Green Roofs Happen" emerged from a process of extensive stakeholder consultation and a consultant's study of the costs and benefits of green roofs to the City.

Section 108 of the City of Toronto Act, 2006 provided Council with the authority to pass a by-law requiring and governing the construction of green roofs. The new authority under COTA allows the City to require green roofs as-of-right as opposed to the current program of encouraging green roofs for new private development. The provincial authority was specific in allowing the City to set standards only for green roofs. This is an "exception" to the Building Code Act, 1992 which generally prohibits municipal by-laws exceed the requirements of the Ontario Building Code.

The October 29, 2008 report from the Chief Planner and the Chief Building Official provided a draft framework and draft construction standard for a Green Roof By-law and served as the basis for subsequent stakeholder consultations in November and December 2008 and February 2009.

COMMENTS

The proposed Toronto Green Roof By-law would be an additional chapter to the Toronto Municipal Code, under the authority of COTA. The By-law contains two sections based on the authority granted to the City in the COTA: Part A governing where green roofs would be required in the City; Part B containing the administrative provisions for governing the construction of green roofs.

The following report provides a summary of the public consultation and the recommendations for the City of Toronto Green Roof By-law that will be considered at the May 6, 2009 meeting of the Planning and Growth Management Committee:

Part A: Where to Require Green Roofs

Consultation

The City Planning Division conducted two rounds of public consultations with affected stakeholders on a draft proposal to require green roofs in Toronto. The workshops included background presentations, facilitated table discussions and the submission of workbooks for written responses. Included among the more than 150 participants were building owners, architects, landscape architects, developers, green roof designers, installers and manufacturers, roofing contractors and manufacturers, industry associations, City ABCDs and interested members of the public and business community. The participants identified key issues and provided valuable feedback in facilitated workshop sessions.

Following the first round of meetings in November and December 2008, the comments overwhelmingly identified the need for further consultation and three additional meetings were held in February 2009. In addition, several meetings were held with individual stakeholders including the Toronto District School Board, the Toronto Catholic District School Board and roofing contractors to further explore issues raised during the public consultation. The Technical Advisory Group was also convened for a meeting to provide comments to staff on the green roof requirement.

Staff received 149 written submissions from individuals who attended the consultation sessions and 14 written submissions on the draft proposals for the Green Roof By-law. Comments were generally supportive of the intent of the By-law; however there were many suggestions as to how best the Green Roof By-law could support the sustainability objectives of the City. A detailed summary of the public comments and staff responses will be available to view on the City's website at: <http://www.toronto.ca/greenroofs/>. The following provides a summary of the comments received:

Coverage and Thresholds

During the consultation on what building types and sizes green roofs would be required on, it became clear that there were many stakeholders that support green development practices, however the By-law proposals appeared too rigid to accommodate the diversity of development that occurs in Toronto. Stakeholders raised the following concerns:

- green roof requirement will impact building design options;
- green roof requirement would preclude the use of rooftop renewable energy technologies;
- green roof requirement would limit the uses of the roof area;
- 50 percent coverage of the building footprint will be difficult to achieve; and
- green roof requirement should be based on performance rather than just green roof technology.

Several stakeholders suggested that the By-law contain a graduated requirement that would ensure larger buildings require larger green roofs. This would minimize the impact on smaller developments where the cost is spread across a fewer number of units, or where the environmental impact is less. Some stakeholders also expressed concerns that non-residential development had a lower threshold than residential development. It was also noted that it is important to ensure that the By-law does not focus only on the large buildings, because all development contributes to the quality of the environment in Toronto.

Comments from stakeholders have been used to inform the revised structure of the green roof requirement, the definition of available roof space and the variance process that is proposed in the By-law.

There were several stakeholders that highlighted the need to carefully consider the application of green roofs on tall buildings. Some questioned the benefit to the City of requiring small green roofs on the towers of tall buildings. Preference was given for a

solution that encouraged green roofs at the podium level. Some stakeholders stressed that any requirement for tall buildings must be consistent with the City's Tall Building Guidelines. These comments are reflected in the criteria for calculating available roof space for buildings containing a tower and a podium and support the implementation of the Tall Building Guidelines.

