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Green Roofs: Fact and Fiction

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Introduction

If you were to do a spot survey of engineers in New England, nine out of ten would probably advise you that green roofs are impractical in our climate. Could nine out of ten engineers be wrong? 'Wrong' is a strong word, perhaps 'mistaken' would be a better term. It is true that green roofs have not been used extensively in New England, and it is also true that between snow loads and the wet weight of green roofs, there is an added burden on the building. It is also true that conventional roofs leak, so will retaining water on a conventional roof make it worse? Here is the real scoop.

Fiction

1. Leaks. Conventional roofs do leak as they age, as most of us know personally. The roof membrane becomes damaged by ultraviolet light and weather and is eventually compromised, leading to leaks. Green roofs do not make the situation worse: instead, they improve it because great attention is paid to having a high quality, impermeable barrier and the barrier is then protected from U.V. light and other environmental damage by the green roof itself. So instead of encouraging leakage, green roofs actually are less likely to leak than conventional roofs. For the extra cautious, vendors have created low cost leak detection equipment and wiring that can quickly identify the source of any leaks should these occur. Most green roofs also come with inspection ports and the ability to remove/replace modular areas of the roof should leaks occur. The bottom line is that all the extra attention to the impermeable membrane means that green roofs are less likely to leak than conventional roofs.

2. Weight. Weight concerns are a different story, as those of us reaching middle age know so well. For redevelopment projects, weight is also an issue and it is typically handled through the review of a structural engineer. But the weight problem is not as serious as it seems: the greenroof is designed based on the structural capability of the building, not the other way around. Green roofs range from lightweight extensive roofs such as that on the Ford Motor Company building covering ten acres with only an inch of media, to much deeper, heavier roof gardens. Typical weights can be as low as 14-35 pounds per square foot saturated weight (far less than a middle-aged person walking around on the roof), to more intensive roof treatments that may range from 50-1,000 or more pounds per square foot. In larger buildings of course, the weight of the green roof becomes even less of an issue as it becomes a smaller percentage of the total weight that must be borne by the building.

3. Stressed Basins. In Massachusetts, some people have asserted that green roofs won't work in stressed basins, they will make streams worse. Again, incorrect. True, green roofs do absorb the first half inch or so of rainfall, releasing it through evapotranspiration just as in forests. But is this first half inch of rainfall significant to streamflow? The answer is no, however, the first half inch of rain IS significant to stormwater pollution and the first flush effect. A green roof is much like the forest: it has evapotranspiration, so asserting that green roofs are bad for stressed basins is the same as saying forests are bad for stressed basins. This hydrologic misconception first assumes that the first half inch is significant to streamflow (which it is not) and second that it robs groundwater of recharge. The latter statement is partially true and yes, a green roof can not match a forest in terms of environmental and water resources protection. But it certainly beats the alternative of a black roof.

Facts

Now that some myths have been debunked, here are some basic facts:

1. Green roofs extend the life of the roof by absorbing some of the damaging ultraviolet light and other environmental factors to protect the roof membrane from weathering. Various authors have asserted that green roofs may extend the life of the roof to 40 years or more compared to 10-15 years for a regular roof.
2. Heating and air conditioning costs are clearly reduced with green roofs. The cost savings vary depending on the size of the building and the depth of the roof, but clearly air conditioning needs are less and heating needs are less with a green roof. Depending on various issues, energy savings of a green roof may be dramatic.
3. Stormwater management is also benefited through green roofs. The first half inch typically absorbed by a green roof is the worst actor in terms of bringing pollution into water bodies and for erosive force. Stormwater is not just about water quality pollution but also about too much quantity too fast. Green roofs help slow the entrance of stormwater into local waterways, a major benefit in terms of preventing erosion and delaying flows to a more natural and manageable pace. It should be mentioned that green roofs should not be stand-alone units, but instead should be coupled with dry wells or biofilters/raingardens or similar techniques to manage the entire site's runoff.
4. Heat islands and air pollutants are also reduced by green roofs. In Chicago, the heat island effect in the city means an almost ten degree gain during the summer. This urban heat island effect has dramatic energy costs and risks for elderly and other people without air conditioning. Using green roofs can not only provide wildlife benefits in the city, but also can help reduce the heat island along with air pollution.
5. Greenroofs go hand-in-hand with Smart growth. Building livable villages where recreational and open space uses are built into urban areas help build a sense of community and improved quality of life. In our cities and downtowns, and even in the suburbs, using roof space for people space or just for aesthetics, makes sense. Greenroofs are already popular in Europe, and are even required in some areas, so the costs and benefits are well-proven in other snowy areas.

Expense of roofs

Yes, this part is real. Green roofs on redevelopment projects can be expensive and may need to multi-task to be cost-effective. The lifecycle cost, however, is a much more attractive than strictly looking at capital costs. Owners would be wise to consider their longer term expenses on these projects. New green roofs on larger buildings may only be a minor increase in expense, and should be robustly encouraged especially where other buildings or roads overlook the new building. Finally, as green roofs become more popular in New England and the U.S., the cost will surely come down.

(Please note that the article was published initially before our 4th Annual Greening Rooftops Conference, Awards and Trade Show, and originally ended with a paragraph advertising the conference. We extend our thanks to all of you who were able to join us at the conference this year.)