# Can Going GREEN Help Your Business?

By Tom Harris

## Customer demand for sustainable roofing can mean BIG OPPORTUNITIES

Is the roofing you install today what your customers will want tomorrow? Buildings account for approximately one-sixth of the world's freshwater withdrawals, one-quarter of its wood harvest, and two-fifths of its material and energy flows.

An estimated 54 per cent of energy consumption in the United States is directly or indirectly related to buildings and their construction, according to a 1998 report by Godfried Augenbroe and Annie R. Pearce of Georgia Institute of Technology. With electricity market deregulation and the ongoing threat of war in the Middle East creating volatile energy markets, energy efficient construction makes increased business – as well as environmental – sense.

According to Oak Ridge National Laboratories (ORNL), "The need for multiple roofs makes roofing one of the largest contributors of solid waste." Every year, an estimated 9 to 10 million tons (8 to 9 million metric tons) of asphalt roofing waste are sent to U.S. landfills with a price tag of more than $400 million in disposal fees.

Is it any wonder that the concept of sustainability in commercial, industrial, and institutional roofing is gaining in popularity and importance? How can consultants prepare to benefit from this market shift?

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ORNL defines sustainable low-slope roofing as "a roofing system that addresses the issues of energy efficiency, use of materials with a lower environmental impact and embodied energy, durability with less maintenance, and reduced waste generation throughout the life cycle from design, through construction and re-roofing, to reuse and final disposal."

Anyone involved in putting roofs on buildings is going to hear a lot more about sustainability. If your business depends on roofing government and educational facilities, you're probably already addressing the issue.

Sustainability may be one of the reasons Spray Polyurethane Foam (SPF) roofing – and the contractors who install it – are experiencing steady growth. According to the National Roofing Contractors Association's (NRCA) *2000-2001 Annual Market Survey,* SPF is now the third most often installed low-slope re-roofing system in the West South Central region of the United States, as well as accounting for 7.2% of low-slope reroofing projects in the $700,000 to $1.6 million range.

Texas A&M University specifies SPF for sustainability. The main campus boasts over 7 million square feet of SPF roofing. The university has installed almost no other type of roofing system over the past 29 years. The university specifies a minimum of two inches of top quality SPF, with a 24-mil silicone coating. The final 8-mil pass of coating includes a #1 grit blasting sand to create a non-slip surface with increased tensile strength to resist damage from the high volume of foot traffic the roofs are exposed to throughout their service lives.

In 1974, dissatisfied with the performance of the university's traditional built-up roofing (BUR) systems, the Physical Plant Department at Texas A&M began looking for alternatives. The BURs were leaking constantly after an average of five years of service, and isolating the sources of the leaks was proving to be difficult. The university selected SPF because it is seamless, monolithic, and fully adhered. And, because it is lightweight, a complete tear-off of the existing BUR could be avoided.

"We sprayed over the failing BUR for a number of years, mainly due to budgetary constraints," says Sam Cohen, construction project manager of Engineering Design Services at Texas A&M. "That's one of the advantages to SPF. And environmentally, it means all that material doesn't end up in the landfill."

In 1985, Gerald Scott, P.E., then in charge of roofing and energy conservation within the Physical Plant Department, announced another benefit the university had been receiving from the SPF roofs: energy savings. Scott monitored energy savings on 27 buildings on the campus that had received an SPF roof from 1980 to 1984. The results showed the university was able to cover the complete cost of the roof application through energy savings in an average of 4.5 years.

The oldest over-BUR SPF roofs on the campus are approaching their 29th birthdays. According to Cohen, they have received little or no maintenance, yet remain leak free and retain their energy efficiency performance. On newer buildings, SPF was applied directly to the metal deck. Most of these roofs are now 10 to 15 years old and Cohen says they perform as well as the day they were installed.

The main campus at Texas A&M is a busy place. Roofing installations and repairs simply cannot disrupt classes. Cohen says that the speed of SPF installation is an important consideration. With a little planning, his team, along with the university health and safety committee, the building proctor, and the contractors performing the work are able to schedule installations and repairs with minimal or no occupant disruption.

