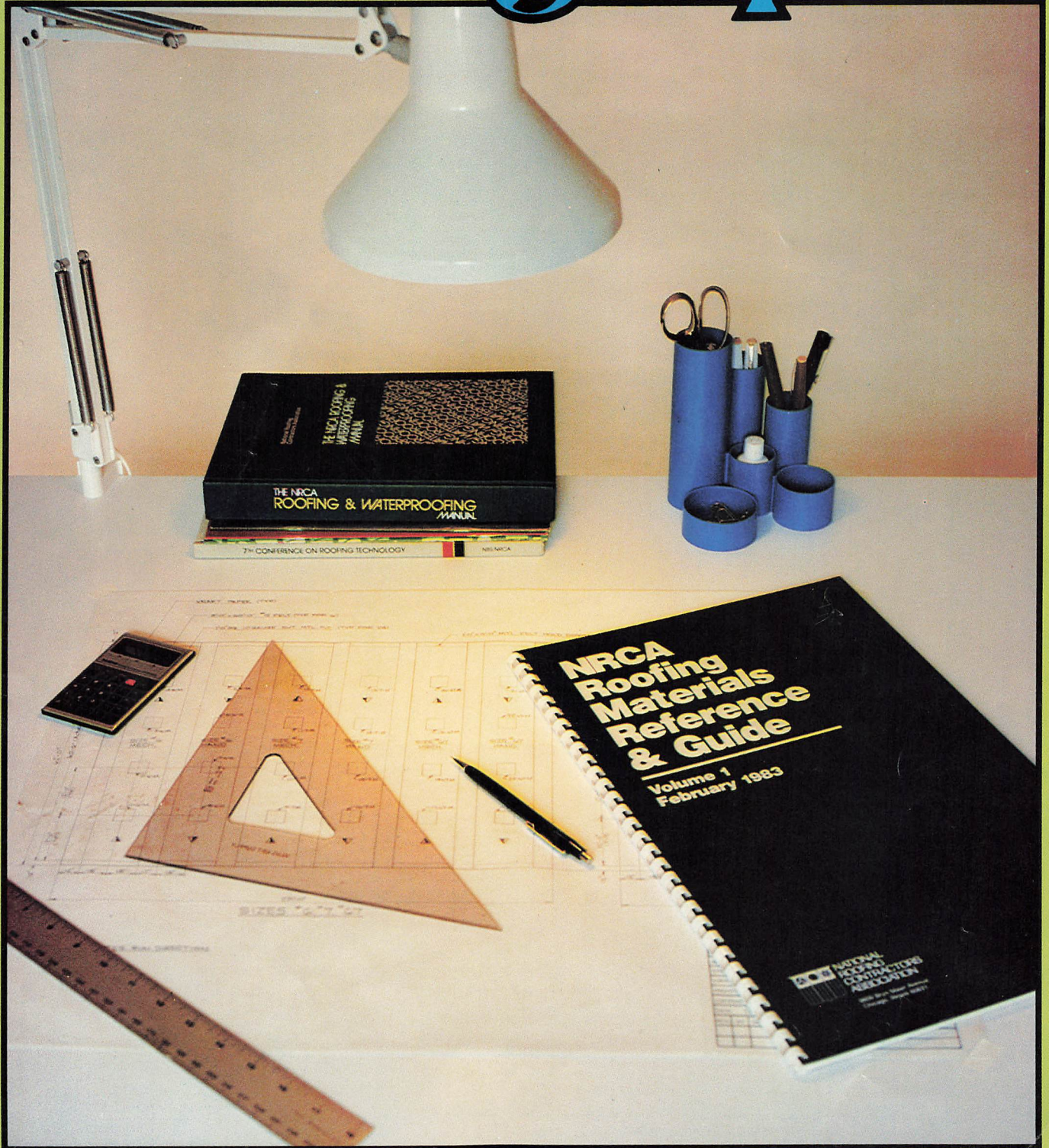


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# roofing spec

National Roofing Contractors Association

June 1983



# CAPABILITY



**Because the capability of the roofing contractor is often measured by the integrity of the roof.**

That's why more are roofing with the ACR™ systems; the single-ply All Climate Roofing™ membranes from General Tire. ■ And in more ways than one. Because both GenFlex ACR™, the EPDM elastomeric material, and GenSeal ACR™, the non-calendered PVC membrane, can be installed three ways. Making six in all. And each aimed at the kind of ability needed from today's roofs, like durability, reliability, accountability. And profitability. ■ It's because the ACR systems are from a company with some unique capabilities of its own. The kind that provide professional installer training, qualified technical service, competent engineering assistance, a 10-year limited warranty, and a product line fine tuned to the job requirements. ■ So install a roof with capability that measures up to your own. It's from General Tire, a company that's measured up for over 65 years. Your single source for single-ply. ■ Contact your General Tire Sales Representative for further information. Or write: General Tire Building Products Company, P.O. Box 875, Toledo, Ohio 43696-0875 (419) 729-3731. **Your Roofing Assurance.**



# New Products, Ideas, & Publications

## Manville Using High Tech For Glass Mats

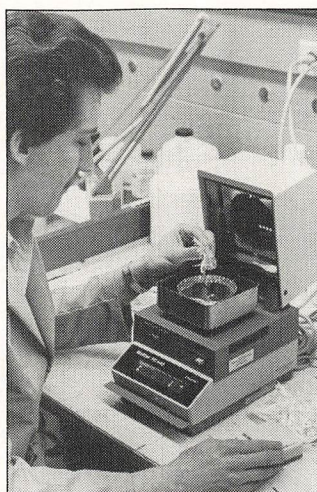
Manville Corp. now uses Mettler moisture weighing equipment to produce a durable, fire-resistant fiber glass mat.

A quality glass mat product depends on the manufacturer's ability to measure exact moisture content. With the Mettler equipment, tests determine precisely the amount of urea-formaldehyde binder needed to hold the molten fiber glass compound together.

Test results are then used to accurately calibrate the on-line moisture analyzer.

Prior to using the Mettler system, lab technicians hand weighed the fiber glass mat samples and alternately placed the samples in drying ovens to remove excess moisture.

The Mettler moisture test takes only six minutes, provides consistent results, frees the user from having to make lengthy calculations and removes the opportunity for error, according to a Manville spokesman.



