Consultation publique sur l'aménagement
des bâtiments dans une perspective
de développement durable.

November 8th, 2016

Dear members of the Commission,

Thank you very much for inviting Xeroflor to participate in the public consultation in promoting sustainable built environment and green infrastructure in Montréal. I would also like to congratulate the Commission for taking the extra miles to make the City of Montréal greener and more livable.

Just a little background about myself. I have been involved in various aspects of green roofing for over 15 years. I established the first green roof research facility to study the benefits of vegetated roofs on buildings in 2000 as a research officer at the National Research Council of Canada in Ottawa. I monitored the performance of various green roofs in Toronto, Montréal and Vancouver to study the climate sensitivities. I was involved in monitoring and comparing the energy and stormwater performance of different commercial green roof systems as a researcher at the British Columbia Institute of Technology in Vancouver. In 2008, I joined Xeroflor, a company that has been greening rooftops worldwide for 40 years, and have been involved in technical support, R&D and business development. I am currently managing the green roof product portfolio for Xeroflor.

Green roofs offer multiple environmental, ecological and economic benefits to urban areas, so many municipalities around the world are encouraging their implementation through bylaws and incentive programs. In a 2013 survey conducted by Green Roofs for Healthy Cities [1], 33 cities in North America had dedicated policies, incentives or guidelines to promote green roof implementation. These strategies are working: the top 5 North American metro regions with the highest green roof area installed in 2014 – Washington DC, Toronto ON, Philadelphia PA, Chicago IL and New York City NY – have supportive policies or programs. Their combined green roof area constituted over 75% of the total green roof area installed (515,000 m^2) in North America in 2014 [2].

The City of Toronto has the second most installed area at 72,500 m^2 in 2014. Thanks to its green roof bylaw, eco-roof incentive program and green roof construction standard, 300 green roofs with a total area of 250,000 m^2 have been created between 2010-2015. There are approximately 500 green roofs in the City of Toronto [3] and the number is rising. These successes suggest that similar incentive programs/bylaws would help to accelerate green roof adoption in the City of Montréal and making it greener and more sustainable for its citizens.

I have the pleasure to work with M. Jean-Jacque Laplace, distributor of Xeroflor green roof systems in Québec, who has personally oversaw many green roof installations especially in the City of Montréal for the past 10 years. We have come across many questions, myths and obstacles that hinder widespread adoption of green roofs in the City of Montréal. It is my intention of this letter to bring up these issues for your considerations with the hope to assist the Commission to produce a successful green roof guideline/program that will achieve the highest positive impact.

1. **Plant Survivability and Performance in Cold Climates**

   Extensive green roofs featuring shallow lightweight growing media can present more difficult growing environments for vegetation especially during the cold harsh winters in Montréal. Many manufacturers and designers in Montréal would propose deeper growing media (>150 mm) to buffer extreme temperature fluctuations to improve plant survivability over the winter. While this is a logical and feasible option, these green roof systems tend to be heavy and expensive.

Properly designed thin-layered green roof systems with suitable plant selection can survive the harsh winter in Montréal while offering lightweight and more economic alternatives. They also enable green roofs to be installed on buildings with low structural capacity such as warehouses and retrofits that would otherwise not possible with deeper heavier systems.

There are lightweight extensive green roof systems on the market that have system profile less than 75 mm and weigh no more than 60 kg/m^2 when fully saturated, using cold hardy small sedums that grow in 20 mm of growing medium in conjunction with water retention layers. Our company has installed these thin-layered lightweight systems on many rooftops in Montréal – over 50 projects totaling about 15,000 m^2 since 2006. These green roofs survived many harsh Montréal winters despite of their thin-profile and continue to thrive year after year.

It is my hope that the City of Montréal would recognize in the new guideline that properly designed thin-layered green roof systems can succeed in the cold climates and offer lightweight alternatives to green rooftops that cannot support deeper heavier traditional systems.

2. Stormwater Management and Growing Medium Depth

During a rainfall event, rain is intercepted by the plants before it reaches the growing medium on a green roof. Much of the incident rain is infiltrated, absorbed and adsorbed by the growing medium and plants. Excess rain travels through the growing medium, exits the filter layer into the drainage layer, flows along the roof membrane to the roof drains. The stored water is either used by the plants or returned to the atmosphere through evaporation.