## What makes SPF sustainable?

As Texas A&M's experience shows, the number one sustainability benefit SPF has to offer is its durability.

SPF offers a lifespan of 20 to 30 years with minimal maintenance. It is also a renewable system. While BUR and single-ply membrane systems usually need to be removed and replaced after their usable service, SPF systems can be scarfed down and recoated.

SPF offers the highest wind uplift resistance rating available. Independent testing organizations, such as Underwriters Laboratories (UL) and Factory Mutual Global, test various roofing systems for wind uplift performance and then publish the results in their directories. Designers can then look for systems that meet the UL designations class 30, class 60, and class 90 or FM1-60, FM1-90 or higher where needed.

In an article titled "New Spray Foam Roofing Approval Gives Building Owners New Options," that appeared in *Approved Product News* (Volume 16, Number 3, 2000), published by Factory Mutual Research, the following observation was noted: "According to George Smith, P.E., manager of Factory Mutual Research's materials section, spray applied polyurethane foam offers many benefits over other roofing technologies, including...uplift resistance up to the limits of the test equipment as demonstrated in full-scale testing."

Mason Knowles, technical director of the Spray Polyurethane Foam Alliance (SPFA), reports that during laboratory testing of SPF systems, SPF's wind uplift resistance also exceeded the capacity of UL's equipment. UL also observed that SPF roofs applied over BUR and metal increased the wind uplift resistance of those roof coverings. He says FM Global's testing showed similar results over concrete, metal, and wood.

Roof failure during severe weather can also be caused by flying debris or hail actually puncturing the roof. SPF systems have proven to offer unparalleled resistance to impact. Documentation was gathered and published by former NRCA Research Director Thomas L. Smith of TLSmith Consulting after Hurricane Andrew decimated Dade County, Florida. It shows that even if debris punctures the foam straight down to the metal deck, the roof will not leak and can remain unrepaired indefinitely without developing leak or water absorption problems.

If minor repairs are required, they can usually be accomplished with a tube of silicone or urethane caulk, depending on the type of coating used in the original installation.

Energy efficiency is one of the most important factors in sustainable construction. The study conducted at Texas A&M by Gerald Scott in the 1980s proves SPF improves the energy efficiency of the building.

A 1992 paper by Sara Bretz of the University of California, Berkeley, titled "Implementation of Solar Reflective Surfaces: Materials and Utility Programs," shows black-surfaced roofs absorb solar energy measuring up to 190˚F on a 90˚F day. If the interior of the building is maintained at 78˚F, the HVAC system has to work hard to make up the resulting 112˚F difference. These high rooftop temperatures also contribute to urban heat islands and poor air quality.

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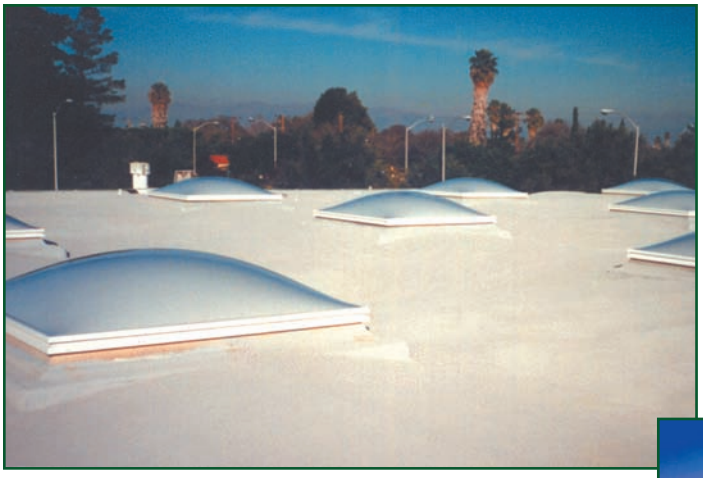
SPF systems are typically coated with light-colored, reflective coatings that utilize the albedo effect (the extent to which a material can reflect sunlight; the higher the albedo, the greater the ability to reflect sunlight) to reduce rooftop temperatures. SPF offers an aged insulation design R-value of 6 per inch, depending on the



*Above: SPF is self-adhering, self-flashing, and spray-applied, making transitions like these seamless and leak-free. It requires no fasteners and eliminates thermal bridging by providing a continuous layer of insulation over existing thermal bridges in the roof deck and assembly.*

thickness of the application (the thicker the foam, the higher the R-value). And because SPF is self-adhering and spray-applied, it requires no fasteners and eliminates thermal bridging by providing a continuous layer of insulation over existing thermal bridges in the roof deck and assembly.

