

GREEN TECH THE SERIES COLUMN FOR MAY 11, 2016
HEADLINE: A GROWING IDEA; GREEN ROOFS

A couple of weeks ago, I wrote on the slow, but sure advancement of flat and low slope roof assemblies for homes. A number of readers commented, most were not aware of the advancements in flat roof coverings, the energy savings possible and the fact that costs of this type of roof have declined in the past few years. What I did not discuss was the other benefit, a green roof and the possibility of another open living space, your roof.

While the popularity of green roofs emerged in Germany in the 1960's, in fact it's well documented that sod roofs have been around for centuries. The Vikings covered their homes in Newfoundland with sod. Today it's estimated that over 10% of all roofs in Germany are some form of vegetated roof or living roof. Here at home, close by, in Toronto, they passed a by-law in 2009 mandating green roofs on all commercial buildings and, if a residential building is 6 stories, it too must have a green roof. Toronto offers incentives to builders; \$7.00 a square foot towards the finished cost. With green roofs often budgeted at \$25.00 per square foot or more, this is a significant incentive. Grass covered roofs are now in use in Ottawa at the Canadian War Museum and, in Hamilton, grass covers the roof of the city hall.

The technology seems daunting when in fact it's not really that difficult to provide for a green roof, especially in a new building. The single most important design consideration is factoring in the weight of the growing medium. A good civil engineer, working with a professional green roof contractor, can arrive at the necessary additional roof assembly. Not all green roofs are equal. In fact, there are two major classes and some innovation is possible to these two kinds. The largest consideration, do you want to have the roof accessible or not and if so, then the intensive class is your best choice.

An intensive green roof usually has a growing medium, which is a light weight engineered soil, of more than six inches of material/soil. This method allows for a greater diversity of plants and can actually stimulate some wildlife activity, especially birds. This depth allows for growing some food and can simulate a wildlife garden on the ground. Roof top gardens with patios and recreational space are popular for many residential apartment/condominium buildings today. They are the heaviest of the two, ranging anywhere from 35-300 lbs. a square foot in their fully saturated weight. The side benefit is the increased insulation

properties. They are expected to increase the life span of the membrane roof covering substantially. They are the most costly, you are building a landscaped area and landscape work is not cheap. However, consider you have now added an entire living area.

The other type of green roof is called the extensive and these are most often used on very large roofs. They are considerably lighter, with a saturated weight of less than 35lb a square foot. They can also be used on a roof with a pitch up to a 30 degree slope. They offer low maintenance and limited irrigation or drainage systems are needed. If the project is an existing building, the load factor is often a major consideration. What is known as the grass roof is usually an extensive roof.

In the design of a green roof there are two main methods of installing the growing medium, it can be a loose laid material and built up or modular where the growing medium and plants are prepared in trays or interlocking mats. Where blending of the two methods is done, called semi-intensive, it is usually dictated by location, desire of the owner for accessibility and plant diversity, similar to a conventional garden. You are only limited by the structure's ability to carry the load of the green roof.

Commercial green roof installations are done for one major reason, reduction of the urban island effect. The secondary benefits are a long list, starting with the reduction of storm water runoff. A well-developed intensive roof retains 70-90% of the precipitation that falls on it. Along with this management, the water that does leave the roof has been naturally filtered. This water management greatly reduces the peak demand on the storm water system or sewer system in the municipality. One consideration many do not consider; a green roof reduces the noise attenuation, especially for the low frequency sounds. Depending upon the design, a green roof can reduce the decibels levels by upwards of 50DB.

In a residential application, all of these benefits are applied along with insulation value. A study by NRCan found that an extensive green roof reduced the operational costs of air conditioning by upwards of 75%. I have not had a client ask about electromagnetic radiation until recently and, while this is still a debated issue, upon a study I have on this issue, green roofs are capable of reducing this radiation upwards of 99%. Yet another benefit; the improved air quality of a green roof. Plants on this type of roof act like plants on the ground, capturing pollutants in the atmosphere.

Like any advanced green system, green roofs are not cheap; anywhere up to \$25.00 a square foot can be expected, over and above the additional cost of the structure upgrades to handle weight of the green roof. An extensive roof needs

little or no maintenance, other than a yearly inspection to remove any unwanted plants. However, an intensive roof is usually a fully designed garden and maintenance will be necessary. While the designs of green roofs have been evolving since the 60's, there is still the possibility, all be it small, of leakage. Roots of the plants have been known to penetrate the root barrier layer. Finding this leak can be time consuming and expensive. There are some leak detectors that use electronic charges to trace the leaks to the point where the water is entering the building.

Right now, green roofs are most utilized on commercial buildings. With growing popularity of flat and low slope residential construction, it's simply a matter of time before they are used on new homes.

Comments and Questions: Cam Allen L.I.W. NHI ACI
E-mail: cam@alltechconsultinggroup.com