



ROOFING / SIDING / INSULATION

Planting an indigenous Green Roof:

The installation of the Green Roof on the Cleveland Environmental center involved a unique partnership between the Cleveland Green Building Coalition, Holden Arboretum, Parkworks, and The Garland Company, Inc. The Arboretum provided several native, endangered species of plants, including the prairie dropseed, prickly pear cactus, dense blazing star, rattlesnake master

The project aims to reintroduce numerous native species back into the urban neighborhood.



▲ In addition to the GreenShield green roof, the Cleveland Environmental Center includes SolarGrid photovoltaic (PV) panels. This system includes PV modules, combiner boxes, inverters, transformers and the necessary hardware to attach SolarGrid to the roof.



◀ The Cleveland Environmental Center building, formerly a Cleveland Trust bank, is a well-know city landmark. The renovated historical building, in an area called Ohio City, displays a variety of sustainable roofing solutions. (Photos courtesy of The Garland Co. Inc., Cleveland, OH)

▶ The underlying system protecting the Environmental Center is a StressPly EUV roof that incorporates post-consumer-recycled tires in its construction. Also used was a Starburst mineral surfacing and white Pyramic coating, which is Energy Star compliant.



◀ The goal of this project was to demonstrate how current sustainable design principles could be incorporated into a historic preservation project. A rooftop patio was included to facilitate tours, and to provide building occupants with an amazing view of downtown Cleveland and Lake Erie.



Sustainable Roofing Options

Eco-friendly roofing comes in a variety of forms

The ability to endure, to keep on going—is at the heart of sustainable design. When applied to buildings, sustainable design refers to product solutions that can conserve, recycle, and even help renew natural resources over time. Many products that accomplish that goal are here already, and new ones are being introduced every day.

To paraphrase the Rocky Mountain Institute, from its *Primer on Sustainable Building Design*: Sustainability is not a style; it is nothing less than a revolution in how we design, construct, and operate buildings. In roofing, sustainability can be accomplished in any of five ways:

- ▶ Through the use of recycled materials (i.e., materials that are being reused)
- ▶ Through the use of materials that are, in themselves, recyclable (i.e., materials that can be reused in the future)

Ecologically beneficial green roofing solutions substitute post-consumer crumb rubber for conventional filler to further enhance sustainability. (Photos courtesy of The Garland Company, Cleveland, OH.)

- ▶ Through extended service life
- ▶ By promoting the more efficient use of

- energy and other natural resources
- ▶ By actually renewing our natural resources

Some of today's sustainable roofing solutions perform only one of these objectives; others perform several. Today's most popular sustainable roofing solutions include:

- ▶ Cool, highly reflective roofing
- ▶ Metal roofing
- ▶ Modified bitumen and other membranes that incorporate post-consumer recycled materials
- ▶ Adhesives and other roofing materials and products that eliminate or reduce hazardous fumes
- ▶ Photovoltaic panel systems
- ▶ Green roofing, which is the subject of RSI's cover story this month.

In their efforts to promote sustainable design, government and industry groups are rapidly evolving methods of applying uniform standards of measurement to certify performance. The two standards most often used to evaluate sustainable roofing solutions are:

The Leadership in Energy and Environmental Design



(LEED) Green Building Rating System, a voluntary, consensus-building national standard that was initiated by the U.S. Green Building Council (USGBC)

Energy Star, a collaboration between the U.S. Department of Energy, the U.S. Environmental Protection Agency, and private industry.

Reflective solutions

According to the Environmental Protection Agency (EPA) Web site, buildings with white roofs that reflect ultraviolet rays typically require 40% less energy for cooling. Add to that the fact that a highly reflective roof resists ultraviolet degradation, and the sustainability factor is even higher.

Energy Star certification is an accurate indication of a roof's ability to reduce fossil fuel usage. When products that comply with this performance standard are used in urban areas, peak cooling demand can be reduced by up to 15%. It's no wonder that states like California and others are creating incentive programs to promote the use of Energy Star roofing solutions.

The rapid development of new Energy Star approved roofing products is making it possible for contractors and designers to choose—from a variety of reflective solutions—a roof that will retain the integrity of their original design concept. Knowing that some of these products have been demonstrating their ability to resist UV-related failures for 20 years or longer, is an added incentive for specifying a product that can dramatically reduce a client's energy costs.

Roof reflectivity can be achieved in a variety of ways. One of the most lasting methods is the application of a highly reflective top coat or mineral surfacing. Although Energy Star solutions are available for all types of roofing, their energy payback benefits are particularly significant when they are installed on single-story, air-conditioned buildings with large roof surfaces and older buildings with insufficient insulation.

Metal solutions

Metal roofing solutions are perhaps the fastest growing segment of the sustainable roofing market. Their sustainability derives from the fact that typically as much as 100% of their material components are recyclable. In other words, when the day comes that your client has to tear off the old roof and put up a new one, virtually the entire roof can be reused to create new metal products.

