

THE GREEN ROOF INFRASTRUCTURE MONITOR



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Green Roofs for Healthy Cities Launches Green Roof Infrastructure Demonstration Project

On Thursday November 2nd, Green Roofs for Healthy Cities formally launched the *Green Roof Infrastructure Demonstration Project*. This is a public-private partnership between the member companies of Green Roofs for Healthy Cities and the City of Toronto, the Toronto Atmospheric Fund, the National Research Council's Institute for Research in Construction and Environment Canada. The launch was held on the podium roof at Toronto City Hall and over 150 people attended. "One of the greatest opportunities for greening our city is the promotion of green roofs," said Case Ootes, Deputy Mayor of Toronto.



GREEN ROOF INFRASTRUCTURE DEMONSTRATION PROJECT LAUNCH
From left to right: John McManus, Vice President, Flynn Canada Ltd.; Councillor Jack Layton; Deputy Mayor Case Ootes; Councillor Lorenzo Berardinetti; and Steven Peck, Executive Director, Green Roofs for Healthy Cities.

"This project will enable us to better understand the technical performance of green roofs in the Toronto climate and to raise awareness among clients, industry representatives and the public".

-John McManus, Vice President,
Flynn Canada Ltd.

There are two sites for the demonstration: the City Hall podium roof and the Eastview Neighbourhood Community Centre. The size of the City Hall demonstration site on the podium roof is approximately 7,000 square feet and the re-roofing and green

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The Green Roof Infrastructure Monitor

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Green Roofs for Healthy Cities is a coalition of private companies working to develop a market for green roofs in North America.

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“Green roofs present an important development opportunity for the City of Toronto. Encouraging a market for green roof infrastructure will take advantage of wasted rooftop space and help to create a healthier, more livable city”.

- Councillor Lorenzo Berardinetti,
City of Toronto

roof installation investment was \$260,000. Eight publicly accessible green roof demonstration plots totaling 3,200 square feet feature many different green roof applications:

- A Black Oak Savannah, native prairie ecosystem that is now endangered in North America. These plants are drawn from a local gene pool;
- Two extensive plots featuring a variety of sedum and alpine perennials - typical of industrial and commercial applications;
- Two semi-intensive plots featuring a variety of flowering plants, shrubs and small trees;
- A native butterfly and bird habitat plot; and
- Two urban agricultural plots featuring perennials and annuals.

(see photograph on page 3)

“Green roof infrastructure can help us address many key challenges facing cities across North America as we move into the 21st century such as how to accommodate population growth and maintain a high quality of life; how to generate new investment and new employment; how to reduce air pollution and ensure that we safeguard our precious water resources; and how to manage the needs of an aging population and infrastructure with limited public resources.”

- Steven Peck, Executive Director,
Green Roofs for Healthy Cities

The second site, at the Eastview Neighbourhood Community Centre, will be planted in the spring of 2001. It will feature an extensive green roof. Extensive green roofs typically have minimal growing medium depth, weight, plant diversity and

maintenance requirements. The Eastview re-roofing and green roof investment was \$274,000 and the green roof portion of the building is 5,000 square feet, on a steel deck. The City is planning to conduct stormwater quantity and quality research at Eastview and monitor energy savings. Anticipated federal funding will allow for more technical research by the National Research Council and Environment Canada.



GREEN ROOF PLOTS AT TORONTO'S CITY HALL, NOV. 2000

For more information about the Green Roof Infrastructure Demonstration Project, including speeches from the Launch, please visit our website: www.peck.ca/grhcc/main.htm.

