

Sarnafil. Sustainable Roofing and Waterproofing Systems.

Sarnafil

Construction teams—owners, architects, designers, builders, and manufacturers like Sarnafil—owe future generations our very best united efforts to minimize our impact on the environment. We must choose environmentally friendly products and manufacturers, but how do we determine which ones qualify?

By evaluating building materials in the context of sustainability principles set forth by respected industry research organizations, we can make informed choices about the inherent sustainability of a given product.

Sustainable roofing products are an important component of sustainable construction. A task group* drawn from CIB and RILEM members has set down these tenets of roofing sustainability:

- > Minimize the burden on the environment, being responsible stewards of Earth's resources.
- Conserve energy, recognizing the importance of savings benefits and improving roof systems' thermal efficiency.
- > Extend roof system life spans, realizing the worthiness of seeking long-term performance.

When measured against these criteria, Sarnafil roofing and waterproofing systems perform exceptionally well.

Let us show you how.



On the Cover: Wells Fargo Bank, San Francisco, CA

The Challenge: Renovate the waterproofing of a 40-year-old Japanese garden, returning each element to its original position.

The Process: Sarnafil Elite applicator Western Roofing divided the garden into a grid; recorded the position of every plant, rock, tree, and sculpture; and removed them for storage during the night to avoid disrupting employees. Once the Sarnafil waterproofing system was installed, Western Roofing replaced the garden, upgraded paving stones and rebuilt a deck according to the original plans.

The Result: Wells Fargo was very pleased. And, Western Roofing received the 2004 National Roofing Contractors Association (NRCA) Gold Circle Award for Outstanding Workmanship-low slopes.

*Council for Research and Innovation in Building Construction (CIB) and International Union of Testing and Research Laboratories (RILEM) (CIBW.83/RILEM166 RMS)



"Minimize the burden on the environment, being responsible stewards of Earth's resources."

Sarnafil. Minimizing the burden.

Green buildings that serve as models of sustainability need not be large urban showcases to make a significant impact on the environment and public awareness. The award-winning green roof atop the Oaklyn Branch Library in Evansville, Indiana is a case in point.

Positive Impact on the Environment

The Oaklyn Branch Library is three times larger than the one it replaced, yet it uses about the same amount of energy. Built into the side of a hill, the building uses the earth itself for insulation against heat and cold with three subterranean walls. Crowned with more "earth," its publicly accessible green roof is vegetated to reproduce a mesic meadow prairie plant community, blending seamlessly into the naturally occurring mesic meadow of the surrounding land. Literally a grass roots effort to restore the land to its prairie origins, the roof proactively enhances the environment.

Positive Impact on the Community

Approaching the library's entrance, one sees a building snug up against a hill. From the rear, however, only the building's dramatic steeple-like clerestory is visible above the green roof. It brings sunlight into the heart of the building, giving it more natural light than any of Evansville's 11 other libraries. Another marker of the building's impact on the public: the library has tripled its book circulation rate since completion of the project. With its

clerestory lit at night, it serves as a reassuring beacon to the community, visible for miles across the Indiana Pigeon Creek Valley.

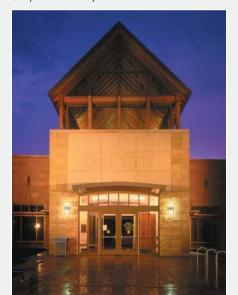
Details

Sarnafil applicator Midland Engineering installed the Sarnafil waterproofing system. Mimicking the layers under the native prairie, the roof overburden has a 6-inch base of granular drainage media over the Sarnafil membrane, topped with an 8-inch upper growth medium.

Roofscapes' innovative design of the roof won the 2004 Green Roof Award of Excellence (intensive institution category) sponsored by Green Roofs for Healthy Cities.

The green roof is designed to last for the life of the building. Its Sarnafil waterproofing system provides the performance and resilience to root penetration that will keep the building watertight, as it must. The alternative is unacceptable: a leak in the membrane would necessitate disturbing or removing the prairie garden over it.

Oaklyn Branch Library facade.



How Green Roofs Help the Environment

Green roofs serve as wonderful quality-of-life boosters, but their benefits to environmental concerns don't end with aesthetics. The Oaklyn Branch Library green roof is a sustainable system unto itself, pro-actively minimizing the burden on the environment by insulating against heat and cold to lower energy consumption, producing oxygen and lowering air temperature to lessen smog formation, and absorbing storm run-off (80 percent in Oaklyn's case) to minimize erosion and the burden on sewer systems.

