

HITTING THE ROOF

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WITH GREEN ROOFS MAKING THEIR WAY INTO US BUILDINGS, NOW IS THE TIME TO START LEARNING ABOUT WHAT GOING GREEN HAS TO OFFER.

Green roofs are, as the name implies, plantings that are placed on the roof of a building. Although green roofs have been around for decades in Germany, US industries are just now starting to pay attention to the benefits offered by this practice. However, even with this increased interest, as well as a sampling of greened roofs nationwide, green roofs are far from being commonplace in the US.

As more people begin to think about the advantages of green roofs, the need for discussion concerning how to implement this practice in the US is becoming more important. In order to get a better idea of what green roofs can offer US industries, as well as what might be in store for nursery professionals around the country, some of the advantages, disadvantages and logistical issues raised need to be considered.

Green roof technology is not new. In Germany, green roofs are divided into two categories: extensive and intensive. Extensive roof greening has a thin layer of overburden (growing medium) – 4 inches to 6 inches – and is not designed for human habitation. Conversely, an intensive green roof has a deep overburden designed for trees and shrubs and can also be used as a roof garden or patio.

After decades of practice, space-cramped Germans have honed greening roofs to a fine art. Industry figures suggest 10 percent of all German roofs are greened. Between 1989 and 1999, German roofing companies installed nearly 350 million square feet of green roofs, and the rate is increasing.

With Germany's considerable research and practical experience, installing green roofs in the US may seem like it should be easy. Unfortunately, it isn't as simple as that. Although some information about green roofs is available, installation specifics are mostly patented or proprietary, and performance data are largely anecdotal. Moreover, much of the popular semi-technical literature concerning green roofs is available only in German, which effectively slows its adoption by Americans.

Still, green roofs have been installed in the US in places such as the Chicago City Hall Building (for more information, see News Watch in this issue), and more are planned, like the Fords River Rouge Building renovation in Detroit. However, roof conditions in the US are substantially different from those in Germany. So while some of the principles can be applied, American nursery professionals need more information that specifically covers conditions in the US.

When planning a green roof, plant size and selection depend on the depth of the roof overburden and local climate. Also, plant selections are almost always drought-tolerant. Low-growing plants, such as some grasses, sedums and other cactus-like plants, are used where the overburden is only a few inches deep; where the medium depth is several feet, shrubs and small trees can be used. Although most easily used on flat roofs, it is also possible to green a low-pitched roof.

THE UPSIDE. There are several significant advantages to green roofs, including water runoff, aesthetics, heating and cooling, heat-island amelioration, roof-life extension and gray water renovation.

Controlling storm water runoff may be the single most important advantage. In some cases, when a building is erected in Germany, laws mandate that it have a green roof so runoff is held back and does not overwhelm municipal sewage systems, thus adding to pollution problems. The growing medium, while designed to support plant growth, absorbs water and also slows down rain runoff, as do the plants themselves. Green roofs also make sense because the vast gray expanses of industrial flat roofs are visually improved when planted, which in turn may add value to a building.

There are also environmental issues that can be addressed by installing green roofs. For instance, heat-island amelioration is fast becoming a worldwide problem, especially for some large urban areas. It is a known fact the air above cities is significantly warmer, sometimes up to 15 degrees, than that of the surrounding countryside. Plants, when they transpire, cool the atmosphere, so they can significantly reduce surrounding temperatures.

Installing green roofs might also reduce heating and air conditioning requirements. The roof overburden acts as a natural insulator, reducing both summertime air conditioning and winter heating requirements. Savings depends on a number of variables, including the thickness, composition and moisture content of the growing medium, the plants used, roof location, as well as roof construction factors. In addition to cooling temperatures, plants scatter light, thereby reducing thermal loading.

Green roofs may also prove helpful in extending the lives of some buildings' roofs. Most roofs are dark-colored and absorb heat, which can cause large fluctuations in the roof's skin temperature. In addition, these fluctuations can cause expansion and contraction, resulting in leaks and premature failure. In hot climates, roof temperatures may approach 200 deg. during the day and plunge to 50 deg. to 60 deg. at night. Because green roofs reduce these dramatic temperature fluctuations, they may, by some estimates, double or triple roof life.

Since all roofs have a natural pitch, building gray water could also be entered at the high point on the roof and allowed to slowly filter through the plant sod. While probably not a primary treatment system, it could significantly improve water quality before its returned to the storm water system. However, to date, there is no evidence that this concept has been tested.

THE DOWNSIDE. There are a few disadvantages associated with greening roofs, but most of them can be overcome with careful planning and maintenance. The climatic differences in Germany are much more uniform than those in the US, so while some technology can be transferred, architects, horticulture professionals, and roofers must develop new paradigms to deal with conditions in the US.

Roof strength would have to be increased to support planting overburden, and this may abrogate its use on some existing roofs. Structural support, especially for retrofit roofs, is of critical importance. With lightweight media, relatively little increased support may be necessary for new construction. Additionally, it is simple engineering with most modern roofs to support the added 10 pounds to 15 pounds wet weight per square foot.

The growing media for green roofs must be lightweight. Europeans use combinations of materials, including calcined clays, scoria, shale and organic matter. The physical characteristics of this media, such as aeration, water-holding capacity and hydraulic conductivity, must also be addressed.

Most of these materials are too expensive to import, however, so domestic sources must be located. In this way, green roofs represent a significant niche market for horticulturists, especially propagators, who would grow plants for these roofs. Plants used on green roofs are usually low-growing and drought-tolerant species such as sedums, hen and chickens and grasses. And, depending on medium depth, a variety of other plants, and even trees, can be used. Networks of growers will have to be established. One roof architect recently told us he is involved in an upcoming job in the US that may require 12,000 pounds of sedum cuttings, not something every propagator has on hand!

Maintenance should also be considered. Roofs should require as little upkeep as possible. Planting at the right time of the year and choosing plants that grow rapidly are important. Periodic fertilization or weed removal should be minimal. Providing irrigation should be considered as well, especially in the establishment stage. Water availability will probably be necessary if prolonged drought threatens the roof. However, if plants and media are properly matched, this should only be considered an emergency measure.

Some of the issues that have already been worked out in Germany are new to US builders, roofers, architects and horticulture professionals. Because insurance laws in the US are not currently equipped to deal with green roofs, insurance companies need to consider how greening roofs impacts present insurance practices. Also, questions concerning how long the roof membrane will last, the potential for fire hazards and what kind of media will be tolerated need to be addressed.

As of now, green roof installation in the US is just beginning to take off. Its success, however, depends on the services of diverse groups such as roofers, architects and horticulture professionals. With careful planning, nursery professionals can bring their business to new heights.