Large scale low-rise residential townhouse development was considered during the first round of consultations at the request of the Planning and Growth Management Committee. Stakeholders raised concerns with requiring green roofs on townhouse developments including: high costs for individual owners; potential challenges with wood frame construction; safety associated with maintenance on multi-storey townhouse development; and impact on low-rise residential design. These comments were considered and are reflected in the minimum height threshold for residential development that would exclude low-rise residential development.

Industrial Development

During the public consultation, two of the meetings were designated for owners and developers of industrial use buildings in Toronto. At those meetings staff received 41 written submissions including many from industrial stakeholders. The comments expressed significant concern that any green roof requirement would be technically and economically impractical on industrial use buildings. Written submissions identified a possible 50 to 70 percent increase in construction costs with limited ability for the industry to absorb these higher costs.

Stakeholders suggested that such significant increases in construction costs would only serve to increase the barriers to developing new employment uses in Toronto or expanding existing facilities within the City. These actions, according to participants, would result in a loss of new and existing jobs to less restrictive 905 municipalities and would contradict many City policies to encourage employment in Toronto.

Rather than a regulatory approach, it was recommended by industrial stakeholders that the City should focus its efforts on the education of the industrial sector on green development practices including green roofs, and provide incentives for companies to invest in sustainable practices that will make industry more competitive in Toronto. These comments are reflected in the recommended exemption for industrial use buildings from the Green Roof By-law.

Commercial Development

Stakeholders representing commercial development suggested that commercial buildings are similar in structure to industrial and should be provided with the same "alternative compliance" option that had initially been proposed for industrial and school use buildings. A legal review determined that any alternatives must be on the roof area only and include a green roof. As a result the "alternative compliance" will not form part of the By-law.

Although low-rise commercial and industrial buildings are similar structurally, the City does not treat retail uses the same as industrial uses from a policy perspective. New retail development differs from industrial development for the following reasons: it must be located in a close proximity to its market; it often displaces existing retail in an area and does not result in a net gain in retail floor space or employment; and it is likely to be less sensitive to incremental increases in cost than that of large-scale office and industrial development.

Some stakeholders identified concerns over potential food safety impacts of green roofs on retail food stores. Currently Toronto Public Health does not have any regulations that would prohibit the installation of green roofs on buildings used for food handling.

Incentives

Several stakeholders identified a greater need for incentives to encourage the installation of green roofs on new and existing buildings. Stakeholders specifically mentioned the need for incentives for residential development and the extension of the Eco-Roofs Incentive Program to apply to new industrial, commercial and institutional development.

Implementation

Participants at the workshops from all professional backgrounds acknowledged the need for the City to provide adequate lead time to accommodate the additional requirements of the Green Roof By-law. Stakeholder comments also mentioned that green roofs need to be planned early in the design process for many buildings and suggested that existing planning applications should be exempted from the requirements of the By-law. Some comments indicated a concern that the roofing, green roofing and design communities may not be prepared to meet the new demands this By-law may place upon them. The majority of participants recommended a transition period from between six months to two years before the By-law comes into effect to accommodate these concerns.

The City held a meeting with the Ontario Industrial Roofing Association, representatives of five major roofing companies and a manufacturer of roofing assemblies following the public consultation period. At the meeting, staff heard that experience with green roofs is slowly growing among larger roofing contractors in Toronto. Few roofing contractors install green roofs directly; more often subcontracting to a green roof installer to complete the work. The industry expects to be equipped to handle requirements that result from a Green Roof By-law.

The comments from the consultation are reflected in the recommended implementation strategy for the Green Roof By-law.

Overview of the Green Roof Requirement

It is proposed the green roofs be required based on new development, based on building size (Gross Floor Area). Graduated gross floor area (GFA) thresholds for new development are proposed to ensure that larger green roofs are secured on larger scale development where the additional cost of the green roof may be smaller relative to the total construction cost of the building or where the environmental benefits may be the greatest.

Based on feedback from the consultation process, it is proposed that:

- All new non-residential with a GFA of 5,000 m² or greater be required to install and maintain a green roof; and
- All new residential development with a GFA of 5,000 m² or greater and a height equal to or greater than 23m be required to install and maintain a green roof.

The size of the required green roof is determined by the total GFA of the development, and ranges from 30 percent to 60 percent of the available roof space of the building (see table 1 below). In other words, the larger the development the larger the percentage of green roof that is required. Available roof space is defined as the total roof area excluding the following: areas designated for renewable energy devices; non-vegetative areas required in the Toronto Green Roof Construction Standard; and private terraces (no larger than the first floor area of the abutting unit).