Recycling—The Thermoplastic Membrane Advantage

Vinyl roofs like Sarnafil's provide a significant sustainability advantage. They can be recycled at two points in the life cycle: after the manufacturing process (post-industrial) and after the roof's useful life ends (post-consumer). An industry leader in recycling efforts, Sarnafil recycles a majority of its post-industrial waste back into newly manufactured membrane and walkway pads. And as part of a consortium of European companies, Sarnafil participates in a post-consumer roof recycling program. Further, the company is actively pursuing new technologies to expand this program to the U.S. and around the world.

Minimize the burden...with natural systems like green roofs to transform a building's impact from negative to positive.





"Conserve energy, recognizing the importance of savings benefits and improving roof systems' thermal efficiency."

Sarnafil. Conserving energy.

If conserving energy is identified as a hallmark of a sustainable roofing system, what do you call a roof that generates energy, sometimes enough to sell to the local electrical grid?

We call it...the SR2001 Solar Electric Roofing System

When Frito-Lay's Los Angeles distribution center needed a new roof, it was still reeling from California's electricity delivery and pricing problems of 2000 and 2001. Determined to install the most energy-efficient roof possible, the company chose the SR2001 Solar Electric Roofing System. This system consists of 10-ft-by-40-ft photovoltaic roofing panels that are factory-laminated by Solar Integrated Technologies (SIT) to Sarnafil's highly reflective white EnergySmart Roof® membrane. These panels are in turn hot-air welded to an installed Sarnafil EnergySmart Roof.

The result is a photovoltaic roofing system that protects Frito-Lay's building interior from the elements while generating power for its electricity needs. Frito-Lay personnel use SIT's web-enabled energy management software to control power consumption throughout the facility.

Designed to provide 100 kilowatts of electricity, Frito-Lay's system contains 70 10-ft-by-40-ft solar panels. According to Frito-Lay electricity manager Chris McKenna, the system exceeds expectations, allowing the company to save money on energy costs and get credit for feeding its excess solar power into the local electrical grid.

Why does SIT use only Sarnafil EnergySmart Roof systems with their photovoltaic cells?

SIT warrants its solar electric roofing system for 20 years and requires a roofing membrane proven to last for decades. In addition, the EnergySmart Roof exceeds ENERGY STAR® requirements for reflectivity*. And, tests have shown that the high membrane reflectance actually helps boost the productivity of the SR2001 photovoltaic cells. That's synergy!

Another effect produced by the Energy-Smart Roof: a lower roof temperature, leading to a lessening of the urban heat island effect that contributes significantly to the production of smog.

Other SR2001 customers, including Coca Cola Bottling Company of Southern California and the Southern California Gas Company, are enjoying comparable benefits.

Targeting Target

That the EnergySmart Roof lowers cooling costs was scientifically proven in a two-year study commissioned by the U.S. Department of Energy and the EPA and conducted by the Lawrence Berkeley National Laboratory**. For two years, researchers monitored the air conditioning consumption and peak electrical demand of a 100,000-sq.-ft. Target store in Austin, Texas. The first year, the building had a black rubber EPDM roof; the next year, Sarnafil's EnergySmart Roof.

The findings: The EnergySmart Roof reduced peak summertime air conditioning demand by 14 percent. And, annual energy savings were estimated at \$7,200 (7.2 cents per sq. ft. per year), not counting related savings like utility taxes, extended life of the cooling system, and state rebate programs for lower energy usage.

Conserve energy...and cut cooling costs while generating energy with Sarnafil.

^{**}Lawrence Berkeley National Laboratories (LBNL-47149)



^{*} Reflectivity refers to the degree to which solar radiation is reflected from—rather than absorbed by—the roof surface.

"Extend roof system life spans, realizing the worthiness of seeking long-term performance."

Sarnafil. Extending roof system life spans.

Sarnafil has a record of proven performance unparalleled by any other thermoplastic roofing manufacturer. For more than 40 years, we have been manufacturing our membrane using the same basic formulation that has proven its high performance in every climate all over the world.

Defining Proven Performance

In 2001, Sarnafil decided to document exactly what we mean by proven performance. We collected membrane samples from 25 of our oldest roofs across North America that were installed between 1977 (25 years old at the time of testing) and 1986 (16). The average age was 20 years and all 25 roofs were still providing leak-free protection for their building owners.

