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August, 2006

DIY Modular Green Roof Systems



Chicago's Hyde Park Art Center has a greenroof of DIY modules, filled with growth and plant media, atop the Hyde Park Art Center building's existing roof. Photo by Robert Kravitz

By Sandra McCullough, LEED AP
All photos Courtesy GreenGrid®

For those of us who know the value of green roofs and are longtime enthusiasts of green roofing systems, each new installation has been considered an achievement for the industry. And now that the movement has garnered considerably greater acceptance with green roofs found on all types of facilities worldwide, we have an opportunity to concentrate on specific markets that have yet to take advantage of green roofing systems.

One such market is residential—and more specifically, individual home owners. Roofs of any kind are rarely on the mind of most home owners, and when they are, it is often because they need to install a new roof or repair an existing one—both of which are usually costly expenditures.

Encouraging home owners to add a green roof atop an existing roof has been a challenge, not only because of the added expense, but because so few home owners know what a green roof is, its benefits, its long-term cost savings, or how easily it can be installed. Although small green roof undertakings may be easy do-it-yourself projects for the average weekend warrior, more extensive green roof systems can still be perceived as daunting in terms of buying the right materials, installing the layering, and including the important perimeter, flashing, and drainage outlet details.

This is changing now with the introduction of do-it-yourself (DIY) modular green roofing systems. These systems have helped reduce the expense of green roofs significantly because they are designed for self-installation, eliminating much of the labor costs.

Rooted on the Roof: A Brief History

Although green roofs on homes are relatively rare in the United States, the concept is not a new one. Green roofs have been found on Scandinavian, German, British, and Irish homes for centuries. Even some early American prairie homes in Iowa, Nebraska, and other states had green roofs of sorts decades ago.

These sod houses with sod roofs used a layer of grass, grass roots, and other plant media as a construction material, especially in those areas where other types of construction materials such as bricks and lumber were not as readily available. A sod covering that was historically a material of choice in the United States was frequently referred to as buffalo

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grass. It had a thick root system that would be plowed into long strips and then cut as necessary to be stacked on the house—roofs, walls, and all.

Often the grass would stay green and continue to grow on the outside even after being placed on the house. This would sometimes attract goats, cows, and other animals that grazed on the surface, acting as living lawn mowers. The big benefit of sod for the home owner was its insulating qualities. Sod homes tended to stay warm in the winter and comfortably cool in the summer—one of the benefits attributed to green roofing systems today.

Modules Make the Difference

However, as mentioned earlier, one of the big obstacles to green roof installation, especially for home owners, has been the cost. With the traditional built-in-place green roof, several workers are often required to haul plants and soil to the building top where the green roof is installed.

In addition, a built-in-place roofing system can take many days to install on a home. If several laborers are brought in to install the roof, this increases the concern that an accident might occur. Often this concern translates into higher insurance costs for the roofing contractor, which is passed on to the home owner.

Modular green roof systems are an alternative to built-in-place systems. They help eliminate many concerns about safety risks and reduce the cost to install a green roof.

One such system, the GreenGrid® Do-It-Yourself (DIY) Kit just introduced by Weston Solutions® uses lightweight 2' x 2' x 4" modules made of 60 percent recycled plastic. The Kit is delivered directly to the homeowner or installation site and consists of four main components: the plastic modules just mentioned, geotextile root and soil barrier, growth media, and plants.

Different plant palettes are also available. Plant selection is based on the region of the country where the green roof is to be installed, as well as hardiness, drought tolerance, and low maintenance. Additionally, because green roofs can be visually appealing, the selections have varying foliage and flower colors, which bloom at different times of the year.

As with all green roofs, there is periodic maintenance, at least initially. If natural precipitation is insufficient, the plants may need to be irrigated during the "establishment period," which usually lasts for four to six months. Occasional weeding may also be required during this period. Although the growth media is specially prepared for the roof, application of slow-release fertilizer once or twice per year may be required for plant nutrients.

