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# **CLARIFYING THE MYTHS AND REALITIES OF GREEN ROOFS, WHITE ROOFS AND HIGH-PERFORMANCE ROOFS**

By Ralph M. Paroli & Jim Gallagher

Submitted to Canadian Property Management, The B.C./Alberta Edition

*This article briefly describes three types of sustainable roof systems and clarifies some of the terminology and misconceptions surrounding their use.*

As sustainable construction has gained momentum, confusion surrounding its definition and scope has become more widespread. In fact, because it is such a broad field, it is often difficult to find anything other than general consensus about what sustainable construction really means. Consensus is more easily achieved, perhaps, when the discussion is narrowed to address the various elements that make up the construction industry.

Roofing is a case in point. It is a key component of any building and one whose failure, if it occurs prematurely, can result in business losses associated with the downtime needed for repair. Accordingly, the roofing system plays a significant role in achieving sustainable construction.

While many believe sustainable roofs, green roofs, white roofs or reflective roofs and high-performance roofs are new, these roofing systems have been around for more than 30 years. Over time, interest in them has increased significantly, studies have been undertaken to shed light on their design and performance and, as results have become available, the construction industry and building owners have had the confidence to try these technologies.

Good roofing practices have always been promoted by roofing associations and industry. Roof systems can be designed in such a way that there is an emphasis throughout their entire lifecycle on the efficient use of natural resources and protection of the environment.

## **SUSTAINABLE ROOFING**

In 2001, the International Council for Research and Innovation in Building and Construction (CIB) published *Towards Sustainable Roofing*, which presented 21 tenets of sustainable roofing. These basic principles are applicable to membrane roofing systems on permanent buildings. They have been broadly grouped under three key interrelated areas – minimizing burden on the environment, conserving energy and extending the life of a roof.

The roofing industry can strive to minimize burden on the environment by:

- Encouraging environmentally friendly production processes;
- Avoiding generating hazardous waste;
- Adopting practices that minimize waste;

- Designing systems that facilitate sorting and salvaging materials, such as cover boards on top of insulation;
- Reusing and recycling materials;
- Reusing material on the same job to avoid the cost of transporting it elsewhere; and
- Using garden roof systems in the city (where appropriate).

The scope for conserving energy is wide. Most obvious is the use of thermal insulation, which reduces heating and cooling costs. Other approaches include:

- Keeping thermal insulation dry and using cover boards;
- Using reflective roofs (where applicable); and
- Using local labour, material and services. This not only reduces energy use and cost but helps the economy where the labour force is located.

Extending the life of a roof entails:

- Employing skilled professionals, which enables the roofing sector to effectively put knowledge into practice, ensure good workmanship and site co-ordination, perform regular maintenance and carry out prompt repairs;
- Adopting a responsible approach;
- Assigning adequate resources and time;
- Designing a robust roof that is more stable, reliable and more forgiving of errors;
- Ensuring a sound support structure;
- Avoiding ponding of water;
- Ensuring regular maintenance;
- Monitoring the roofing system and taking corrective action promptly; and
- Adopting preventive maintenance. This includes identifying issues before they become problems, monitoring minor issues and repairing them promptly.

## GREEN ROOFS

Green roofs, also referred to as rooftop gardens, fall into two categories: intensive and extensive. An intensive green roof is a traditional style roof garden consisting of large trees and shrubs and is labour-intensive to maintain. An extensive green roof is a garden system designed to be virtually self-sustaining and requires minimal maintenance.

While green roofs or garden roofs have been used in Europe for years, they have recently gained greater acceptance and use in North America. This is because green roofs help preserve the environment – an important aspect of sustainability – by reducing roof runoff and replacing displaced landscapes. They also help reduce the urban heat island effect, a phenomenon whereby a metropolitan area is between 1 C and 5 C warmer than its surroundings.

While there are a number of benefits associated with installing a rooftop garden, green roofs have a higher initial cost, which must be taken into account. Moreover, the coordination of trades is critical and both the roof and rooftop garden must be maintained.

In addition, although green roofs conserve energy by reducing the cooling demands of a building in summer, the energy savings are not an important factor during winter months.

And since the membrane is essentially protected from the elements, it is similar to a protected roof system where the likelihood of physical damage is reduced but leaks can be difficult to locate and costly to repair. When selecting a system, the root penetration resistance of the membrane needs to be considered.

#### WHITE OR REFLECTIVE ROOFS

A white roof, also known as a reflective roof or cool roof, is a roof surface that has high reflectivity (the ability to reflect solar radiation away from the surface) and high emissivity (the ability to emit more radiant energy into the atmosphere than dark-coloured roofs).

Though not originally referred to as reflective roofs, white roofs have been in use for more than 30 years. And like green roofs, they reduce building energy demand in summer and help mitigate the urban heat island effect. However, as the membrane ages and, for instance, picks up dirt, there is a loss in reflectivity. But cleaning isn't always necessary because reflectivity is still very high.

The overall advantage of white roofs depends on the climate and one must consider both heating and cooling seasons. In Canada, where the heating season dominates, there is a potential economic penalty during the winter season as solar heat is reflected back towards the sky. However, since the sun is low in the sky, the potential heat value lost through reflectivity may not be critical. Plus, since the days are short, less energy is hitting the roof, which means less reflectivity is taking place. And when there is snow on the roof, reflectivity due to the membrane does not occur.

When properly maintained, this membrane system suffers less thermal stress and is known for its extended service life. However, there are glare and visual concerns. As a result, designers must consider the impact these factors might have on people who live or work in the surrounding area and installers need to use additional ultraviolet protection.

#### HIGH-PERFORMANCE ROOFS

A high-performance roof is one that is durable, economical, energy efficient, environmentally friendly and has an extended life cycle.

A high-performance roof encompasses all the elements of sustainable roofs. Some experts refer to the “five Es” of high-performance roofs: energy, environmental, endurance, economic and engineering. These tenets are similar to the basic principles of sustainable roofing, namely environment, energy conservation and endurance (durability).

#### **Caption: Rooftop garden**

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