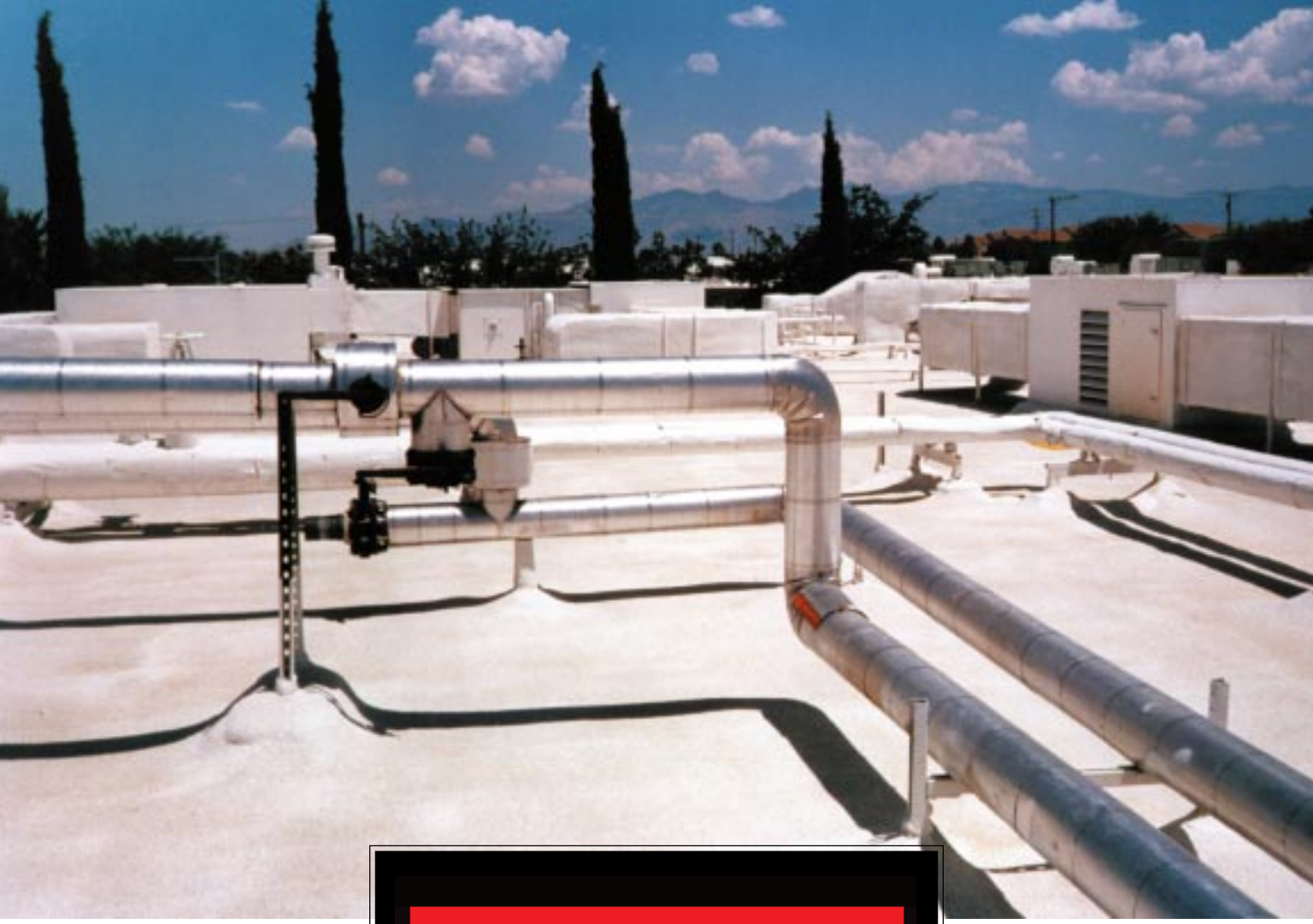

SPF ROOFING

Tomorrow's Roof Today

S E A M L E S S R O O F I N G & I N S U L A T I O N

What is SPF?