In addition, many of today's metal systems have long track records for lasting performance. A copper roof that has protected a cathedral for over a century is sustainable—not only by virtue of its recyclability. It is sustainable because it keeps on going year after year after year.

Metal roofs also eliminate the fume and kettle concerns associated with some types of roofing, for easy and eco-friendly installation. And, with so many manufacturers introducing new products, finishes, colors, profiles, and textures—today's recyclable metal roofing is offering architects and designers a diversity of aesthetic features to support a wide spectrum of design concepts.

Yet another category of sustainable roofing is roofing that reuses materials that might otherwise be overflowing our landfills. For example, some built-up, multi-ply modified bitumen roofing systems replace conventional filler with post-consumer crumb rubber



Garland's high-performance StressPly EUV incorporates post-consumer crumb rubber and is engineered for extended life. For significant energy cost reduction, it can be installed with highly reflective mineral surfacing and/or Pyramic coating.

from recycled tires. With over 250 million tires discarded yearly in the U.S., our landfills are rapidly running out of space. In addition, discarded tires create several health and environmental hazards, including the potential for mosquito infestation, water contamination, and fires emitting hazardous fumes.

In the roofing industry, innovative manufacturers are also helping to reduce landfill problems by using recycled plastics or rubbers to create roofing that simulates the look and feel of natural slate.

Low-fume solutions

In the maintenance and restoration arena, more products are being introduced each year that promote a healthy ecology by eliminating or reducing hazardous fumes. Some BUR roofing can be applied "cold," for eco-friendly installation. Cold adhesives allow multiple layers of built-up roofing to be applied without hot kettles or torches. These adhesives are VOC compliant and significantly reduce odor.

There are also new adhesives available for hot-applied systems that can reduce volatile emissions by as much as 50%, while maintaining all the self-healing, elongation, and performance properties of hot asphalts.

Another innovation in this area is the fume-recapturing kettle, which significantly reduces the environmental and health impact of hot-application processes.

Building-integrated photovoltaic (BIPV) materials integrate photovoltaic panels into a building to create power from the sun. The power is generated in the form of DC current that can be used directly or converted into AC current for future use.

Roof-mounted systems have the distinctive advantage of using the expansive and frequently under-utilized roof surface for placement. Whether integrated into the original building design, or added later as an accessory, roof-mounted photovoltaic systems should be looked at as an integral part of a roofing solution.

BIPV solutions increase building sustainability in at least two ways. First, by creating new power from a renewable energy source, thereby reducing peak energy loads and reducing energy costs. Secondly, they are likely to last 25 years or even longer. Recognizing the community value of such solutions, many green pricing programs are available to help offset the costs of investing in BIPV solutions.

Green roofing

Arguably the most exciting development in sustainable building design is green roofing. Although new green roofing products are being introduced more frequently than ever before, the best designs are integrated solutions that combine a:

- ▶ High-performance waterproofing layer
- ▶ Root-resistant compound
- ▶ Drainage system that draws away excess moisture
- ▶ Filter that prevents drain-system clogging
- ▶ Specially formulated lightweight soil
- ▶ A surface layer of plant life

Aesthetically, green roofing opens up an entire new world of design options. Depending on load capabilities and other application-driven requirements, green roofs can be planted with herbs, grasses, flowers, even trees, in an exciting variety of colors, textures, scents, and heights. Patios and walkways can become a usable part of the roof environment. Green roofs offer tremendous sustainability benefits:

- ▶ Reduced energy costs in hot urban environments

- ▶ The ability to reduce storm water run-off, reducing stress on urban sewer systems and decreasing run-off related pollution of natural waterways
- ▶ Dust reduction
- ▶ Air quality improvement
- ▶ Noise pollution reduction

In addition to the inherent recyclability of natural plant materials, some green roof systems use recycled materials in their underlying membranes, for added sustainability.

Perhaps the single most critical contribution to sustainability is extended life. Many roofing solutions are designed to last 15 or 20 years; and some, 30 years and longer. The longer a roof can be kept in use, the more it contributes to the overall sustainability of the building by prolonging the impact of eventual tear-off.

Measuring sustainability

The USGBC LEED certification is making it easy for architects and building owners to objectively assess the sustainability of an entire building over its life cycle. LEED uses a point rating system to

evaluate various factors that contribute to a building's overall environmental performance. These include:

- ▶ The sustainability of the building site
- ▶ Water efficiency
- ▶ Energy use and atmospheric quality
- ▶ The eco-friendliness of various materials and resources
- ▶ Indoor environmental quality
- ▶ Innovations in the design process

The choice of roofing system can significantly impact the sustainability factor of a building's overall design. Innovative roofing systems and ancillary products that positively impact the natural environment are rapidly becoming more varied, easier to finance, and more aesthetically pleasing. **RSI**

Author Brian Lambert is director of marketing for The Garland Company Inc. and has been active in industry initiatives, promoting green roofing and other sustainable design solutions since 1996. He serves on the board of directors for the Toronto-based Green Roofs for Healthy Cities Coalition and frequently promotes sustainable design as a guest lecturer to professional organizations in the U.S. and Canada.

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