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TECH TALK *from* Georgia-Pacific Gypsum

Technical Insight from the Roof Board Experts

"Extensive" Garden Roofs

A low-maintenance ecological solution.

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The use of garden roof systems is relatively new in the U.S. However, as energy costs rise and environmental awareness increases, the idea of vegetative roofing is poised to become much more common place. In fact, a number of major cities and large property owners are already looking at these ecological roofing solutions. According to Brad Rowe, a Michigan State University horticulture professor and chairperson of the Green Roofs for Healthy Cities (GRHC) Research Committee, the garden roofing industry is growing rapidly. The area covered by garden roofs increased 80 percent between 2005 and 2006 in the United States. "Few people in the roofing industry doubt that we are in the beginning stages of enormous change," says roofing contractor Mark Gaulin, founder of MACGO Inc. and former president of the National Roofing Contractors Association (NRCA). "This is being brought about by the green roofing movement and the realization that buildings play a vital role in conserving energy and protecting the environment." For roofing contractors and their customers, it's no longer a matter of whether to consider a garden roof, but what type of design will work best. Next to TPO single-ply membranes, garden roofs are the fastest growing system in the low-slope roofing market.

Defining garden roofs

Although vegetative roof systems are often referred to as "green" roofs, the latter definition can also include reflective roof membranes that save energy, or "sustainable" roof systems that are recyclable and pose minimal harm to the environment. "As a landscape architect, the word 'garden' is often used when describing an 'extensive' green roof," says Peter Philippi, a principal with Green Roof Service LLC in Forest Hill, MD. "The term is clearly linked to flowerbeds, shrubs, trees, patios, and usage as amenities. From my understanding, roofing contractors and designers may also use the term 'garden' to describe "intensive" systems, which are in fact rooftop gardens." SPRI, the association representing sheet membrane and component suppliers to the commercial roofing industry, prefers to use the term "vegetative" when referring to garden roofs. SPRI and GRHC are also working on wind and fire standards for these systems.

Either way, the thicker and heavier "intensive" garden roofs are giving way to a lighter "extensive" system, which is designed to be more self-sustaining and maintenance-free.

This new system allows contractors, architects and property owners to take advantage of the many benefits of garden roofs at a fraction of the cost and weight. According to GRHC, extensive systems are growing almost twice as fast as intensive garden roofs (see Table 1). Not only do extensive systems offer aesthetic value, but they aid in storm water management and air and water purification, as well as insulating against noise and vibration. Extensive garden roofs can also extend roof life and help reduce the Urban Heat Island effect.

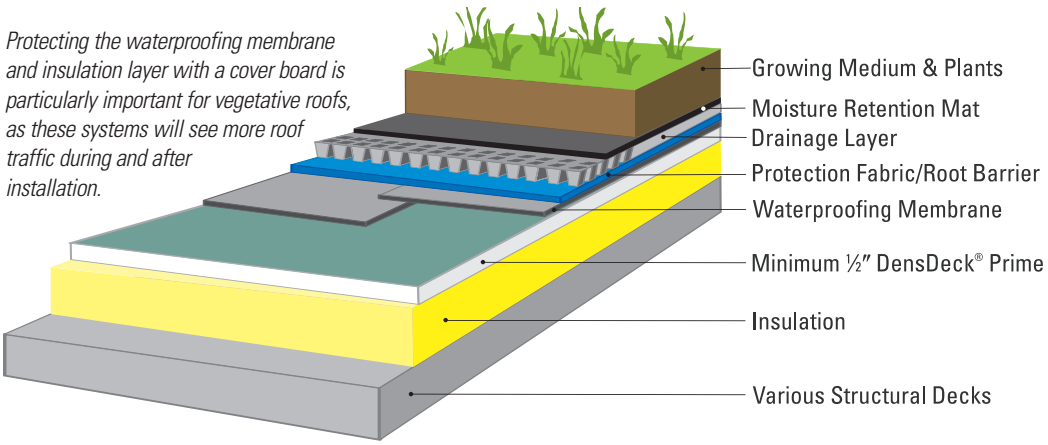
As part of its Urban Heat Island reduction plan, the city of Chicago and scientists from the U.S. EPA and Lawrence Berkeley National Laboratory have studied the performance of the landmark garden roof ever since its installation eight years ago. The latest results (2007) show that if all the roofs in a major city were vegetative, urban temperatures could be reduced by as much as 7 degrees Celsius. Weather stations are in place on the city and county sides of City Hall to compare air temperature and other data as it relates to the garden rooftop. The information is then compared to the county's black roof. In addition, an infrared thermometer is issued to measure surface temperatures. *(For more information on this project, see egov.cityofchicago.org).*

Vegetative specifications

An intensive garden roof traditionally places the waterproofing membrane directly over a high-load capacity roof deck, drainage layer and insulation. Over the top of these components comes a one-foot-thick layer of soil media. However, the more user-friendly extensive systems decrease the amount of soil media to six inches or less and typically incorporate a product like Georgia-Pacific's DensDeck® Prime Roof Board on top of the roof deck and insulation. Over the roof membrane comes a root barrier, drainage board and moisture retention mat to provide support for the growing medium on the top layer.

The cover board serves as a durable substrate for the membrane and protects the more fragile thermal insulation layer from mechanical damage. DensDeck Prime can also increase the wind uplift performance of the vegetative system and protect the membrane from hail damage and foot and mechanical traffic during the installation process. A high density, fiberglass faced gypsum cover board like DensDeck Prime also features high moisture resistance and serves as

Protecting the waterproofing membrane and insulation layer with a cover board is particularly important for vegetative roofs, as these systems will see more roof traffic during and after installation.



a fire barrier. In this way, the use of one cover board solves numerous roofing problems for the architect and property owner. In terms of labor costs, DensDeck® Prime provides a stronger and more economical installation by reducing the damage during installation. The product also eliminates the need for a field primer and reduces the number of fasteners required to achieve high wind uplift values.

Table 1: Garden Roofs Grow by 24%

	North America Total (sq. ft.)
Extensive	1,957,217
Intensive:	1,033,196
Mixed/Semi-intensive	73,787
Total	**3,064,200**

Square footage of green roofs completed in 2006 for North America and USA by General Green Roof Type.

	North America
Extensive	10%
Intensive:	112%
Total	**24%**

Percentage growth in square footage from 2005 to 2006 for North America and USA by General Green Roof Type.

Source: Green Roofs for Healthy Cities, 2006 annual Green Roof Industry Survey.

NRCA recommends that contractors use a cover board in all roofing applications. However, protecting the waterproofing membrane and insulation layer with a cover board is particularly important for vegetative roofs, as these systems will see more roof traffic during and after installation. Moreover, the cost of adding a cover board is considerably inexpensive insurance against leaks and difficult repairs on a vegetative roof that can cost more than $40 per square foot to install. "Warranty and maintenance issues would be the two biggest concerns for me," says Philippi, who has 25 years of experience in vegetative roof design and installation. "A simple, affordable and safe solution is best."

In the meantime, garden roofs are becoming more popular in Chicago, Atlanta, and Portland (OR), where government and utilities are creating incentives to encourage the use of vegetative roofs. The U.S. market will likely see this trend grow steadily, as architects and property owners embrace the lower-cost, low-maintenance extensive garden roof in order to take advantage of incentives, save energy, reduce noise and increase the life expectancy of the waterproofing system. "We estimate that the actual growth rate for garden roofs significantly exceeds the 25% reported for 2007," says Alex Johnston of GRHC. "We project much greater increases in industry growth and coverage in the years ahead."

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