SPF is Sprayed Polyurethane Foam, a closed cell roofing and insulation material that is rapidly gaining market share in today's construction industry.

What are the advantages of SPF?

SPF has the highest R value of any insulation material. Because it is spray applied, it forms a seamless, monolithic barrier that prevents air and water infiltration.

SPF systems are referred to as "self-flashing" because they can be applied to vertical surfaces such as parapet walls and roof penetrations in a contiguous manner, thus eliminating seams and cold joints, the main source of roof leaks.

SPF roofing systems can be applied quickly and safely, without disruption to the facilities. In most reroofing applications there is no need to tear off existing membranes, offering cost and logistic advantages.

What are the disadvantages of SPF?

Though SPF roofs exist today that were applied almost 30 years ago, to many, SPF is considered new technology. As such, there are many misunderstandings concerning proper utilization of this product. As with any roofing system it requires skilled craftsmen and the proper materials to assure a quality application. Improper material selection, design or application has created roof failures as severe as those found with conventional roofing systems.

Where can additional information be found?

The Spray Polyurethane Foam Alliance has amassed a tremendous library of information on SPF systems. The SPFA provides training courses which can lead to accreditation. For information, including application guidelines and technical bulletins, call (800) 523-6154. To request copies of this publication, ask for document AY-129.

The National Roofing Contractors Association has an extensive section on SPF roofing in the current NRCA Roofing and Waterproofing Manual. To order copies call (800) 323-9545.

The National Roofing Foundation has conducted an exhaustive survey of SPF roofing systems.

SPF is ideal for unusual shapes and configurations

SPF Touted as "Green Building Material"

Mason Knowles, Technical Director of The Spray Polyurethane Foam Alliance delivered a paper on the use of roofing and insulation at the University of Florida's Conference on Green Building Materials. SPF which has been used as a roofing and insulation material for over 30 years, has exhibited many characteristics that identify it as a "green" or "sustainable" building material.

Mr. Knowles' program highlighted the following SPF characteristics:

The application of SPF will provide better climate control within a building envelope. Better climate control reduces the consumption of fossil fuels, thereby reducing greenhouse gases released into the air.

SPF provides a continuous air barrier, preventing moisture infiltration through air leakage, minimizing dew point problems and condensation within the building envelope, avoiding thermal bridging, resisting heat movement in all directions and providing reliable performance under varying conditions.

By controlling moisture infiltration, SPF also provides greater durability to buildings. The number one cause of building deterioration is moisture within the building envelope.

SPF's climate control ability enables a downsizing of the heating and cooling equipment of a building, further reducing energy usage.

There are no known end of service life figures for SPF. Generally, SPF shows little sign of deterioration or change in physical properties even after 30 years. SPF used as commercial or residential insulation typically requires no long term maintenance.

SPF can add structural integrity to a building's envelope. The National Association of Home Builders Research Center concluded after testing SPF in stud wall construction, that a structure braced with SPF filled walls will have less damage and permanent deformation of wall elements during a hurricane.

SPF roofing systems can be applied directly over BUR, modified bitumen, concrete, wood, asphalt shingles, clay tile and metal. Since it adds very little weight, SPF is used as a recover system over existing roofs without the need for tear-off. This reduces the amount of construction debris in landfills.

SPF roofs are renewable. With simple recoats, the life of an SPF roof can be renewed indefinitely. ❖

SPF and Code Ratings

Most SPF systems meet or exceed the minimum requirements established by various code and regulatory authorities. Following are some examples along with sources for further information.

Underwriters Laboratories ANSI UL 263 is a long-term fire exposure test for building materials. It evaluates complete systems and offers reports of fire resistance values for specific periods of time. Listings for SPF systems can be found in the Underwriters Fire Resistance Directory under design P733. Copies may be obtained from SPFA by calling (800) 523-6154 and requesting AY 125.

SPF roofing systems offer exceptional wind resistance because of their field spray application that provides full adhesion to substrates. No fasteners, battens, strips or heavy ballast is required. Wind uplift testing information is available from SPFA by requesting AY 124.