Some manufacturers' SPF roof coating materials are Environmental Protection Agency (EPA) ENERGY STAR® labeled products. ENERGY STAR® was introduced by the EPA in 1992 as a voluntary labeling program designed to identify and promote energy efficient products in order to reduce carbon dioxide emissions.

Environmental responsibility is another important consideration for sustainable roofing. SPF is a two-component product that is manufactured on-site, but engineered on the molecular level to optimize performance for a specific application. Some SPF manufacturers are engineering those molecules to be environmentally friendly. For example, BASF Corporation, Wyandotte, Michigan, has developed zero ozone depleting foams incorporating ZONE3® technology.

There are still some groups that consider SPF to be harmful to the environment due to the blowing agents used in the installation process of some higher density foams. Prior to 1992, most high density SPF used CFC 11 as the main blowing agent. For the past 10 years, HCFC 141b has been used for a 92% reduction in SPF's global warming potential. While HCFCs do contain chlorine, most of it is destroyed in the lower atmosphere before it can reach the stratospheric ozone layer.

As of January 1, 2003, HCFC blowing agents are being phased out and replaced with zero ozone depleting HFC 245fa, hydrocarbon, or water.

SPF reduces waste. According to the NRCA's 1999 survey, more than 68.5% of the $11.3 billion low-slope roofing market includes tear-off and replacement of the existing roof membrane. SPF can be applied to a variety of substrates, including BUR, modified bitumen, concrete, wood, asphalt shingles, clay tile, and metal as a recover system over existing roofs without tear-off, provided moisture levels are not more than 15%, the deck itself is structurally sound, and there is good adherence throughout the system. This greatly reduces the amount of construction debris in landfills. To the roofing contractor, this versatility also provides increased business opportunities.

*Below: SPF is a two-component product that is manufactured on-site, but engineered on the molecular level to optimize performance while generating almost no waste. It can often be applied as a recover system over existing roofs without tear-off, reducing the amount of construction debris in landfills.*

According to the SPFA, SPF's on-site manufacture and application generates very little debris and waste. A typical 10,000 ft² roofing project produces less than 1/2 cubic yard of scrap, tape, and plastic, and from one pint to three gallons of waste solvent.

In a 1998 report titled "Sustainable Construction in the USA: Perspectives to the Year 2010," Godfried Augenbroe and Annie R. Pearce of the Georgia Institute of Technology state, "...the construction industry is one of the main contributors to the depletion of natural resources and a major cause of unwanted side effects, such as air and water pollution, solid waste, deforestation, toxic wastes, health hazards, global warming, and other negative consequences. And although the traditional attitude of having unlimited resources and space is still dominant in the USA, the awareness of environmental impacts is growing and many movements seeking to address sustainability concerns are gaining momentum."

Today, the concept of sustainable construction is not just alive, but thriving. Building owners are expecting improved energy efficiency and lower lifecycle cost from their roofing systems. Contractors are being challenged to provide cost-effective, durable, environmentally responsible solutions. SPF roofing systems have proven to meet – and even exceed – sustainability expectations. ■

## ABOUT THE AUTHOR

TOM HARRIS

Currently the product manager for BASF's Spray Foam Group in the U.S., **Tom Harris** is originally from Canada and is a chemical engineering graduate of Ryerson Polytechnical University. He is currently completing his MBA. Over his 20-year career within the polyurethane systems business, Harris has chaired eight Technical Committees within the SPI, Canadian General Standards Board, National Research Council of Canada, and the Canadian Urethane Foam Contractors Association. Tom is currently contributing to two ASTM committees, one NRCA committee, and the SPFA's Building Envelope Committee. Harris also represents BASF as a founding member of the Air Barrier Association of America.