

# THE SUSTAINABILITY MOVEMENT IN ROOFING

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Roofs are an important part of the sustainable movement taking place in our society today. Benchmark remains committed to keeping abreast of this new role for roofing systems, and to assisting our clients with sustainable roofing design options.

Sustainable developments in roofing include:

**Garden Roofs** - The roof system is used as a platform to grow plants. Garden or vegetative roofs help control rainwater run-off, mitigate the urban heat island effect, and make rooftops aesthetically pleasing. In some urban areas, Garden Roofs are utilized to grow vegetable and herb gardens.

The types of plants that can be grown on the roof are limited by climate, structural limitations and maintenance budgets. For the concept to be successful, plants must be able to thrive in the local climate. Plants that thrive in Florida may not survive the harsh winters of the North. As Garden Roofs will add a minimum of 15 pounds per square foot of loading on the roof, the structure must be designed or adapted for the load. On an existing building, it is imperative that a structural evaluation be completed. Garden Roofs will require maintenance; how much is dependent on the type of plants, the type of soil, and the local climate. Extensive systems that use one or two types of sedums may only require an occasional watering and weeding; while an intensive system, with plants much like a ordinary garden, may require almost constant maintenance.

Several questions should be answered when considering a Garden Roof:

- How much will it cost?
- Is the type of roof system feasible?
- Can the building structure support the load?
- What type of Garden Roof is best for a given situation?
- What type of maintenance does a Garden Roof require?
- Will irrigation be required to sustain growth?

**Cool Roofs** - These roofs are constructed of materials that reflect the sunlight and do not absorb heat. Cool Roofs help control energy usage, increase building comfort, and control urban heat absorption. The Cool Roof Rating Council (CRCC) has tested and rated numerous roofing materials for reflectivity (the ability to reflect visible light) and emissivity (the ability to absorb and release heat), while the Department of Energy tests materials

only for reflectivity as part of the Energy Star Program. Reflectivity and emissivity are rated on a scale of 0.0-1. These two ratings are combined by a formula to obtain a Solar Reflective Index (SRI) rating.

The state of California has acknowledged the benefits of Cool Roofs and has mandated their use. Title 24, Part 6, of the California Code of Regulation, establishes energy efficiency standards for buildings. The state is divided into 16 climate zones with each zone having its own energy requirements. For instance, the roof of a building in Los Angeles is required to have a 3-year aged reflectance of 0.55, emissivity of 0.75 and a minimum SRI of 64. In addition to California, several cities such as Dallas, Chicago, and Houston have Cool Roof requirements. A benefit to the mandates is that local utilities sometimes provide financial incentives to install Cool Roof systems. Though the use of a Cool Roof seems straightforward, one should consider the following:

- Will adding more insulation above what is required by the energy code be more cost effective than a Cool Roof?
- How will a light-colored roof remain clean?
- Is the Cool Roof an appropriate roof system for the building?
- In a predominate heating climate, will a Cool Roof really save energy?

**Energy Producing Systems** - Through the use of photovoltaic or solar thermal panels, the roof becomes a platform to produce energy in the form of electricity or to heat water. The roof space now becomes a revenue-producing asset of the building. Once thought to lack payback, with current incentives in some cities and states, and more competitive system pricing over the past few years, the return on investment is appealing to many building owners. Within the last 3 years, the cost of photovoltaic panels has come down in price from approximately \$8 per watt to \$4 or \$5 per watt. Combined with a federal rebate of 30 percent and accelerated depreciation for commercial buildings, these systems are much more viable from a financial standpoint than just a few years ago. Solar hot water systems can have a big impact on utility savings

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for large hot water users such as hospitals, hotels and institutions. Solar hot water does not require nearly the financial investment that a photovoltaic system requires and they may have a greater ROI. Considering that both photovoltaic and solar hot water systems can last in the range of 25 to 30 years, questions to consider include:

- Are these systems appropriate for the building and location?
- Will the roof last as long as the solar panels?
- Is the roof system compatible with the increased rooftop temperatures that the panels may create?
- What type of panel is most efficient for the building?
- What type of panel racking system works with the roof?
- Will an energy audit find areas of waste, reducing the size of the photovoltaic system?
- Can the building support the additional weight and wind loads?
- What will be the impact on the roof's external fire or hail ratings?
- Can the roof be easily maintained?

**Daylighting** - Daylighting is the controlled admission of natural light into a building through windows or skylights to reduce or eliminate electric lighting. By installing specially designed skylights that diffuse and track sunlight into the building, the need for artificial lighting requirements is reduced, in some cases to the point that artificial lights are not needed in the daytime. These systems may be eligible for tax incentives and utility rebates. There are several major retailers and manufacturers who successfully use daylighting extensively in their new buildings. Again, a good concept, but the following should be considered:

- Is the building physically adaptable to daylighting?
- Are there impediments on the building interior, such as overhead piping, that will block the daylighting?
- Will adding multiple penetrations to the roof be a drawback?
- Does the geographical location limit the effectiveness?
- Do conditions on the roof cause excessive shading?

**Wind Turbines** - Advancements in the production of electricity with small wind turbines mounted on roofs has proven successful in some situations. Again, the rooftop becomes a productive asset for the building by supplementing its energy needs. Mounting these small micro wind turbines on rooftops and parapets is

a relatively new concept; however, they may be eligible for federal and state incentives as well as utility rebates. As with other rooftop energy producing systems, several questions should be considered:

- How will the turbines be mounted?
- Is the building structurally capable to support the turbines and associated wind loads?
- Is the geographic/physical location of the building conducive to wind production?

**Recycling** - What can be done with roofs after they have served their useful purpose? This is a question that many manufacturers are starting to address as well as companies that specialize in recycling. We are now seeing old roofs incorporated into new roofs or accessory items, and used as filler for paving materials or incorporated into completely different items. Along that same line, during construction, what can be done to minimize waste from packaging, buckets, pallets, and scrap materials? As landfill space becomes scarce, and the cost to unload at landfills increases, alternative means of disposal may offer economic, as well as environmental, benefits. For instance, in Chicago, there are several recyclers who will pick up all construction debris, sort it and recycle for about the same cost as land filling.

**LEED®** - In the LEED® (Leadership in Energy & Environmental Design) rating system, points are awarded for the use of environmentally compatible materials and construction practices. If LEED® certification for your building is a goal, all of the above items can contribute points to that goal either directly or indirectly, as in the case of a Cool Roof (heat island reduction) or Garden Roof (storm water design).

The best way to meet any sustainability goal is to install roofing materials that, when properly maintained, will provide the longest, practical service life. In doing so, the need to prematurely replace the roof may be eliminated.

This is an important time for roofing - a time when the roof is viewed and utilized differently. There is not a perfect solution to meeting all sustainability goals. Again, when considering sustainable roofing options, our objective is to assist you in determining what is appropriate for your needs and your building.