Factory Mutual Research Corporation has a test method that combines many individual tests under one standard. This standard is called FM 4470 and evaluates roofing materials for listings as a Class I roof covering. The individual tests that are conducted on the SPF systems are:

ASTM E-108, Roof Covering
Flammability Test
ASTM E-119, Calorimeter Fire Test
Hail Resistance (Severe & Moderate)
Foot Traffic
Weathering
Leakage
Corrosion of Metal Components

Listings for tested materials may be found in the FMRC Roofing Materials Approval Guide under the Spray Polyurethane Foam (SPF) roofing section. ❖

GE Appliance Park

Problem-plagued conventional roof

Same roof... leak free after SPF

"For years I've heard from roofing experts that there are problems with all roofing systems. After applying over 6 million sq. ft. at this location I can state there are virtually no problems with our SPF roofs."

Ray Oaks
Facilities Engineer
GE Appliance Park

The National Energy Labs report that 40% of your energy dollar is spent due to air infiltration.

SPF used as perimeter wall insulation: providing a seamless air barrier that saves money and energy.

Historical documents in the George Bush Presidential Library are protected and preserved by the performance of an SPF roof.

George Bush Presidential Library

NEC

NEC Goes Hi Tech With SPF Roof

In Roseville, California, NEC went to great lengths to protect their microchip manufacturing facility from the elements. Completed in 1991, the manufacturing operation is housed in a building that is surrounded by an outer building. This provides protection from wind and earthquakes. Restricting movement is vital with NEC's sensitive manufacturing equipment. To further reduce movement NEC specified an SPF roof. By totally encapsulating the roof deck with SPF, roof movement from heating and cooling is virtually eliminated.

An even more important design consideration at NEC was waterproofing integrity. Water can be more damaging than movement to microchips and equipment used in manufacturing. NEC was well aware of the waterproofing advantages of SPF, having over 600,000 sq. ft. of SPF roofing applied at Roseville, dating back to 1982.

According to Robert T. Stetson, P.E. , Staff Facility Engineer at NEC:

"I have worked with built-up asphalt, single-ply and SPF roofing. SPF is far superior to other roofing systems for the following reasons:

It does not leak. If mechanical damage cuts the top coating, the underlying foam will keep the roofing from leaking.

We frequently make penetrations in our roof. They could not be any easier. Any worker making a penetration simply seals the penetration temporarily using a caulking gun before he leaves the roof. No flashing is needed. The permanent sealing of the roof is accomplished later by the contractor. However in the interim, the roof is watertight. The cost is very reasonable and work is covered by the warranty just as the original installation.

After working with spray applied foam roofing for 13 years, it is by far my first choice."

"We chose an SPF roofing system because we simply cannot afford to have roofs that leak."

Rick Pribnow
Facilities Engineer
Metropolitan Museum of Art

Metropolitan Museum of Art, NYC

OMC Waukegan, Waukegan, IL

"The SPF roof stopped all leaks and reduced our energy bill by an average of $464,000 per year on this million square foot reroof."

M. M. Forrester
Ford Motor Company

Ford Motor Company

A Comparison of Conventional and SPF Roofing Systems

Sam Cohen
Project Management Supervisor
Engineering Design Services
Physical Plant Department
Texas A&M University

In 1974, dissatisfied with performance of traditional tar and gravel built-up roofing (BUR) systems, the Physical Plant Department began looking for viable roofing alternatives. The BUR roofs were constantly leaking, and because of the nature of BUR, leak detection was virtually impossible.

As the Physical Plant Department began soliciting information from various roofing sources and checking references, sprayed polyurethane foam (SPF) roofs exhibited advantages that seemed to fit the criteria of the University. The Physical Plant Department found the following:

1. Seams are one of the major sources of leaks in roof systems and SPF roofs are totally seamless.

2. Water does not travel laterally in SPF roofs as it can in BUR or single-ply roofs. A leak in the top membrane of a BUR or single-ply roof will create the spreading of water, saturating the insulation and causing multiple interior leaks. With SPF, even if a hole is punched through the entire two inch membrane, water movement will be restricted to the hole. In most cases repairs can be made with a tube of caulk.