Gross Floor Area (Size of Building)	Coverage of Available Roof Space (Size of green roof)
5,000-9,999 m²	30%
10,000-14,999 m²	40%
15,000-19,999 m²	50%
20,000 m² or greater	60%

For buildings where a development contains a tower set atop a podium, the following conditions are applied to the calculation of available roof space:

- Where the average floor plate size of the tower is less than 750 m², then the roof area of the tower is excluded from available roof space.
- Where the average floor plate size of the tower is greater than 750 m², then the roof area of the tower is included as available roof space.

Exemptions from the Green Roof Requirement

It is proposed that industrial, school and affordable housing development be exempted from the green roof requirement of the By-law.

The City of Toronto has expressed its commitment to improving the environmental performance of new buildings in Toronto through its adoption of the Toronto Green Standard (TGS) and incentive programs to encourage green development. All new development requiring site plan approval will be required to meet Tier 1 of the TGS in September 2009 and development receiving funding through economic development and affordable housing programs are already required to meet the TGS. As a result, development that is exempted from the requirements of the By-law will not be exempt from achieving higher levels of environmental performance.

Industrial Development

Industrial development poses several technical and economic barriers to the installation of green roofs on low-rise industrial use buildings. During consultation, stakeholders concluded that industrial buildings are typically low-cost, single-storey buildings with a roof area equal to the building footprint; and often contain open, unconditioned spaces with long clear roof spans. The incremental cost of an extensive green roof accounts for a significantly higher percentage of the total construction cost than would be found in other building types, with limited opportunities for energy savings.

The City of Toronto has an interest in encouraging the retention and expansion of industrial development as evident in the Imagination, Manufacturing, Innovation, Technology (IMIT) Grants Program and the Development Charge By-law. In May 2008, Council approved the creation of a City-wide financial incentive program to stimulate economic growth and job creation through grants to key employment sectors. The IMIT grant program was created to assist industrial and commercial sectors by providing incentives to help address the challenges facing the development of employment uses in Toronto. The IMIT report notes that the level of industrial and office growth in the City is currently too low for City to achieve its Official Plan employment targets.

The 2009 Development Charges By-law that comes into effect on May 1, 2009 continues to include a long-standing exemption from development charges for industrial development. The report cites the sensitivity of industrial uses to development cost pressures; industry's inability to pass on costs to their customers; and benefits that result from job creation and local economic activity as the rationale behind the exemption. The report acknowledges that similar to taxes, Development Charges can impact the economic decisions made by landowners, developers and other economic participants and have the potential to decrease the rate of development for industries serving markets outside of the City of Toronto.

Initially an "alternative compliance" was considered for industrial buildings which would have benefits similar to those of a green roof at a lower cost using cool roofing materials, tree planting and at-grade soft landscaping. However, a legal review of Section 108 of COTA concluded that any alternative requirement of the By-law is restricted to the roof area of the development and must include a green roof— ruling out the alternative compliance option.

Options were considered to limit the requirement for industrial buildings to large buildings over 10,000 m² and/or provide a maximum green roof area of no larger than 10 percent of available roof space up to a maximum size of 2,000 m². Despite limiting the cost of the green roof to as low as \$200,000 for large industrial buildings and maximizing the incentives available through the Eco-Roof Incentive Program, this option continues to impose costs that are inconsistent with Council policies to encourage employment uses.

In the meantime, a number of efforts are underway to ensure that the environmental performance of new industrial buildings will not lag behind other development sectors including:

- Eco-Roof Incentive Program that provides incentives for retrofitting existing industrial, commercial and institutional buildings with green and cool roofs;
- Tier 1 of the Toronto Green Standard (TGS) will be required for all new development requiring site plan approval in September 2009; and
- Compliance with the TGS is required to receive grants under the IMIT program.

It was concluded that imposing the costs associated with a green roof on industrial development could effectively negate any incentives designed to attract new business to Toronto, and may limit the ability for existing industries to expand in-place. An exemption for industrial development is consistent with the City's policies to retain employment uses in Toronto's Employment Areas.

Non-profit Housing

Council has recognized that affordable housing contributes positively to the City's economy and environment and supports the development of affordable housing through policies in the Official Plan that encourage the creation of low-income housing opportunities; an exemption from development charges; and facilitation support through the development approval process.