Many manufacturers and designers focus on increasing the water retention of the green roof system by increasing the growing medium depth. While it is a viable approach, wet growing medium is heavy and this significantly increases the structural loading on the roof structure. It increases the cost of the system and the associated structural upgrade.

In addition, not all growing media are made equal. The water storage capacity of the growing medium depends on many factors such as composition, particle size distribution and organic contents. Porous mineral such as lava and expanded clays can hold considerable water in their pores. Different particle size grading changes the capillary pores and thus the water holding capacity. Increasing the depth of a sandy growing medium for example does not increase the water storage capacity of the green roof considerably.

Innovative materials such as water retention fleeces and hygroscopic mats offer lightweight alternatives to growing media to achieve water retention in green roof system. The saturated weight of the water retention layers are on average about 25% lighter than typical growing media at the same thickness. More importantly, a high fraction (>85%) of the saturated weight of the water retention layers comes from the stored water, making them particularly efficient to store water on a per unit weight basis. Replacing all or part of the growing medium in a green roof with water retention materials can achieve equal or better water storage capacity while keeping the system weight low.

With increasing frequency of storm events due to climate change, more policy makers are turning to green roofs as a low impact development (LID) option to manage stormwater in the urban areas. In fact, many municipalities have policies focus on stormwater management. Current green roof policies tend to be prescriptive-based that mandate a minimum depth and/or composition of green roof growing medium, e.g., Portland OR's Density Bonus Program and Nashville TN's Green Roof Credit Program require a minimum depth of 100 mm. Others are objective-based that require the green roof to achieve a specific stormwater performance, e.g., New York City's Green Infrastructure Grant program requires the green roof to manage at least a 25 mm rainfall event, which also applies to Washington DC's RiverSmart Rooftops program.

While prescriptive-based policies that require a minimum growing medium depth are easier to deploy and manage, objective-based policies that mandate specific stormwater performance are likely to be more effective in achieving stormwater management goals and maximizing the benefits of green roofs. It is my hope that the City of Montréal would take the more effective approach to implement an objective-based green roof policy.

3. Proven System Performance and Building Safety

Green roof forms part of the building envelope so it is important to consider its effect on the building and safety to the occupants, in particularly the concerns on root penetration, wind uplift and fire resistances.

Recently, the CSA Group published the CSA A123.24-15 Standard Test Method for Wind Resistance of Modular Vegetated Roof Assembly. This is the first national standard test method for evaluating the wind uplift resistance of green roof systems in the world. Using this method, the wind uplift resistance of a green roof system can be evaluated. A designer can then compare this resistance to the wind design values calculated from the National Building Code to decide if the green roof system is secured against wind uplift for a particular project.

Unfortunately, there are no national test method for evaluation of root penetration and fire resistances of green roof systems at this time. However, there are guidelines coming out of the USA such as ANSI/SPRI VF-1 External Fire Design Standard for Vegetated Roof and ANSI/SPRI VR-1 Procedure for Investigating Resistance to Root Penetration of Vegetative Roofs that are useful references. In addition, there are also standard test methods coming out of Germany such as DIN 4102 Part 7 for fire resistance and FLL for root penetration resistance.

The Régie du bâtiment du Québec (RBQ) has issued a guide regarding green roofs in Québec. A green roof system needs to demonstrate that it meets the requirements set out in the norm before the RBQ would approve its installation. I would like to ask the Commission to require all green roofs to be tested and demonstrate compliance such as wind uplift resistance to ensure public safety.

Thank you for considering my suggestions. If I can be of any further assistance to help the City of Montréal to create a successful green roof program/policy, please do not hesitate to contact me or M. Jean-Jacques Laplace (514-242-5470, jean-jacques@xeroflorcanada.ca). Thank you.

Sincerely,

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References:

1. *"Green Policy: Why Green Roof and Wall Policy is Important" Winter 2014/15 issue of Living Architecture Monitor (vol. 16, no. 4)*
2. *"2014 Annual Green Roof Industry Survey", Green Roofs for Healthy Cities, April 2014*
3. *City of Toronto website, visited on November 8, 2016. http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=3a7a036318061410VgnVCM10000071d60f89RCRD*