3. Because the SPF roof is lightweight, permeable and fully adhered, normally an old roof does not need to be removed in order to apply a new one. If underlying areas of saturated insulation are found, minimal tear-off may be required.

4. The SPF roofing is less disruptive to students and faculty since tear-off is minimal. Also, projects are accomplished faster because the application is quieter, quicker and requires far less laborers.

5. Roof mounted units, penetrations, curbs, and parapets can receive a seamless monolithic application because SPF is spray applied. BUR and single-ply roofs require flashing materials with sealants which frequently result in leaks.

In 1974-75, convinced the preceding advantages warranted taking a look at this relatively new roofing system, the Physical Plant Department issued contracts for the reroofing of several buildings. One of the earliest roofs done with this system was Davis-Gary dorm. After seventeen years this roof has not leaked and requires minimal maintenance.

Between 1975 and 1977 the Physical Plant Department and TAMU Systems Facilities Planning and Construction (FPC) communicated back and forth concerning the monitoring of these roof installations. New BUR roofs were providing the University with service life of less than five years, and many of the BURs were leaking from the onset. In 1977 the Physical Plant Department foamed over a BUR application that was less than four years old. After monitoring the SPF installations, FPC was also convinced and since 1977, all new roof applications have used SPF roofs.

FPC received numerous complaints stemming from this decision. Few roofing contractors had the financial ability to mobilize spraying foam. Fewer still had the caliber of crews that chemically formulate foam in the field. Though this eliminated potential bidders, it in effect greatly elevated the caliber of roofing contractor performing work at Texas A&M.

Many outside architects working at the University were unfamiliar with the system, and some of these had a reluctance to learn anything new, but the Physical Plant and FPC were adamant. As time went by, architects and general contractors learned the many advantages of the system. This caused proliferation of the SPF roof systems in surrounding school districts and Universities.

Continued on last page...

"I have worked with built-up asphalt, single-ply and SPF roofing. SPF is far superior to other roofing systems..."

Robert T. Stetson, P.E.
Staff Facility Engineer
NEC

Robotic 'Romer' Applicator

This robotic applicator is just one example of the technological advances in the SPF industry.

"There now is sufficient evidence to demonstrate that SPF roof systems - when properly manufactured, designed, and installed - can perform side by side with any roof system."

William Good
Executive Vice President
Nat'l. Roofing Contractors Assoc.

Sears

"With a decent recoating schedule - it's best to recoat when pinholes first appear - a foam roof can last for decades."

Dick Fricklas
Technical Director Emeritus
Roofing Industry Educational Institute

The Superdome, Still Dry

In 1974 the State of Louisiana embarked on building a state of the art athletic and convention facility. The Superdome was only the second domed stadium ever built, twice as large as its seven year old predecessor, the Astrodome.

The architects and engineers who were building a free standing 486,000 square foot stadium roof structure could not count on help from any textbooks. In many aspects of the construction they were literally breaking new ground.

As they explored options concerning roof selection one thing become clear. The advantages purported to be offered by a relatively new roofing system answered most of their concerns. SPF could be applied directly over the metal deck, providing seamless water protection as well as insulation. Its lightweight nature allowed for cost savings in the structural design. It offered unsurpassed wind resistance capabilities, necessary in a hurricane area, and excellent fire resistance characteristics.

As in most cases where large sums of public funds are used, there were complaints from manufacturers and applicators of other systems. In 1979 these opponents of SPF roofing systems got their chance to take shots at the roof. A severe hail storm ravaged New Orleans creating thousands of hairline cracks in the coating covering the SPF. Though the coating cracked, no leaks occurred.

The State of Louisiana had roof consultants, unfamiliar with SPF systems, explain that the damage would grossly effect the integrity of the roofing system. They allowed that the SPF would deteriorate rapidly and should be replaced with a conventional system.

So for almost ten years the State of Louisiana did nothing. And the roof did not leak! Finally in 1987 the State of Louisiana contracted to repair the damage and recoat the roof.

According to Danny Vincens, Vice President of Engineering at the Louisiana Superdome, "The performance of our urethane roof has been quite remarkable. It is lightweight and maintains easily. We have had less problems overall with the urethane roof than other roofs on site."