About Green Roof Infrastructure and our Business Coalition

Green roof infrastructure provides a wide range of public and private benefits. These extend from improved stormwater management and smog reduction to energy efficiency, cost savings and new amenity space for building occupants. **Green Roofs for Healthy Cities** is a business coalition founded in March 1999 to foster the development of a market for green roof infrastructure. Green roof development involves the creation of 'contained' green space on top of a human-made structure. This green space can be below, at, or above grade, but in all cases the plants are not planted in the 'ground'. A green roof is an extension of the existing roof, which involves a special root repelling membrane, a drainage system, a lightweight growing medium and plants. The members of the Coalition are **Kaaren Pearce, DeBoer Environmental Concepts; Doug Flynn and John McManus, Flynn Canada Ltd.; William Bean and Brian Lambert, Garland Canada; Al Duwyn, IRC Buildings Sciences Group Inc.; Bill Stensson and Manuel Sobrinho, Sheridan Nurseries; and George Challies and Colin Donaldson, Soprema Inc.** For membership information, please contact **Steven Peck**, Executive Director, Green Roofs for Healthy Cities at speck@peck.ca or call (416) 971-4494.

Member Companies of Green Roofs for Healthy Cities



Establishing Common Green Roof Research Protocols - Conference Proceedings

The need for technical information relating to the benefits of green roof infrastructure is essential for developing a market which adequately reflects the public and private benefits of green roof investments. **Idil Mussa** from Innis College, University of Toronto is working with Green Roofs for Healthy Cities and Environment Canada to prepare the proceedings from the June 13, 2000 workshop, *Establishing Common Protocols for Building and Aggregate Level Green Roof Benefits Research*. This workshop was an important first step in developing a common research protocol for conducting comprehensive green roof benefits research at the building level and beginning to develop methodologies for city-wide level benefits analysis. The proceedings will be published online in February 2001.

Green Roofs for Healthy Cities Partners with Toronto Hydro to Implement Two Green Roofs

Green Roofs for Healthy Cities has reached an agreement with Toronto Hydro Energy Services Inc. to implement two green roofs – one on an existing Catholic school building and the other to be incorporated into the design of a new school building. The retrofit is expected to be completed by the fall of 2001. The goals of the project are to demonstrate the unique applications of green roof infrastructure on schools and to conduct further technical research. In addition to its many benefits, green roof infrastructure can be designed as an educational resource for teachers and students. For more information, please contact **Joyce McLean**: jmclean@torontohydro.com.

New 10,000 Square Foot Multi-Unit Residential Green Roof in Toronto



EXTENSIVE GREEN ROOF ON NEW MERCHANDISE LOFTS, TORONTO, ONTARIO

Green Roofs for Healthy Cities has launched an online *Researcher's Corner* at: www.peck.ca.

The purpose of the Researcher's Corner is to facilitate the sharing of information among green roof researchers and to profile new and ongoing research projects.

In the summer of 1999, former president of Cresford Developments **Kathy Kinnear**, enjoyed the view of a green roof from the window of a Paris hotel room. This, in turn, inspired a massive project on the 12th floor of an historic Toronto building. Cresford was in the process of renovating the old Sears building into the luxurious new 'Merchandise Lofts' which now has the largest green roof on a multi-residential building in Canada. Landscaper/

Designer **Terry McGlade** of Perennial Gardens, together with architect **David Lieberman** collaborated to create an aesthetically pleasing extensive green roof. In February 2000, a complete plan for the 10,000 square foot area, including the connecting pathways, decks and eight gardens, was approved. Special perennials were grown in 'plug' sizes in order to ensure firm roots in a shallow growing medium. Soprema's *Sopraflor* soil from Quebec, plant materials from Niagara-on-the-lake and 2'x 2' patio slabs were lifted 12 stories onto the roof. During a period of three weeks, over 8,000 plants of 45 species, including trees, grasses and shrubs were planted. Watering was done manually, three times a week until a drip irrigation system was installed. The work is now complete and residents and developers alike are looking forward to seeing the plants firmly established in their second year and the continued evolution of a rooftop in bloom. For more information, please contact **Terry McGlade**: pergar@interlog.com.