Similar to industrial development, non-profit housing providers cannot pass on the additional construction costs associated with a green roof on to tenants. The additional cost of a green roof could make such project financially challenging and may come at the cost of affordable rental units.

It was concluded that requiring a green roof on non-profit housing may reduce the financial viability of many affordable housing projects. It is recommended that non-profit housing be exempt from the requirements to construct green roofs. An exemption is consistent with City policies to encourage affordable housing development in Toronto.

School Use Buildings

Public and separate schools in Toronto represent a type of development that occurs relatively infrequently within the City. Schools typically consist of a low-rise building on a large site with large open space areas for students. The characteristics of typical school

sites provide excellent opportunities for greening of the site and achieving benefits equal to or greater than that of a green roof, at-grade which benefits the users of the school and the environment simultaneously.

The Toronto District School Board (TDSB) has installed a small green roof on the new Morningside Heights North Elementary School and has received funding through the former Green Roof Incentive Program for a green roof on Jackman Public School. The TDSB is currently not recommending any green roofs be installed on its facilities. Based on their experience to-date with green roofs and current capital budget constraints for new schools, the TDSB has concluded that greening of school sites would best serve the needs of students and surrounding neighbourhoods if it maximized at-grade greening opportunities.

All new school development and significant additions will be required to meet Tier 1 of the Toronto Green Standard in September 2009. This ensures that all sites will achieve the air quality, energy efficiency, urban heat island, stormwater management and biodiversity benefits that a green roof provides. It is proposed that public and separate schools be exempt from requirements to construct green roofs in the By-law. It is proposed that the Province provide funding for the construction of green roofs on new schools in Toronto.

PART B: GOVERNING THE CONSTRUCTION OF GREEN ROOFS

Overview

The purpose of the Toronto Green Roof Construction Standard (TGRCS) is to provide a set of minimum requirements that would allow a designer to design a green roof that will meet the City's minimum requirements for green roof construction while also meeting the Ontario Building Code (OBC) requirements for the building as a whole.

The TGRCS will apply to all green roofs built in Toronto. This includes those required under the By-law, as well as those green roofs which are voluntarily built.

The TGRCS is contained in Article IV of the By-law. Article V sets out the structure for Toronto Building's administration of the standard including application process. The proposed administrative provisions are intended to make the application process as seamless as possible with the current building permit process.

Consultation

Toronto Building held an online consultation soliciting feedback on the proposed TGRCS from interested stakeholders during November and December 2008. This was a parallel consultation to the City planning sessions on the question of where to require green roofs. Toronto Building prepared a consultation paper containing key questions for review and comment. Stakeholders were asked for technical comments on the standard. Policy related questions were also part of the consultation. These addressed implementation

matters and whether the proposed standard balanced prescriptive requirements and performance based guidelines for ease of application.

Toronto Building received close to thirty responses to the consultation from green roof manufacturers, designers, growers, builders and City ABCDs. Additional comments on the standard were provided to Toronto Building through the City Planning stakeholder sessions.

The comments on the City's proposed approach to the TGRCS were consistent in supporting a less prescriptive green roof construction standard. Several respondents noted that a standard should facilitate the construction and design of green roofs of all sizes, especially in the urban context of Toronto where smaller green roofs may be more prevalent.

The technical comments reviewed by Toronto Building staff and the Technical Advisory Group were supportive of the need for an engineering review to verify a roof's structural sufficiency for green roof installation. This requirement is consistent with current requirements of the Ontario Building Code for professional design review. There were two key issues raised by stakeholders with the initial draft of the proposed standard. 1. Issues with the section on Vegetative Performance including growing media depth and stormwater runoff coefficients. 2. The proposal to require that an Ontario Association of Landscape Architects Architect review and sign off on the green roof assembly. The revised TGRCS addresses these stakeholder concerns.

Supplementary Guidelines and Best Practices

Stakeholder feedback strongly supported the development of an additional more detailed document with supplementary guidelines and best practices on green roof design in Toronto to augment the By-law. Green Roofs are relatively new in North America and the public expressed a strong interest in accessing as much information as possible on green roof design and building. In response, the technical review process identified components of the draft standard that should be identified as best practices, rather than requirements of the standard. The proposed By-law includes a provision to allow the Chief Building Official to develop a supplementary guideline document. The TAG will act as an advisory group to Toronto Building which will release the "Green Roof Guidelines and Best Practices" document prior to the effective date of the By-law. The document will be revised periodically to reflect new technologies and best practices as they evolve.