**Mettler**®

Mettler Instrument Corporation • Box 71 • Hightstown, NJ 08520 • (609) 448-3000

Reprinted from ROOFING SPEC June 1983



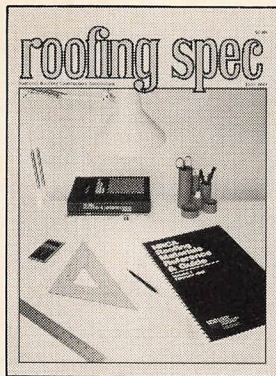
# roofing spec

Vol. 11, No. 6

June 1983

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NRCA publications  
make specifying  
roofs easy.



## NATIONAL ROOFING CONTRACTORS ASSOCIATION

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## Departments

- 4 Comment
- 5 Ideas, Notes & Random Thoughts
- 8 National News
- 16 Associate News
- 18 Legal
- 44 On The Roof
- 50 New Products, Ideas & Publications
- 52 Classified Ads
- 54 Tech Talk

## Features

- 22 NRCA Director Kurt Carlson talks about the merits of recovering existing roofs with single-ply materials.
- 28 NRCA/NBS Technical Conference Report: A look at a most forwardly-progressive meeting.
- 32 The Pros & Cons of Sprayed-In-Place Polyurethane Roofing Systems, by Robert Alumbaugh and Spencer Conklin.
- 38 How Soon the Revolution: The conclusion to a special *Roofing Spec* report.
- 43 Single-Ply: Contractors discuss single ply at NRCA convention session in San Antonio.
- 48 A National Roofing Foundation tribute to a one-in-a-million roofer.

## Advertisers

- |                                      |                                       |
|--------------------------------------|---------------------------------------|
| 12 Aeroil Products Co., Inc.         | 14 Hindall Products Co.               |
| 11 Arco Chemicals Co.                | 55 Kelly Energy Systems               |
| 4 Associated Foam Manufacturers      | 47 Koppers Co., Inc.                  |
| 19 The Bilco Company                 | 42 Nieman Manufacturing Co., Inc.     |
| 20 Boato TecSystem s.p.a.            | 6 & 7 Owens-Corning Fiberglas Corp.   |
| 9 Carlisle SynTec Systems            | 46 Polymer Plastics Corp.             |
| 40 Clearfield Conveyors              | 14 Red Bell, Inc.                     |
| 49 CNA Insurance                     | 46 Reeves Roofing Equipment Co., Inc. |
| 21 Consolidated Fiber Glass Products | 26 Roofmaster Products Co.            |
| 15 Dow Chemical Company              | 13 Siplast Roofing Systems            |
| 56 Elk Roofing Products              | 10 SYENERGY Methods, Inc.             |
| 42 Evergreen Slate Co., Inc.         | 26 Synthetic Rubber Distributors      |
| 17 Firestone Industrial Products     | 31 Taurus — Liquid Asphalt            |
| 41 Futura Coatings Inc.              | 27 Wausau Tile                        |
| 2 General Tire & Rubber Bldg. Prods. | 40 Brian R. White                     |
| 53 E.L. Hiltz & Co.                  | MS Nat'l Rfg. Contractors Assoc.      |

# Comment

## The Single-Ply Challenge

*Single Ply Issue*

It was only a few years ago a report was issued that shocked the industry. Single-ply roofing, the study said, will account for 25 percent of the non-residential roofing market by 1985.

Skeptics contended a change of that magnitude was inconceivable, impending single-ply failures would prevent their growth, and we've been hearing about single plies for nearly 25 years without any appreciable market significance.

Well, in 1982, according to the latest Project Pinpoint survey of NRCA members, single plies accounted for 32.5 percent of the market, and today there are individual manufacturers who speak of having 25 percent of the market by 1985.

Lots of knowledgeable people have debated the causes of this incredible turnaround, mostly without consensus conclusions. And we won't attempt to

speculate here either, except to say that there is no single identifiable factor to point one's finger at.

What we would like to suggest, rather, is we are presented with a unique opportunity to change the course of our industry, and we must see to it that the change occurs in a positive and professional manner.

That's the challenge to the entire roofing industry.

The challenge to the roofing contractor is to maintain the highest professional standards as he attempts to make product comparisons, and to make assurances to his customers that they are buying quality products.

The challenge to the roof designer is to understand that complex subjects like roofing demand his involvement and his study — and no new product will relieve him of that obligation.

And the challenge to the single-ply manufacturer is to recognize the roofing industry is his home, and he must work within that industry if he expects anything more than a short ride on the single-ply bandwagon.

*Bill Good*



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Contour Taper Tile® is a high performance expanded polystyrene (EPS) roofing system designed for fast and easy installation. Save time and money by eliminating on the job fitting. The factory pre-cut pieces are lightweight and easy to handle. Single layer, preformed crickets, saddles, valleys and ridges simplify even the most complex installations.

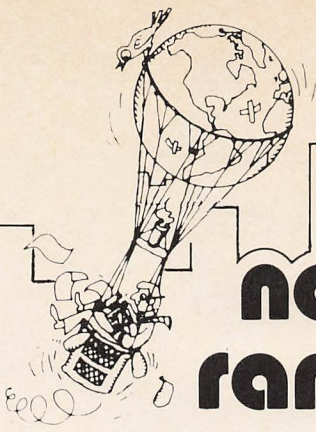
Our experienced team of field engineers are always available to give “on the job” assistance when requested. Contour Taper Tile® is clearly the best choice for high performance and easy installation in a roof drainage system!

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# Ideas, notes and random thoughts

**Welcome to summer**, at least that's what we think it is now that the cold weather seems to be behind us and business is booming. This issue of *Roofing Spec* presents our annual look at the single-ply industry. Included are a report by Former NRCA Director Kurt Carlson on recovering roofs with single ply; Associate Editor Connie Arkus's story on the San Antonio convention rap session on single ply; and, a report on the recent NRCA/NBS 7th Conference on Roofing Technology. Also included is Robert Alumbaugh's report on sprayed polyurethane roofing, and the regular department features. Read on!

m.b

**Communication** is best achieved when it's a two-way street. The staff of *Roofing Spec* is interested in what's on your mind. To find out, in the May *Roofing Spec*, we included a brief questionnaire requesting some information from you. By now you've probably already filled it out and returned it to us, but if not, please look back to the May *Roofing Spec*, fill out the questionnaire and return it to us. Thanks.