Singapore Study Tour Comes to Toronto to Learn about Green Roofs

On October 16th and 17th, the City of Toronto hosted a study tour delegation from the government of Singapore, on green roof infrastructure and rooftop gardens. The eight person delegation consisted of (see picture) **Mr. Low Puk Yeong**, Deputy Secretary of Ministry of National Development (MND); **Mr. Yuen Kum Cheong**, Assistant Director, MND; **Dr. Tan Wee Kiat**, Chief Executive Officer of the National Parks Board (NParks); **Mr. Simon**



GREEN ROOF STUDY TOUR DELEGATION FROM THE GOVERNMENT OF SINGAPORE

Longman, Director of NParks' Park Management, South/West Division; **Mr. Anthony Kong Yit San**, Principal Park Manager, Park Management Department, North Branch; **Mr. Yeo Meng Tong**, Principal

"I am glad to visit a city that has a lot of green roof activity, but am still struggling with policy, research and implementation issues. Singapore feels they are at the beginning of considering green roofs and going directly to the European hotbeds of green roof technology would be to move too fast without seeing the process".

- Dr. Tan Wee Kiat, CEO,
National Parks Board, Singapore

Project Manager of NParks' Design & Development Branch; **Oh Cheow Sheng**, Senior Planning Manager, Policies & Research Section, NParks; **Mr. Hugo Frieszo**, Executive Planner, Urban Renewal Authority; and **Ms. Boey Yut Mei**, Head of Landscape Studio, Housing Development Board. Singapore is concerned that with the rapid development of their small city-state (about the size of the new City of Toronto), urban greening and landscaping will have to move up from the ground to rooftops, balconies and terraces. While in Toronto, the study tour visited a number of green roofs and attended expert presentations in workshop format. Tokyo is the other city on their tour. For more information about the study tour delegation, please contact **Sean Cosgrove**: scosgrove@city.toronto.on.ca.

Planting Begins on Chicago's City Hall Green Roof

The green roof on Chicago's City Hall is now in full swing. On September 20th, Chicago Mayor **Richard M. Daley** planted the first of 20,000 plants. One hundred and fifty varieties of shrubs, vines, flowers, and grasses will grow on the downtown 11th story rooftop in an effort to save energy and lower air pollution.

Officials hope that the garden will reduce the urban heat island effect by lowering the roof temperature by 30 to 40 degrees Fahrenheit. This will reduce the City's air conditioning bills by approximately \$4,000 annually and extend the roof's life by 50%. Tenants of surrounding high-rises are able to view the green roof, which will hopefully encourage building owners to include green roof infrastructure in future designs.



MAYOR RICHARD DALEY AND ENVIRONMENT COMMISSIONER WILLIAM F. ABOLT PLANT THE FIRST PLANTS ATOP CHICAGO CITY HALL

The City's electric utility, ComEd, is paying for the majority of the demonstration project as part of a settlement agreement. For more information email: environment@cityofchicago.org.

Ford Motor Company Plans Huge Green Roof in Michigan



FORD'S GREENZONE CAR DEALERSHIP AT UMEA, SWEDEN WITH GREEN ROOF

Ford has committed to building a new assembly plant on the 600-acre Rouge complex in Dearborn, Michigan in 2003. Over 450,000 square feet of the plant's roof will be green roof infrastructure, making it the world's largest green roof on an industrial building. The assembly plant green roof will be covered with sedum, a succulent groundcover and other plants. The green roof is expected to reduce stormwater runoff by holding an inch of rainfall. "This is not environmental philanthropy; it is sound business, which for the first time, balances the business needs of auto manufacturing with ecological and social concerns in the redesign of a brownfield site," said Ford Chairman **Bill Ford**. "This is what I think sustainability is about, and this new facility lays the groundwork for a model of 21st century sustainable manufacturing at the Rouge". The newest Ford dealership in Sweden, already uses green roof infrastructure. For more information, please contact **Don Russell**, Ford Motor Company, Environmental Quality Office: drussell@ford.com.

Overview of Stormwater and Green Roof Infrastructure

Stormwater Management in Urban Areas

Green roofs hold significant promise as an effective approach to managing stormwater, which is a challenge in most urban areas. Stormwater refers to rain and melting snow that flows over land into sewer systems and rivers and in natural or rural areas, soaks into the ground, evaporates or runs off slowly into local streams. In urban areas, impervious materials such as asphalt or buildings significantly alter the natural course of stormwater flow. As a result, during storms and spring thaws, large volumes of contaminated stormwater quickly run off into rivers, streams as well as the existing, and often, already stressed municipal sewer systems.