Technical Advisory Group

The authority to develop provisions regulating construction in Ontario generally lies with the province. Green roofs are the only aspect of construction for which the City has the authority to set standards. In developing the TGRCS, Toronto Building has therefore

undertaken a process normally under the purview of the province or by the federal government. It has been essential to subject the TGRCS to a level of analysis and due diligence consistent with other code setting organizations. In order to provide this analysis, the Chief Building Official established a Technical Advisory Group to review the proposed standard and consider the consultation comments. Council previously endorsed this approach and directed that any amendments or additions to the technical requirements of the standard undergo review by the TAG. The TAG Chair has submitted a report to the Chief Building Official recommending appropriate amendments to the standard based on the TAG review and consideration of public comments. That report is Attachment 2 to this report.

The TAG is comprised of members appointed by the Chief Building Official based on a terms of reference and matrix to ensure representation of various interests. The members have expertise in engineering, building science, architectural design and green roof research and development. Stakeholder groups represented include: Green Roofs for Healthy Cities; the Ontario Association of Architects; Building Industry and Land Development Association; the Ontario Association of Landscape Architects; the Ministry of Municipal Affairs and Housing; the Ontario Society of Professional Engineers and the Ontario Industrial Roofing Contractors Association. The TAG is chaired by a professor in Architectural Science from Ryerson University. A Toronto Building staff member is also on the TAG to provide guidance on potential enforcement and administrative aspects of the proposed standard.

The TAG met four times between December 2008 and March 2009 to review the public comments and the draft standard. From these discussions the TAG provided amendments to the standard. The recommendations include amendments to the proposed standard, considering stakeholder comments and in some cases additions to the standard. The report from the Chair of the Technical Advisory Group is attached to this report as: Attachment 2. This report provides a more in-depth overview of the key recommendations from the TAG.

The TAG will continue to act as a reference group to the Chief Building Official in the development of the Best Practices/Guidelines document. It is recommended that the group reconvene prior to the implementation date of the By-law to consider the need for any updates to the technical requirements of the standard. Council previously endorsed the recommendation that “proposed amendments or additions to the technical requirements of the Toronto Green Roof Construction Standard undergo review by the Green Roof Technical Advisory Group prior to consideration by Council.” This process has been incorporated into the draft By-law.

The Revised Green Roof Construction Standard

The revised TGRCS is Article IV of the Green Roof By-law. This section contains the minimum design requirements that green roofs must comply with in order to receive a building permit. The number of prescriptive requirements set out in the standard

previously considered by Council has been minimized to facilitate design innovation while still achieving the objectives of the Code and the City’s policy objectives in “Making Green Roofs Happen”.

The Supplementary Guide to the standard will serve as a companion document to the By-law and will contain best practices and explanatory materials including some issues included in the draft standard that was the subject of the consultation. The Guide will also include relevant sections of the OBC that intersect with green roof design and the requirements of the by-law.

The revised TGRCS covers the same scope as the draft standard. This report highlights key sections that have been amended as a result of the stakeholder consultation and recommendations from the Technical Advisory Group.

Green Roof Definitions

The definitions section of the by-law defines green roofs for the purposes of the standard. The definition clarifies that the objective of a green roof is to support the growth of vegetation in a growing medium. The definition is also structured to ensure consistency with the provisions of the By-law requiring green roofs.

Structural

The Structural section of the standard addresses increased loads that green roofs place on traditional roof systems. The TAG recommended that the standard provide designers with a default maximum value for calculating loads as a compliance alternative to the ASTM (American Society for Testing and Materials) standard contained in the draft standard. The section has been revised based on this recommendation to facilitate designer flexibility while ensuring consideration of safety issues.

Wind Uplift

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.” This standard is targeted for completion in mid-2009 at which time it is expected to be adopted by the American National Standards Institute (ANSI). Therefore, there are presently no technical standards that provide a method of designing wind uplift resistance of green roof systems for reference in the By-law. As the final standard is not available, the proposed By-law cannot currently reference an incomplete standard.