Testing Against ASTM 4434



The samples were sent to the National Research Council of Canada (NRCC) Institute for Research

in Construction and put through their paces using ASTM 4434 testing criteria designed to test new vinyl membrane.

Amazingly, 94 percent of the samples still met the minimum thickness standards, 97 percent met the requirement for linear

dimensional change, and 100 percent had intact seam strength and could be hot-air welded to new material. This is truly an impressive performance for roofs of this age.

Charrette Leads the Way

One of the oldest roofs in our testing was the Charrette building in Woburn, Massachusetts. Its samples were still waterproof and flexible.

In 1977, the 118,000 sq. ft. Sarnafil roof replaced the existing built-up roof, which was unable to withstand the movement of the building. The owners needed a new roof that would be lightweight and flexible to withstand building movement, long lasting and low in maintenance costs for life cycle economy, and capable of reflecting solar radiation to minimize cooling costs.

For the outstanding condition of their 27-and-counting-year-old roof, Sarnafil named Charrette the winner of the 2004 Sarnafil Sustainable Roofing Performance Award. The award recognizes those organizations that select commercial roofing applications on the basis of performance-driven criteria, resulting in a long life span.

A long lasting, energy efficient roofing system means the building uses less energy, consumes fewer raw materials, and generates less waste. The specification of a Sarnafil roof results in the lowest life cycle costs and the lowest total environmental impact.

Life Cycle Analysis

Recently, Carbotech, a leading European consulting firm, performed a comparative life cycle analysis of six of the most widely used low-slope roofing systems, including Sarnafil. Study criteria included the material's impact on the environment (from raw materials to end-of-life) as well as the initial and ongoing energy costs.

The results: Sarnafil membrane was rated the best choice when considering all criteria in the study.

Extend roof system life spans...for decades of waterproof protection with Sarnafil.



To learn more about how roofing and waterproofing systems affect building sustainability, call 1-800-576-2358 for a FREE Roofing Sustainability Kit.

Or, visit Sarnafil on the web at www.sarnafilus.com



Sustainability According to LEED

The U.S. Green Building Council (USGBC) is a coalition of public and private organizations promoting buildings that are "environmentally responsible, profitable, and healthy places to live and work."

USGBC's Leadership in Energy and Environmental Design (LEED) and LEED-EB Rating Systems rank the performance and degree of environmental sensitivity of new and existing buildings.

The photos below show five of the eleven LEED-certified buildings with Sarnafil systems (left to right: The Donald Bren Center, Caltrans D 7, Hewlett Foundation, National Geographic Society, Utah Olympic Oval).

Quick Reference Guide

Sustainability Tenet

Highlights

Minimize the burden on the environment, being responsible stewards of Earth's resources.

· Green roof designed to last for the life of the building

- · Consumes energy equal to a building one-third its size
- · Greatly lessens erosion and storm water burden on sewer systems
- Supports regional effort to reclaim natural prairie ecology
- Earned designer Roofscapes the 2004 Green Roof Award of Excellence from Green Roofs for Healthy Cities

Oaklyn Library mesic prairie green roof with Sarnafil Waterproofing System 1000

Conserve energy, recognizing the importance of savings benefits and improving roof systems' thermal efficiency.

Frito-Lay SR2001 Solar Electric Roofing System with Sarnafil EnergySmart Roof membrane

- Membrane reflectivity rating exceeds ENERGY STAR requirements
- Membrane reduces cooling costs and the urban heat island effect
- · Solar integrated roofing sytem generates energy
- EnergySmart's high reflectance improves SR2001 photovoltaic cell output

Extend roof system

life spans, realizing the worthiness of seeking long-term performance.

Charrette roof: 27+ year-old Sarnafil membrane

- Winner, 2004 Sarnafil Sustainable Roofing Performance Award
- Testing of 25 Sarnafil roofs aged 16 to 25: still providing leak-proof performance
- Independent ASTM 4434-based tests document the superior membrane performance











About Sarnafil

Sarnafil is an international manufacturer of high-tech plastic membranes for a wide range of applications including roofing, waterproofing, and civil engineering. Since 1964, Sarnafil has manufactured close to 4 billion square feet of thermoplastic roofing and waterproofing membrane in Switzerland, China and the U.S. Sarnafil roofing and waterproofing systems protect some of the world's most valuable structures and treasures, including schools and universities, libraries, museums, hospitals, commercial and government buildings, retail buildings and Olympic stadiums. For more information about Sarnafil in the U.S., visit

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