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Taking Green Building to a Higher Level

Green Roofs Offer Environmental, Economic and Aesthetic Benefits

By Lynn Murray

It's a new world when it comes to commercial architecture and construction. No longer is the focus only on expert craftsmanship, innovative design and attention to detail. Rather, all eyes are examining the process itself, the materials used, and most of all, the impact of construction on the environment. And there has been a quite a crowd jumping on the green bandwagon.

The reality is that building truly sustainable structures that conserve natural resources and recognize global needs and issues is a challenge that few companies are meeting successfully. But one area where green building is rising high above the colorful marketing hype is green roofs. Not roofs painted green – but building coverings that are partially or completely covered with plants, grass and soil, planted over a waterproofing membrane.

Still a relatively new phenomenon, green roofs first were developed in Germany in the 1960's and today, make up about 10 percent of all German roofs. The first green roofs in the United States made their appearance several decades later, but interest and popularity continues to grow as developers, building owners and government officials begin to see the environmental, economic, aesthetic, and social benefits of roof-top vegetation.

Green Roofs 101

Green roofs, also known as garden roofs and eco-roofs, are made from a layered structure of components. Covering the roof deck is a waterproofing membrane, often composed of rubberized asphalt, to guarantee a tight seal. The next layer is a protective root barrier, to prevent plant roots from penetrating the roofing membrane. This layer varies in strength based on the landscape design or selection of plants. On top of the root barrier is an insulation/air barrier, composed of extruded polystyrene or other insulation material. Depending on the needs of the vegetation, the insulation layer may be topped with an additional moisture-holding mat.

Next is the drainage/water storage and aeration layer. Using specially designed retention cups and channels made of recycled polyethylene,



The green roof on the headquarters of the American Society of Landscape Architects in Washington, D.C. was completed in 2006 and is a showpiece for aesthetic design and environmental benefits. American Hydrotech, Inc. supplied the Garden Roof® Assembly components for the green roof.

the drainage layer allows for effective, controlled run-off of excess water. A layer of filter fabric tops this, to filter soil fines and debris, allowing water to pass through to the drainage and aeration layer.

The top layers are the soil layer and the vegetation. Lightweight engineered soil provides a stable structure for the plants' root system and supplies nutrients, water and oxygen while remaining as light as possible to prevent excess loading of the root structure.

Depending on building conditions, climate and anticipated use of the roof, a wide variety of typical landscape and garden plants are suitable. Plants with shallow root systems and resistance to direct radiation, drought, frost and wind are well-suited to all types of green roof landscaping; but even perennial flowers, shrubs, small trees and sod grasses can be used for intensive roofing landscapes.

Types of Green Roofs

Green roofs are generally categorized as extensive or intensive. Extensive roofs are ideally suited for locations that will receive little maintenance or where structural capacities of the roof are a concern. Sedum, herbs, grasses

and other vegetation that can withstand harsh conditions are recommended. Intensive roofs use plants that require regular maintenance, such as watering, fertilizing and mowing. These roofs must be structurally stronger, and often serve as pedestrian recreational areas. Several other variations include the shallow-intensive garden roof, which combines a lightweight roof assembly with slightly deeper soil to accommodate sod lawns and perennials, and sloped extensive applications, which can be applied to sloped roofs with a pitch of up to 45 degrees.

Benefits

Green roofs are certainly eye-catching and innovative, but their benefits extend far beyond their aesthetic value. They add additional space for recreation and relaxation for building tenants and create therapeutic and peaceful environments in the midst of an asphalt jungle.

Ecologically, the benefits of green roofs are remarkable. They help cool and humidify the surrounding environment, creating a microclimate with beneficial effects. As a natural habitat for animals, plants, birds and insects, green roofs create biodiversity and encourage wildlife to remain within urban areas. In cities, green roof

vegetation also helps to filter dust and smog particles and absorb nitrates and aerosol contaminants from the air and rainfall, binding them within the soil.

"Whenever you have the opportunity to replace an asphalt or gravel roof with a garden roof, you've got a very strong case for putting it in," said Steve Skinner, garden roof project manager for American Hydrotech Inc., a leader in the development, production and distribution of premium waterproofing and roofing products, located in Chicago. The company has been installing waterproof membranes for more than 30 years and installing green roofs since 1997.

A major benefit of green roofs is storm water retention. Depending on the design, a green roof can typically reduce storm water run-off by 50 to 90 percent. Peak flow volume is reduced and peak flow period is delayed up to four hours, minimizing the impact on sewer systems.

For the building owner, a green roof also can result in lower heating and cooling costs, as much as 20 percent or higher, by providing an insulating barrier. Green roofs also improve sound insulation up to eight decibels and reduce reflective sound up to three decibels, which is especially valuable for buildings near airports, highways or factories.

The very design of a green roof extends its life by 2-3 times by protecting the roof membrane from temperature extremes and physical abuse, according to research study by Penn State University's Green Roof Research Center. Developers see marketing advantages and increased property values as tenants are attracted to the additional unique and useable space. And as municipalities and other government agencies realize the immediate and long-term benefits of green roofs, building owners have access to incentives that can help offset initial costs of installation.

"Each project has its own driver. With each project we learn new and unique ways that green roofs can add value and benefits," said Skinner.