Based on the technical advice from its consultant and recommendations from the Chair of the Technical Advisory Committee, the TGRCS has been amended to require that the structural analysis by the engineer detail how wind uplift pressures have been taken into account.

Staff will reconvene the Technical Advisory Group to review the SPRI/ANSI “Wind Design Standard for Vegetative Roofing Systems” once it is completed for its applicability to Toronto and to consider recommendations for appropriate amendments to the TGRCS.

Fire Testing

Similarly, there are presently no approved fire testing methodology for green roofs, which prevents their classification in terms of fire resistance. Standards for fire safety are also under development by the SPRI. Toronto Building anticipates that when these standards are adopted by ANSI sometime in 2009, the TAG will reconvene to consider whether these standards are appropriate for inclusion in the TGRCS. In the meantime, the standard includes provisions to require a vegetation free border in certain cases to act as fire breaks.

Waterproofing

The Technical Advisory Group recommended that the standard include provisions for leakage testing of the green roof membrane as a quality assurance procedure. Appropriate quality assurance processes are necessary so that the green roof system can meet the expectations for performance over the building’s design service life. The standard has been amended to incorporate this important procedure.

Vegetative Performance

A significant component of any green roof is the growing media for the green roof vegetation. Growth media functions to retain water to sustain vegetation on the green roof. It is comprised of air, water, aggregate material and organic material. The design of growth media is also a matter of additional consideration when green roofs are designed for existing buildings as its design impacts the load capacity of the roof structure.

In the vegetative performance section, the draft standard proposed a prescriptive requirement for 150mm of growing medium depth. Defining this depth value was intended to support the construction of green roofs that meet the City’s policy objectives (e.g., reduced stormwater runoff, energy efficiency). Stakeholders noted, however, that defining the growing medium at that depth may limit the types of green roof systems installed in the City and place unnecessary restrictions on designers and green roof manufacturers. This proposal has been revised in the new standard to allow designer flexibility while still meeting the City’s green roof objectives as outlined in the City report “Making Green Roofs Happen.”.

To support plant survivability in all green roofs, the standard requires that when structurally possible, the growing media should be at a minimum of 100mm or the designer may provide a report confirming that the engineered system as designed provides comparable survivability.

The supplementary guidelines will encourage a growing media depth above 100mm to increase biodiversity in some cases. Amending this requirement was also intended to facilitate the construction of green roofs on existing buildings that may not have been able to support deeper depths of growing media.

Irrigation

Green roofs require a certain amount of irrigation to initiate and sustain the vegetative cover. The amount of irrigation and the type of irrigation system required varies depending on the particular green roof system, including the choice of vegetation. The supplemental irrigation required is also dependent on the amount of natural precipitation during any period. The supplementary guidelines will recognize that irrigation requirements differ. The TGRCS requires that adequate measures be provided to permit necessary irrigation to assist with plant survivability.

Maintenance

The matter of green roof maintenance was raised in both the Toronto Building technical consultation and the City Planning sessions. The TAG strongly recommended that the TGRCS include a maintenance component in order to ensure that the green roof components perform their required functions. The standard has been amended to require that applicants develop a maintenance plan which addresses the requirements of the growth media and the vegetation. The standard provides parameters for an acceptable plan.

Designers

The Ontario Building Code is consistent with the Act governing the professions of architecture and engineering which stipulate where professional design is required for the design and review of building construction. The TGRCS has been developed to be consistent with these by requiring mandatory review by professional designers in certain cases where prescriptive requirements are not available. This is to ensure that there is a level of responsibility and accountability in the design of green roofs, consistent with other buildings and building elements.

There are legal and practical limitations, however, to requiring review by designers other than Architects and Engineers in the TGRCS. During consultation stakeholders raised concerns with the proposal that Landscape Architects review may add significant additional costs to green roofs.

Instead of a mandatory requirement, the supplementary guideline document will suggest that green roof construction would benefit experienced advice in green roof design (e.g., Landscape Architects and persons qualified under the new Green Roof Professional program (developed by the organization Green Roofs for Healthy Cities).

Administration of the Green roof construction standard

The Building Code Act provides the framework under which municipalities administer and enforce the Ontario Building Code. Section 108 of the City of Toronto Act provides the city with the authority to govern the construction of green roofs, but does not set out the manner in which the authority is to be administered. The November 2008 report outlined Toronto Building's proposal to set out an administrative structure parallel to the current system for building permits in the BCA. That report proposed a system including a specific "green roof permit".