**Letters**, letters and more letters! That's something we'd like more of. (In fact, reading your letters is the best way for us to get to know you better). Please feel free to sound off. *Roofing Spec* happily publishes any and all letters received, so long as the subject matter is, in our opinion, relevant and of interest to all readers. We do reserve the right to

## National Roofing Foundation Update

The National Roofing Foundation is a FRIEND of the roofing industry. To perform its activities, The Foundation needs FRIENDS like you!

The FRIEND of The Foundation program is The Foundation's most important means of raising funds. To become a FRIEND of The Foundation, all you need do is agree to contribute \$50 or more per year.

The other contribution programs are:

- SCHOLARSHIP/MEMORIAL FUND** — This category is for those contributions of \$500 or more specifically designated to be used for scholarships. This area is also for bequests or memorial gifts in the name of a deceased.
- LIFE-TIME MEMBERS** — The Foundation has a third category for those who wish to be considered Life-Time members. Life-Time members contribute \$1,000 or more.
- DONATIONS** — The Foundation welcomes any and all donations. Personal and corporate donations are tax deductible.

For more information on The Foundation, contact the NRF office, 8600 Bryn Mawr Avenue, Chicago, Ill. 60631.

edit for length and clarity, but other than that, it's all up to you. Mail your letters to *Roofing Spec*, 8600 Bryn Mawr Ave., Chicago, Ill. 60631.

**Robot roofers in 1990?** It's possible, said Milt Trospen, Scientific Educational Business Software (S.E.B.S.) Highly sophisticated robots could apply substances that might be hazardous to the human roofing mechanic's health. Robotic and computer technology is advancing at an amazingly fast rate. Trospen foresees the dominance of PASCAL computer language and tells us not to laugh at home-made computer kits — some are quite powerful.

**The National Roofing Legal Resource Center** is pleased to present its third annual seminar, "Legal Considerations for Roofing Contractors." This year's seminar will be held at the Hyatt in Lake Tahoe, Nevada. The topics to be covered are:

- Tax planning for the second generation family businesses, tax consultants on deferred income, setting up trusts and limited pensions.
- Recent developments in labor law.
- Consultants Panel - how consultants work on a job from start to finish.
- Contract documents, bonds, warranties and guarantees.
- Insurance for contractors.
- Do's and Don'ts.
- Case histories and opinions on why particular cases have been lost.

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**Coated Glass fiber roof**

# YOUR REPUTATION WILL HOLD UP ONLY AS WELL AS THE ROOFS YOU PUT DOWN.

No matter how good your workmanship, if the roofing products you're using are second-rate, the roof will be, too. And that can mean call-backs.

## THE PROOF IS ON THE ROOF

It stands to reason, then, that the most dependable roofs should start with the most dependable roofing materials.

Take Owens-Corning Perma Ply-R® roofing felt. It's the most durable ever developed. Thanks to our unique continuous-strand Fiberglas® mat, Perma Ply-R offers roofing contractors the highest tensile strength, the best tear resistance and unequalled proven in-use performance. Over six billion square feet installed in 18 years.

## WE HAVE EVERY ROOF COVERED

And that's just the beginning. Owens-Corning is the single source for the single best line of durable roofing products. For virtually every roofing need. At costs that won't go over your budget.

Perma Ply®-WP, for example, is our newest and most economical

Type IV glass fiber roofing ply. For use in all area specifications.

Or consider Perma Ply No. 28, a glass fiber base sheet used over nailable decks and recover surfaces. It lays smooth and flat where ordinary felts wrinkle and crack.

Or Perma Ply No. 28 Perforated, which can be used over foam insulations to minimize blistering.

Or Perma Plus-2,™ a stronger version of the continuous-strand mat used in Perma Ply-R. This unique two-ply roofing system offers lower installed costs and improved productivity.

A real competitive edge in bidding jobs.

## THE ONLY 3-PLY SINGLE-PLY ROOF

Derbigum® HPS is the first and only roofing system that combines the strength of three-ply, built-up roofing with the ease and low-cost installation of a single-ply.

This unique system is a modified bitumen with a top layer of glass fiber mat for weathering and stability and a base mat of polyester for elongation and puncture resistance. Sandwiched between is a glass fiber web that provides increased tensile strength. The result: a high-performance, long-lasting roof.

In addition, it is also a highly flexible system. Derbigum excels

not only as new and re-roof membranes, but, due to its strength and elasticity, it forms superior flashing systems.

It's no wonder that with over 1.5 billion square feet installed in over 17 years, Derbigum is one of the world's best-proven, single-ply roofs.

## THE BEST FOUNDATION FOR ANY ROOF

Because it's underneath where it can't be seen, the benefits of roof insulation are too often overlooked. But using the right insulation can mean the difference between life and death for a roof.

Owens-Corning's Fiberglas® and FURI® roof insulations, while providing a full range of thermal values, offer excellent dimensional stability, resilience and ventability.

And no other roof insulations conform as well to minor deck irregularities.

In addition, a double layer of Fiberglas roof insulation can add years to the life of a roof. By offsetting the second layer so the joints never line up, continuous vertical gaps are eliminated. So heat loss is minimized and membrane stress is reduced by as much as 10%.

Let Owens-Corning roofing products and technical expertise help the jobs you do hold up. After all, it's our reputation, too.

For more information, contact your Owens-Corning sales representative or distributor.

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**FIBERGLAS**  
TRADEMARK ©

## THE TOP ROOF FOR ANY BOTTOM LINE

# NATIONAL NEWS

## Dodge Reports March Construction Increased

Strength in homebuilding and public works construction carried the recovery of the construction industry another step forward in March, according to the F.W. Dodge Division of McGraw-Hill Information Systems Co.

The March total of \$16.2 billion of newly started construction of all kinds boosted the seasonally adjusted Dodge Index of construction contract value 10 percent to 131 (1977 = 100), after February's temporary setback to 119.

In 1983's first quarter, the Dodge Index — the leading indicator of building materials shipments and construction employment — averaged 126 for a five percent gain over 1982's last quarter. This was nearly a 30 percent advance from the cyclical low point which occurred in the second quarter of 1982.

"The building industry was a major force in the economy's turnaround during the first quarter of

1983," said George A. Christie, vice president and chief economist for F.W. Dodge. "With room for a further decline of mortgage rates plus two brand new federal programs now providing extra funding for highways, bridges, and other public works construction, there's good reason to look for continued support from the construction sector in the quarters ahead."