Requirements

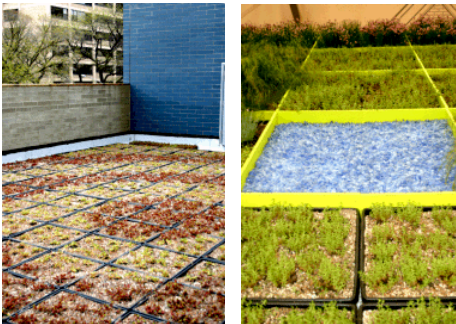
As with any green roof project, certain installation requirements must be followed for all DIY modular systems. For instance:

- *Structural Capacity:* The home owner may need to consult with an engineer to determine if the home can support a green roof. The GreenGrid modules, for example, filled with plants and growth media, weigh 15 pounds when fully saturated.
- *Existing Roof Condition:* The existing roof surface must be in good condition and free of leaks. If repairs are needed, these should be completed before the green roof is installed.
- *Maximum Slope:* This can vary with the type of DIY system installed, but for a GreenGrid modular DIY green roof system the slope must be 5 percent or less.
- *Permits:* The home owner must secure any local permits and/or approvals that are required.
- *Installation:* DIY systems are designed for home owner installation – see pointers below. However, some home owners prefer to have roofing or landscape contractors install the green roof. (See below for step-by-step installation instructions.)

DIY System Installed on Arts Center in Chicago

To help celebrate the opening of its new location in April 2006, Chicago's Hyde Park Art Center asked area artists to create new work for the local community to enjoy.

One of the projects that has garnered considerable attention—and is now a permanent exhibit—is the building's green roof.



The DIY modules atop the Hyde Park Art Center is a permanent art display as well as an environmentally friendly greenroof. Photos by Robert Kravitz.

"It's an art project, called Bullseye, by local artist Stuart Keeler who worked in collaboration with Weston Solutions®, Inc., GreenGrid® Green Roof System, and Midwest Groundcovers," says Allison Peters, the Center's Director of Exhibitions. "It is part of the Center's attempt to operate in a more sustainable manner and, even more, to show the community how this can be accomplished."

The DIY modules, filled with growth and plant media, were laid out atop the building's existing roof. This system tends to be more cost effective and faster to install. In fact, the center's green roof only took 14 hours to install.

Installation Instructions for the GreenGrid DIY Green Roofing System



All the materials necessary for your DIY modular greenroof project are shipped to you.

The first step:

Before beginning, a qualified structural engineer should be brought in to assess the roof to determine that the roof is in good condition, there is not more than a 5 percent slope and the structural capacity will handle the additional 15 pounds per square foot that will be added by the GreenGrid modules.

Also, any applicable local permits and/or approvals should be obtained prior to installation.

Safety:

Institute proper safety precautions to assure the safety of the installers and people located near the installation. Also secure all items to help prevent anything from falling from the roof during or after installation.

Design It:

Using a piece of graph paper and assuming each square represents a 2' x 2' module, measure the length and width of the roof and plot it on the paper. Take note of any obstructions on the roof (vents, antennas, chimneys, etc) and make note of them.

Installation Method:

Determine the best method for installation. If the roof is easily accessible, you may want to preassemble the modules on the ground, then place and maneuver the modules on the roof. If the roof is not easily accessible, you may want to carry the modules, growth media and plants to the roof separately, and then assemble on the roof.

Unpack The Materials:

Remove shrink wrap from the modules and growth media and discard them in a recycle bin.

Lay Modules Out:

Lay the modules out on the ground (or roof if that is the desired installation approach).



The DIY modules, filled with growth and plant media, are laid out atop the Hyde Park Art Center building's existing roof.

Soil/Root Barrier:

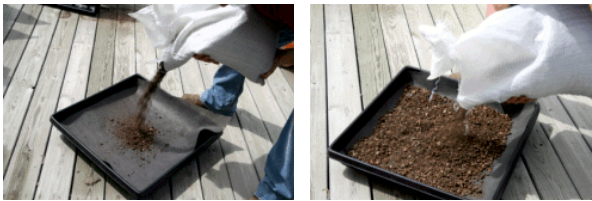
Place the root and soil barrier material inside the bottom of each module.