Such is the case in Chicago, which is providing incentives and faster approvals to encourage green roofs on public and private buildings, to help with the urban heat island effect, reducing the temperature of the urban environment as much as 12 degrees Fahrenheit. The roof gardens on the Chicago City Hall, completed in 2001, were among the first green roof structures completed in the United States, serving as a test for the impact of green roofs on the heat island effect, rainwater runoff and the benefits of roof design and plant species. Atlanta, Portland and many other cities



Intensive roofs use plants that require regular maintenance, such as watering and mowing. These roofs must be structurally stronger, and often serve as pedestrian recreational areas.

are providing similar incentives for green roof construction.

Similarly, developments in Maryland, Virginia and Washington, D.C., are using green roofs to help with storm water runoff management, protecting the watershed of the Chesapeake Bay by decreasing the amount and rate of runoff and retaining pollutants in the roof soil. Other communities in the Chesapeake area are using green roofs to filter and store storm water, offsetting the need for underground sand filters.

"Off the Charts" Green

Green roofs also can earn builders up to 14 LEED® credits, depending on local codes, design and level of integration with other building systems, to certify their building as sustainable construction. The Leadership in Energy and Environmental Design (LEED) Green Building Rating System® is the nationally accepted benchmark for the design, construction and operation of high performance green buildings. Green roofs contribute to LEED® credits in storm water management, landscape design that reduces urban heat islands, water-efficient landscaping and innovation in design.

"Everyone is saying that what they build is green, which creates a lot of confusion. If they're green, then we're 'off the charts' green. The fact that green roofs are able to contribute significantly to the overall LEED® score speaks volumes about their impact on sustainability," said Skinner.

Projects of Note

The U.S. Census Bureau Headquarters in Suitland, Md., and the American Society of Landscape Architects Headquarters in Washington, D.C., both completed in 2006, are two high-profile

projects that have embraced the concept of green roofs. Chicago-based American Hydrotech, Inc. supplied Garden Roof® Assembly components for each project, including waterproofing membranes, insulation, drainage/moisture retention elements and lightweight engineered soil.

The U.S. Census Bureau – "America's Fact Finders" – added 70,000 square feet of intensive and extensive green roof space to its new headquarters at Suitland Federal Center, now the third largest area of green roofs in the country behind Chicago and Washington, D.C. The building's two interconnected wings curve over and around a stunning courtyard, while green roofs rise above the lobby and also above the fourth and fifth stories.

The Census project represents the Government Services Administration's (GSA) commitment to sustainable building practices and the certification of facilities through the LEED® program; the headquarters has received a LEED® Silver rating from the U.S. Green Building Council for its sustainable design and construction. While the green roofs provide a beautiful, natural environment to be enjoyed by the bureau's 6,000 employees, they also lower heating and cooling costs for the building, reduce the "heat island effect," extend the life of the roof's membrane, reduce storm water runoff and provide a local wildlife habitat.

Just down the road, the American Society of Landscape Architects Headquarters serves as both an example and an inspiration, demonstrating how landscape architects play a central role in green roof design and construction. The previous black tar roof on the 11-year old brick building is now a showpiece for aesthetic design and environmental benefits. The roof employs a matrix design, containing distinct areas of extensive, shallow-intensive and intensive green roof systems with plantings ranging in depths from three to 24 inches. The dominant features of the roof are two highly sloped areas, or waves, covered with plantings, which demonstrates design relationships between the roof, the horizon and the building.

"This green roof is a place for people but also a place for the environment and nature. In many scenarios, it's almost like a choice has to be made between one and the other," said Project Manager Chris Counts, ASLA, of Michael Van Valkenburgh Associates, the landscape architectural firm that led the design process. "The ASLA green roof is an example where we've been able to do both and accomplish quite a number of things on this one small, intimate roof."

The true beauty of a green roof is what you can't see



Seattle City Hall

.....the membrane

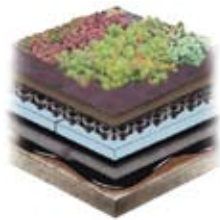
A green roof is about more than just 'green', its success also depends on keeping the building dry. That's why the most important component of American Hydrotech's Garden Roof® Assembly is the membrane, Monolithic Membrane 6125®. For over 40 years, MM6125® has been the membrane of choice for critical waterproofing and roofing applications world-wide.

MM6125 creates a seamless membrane, forming a tenacious bond to the substrate, ideal for new construction and renovation. Applied at a thickness of 215mils, the

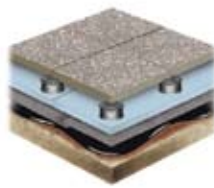
membrane conforms to deck irregularities, is self-healing, and is designed to perform in a submersed water environment.

In addition, American Hydrotech's Total Assembly Warranty provides owners with single source responsibility from the deck up. This is a warranty that only American Hydrotech can offer, and peace of mind that only American Hydrotech can provide.

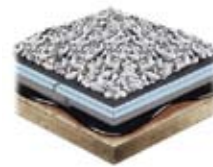
To learn more about what American Hydrotech can do for you, please give us a call at [800.877.6125](tel:800.877.6125) or visit our website at www.hydrotechusa.com.



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