The administrative structure in the By-law has been refined from the previous proposal, responding to stakeholder comments. The administration and enforcement of the TGRCS is intended to be seamless with the existing building permit process. Applicants would apply and pay for a building permit at the same rate that currently applies, rather than a separate "green roof permit". A building permit for a green roof would be issued by the Chief Building Official if all of the prescribed conditions are met. The provisions of the Municipal Code Chapter 363, "Construction and Demolition" would generally govern the application and issuance of building permits for green roofs under this By-law.

Building permit fees are charged to applicants to cover the direct and indirect costs of plan review and inspection. Staff will review the applications to ensure that they meet the minimum requirements of the Code and all applicable laws. Inspections are conducted to verify that construction has taken place in accordance with the approved plans.

Adoption of the recommendations in this bylaw will not impact the fees collected for green roof building permit applications. Where green roofs are part of the construction of a new building, the green roof is considered part of the building permit application, as is a "traditional" roof. An application for a stand alone building permit to construct a green roof is presently assessed the fee (2009 Toronto Building Fee Schedule) for "Re-Roofing with structural work, raise roof structure". It is recommended that the fee schedule be amended to clarify that this classification also includes green roofs.

IMPLEMENTATION

Applicable Law

Section 8 (a) of the Building Code Act obliges the Chief Building Official to issue a permit where all applicable law has been met. A by-law passed under Section 108 of the City of Toronto Act is currently not listed as applicable law. If the By-law is listed as an applicable law the Chief Building Official would have the authority to refuse the issuance of a building permit if the requirements of the By-law are not met. This includes the provisions requiring the construction of a green roof and the TGRCS.

In order for the City to effectively enforce the green roof By-law it will be necessary for the province to amend the Building Code Act regulations. If the proposed By-law comes into effect without a provincial amendment to the list of applicable law, the City runs the risk of a legal challenge when enforcing the By-law.

Toronto Building staff consulted with Ministry of Municipal Affairs and Housing staff in the development of the By-law. Provincial staff are aware of the need to establish the bylaw as applicable law to ensure that building permits issued meet the requirements of the By-law. It is recommended that Council request that the province amend the regulation under the Building Code Act, 1992 to include as applicable law a by-law made under section 108 of the City of Toronto Act, 2006.

Enforcement

Any person who fails to construct or maintain a green roof in accordance with the Green Roof By-law is guilty of an offence and may be prosecuted under the Green Roof By-law. Prosecution may result in fines of up to a maximum fine of not more than \$100,000.

Variance Process

Once the Green Roof By-law is in effect, any green roof that is required under the By-law must be constructed to meet the coverage criteria established in the Green Roof By-law. It is recognized that there may be site specific conditions that could limit the size of a green roof, and in some situations, preclude the construction of a green roof at all, including the desire for distinctive architectural features. To address this, it is proposed that where a green roof is required under the Green Roof by-law, and an applicant is unable to construct a green roof in accordance with the coverage requirements, the applicant may request a site-specific variance to the By-law from the Chief Planner. If an applicant seeks a complete exemption from the green roof requirement of the By-law, an appeal should be made to City Council.

In the case where a variance is granted by the Chief Planner or exemption is granted by City Council, it is recommended that cash-in lieu of a green roof be paid. This amount should be equivalent to the cost of the area of the green roof that is required under the By-law, but is not being provided by the applicant. It is recommended that any funds collected through the cash-in lieu process be directed to the Eco-Roofs Incentive Program, which provides incentives for the installation of green roofs on existing industrial, commercial and institutional buildings.

One common concern that was expressed during stakeholder consultation was the need for adequate time to plan for the inclusion of a green roof into a project. It is therefore recommended that the Green Roof By-law come into effect January 31, 2010. Developments that have received or submitted an application for a Building Permit prior to January 31, 2010 will be exempt from the requirement for a green roof under the By-law. A grandfathering clause will be included in the By-law.

It is proposed that the entire By-law be reviewed after two years to assess its impact and also consider the options available to require green roofs on other buildings including industrial use buildings.

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ATTACHMENTS

1. Toronto Green Roof By-law
2. Report from the Chair of the Technical Advisory Group to the Chief Building Official