A soil filter fabric and root barrier is a necessary component to keep the drainage holes from clogging and to ensure non-penetration of any unwanted volunteer seedling taproots into the roofing membrane.

Filling The Modules:

Open one bag of growth media. Steadily pour the media into the tray, while keeping the barrier fabric in place. Each bag is sized to fit one module. Complete this process until all modules are filled.



Filling the DIY modules with the pre-packaged growth media is easy.

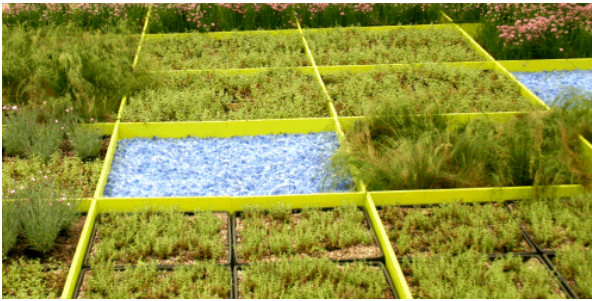
Planting:

Gently remove a single plant from the flat; it may be easier to remove by pushing the plant from the bottom of the plastic. Next lay the plants out in the module to identify that you have the desired look and have spaced them evenly throughout. With your hand or a hand trowel, scoop out an area of growth media approximately 3 inches in diameter. Place the plant in the hole and gently back fill the growth media around it. Repeat until the entire module is planted.

Placement:

If the modules were planted on the ground, take them to the roof, one at a time, until all of the modules have been delivered to the roof. Place them in an arrangement that pleases you and in accordance with your design. If you planted the modules on the roof, simply place them in the arrangement that pleases you or shown on your design. The modules may not be stacked on one another.

Install your green roof by establishing an outside line, then working towards the other side of the roof and maintaining straight lines. The corners of modules should all touch.



A beautiful and easy do-it-yourself greenroof project is possible for anyone - home owners or even commercial building owners.

Home Owner Benefits

As with green roofs on commercial settings, a green roofing system can provide home owners with several benefits. For instance, one can double the life expectancy of the home's existing roof. And with a new roof on a typical American home costing \$5,000 or more, depending on location, type of roof, and other variables, this can be a significant savings.

A green roof also can help reduce energy costs. Scientists at the University of Toronto report that a green roof can contribute to a 6 percent energy savings in summer and that the savings could be greater when the roof is placed on a home or facility with a wider rooftop.

Other studies indicate that green roof systems can reduce both cooling and heating costs by as much as 50 percent (when compared to a traditional blacktop roof) and significantly slow a home's heat gain and loss. The result is that the home owner's heating and air-conditioning systems do not have to work as hard; in new construction, this can allow the

home owner to reduce the size of the heating and air-conditioning systems being installed, another cost savings.

These savings also have the potential to increase the property value of a home and, because green roofs on residences are still relatively rare, one can give it a competitive edge over similar properties when up for sale. In addition, some localities may allow home owners to take advantage of tax credits and other benefits that come with installing energy-saving materials, and these, combined with improved roof longevity and insulation, can outweigh the increased installation costs for a DIY green roof system.

The many benefits of green roofs are making building professionals—including architects, planners, and developers—take notice. Old barriers, such as costs and a lack of understanding of green roof benefits, are withering away. In Chicago alone, there are more than two million square feet of green roofs, with more planned. Now, new technologies and modular DIY systems will allow home owners to take advantage of green roof technology, spreading the benefits from the commercial and industrial setting to the residential one as well.

Sandra McCullough is a LEED® Accredited Professional and recognized expert on green roofing systems with GreenGrid, a business of Weston Solutions. McCullough is a member of the U.S. Green Building Council; serves on the board of directors of the Environmental Technology Program, City Colleges of Chicago; is president of the Cornell University Club of Chicago; and was vice president of the Environmental Auditing Roundtable from 2001 to 2003.

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