March contracts for nonbuilding construction (public works and utilities) totaled \$3 billion, up 12 percent from February's value after adjustment for seasonality.

"Public works contracting rose sharply, due in part to a major bridge project in Florida," Christie said. "Replacement of sections of Tampa Bay's Sunshine Skyway Bridge, which was heavily damaged by a ship collision in 1980, is going ahead at a cost of \$107 million."

All other categories of public works construction showed im-

provement in March.

"In keeping with the recent recovery of housing, contracting for sewer and water facilities advanced firmly in March," Christie said.

Contracting for residential building continued to respond strongly to falling interest rates in March, resulting in contracts totaling \$7.8 billion for new homes and apartments started during the month.

On a seasonally adjusted basis, Dodge contracts for residential building showed an 11 percent improvement in March. Noting that the Department of Commerce data showed a modest decline in housing activity for the month, Christie said that the difference is due to the factors used to adjust the actual building data for weather and other seasonal conditions.

"Dodge seasonal factors indicate a lower adjusted rate of building in February than was shown by the Commerce Department, followed by a gain in March," he said. "Both sources report a strong volume of housing activity during 1983's opening quarter, however." In the first three months of 1983, new residential building contracts amounted to \$17.6 billion, 66 percent higher than the year-earlier quarter.

Nonresidential building contracts totaled \$5.4 billion in March, up two percent from February on a seasonally adjusted basis. "The month's small gain was confined to institutional buildings, as post-recession excess capacity inhibited the construction of business-related facilities," Christie said.

In the first quarter, commercial and industrial building contracts, at \$8.8 billion, slipped 19 percent below the total for the same quarter of

**MONTHLY SUMMARY OF CONSTRUCTION CONTRACT VALUE**  
Prepared by F.W. Dodge Division  
McGraw-Hill Information Systems Company

	March 1983 Construction Contract Value (000,000)	Seasonally Adjusted Percent Change From Previous Month	
Nonresidential Building	\$ 5,437.8	+ 2	
Residential Building	7,762.2	+ 11	
Nonbuilding Construction	2,970.7	+ 12	
<b>Total Construction</b>	<b>\$16,170.7</b>	<b>+ 10</b>	
	3 Mos. 1983 (000,000)	3 Mos. 1982 (000,000)	Cumulative Percent Change
Nonresidential Building	\$13,976.6	\$15,502.4	- 10
Residential Building	17,581.1	10,620.2	+ 66
Nonbuilding Construction	7,222.2	9,940.3	- 27
<b>Total Construction</b>	<b>\$38,779.9</b>	<b>\$36,062.9</b>	<b>+ 8</b>
DODGE INDEX (1977 = 100, SEASONALLY ADJUSTED)			
January 1983			127
February 1983			119
March 1983			131

continued, page 10

# Sheraton Hotel reserved the best roof in town.

## They specified Carlisle single-ply.

Once again, a Sheraton Hotel showed good "taste". Owners of the Sheraton Motor Hotel at Station Square did so by selecting today's premier roofing product to cover their stunning new 14-story motor hotel overlooking the dynamic skyline of Pittsburgh, PA. They specified Carlisle's Sure-Seal™ single-ply to cover the 56,000 sq. ft. roof, including the ground-level restaurant area at lower right. And they did it for a lot of good reasons.

Carlisle helped pioneer single-ply; our first roof installed over twenty years ago is still going strong. And Carlisle provides the complete system: EPDM membrane produced in extra-wide widths at our two American plants. Insulation. Flashing. Edging. Factory pipe seals. And application materials. We even train our approved single-ply applicators at our school in Carlisle.

What's more, a Carlisle single-ply roof can be easily installed in almost any weather. And it can be warranted for up to 15 years!

Call or write today for more information about the single-ply roof that American business is banking on. The Carlisle Sure-Seal roof. Carlisle SynTec Systems, Division of Carlisle Corporation, P.O. Box 7000, Carlisle, PA 17013.

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*Owner: Station Square Hotel Associates  
Arthur Santomo, Managing General Partner*

*Roofing Contractor: Mak-Lyn, Inc., Pittsburgh, PA*

*Architect: Archeon, Inc., Memphis, TN*

**The roof that's requested by name.  
Carlisle SynTec Systems**

**CARLISLE**

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## NATIONAL NEWS

continued from page 8

1982, with most of the decline concentrated in industrial building. Contracts for institutional buildings — schools, hospitals, etc. — totaled \$5.2 billion in 1983's first quarter, 11 percent greater than a year ago.

At the end of three months, the value of all new construction started in

1983 was \$38.8 billion, a gain of eight percent over the first-quarter total for 1982.

The accompanying chart is a summary of the latest month's Dodge construction statistics. These contract-award statistics measure the value of newly started construction to be brought to completion in the months ahead. They indicate the amount and direction of future expenditures of this major sector of the economy.

## Manville Starts Fund To Guarantee Guarantees

Manville Corporation has taken the unprecedented action of establishing a separate multi-million dollar Customer Assurance Trust Fund.

The purpose of the Third Party trust fund is to protect Manville customers by guaranteeing Manville's performance on all bona fide product claims related to roofing materials and fiber glass building insulation, regardless of the outcome of the company's August 26, 1982 filing for reorganization under Chapter XI of the United States Bankruptcy Code.

Although, at Manville's request, the bankruptcy court has previously given the company approval to regularly respond to all roofing material and fiber glass building insulation product claims in the normal course of business, Manville has elected to take customer protection a significant step further.

"For 125 years Manville has scrupulously honored its warranties and guarantees and promptly responded to all product claims," said John B. Dorsey, Vice President and General Manager of the Manville Building Material Corp., Marketing Division. "Under Chapter XI we are continuing to do so without interruption or inconvenience to our customers. However, our Chapter XI filing has raised questions among some customers and specifiers of our products as to our longterm ability to continue to answer such claims. While Manville expects its plan for reorganization to be successful and for our company to remain a viable operation for the indefinite future, we have nevertheless now employed an extraordinary means to allay customer concerns."

According to Dorsey, Mellon Bank N.A. of Pittsburgh has accepted the appointment as trustee of Manville's Customer Assurance Trust Fund. As trustee, Mellon Bank will hold the multi-million dollar fund, plus interest investment, as a reserve for

continued, page 12



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EPS (expanded polystyrene) insulation is combustible and should not be exposed to flame or other ignition source.