Negative Impacts

There are many negative environmental, social and economic impacts from poorly managed stormwater. These include: poor water quality, flooding, the destruction of fish habitats, stream bank erosion and the build up of contaminated sediment. There are also social, cultural, economic and legal impacts including the degraded appearance of streams, loss of recreational use of beaches, cost of maintaining stormwater infrastructure such as erosion control, damage to fisheries and the loss of tourism. Combined sewer overflows are another serious problem which faces most older areas in cities. A combined sewer conveys both sanitary flows and stormwater in one pipe to a treatment plant and when volumes exceed the capacity of the treatment plant, raw diluted sewage is discharged into local rivers and lakes.

This story is part 1 of an ongoing series on the benefits of green roof infrastructure. Upcoming issues will feature the benefits of green roofs with regards to energy efficiency, the urban heat island, urban food production and human health.

Green Roof Infrastructure and Stormwater Management

Green roof infrastructure is an important and often overlooked component of a comprehensive stormwater management strategy. By mimicking natural hydrologic processes, green roof infrastructure can retard runoff from roof surfaces during storms. There are three components of a green roof system, which if selected appropriately, can achieve specific hydraulic performance objectives: the subsurface drainage system; growth media and vegetation. A wide range in hydrologic responses can be achieved by varying the saturated infiltration capacity, growing media thickness, matric potential versus moisture content relationship, field capacity, porosity, under-drain transmissivity and relief drain spacing of a

green roof system (Miller, 1998). Green roof plants intercept and delay rainfall runoff by capturing and holding precipitation in the plant foliage, absorbing water in the root zone and slowing the velocity of direct runoff. For example, a vegetated green

Upcoming Events

April 19-24, 2001 - The Roof Consultants Institute's International Convention and Trade Show, Baltimore, MD.

June 26-29, 2001 - The National Research Council's International Conference on Building Envelope Systems and Technologies (ICBEST), Ottawa, ON.

roof with an 8-16" (20-40 cm) thick layer of substrate can hold between 4-6" (10-15 cm) of water (Peck et al, 1999).

"Green roof infrastructure holds significant promise as an effective approach to managing stormwater. For example, a green roof with an 8-16" (20-40 cm) thick layer of substrate can hold between 4-6" (10-15 cm) of water" (Peck et al, 1999).

Green Roof Opportunities

Based on a 1996 survey by the Zentralverband Gartenbau, more than 80 cities in Germany offer incentives to building owners to install green roofs, of which, 13 allow a reduction in the stormwater usage fee for buildings with green roofs (Miller, 1998). A multi-million dollar green roof industry exists in Germany due largely to public incentives for, and direct investment in, green roof infrastructure for stormwater management. Green roof infrastructure presents opportunities not only for stormwater management, but generates co-benefits that help to address many other pressing urban problems such as energy conservation, reduction of the urban heat island and air quality improvements.

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Some jurisdictions in the U.S. are looking to green roofs to help address stormwater objectives. For example, the Pennsylvania Association of Conservation Districts identified green roof infrastructure as a stormwater best management practice in their *Pennsylvania Handbook of Best Management Practices for Developing Areas*. Seattle and Portland are developing stormwater management standards that incorporate green roofs. Efforts are also underway in Washington, D.C. to evaluate the stormwater benefits of green roofs.

The City of Toronto is working to develop the *Wet Weather Flow Management Master Plan*, a partnership between agencies, the public and the City to improve the water quality of its rivers and lake Ontario. The plan will find ways to prevent, reduce and control the pollution in stormwater runoff. This presents an opportunity for Toronto to exhibit leadership in advancing the Canadian green roof infrastructure market. Currently, Green Roofs for Healthy Cities is working with other green roof researchers to develop a protocol for evaluating the city-wide benefits of green roof infrastructure. Please check our website for details (www.peck.ca).

Resources/Citations

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