National Roofing Foundation Surveys SPF Roofs

In the most comprehensive roof survey ever performed the National Roofing Foundation has examined SPF roofs from Eau Claire, WI to Houston, TX and from Los Angeles to New York City. With Dr. Rene Dupuis acting as principle investigator, the foundation examined in-place foam roofing, predominantly with service ages ranging from ten to twenty years. This survey includes field observations and random sampling as well as extensive laboratory analysis.

The 1997 report is already providing some interesting insight into a roofing system that is still widely misunderstood in many roofing circles. Dick Fricklas, Technical Director for The Roofing Industry Educational Institute, discussed the need for such a survey in his monthly column for RSI magazine.

Mr. Fricklas states, "Many readers of this column are roofing contractors and consultants who may be very knowledgeable on BUR, modified bitumen and single-ply systems, but who have never sprayed foam. When asked to look at an existing foam system... They're more likely to tell the owner to tear the foam roof off and put down something they do know how to handle."

Mr. Fricklas goes on to state "For building owners, dubious because of the 'horror stories' they've been told, the field survey should be reassuring. Earlier work done by Dr. Dean Kashiwagi at Arizona State indicated many foam roofs have lasted 20 years or more and appear to last indefinitely if maintained. Kashiwagi also discovered that owners have been extremely satisfied with the performance of their foam roofs. ...Should the (NRF) survey be as positive as Kashiwagi's earlier work, perhaps some skeptics will be willing to take another look."

Dr. Dupuis expects many members of the roofing community to be surprised by the NRF findings. According to Dr. Dupuis, "most people think a foam roof is a foam roof is a foam roof. They see an application performed by unskilled labor using improper materials and they assume that all foam roofs are the same. Our survey demonstrates that the high end specification of SPF is equal to any other premium roof system."

At the 1996 NRCA convention in San Diego Dr. Dupuis stated that "SPF roofing systems appear to have a very high degree of sustainability. Properly maintained with periodic recoating these systems have an indefinite life expectancy."

Copies of this report are available by writing to:

The National Roofing Foundation
O'Hare International Center
10255 W. Higgins Rd., Suite 600
Rosemont, IL 60018-5607

"SPF roofing systems appear to have a very high degree of sustainability."
Dr. Rene Dupuis
Structural Resources Inc.

University Attempts to Define Performance

In the early 1980's, a young captain in the air force engineering group stumbled onto a roofing system that appeared to have some enviable qualities. As Captain Dean Kashiwagi prepared to reroof some Air Force buildings with sprayed polyurethane foam (SPF), he found himself inundated with both positive and negative information about the SPF system he was attempting to specify.

"With all the negative feedback I received there was no way I was going to go against the tide and specify a relatively obscure product." Somewhat later, performing his own analysis as to the true capabilities of the system, Kashiwagi discovered that most of the negative information he had received was due to improper application, and that if installed correctly, SPF roofing had high performance characteristics, comparable to other performing roofing applications (Professional Roofer, Jan. 1996).

This discovery led Captain Kashiwagi to a startling conclusion. In the construction industry very few decisions are made based on true performance information. Kashiwagi discovered that the construction industry sold products based on marketing.

Today the Del E. Webb School of Construction at Arizona State University has developed a highly successful program which assists consumers to select products based entirely upon performance, rather than "marketing hype".

Dr. Dean Kashiwagi has been the leading pioneer in the implementation of "The Performance Based Procurement System (PBPS)". "As an Air Force engineer, I was a consumer, constrained by a procurement system that had no safeguards for assuring performance. I felt certain that there had to be a better method for providing quality construction materials and practices. I have since made it my life's work to provide such a system."

Today Dr. Kashiwagi's PBPS is providing a better system of procurement for entities such as IBM, Honeywell, Motorola and the State of Wyoming. The system is based on "intelligent processing", which allows the consumer to buy the best product services for the best cost. The cornerstone of the program is a method for collecting actual performance data on prospective systems and contractors and allowing the performance based procurement ranging from floors to roofs, and almost anything between.