EPS insulation is the secret of survival these days. Roofing contractors are using three times more EPS now than in 1978. And with good reason. EPS is the most economical insulation on the market.

EPS insulation offers more Rs per dollar than any other roof

insulation. It's highly water resistant. It performs equally well in new and reroof projects, with BUR membranes and single-ply.

It's also the most versatile product available for the job. You can specify size, thickness, and density, even tapered EPS for positive slope-to-drain. Or it's

available laminated with an integral thermal barrier, and/or an overlayment to accept adhesives or hot bitumen.

If you're still surviving without EPS, take a second look. Things could be better.



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**ARCO Chemical Company**

Division of AtlanticRichfieldCompany

Manufacturer of Dyllite® expandable polystyrene

**Intelligent solutions**

# NATIONAL NEWS

continued from page 10

payment of bona fide product claims if Manville is unable to fulfill its obligations. The fund cannot be drawn upon by Manville or any of its creditors while any bankruptcy proceeding continues and Manville continues business operations.

Calculating a proper amount for the fund entailed making an actuarial-type analysis of claims pursuant to roofing and insulation warranties and guarantees over the company's history and extrapolating from most recent claim experience. The fund will have assets calculated to equal approximately one and one-half times what Manville regularly has paid on all its bona fide roofing materials and fiber glass building insulation claims.

## International Building Expo Set For Britain

Interbuild, the 40th International Building and Construction Exhibition, will be held November 27 through December 3, 1983 in Birmingham, England.

The exhibition is the leading sales showcase for the British construction industry.

The 39th Interbuild held in 1981, attracted a total audience of 133,615. Three-fourths of those attending had not visited any other marketing event for the building industry since the previous exhibition according to Interbuild officials.

Kitchens International will again occupy an entire hall at Interbuild, with other halls devoted to bathrooms and ceramics, building services, interiors and finishes, structural building materials, doors and windows.

A new special feature will be "Design in Building," displaying products and environments for leisure buildings, hotels, restaurants, offices and theaters.

Information on Interbuild can be obtained from Eileen Lavine, Information Services, Inc., Suite 735, 4733 Bethesda Ave., Bethesda, Md. 20814.

## ARMA Okays Staples Use

The Asphalt Roofing Manufacturers Association (ARMA) is releasing a new technical bulletin on stapling.

"Staple Application of Asphalt Strip Shingles for New and Recover Roofing" outlines ARMA's recommendations for application procedures for fasteners.

The information sheet contains standards for nail composition and size; proper installation tools; the number of staples recommended for each strip shingle; how staples should be driven and special procedures for laminated shingles.

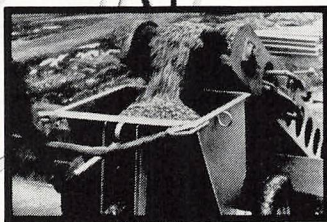
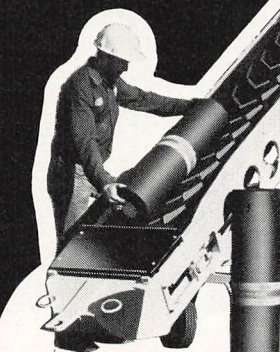
ARMA Form No. 153-RR-83 is available in quantities of 100 at the

continued, page 14

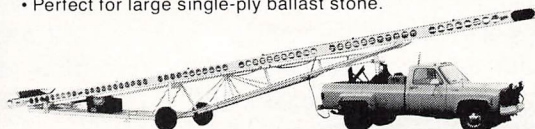
## Peak Performers ... AEROIL'S Roofers Hydraulic Conveyors

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Handles gravel, rolled felt and insulation. Sets up in 10 minutes and delivers more materials to the roof at less cost per ton.



- Special 2½" Insulation Cleats carry insulation to maximum heights.
- Loaded directly from Truck — No Ground Stockpiling.
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- No Labor on Ground — Driver sets chute in Tail Gate.
- Perfect for large single-ply ballast stone.



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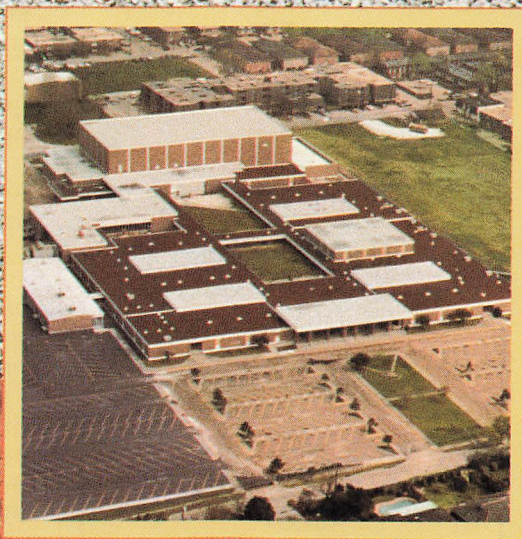
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## Elastomeric Design

Paradiene 20/30 includes two component plies, each composed of an elastomeric asphalt blend, reinforced by a light fiberglass mat. This allows exceptional elongation/recovery characteristics, while providing superior dimensional stability.

## Multi-ply Practicality

Paradiene's multi-ply design provides double protection. Its durable top ply has a factory-applied granular surface, available in a variety of colors. The system can be applied conventionally with hot asphalt or with cold adhesive.



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## proven performance

Paradiene: time-proven in the world's climatic extremes since 1968; a lightweight, highly flexible system, with superior resistance to sun, ponding water and other traditional causes of roof degradation — guaranteed against leaks for a full ten years.

## Call Today

For more information on the engineered excellence of Paradiene or any of SIPLAST's time-proven roofing systems call:

**1-800-643-1591**

In Arkansas, Call Collect:

501/246-8094

**SIPLAST**

Hwy 67S, Arkadelphia, AR 71923

# NATIONAL NEWS

continued from page 12

price of \$4.90 for members and \$5.40 for non-members through Sumner Rider & Associates, Inc., 355 Lexington Ave., New York, N.Y. 10017.

## Computer Usage May Have Peaked

Computer purchasing may have peaked in the construction industry, according to Sweet's, a division of McGraw-Hill Information Systems Co.

The results of a recent survey indicated that the nation's top 6,000 construction contracting firms will spend \$31 million annually for computers and software for the next five years.

