COASTAL SMART GROWTH

Low Impact Development Case Study

City of Boston – *City Hall Green Roof*

Highlight: *Boston installed a green roof — of 150 modular pre-grown gardens—on the eighth and ninth floor terraces of City Hall to help capture and treat stormwater runoff at the source.*

Why Low Impact Development (LID)?

Roofs cover a significant portion of the urban landscape and generate large volumes of stormwater runoff. When it rains, this stormwater flows through the municipality's drainage infrastructure into natural waterways, having the potential to create irreversible damage to local ecosystems via erosion and water-borne pollution.

What LID Practice Was Applied?

Green roofs are one method of reducing stormwater runoff. Initially designed to provide insulation in cold climates such as Iceland and Scandinavia, green roofs have recently been developed to harness water retention capabilities to reduce runoff in urban areas. By using a layer of vegetation instead of traditional impervious roofing systems, a large amount of rainfall can be captured, retained, and filtered at the source.

Close up of plantings on Boston's City Hall roof-top terrace. These mini gardens help hold and treat stormwater runoff.

The city of Boston, prompted by the momentum to be "green" for the Democratic National Convention held in Boston in 2004, and as part of the recommendations provided by the Green Building Task Force, recently installed a green roof—150 modular pre-grown gardens—on the eighth and ninth floor terraces of City Hall. The modular gardens, also known as "green grid" modules, include 12 varieties of sedum, a species commonly used for rooftops because they have high water retention capability, an ability to filter pollution, and are drought tolerant. The plants were also selected for their shallow root systems, regenerative qualities, and hardiness to the elements of sun, frost, and wind.

What Was the Project Scope, Timeline and Budget?

The modular garden is the pilot project for what Boston hopes will be the green roofing of the entire City Hall roof. Due to its high visibility on the eighth and ninth floors, the project will also become a resource for developers and individuals interested in exploring green roof technologies, particularly with the inclusion of the educational signs that are to be installed. Subsequent installations of modular plantings are also planned.

To enhance the appeal of the rooftop for users, the project also includes pieces of sculpture that will be installed on a rotating basis, decorative edging along the containers, and tables and chairs for seating.

The $30,000 project was funded in part by the Boston Redevelopment Authority, Skanska USA (also known for the Gillette Stadium), and the Kendall Foundation. The Coalition for Environmentally Responsible Conventions (CERC) acted as the beneficiary of the funds.

What Are the Benefits?

Green roofs have many environmental benefits. As an LID practice, the most important benefit is the ability to **reduce stormwater runoff** as rainwater is absorbed by the soil and, in turn, by the plant life. These particular gardens are made to absorb 90 percent of the first one inch of rainfall, thereby substantially reducing the volume and peak flow of water that enters the city's drainage system.

In addition to reducing stormwater runoff and improving water quality, this green roof will also:

- **Improve Air Quality:** Vegetation has the ability to filter air by collecting dust and other pollutants, as well as enhance air quality by absorbing and converting carbon dioxide to oxygen.
- **Lessen Urban Heat Island Effect:** Green roofs keep building tops cool, unlike asphalt and black rooftops that trap heat and radiate it back into the air.
- **Reduce Energy Costs:** Green roofs provide an extra layer of insulation, reducing heating costs, as well as reducing the energy demand to cool the interior (traditional city rooftops can reach up to 175 degrees Fahrenheit).
- **Reduce Noise:** With the extra layer of insulation, green roofs can reduce noise pollution into the building by as much as 40 decibels.
- **Extend Roof Life:** Plant modulars protect roof membranes against UV radiation, extreme temperatures, and punctures.
- **Improve Aesthetics:** Green roofs add value to real estate and have been shown to increase worker happiness and productivity by providing pleasant views and quiet, passive recreational space.
- **Provide Educational Benefits:** Visitors will learn the value of the green roof LID practice through interpretive signs explaining the garden's functions.
- **Earn LEED Points:** Green roofs are one way developers can earn Leadership in Energy and Environmental Design (LEED™) points and build buildings that are better for the environment. The LEED Green Building Rating System is a voluntary, consensus-based, national standard for developing high-performance, sustainable buildings. Boston may soon require that all city-owned developments achieve a LEED™ Silver Certification, and all large projects in Boston be LEED™ certifiable.

What Type of Operation and Maintenance (O&M) Is Required?

The modular gardens containers are made up of two by four foot trays composed of recycled materials, containing an engineered growth media approximately two to four inches deep, which is made to be extremely absorbent and lightweight. The light weight of these materials allowed installation on the existing roof without structural adjustments. Because it is modular in nature, the rooftop design can be easily adjusted and rearranged after installation to meet a change in planting schemes, or for maintenance to the roof.

Because some of the plants used for the project were over one year old (having been grown off site prior to installation), they required less maintenance and watering than seedlings and new plants. In addition, the perennial sedum varieties have been selected to withstand a range of seasonal conditions typical of the Northeast without the need for regular irrigation and maintenance. The plants require some fertilization within the first two years and occasional deadheading to prevent the gardens from becoming overgrown. The city was able to extend a spigot to the terraces

The modular garden containers are made entirely of recycled materials.

Sedums used in the plantings were selected for their hardiness and ability to adapt to Northeastern weather conditions, which can range from the very hot to the painfully cold.

where the plants are watered only on an as-needed basis (i.e., hot, dry conditions). A future project may capture water from the main roof (over the tenth floor) and gravity feed it down to the eighth and ninth floor terraces. Although service contracts by local garden companies or installers can be provided to care for the gardens, Boston chose to use their own maintenance staff to lower costs.

What Were the Obstacles or Lessons Learned?

Since green roofs are a relatively new practice to the area, Boston officials had little information and experience on which to rely for planning purposes. Some risk was involved seeing as the likelihood of success of the modular gardens was uncertain. However, due to the ease of the modular garden technology for retrofitting, officials were willing to press forward.

As with any project, design and installation costs are potential obstacles, particularly when such large capital investments need to be made up front. However, because this was a fairly small-scale demonstration project, the city expected quick results and therefore could justify investments. Private and public partnerships for funding were easily forged due to the nature of the historic public site. Boston also applied cost saving measures, such as finding used modules, and providing in-house installation and maintenance services.

Boston continues to promote LID practices, and hosted the Green Roofs for Healthy Cities conference in May 2006. With the knowledge acquired through this conference, the work of the Green Building Task Force, and the experience gained through the pilot project, the city hopes to build on the excitement over the existing green roof technology, and to promote more widespread use of roof gardens.

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Production Notes

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