As Dr. Kashiwagi reflects back he says, "the problem with negative publicity of the SPF roofing systems opened my eyes to the need to protect the consumer purchasing facility systems and services. Here was a roofing system, equal to other premium roofing systems, that was being avoided due to a lack of understanding of the system and due to the lack of marketing dollars to compete in a construction industry driven by marketing efforts. In the roofing industry, as with all construction products, there are performing contractors and suppliers as well as nonperformers.

We have amassed a database that weighs and tracks relative performance. Our clients access this information over the Internet to assist them in their bid evaluations. Today at Del Webb School of Construction we feel we offer a unique information system that provides a method to document and purchase performing construction systems."

For further information contact the PBSRG at:
(602) 965-4273
(602) 965-4371 Fax

or write to:
PBSRG
Del E. Webb School of Construction
Arizona State University
Tempe, AZ 85287-0204

"Texas A&M has been using SPF roofing systems for over twenty years, and today the A&M systems has over 8 million square feet of successful SPF applications. We feel that there is no better roofing system available."

Phil Haas AIA
Facilities Planning
Texas A&M University

General Motors

GM has millions of square feet of successful SPF roofing, some locations dating back over 20 years.

Xerox World Headquarters

IBM

IBM selected an SPF roof for this application as a result of ASU's Performance Based Procurement System

JC Penney

"You can take 'roof leak' out of your vocabulary with a properly installed SPF roof. I know, we have well over a million square feet of SPF throughout our company."

Al Fisco
Manager of Corporate Construction
American Greetings Corporation

Virginia Convention Center Pavilion

Reroofed in 1979, this quarter-million square foot SPF application continues to provide all-weather protection.

OMC Waukegan

SPF is equally well suited for metal roofs. SPF can be applied directly to the metal surface, whether bare galvanized or pre-coated panels.

Cover photo: Honeywell

...Continued from page 5

A Comparison of Conventional and SPF Roofing Systems

Today over 7 million square feet of SPF roofing has been applied throughout the A&M system. With very few exceptions, these roofs are holding up extremely well. In fact, it is extremely rare that one of these roofs leaks at all. Blister defects which occasionally occur do not create leak problems. Most leak problems at our campus occur on the few buildings that still have BUR on them.

In 1985 the Physical Plant Department found another advantage in using SPF roofing systems. For a number of years, Mr. Gerald Scott, P.E. was in charge of roofing and energy conservation within the Physical Plant Department. Vendors of the SPF system always championed the energy saving characteristics of the system. We realized polyurethane was a most effective insulation, but our main concern had always been to prevent roof leaks.

Mr. Scott monitored energy savings on 27 different buildings that had received SPF roofs from 1980 to 1984. The results were astounding. TAMU was able to recover the complete cost of the roof application through energy savings in an average of four and one-half years.

Quoted here is Mr. Scott's conclusion which is still shared by today's Physical Plant Department:

From the time of construction, and throughout the life of the roof, built-up roofs were major maintenance and repair items. The experience that the Texas A&M University Physical Plant gained since 1974, when they began, indicates that no major problem, and very few minor ones exist in the polyurethane roof systems. As a result of this experience, all new construction includes the foamed polyurethane roof system. To date some 16 new facilities have this roof system totaling nearly one million square feet.

Another major advantage in a SPF roof system that does not exist with any other roofing system, is that SPF is a renewable system. While BURs and single-plys must be removed and replaced after their usable lives, SPF roofs can be repaired and recoated to offer an indefinite life expectancy. Coupled with the energy savings and reduction in in-house maintenance costs, the SPF roofing system maintains a tremendous long-term cost efficiency advantage over all other roofing systems. Without question SPF roofs have a tremendous edge in preventing leaks and in detection and repair when one does occur.

The conclusion of today's Physical Plant Department has not varied from the conclusion reached by Gerald Scott in 1985. We at the Physical Plant Department continue to monitor the progress of other roofing systems available. But at this time, no other roofing system can offer the leak free service, the ease of leak detection and maintenance, the energy efficiency, durability, or renewability provided by sprayed polyurethane foam roofs. ❖

SPRAY POLYURETHANE FOAM ALLIANCE
SPFA
a Business Unit of the American Plastics Council

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