The number of additional firms planning to computerize by 1987, however, has dropped significantly.

The leading general contractors

now using computers have already spent an average of \$90,000 per firm for computer equipment and another \$30,000 to \$50,000 for each software program.

The computers are used primarily for accounting, project costs and control functions.

"Two years ago, 95 percent of the top firms expected to be computer users by 1987; now under 70 percent do," said Harry Mileaf, Sweet's director of technology and product development.

The survey was sponsored jointly by Sweet's and *Engineering News-Record* magazine.

The Sweet's Division of McGraw-Hill publishes the Sweet's Catalog Files of building product information.

## New Offices Are Still Not Leased

Large amounts of newly completed but unleased office space, as

well as rehabilitated space in older office buildings, have once again contributed heavily to the rising national vacancy rate.

The Coldwell Banker Office Vacancy Index of the United States noted a steady climb in vacancy rates from 10.3 percent in December to 10.8 percent in March.

The largest surge in vacancies during the first quarter occurred in Miami, from 7.2 to 12.8 percent, following the completion of one major new office building.

New construction is responsible for the sharp office vacancy increases in the downtown areas of Denver, Dallas and Houston.

Elsewhere in the United States, office vacancies in downtown and midtown Manhattan continue to rise gradually, and sharp increases in downtown vacancies in Los Angeles and Philadelphia are due to new construction.

While the predominant, national trend is towards higher vacancies, a number of cities recorded declines, including Boston, San Diego, Charlotte, Portland, San Jose, Kansas City and Minneapolis-St. Paul.

The Coldwell Banker Office Vacancy Index is a quarterly report on vacancies in office buildings situated in the downtown areas of selected major U.S. cities.

It is computed as a percentage, dividing vacant space for lease or rent by the total square footage in office buildings covered by the survey in each city.

At the same time, Coldwell Banker reported industrial vacancies remained unchanged at 4.8 percent during the first quarter of 1983.

The supply of vacant industrial space has remained largely stable for the past six months. The rate of plant closings and consolidations has slowed in many areas.


The vacancy rate remained unchanged in Boston, Chicago and Philadelphia, while Southern California reported a slight decline, the first since mid-1981.

Sizeable reductions in industrial vacancies were recorded in Minneapolis-St. Paul, Seattle, Houston and St. Louis.

Denver, Miami and Dallas reported an increase in vacancies, with the latter two continuing to register the highest vacancy rates of all areas surveyed.



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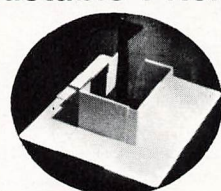
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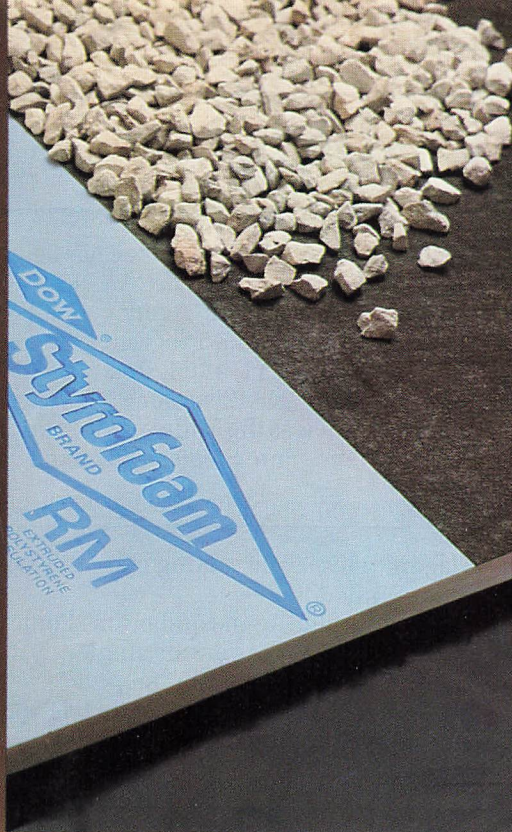
Fully Adjustable to 10" x 10", of fiberglass polyester.  
Unlike Metal Pans, the HINDALL Pitch Pan has:

- Negligible expansion
- High impact resistance
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- Total resistance to weather and ultraviolet
- Surface bonding with fill and stripping material
- Total resistance to electrolysis and corrosion
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THE INDUSTRY STANDARD can be stocked in your warehouse for LESS than your own metal and fabrication costs.

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(202) 547-0537

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## Some of the world's greatest toppings. And the one best way to top a single-ply roof.

STYROFOAM\* RM brand insulation is the ultimate overcoat for any single-ply roof. Because nothing protects, insulates and keeps out the elements year after year, season after season, like STYROFOAM brand insulation.

Only STYROFOAM is performance-proven to provide outstanding protection from physical abuse and moisture in demanding roofing applications *on top of* a single-ply membrane roof. STYROFOAM stands up to gravel and the repeated abuse of vicious freeze-thaw cycles, too. And STYROFOAM RM Brand Insulation installs fast and easy...while its renowned high R-value lasts and lasts.

STYROFOAM Brand Insulation. It's the only topping that works so well with single-ply technology. So if you appreciate all the advantages of the new single-ply membrane systems for both new and re-roofing jobs, put STYROFOAM RM Brand Insulation on top. Don't accept anything less than the greatest topping.

For more information write: The Dow Chemical Company, STYROFOAM Brand Insulation, Dept. H96, Midland, MI 48640.



STYROFOAM Brand Insulation is listed in the General Building File of Sweets Catalog under section 7.15/Dow.

CAUTION: STYROFOAM Brand Insulation is combustible and should be handled and installed properly according to Dow literature available from your supplier or from Dow.

\*Trademark of The Dow Chemical Company 3561

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# Associate News

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## CNA Announces Changes

Debbie Oelze of CNA Insurance has been transferred from her position as Account Manager for the NRCA/CNA Insurance Program to a new division within CNA entitled Agency Support. Under Oelze's direction, the NRCA/CNA Insurance Program grew rapidly in the past two years.

Effective April 11, 1983, Rosita Steele became the new Account Manager for the NRCA/CNA Insurance Program. Prior to her promotion to Account Manager, she was the Midwest Account Manager for the Roofing Contractors Insurance Program. Steele has worked closely with the expansion of the program.

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## Flagon® Now Produced in U.S.

Flagon® single-ply roofing materials will now be produced for the first time in the United States.

The new facility in Kimberton, Penn., will extrude Flagon® PVC roofing materials for all the various single-ply systems marketed by WATPRO, Inc., its exclusive U.S. distributor.

Pioneered in Europe, Flagon® is the only extruded, single-ply roofing system available on the market today, according to WATPRO, Inc., located in Manasquan, N.J.

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## Name Change for Ball's Tenn. Plant

The Metal & Chemical Division of Ball Corp. announced a new name for its facility in Greeneville, Tenn.

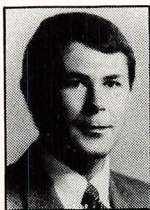
The Metal & Chemical Division will now become the Zinc Products Division, effective July 1.

The division will continue to produce rolled strip zinc for industrial applications, architectural zinc for roofing and fascia systems, zinc cans for dry cell batteries and copper plated zinc coinage blanks for the U.S. penny production.

According to the company, the Tennessee operation is the world's largest facility producing zinc melting, casting and strip making.

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## SYenergy Promotes DonFrancesco



SYenergy Methods, Inc. named Steven DonFrancesco supervisor of its technical services.

For the past two years, DonFrancesco was the New England regional technical service representative for the Rhode Island firm. He will now be responsible for supervising regional technical service representatives throughout the United States.

SYenergy Methods, Inc. is a leading manufacturer of exterior wall and roof systems for industrial and multi-housing structures.

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## Advisory Council Improves Contractor Relations

The Firestone Roofing Contractors' Advisory Council held its first meeting in San Antonio during NRCA's 96th Annual Convention and Exhibit.

The 12-member council is composed of representative roofing contractors from throughout the United States.

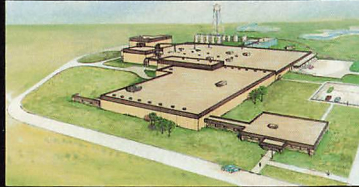
"At the first meeting, the council members became acquainted with several of our Firestone RubberGard sales managers," said Terry J. Renninger, president of the Firestone Industrial Products Co.

"We also discussed suggestions from the council on ways of improving our Firestone EPDM roofing program," Renninger added.

The council was formed in an effort to obtain direct and comprehensive information on roofing contractors' needs.

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At Firestone, we're committed to the roofing business. And we're putting our money where our membrane is by constructing a modern, highly-efficient roofing manufacturing facility with an annual production capacity of 400 million square feet. But that's not all.



We're helping Firestone roofers get tomorrow's jobs by going after next year's buildings where they start. On the drawing board. In architect's offices. And owner's offices, too.

And we're backing Firestone roofing contractors with comprehensive training programs, hard-hitting sales promotion tools, and responsible warranties that'll help make EPDM/Firestone roofing systems the name to remember.

### Coming with us?

As a responsible, prime-manufacturer supplier of roofing products, we

need roofing contractors who are as committed to the business as we are. If that sounds like you, call . . . Sales: (800) 428-4442, Technical: (800) 428-4511. Together, we'll both come out on top.



Firestone Industrial Products Company, Roofing Products Department, 1700 Firestone Blvd., Noblesville, IN 46060



Division of The Firestone Tire & Rubber Company

## Come up to the top with us.

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This column was prepared for *Roofing Spec* by the law firm of Summers, Hendrick, Spanos, Phillips & Grant. The column presents information of legal matters of general interest. The test is necessarily generalized, and you are advised to consult with a professional legal advisor before taking any action.

# Court Okays Subcontractor Action Against General Contractor

A case that will probably be cited by many subcontractors in the years to come is *Miller v. Guy H. James Construction Company*, 653 P.2d 221 (Okl. App. 1982). In this recent decision, the Oklahoma Court of Appeals held that a general contractor on a project who furnishes a subcontractor with plans and specifications prepared by the owner's engineer, impliedly warrants the sufficiency of those plans and specifications to the subcontractor.

The contractual relationships involved in the *Miller* case are typical of the owner/general contractor, general/subcontractor relationships prevailing on many construction projects. In *Miller* the general contractor contracted with the owner to construct a surface drainage system on a 300-acre industrial site, in accordance with plans and specifications prepared by the owner's project engineer. The general contractor, in turn, subcontracted a portion of the work, in this case concrete ditch work, to a concrete subcontractor. During construction, the concrete subcontractor incurred unanticipated additional costs as a result of defects in the plans and specifications; specifically, the owner's engineer had provided for too steep a grade and improper loading of the ditch.

In order to recover these costs, the concrete subcontractor filed an action against the general contractor and alleged that these increased costs resulted from defective plans and specifications that were provided to it by the general contractor. The trial Court found in favor of the concrete subcontractor and the general contractor appealed to the Oklahoma Appellate Court. On appeal, the prime contractor argued that the general rule of law is that a prime contractor cannot be held liable for unanticipated increased costs incurred by one of its subcontractors caused by defective plans and specifications prepared by the owner.

The Oklahoma Court of Appeals disagreed with the general contractor's reasoning and found that only when disputes arise between the general contractor and the owner can the general not be held liable for defective plans and specifications; however, this would not hold true in an action between the general contractor and the subcontractor. The Court went on to hold that when a prime contractor awards a subcontract, the prime contractor impliedly warrants the sufficiency of the plans and specifications provided. The Court further stated that if a subcontractor incurs additional costs resulting

from defective plans and specifications, the subcontractor has a cause of action against the general contractor for those damages. In essence, the Court believed it was rational and reasonable "to shift the risk of loss from the least culpable party back up the contract chain to either the party who created the defective plans or the first party in the chain who contractually agreed to assume the risk."

Accordingly, the Court stated that the general contractor, once sued by the subcontractor, would have a right of action against the owner for the defective plans and specifications, who in turn would, of course, have a right of action against the project engineer. It will be interesting to see how other jurisdictions treat this particular opinion by the Oklahoma Court of Appeals.

## Court Rejects Union Challenge

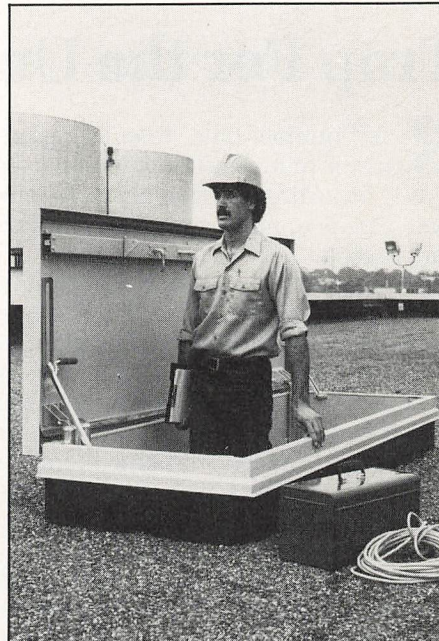
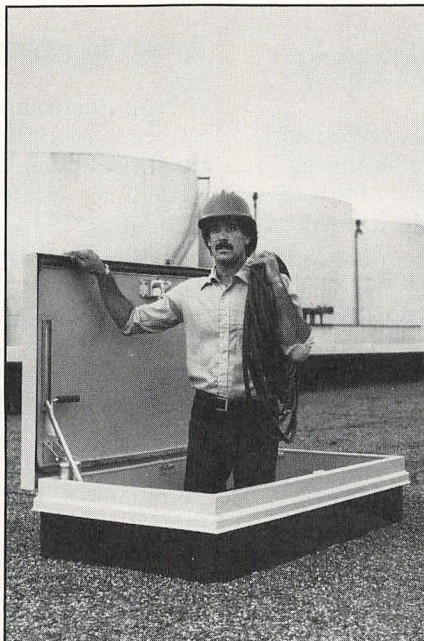
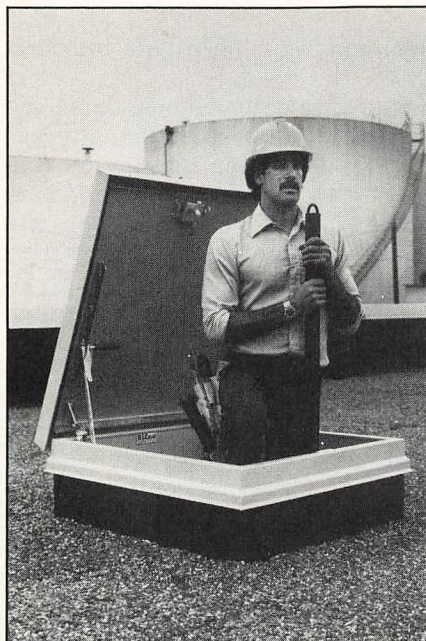
In 1981, the Ninth Circuit Court of Appeals ruled that a complaint by the California State Council of Carpenters against the AGC of California alleging a "conspiracy" among the AGC and its members to promote open-shop and dual shop contracting stated a potential cause of action for violation of the federal antitrust laws. This decision was appealed to the U.S. Supreme Court, which heard arguments in October, 1982. In an 8 to 1 ruling, the Supreme Court determined that the unions cannot sue the AGC for antitrust damages, finding that the unions lack standing to bring an antitrust suit because only union contractors not the unions themselves could show that they would be harmed by the alleged activities. The court based its decision on the fundamental antitrust rule that only parties actually suffering damages to their "business or property" may sue for antitrust damages.

The Supreme Court's decision will also affect the outcome of the recent major dual shop case in Louisiana, *Carpenters Local Union No. 1846 v. Pratt Farnsworth, Inc.*, included allegations similar to those in the California case.

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continued, page 20

# three ways to come out on top...



## with quality Bilco Roof Scuttles

When your specifications call for performance proven Bilco roof scuttles in any size, standard or special, you call for the design, the workmanship and the ease of operation that are uniquely Bilco.

Of heavy gauge material throughout, Bilco scuttles are insulated and gasketed for complete weather-tightness. Their overall quality of construction combined with built-in compression spring mechanisms for proper operation assures your client's lasting satisfaction.

Standard sizes shown in steel or aluminum are normally in stock for prompt shipment. Special sizes can be fabricated in a wide range of sizes to meet your special needs.

### Type S for ladder access\*

Every building needs at least one ladder access size Bilco roof scuttle. It provides easy, safe, economical access to the roof in all kinds of weather.

Size: 2'6" x 3'0"

### Type NB for ship stair

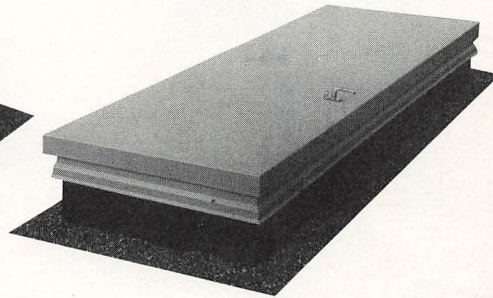
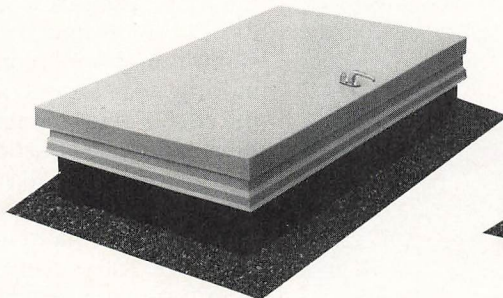
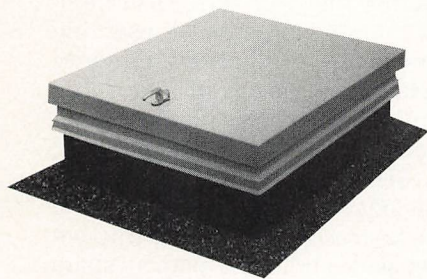
This size Bilco scuttle is ideal for installations where frequent use may be indicated. It permits easier movement of maintenance personnel, tools and equipment.

Size: 2'6" x 4'6"

### Type L for normal stair

The ultimate in roof access. This size Bilco scuttle allows a normal stairway. It takes the place of costly penthouse construction. Helps maintain a clean roof line.

Size: 2'6" x 8'0"



\* Shown with the new Bilco Ladder Up Safety Post. For safer, easier ladder use.

For complete information, details and specifications see Sweets General Building, Industrial Construction and Engineering Files, or send for a copy.



The Bilco Company, Dept. RS-63, P.O. Box 1203, New Haven, CT 06505

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## Trap For the Unwary

**R**ule "number one" in entering into a written contract is to make sure you read it from beginning to end — including the fine print. A corollary of this cardinal rule is to make sure that you *have* the entire contract to read.

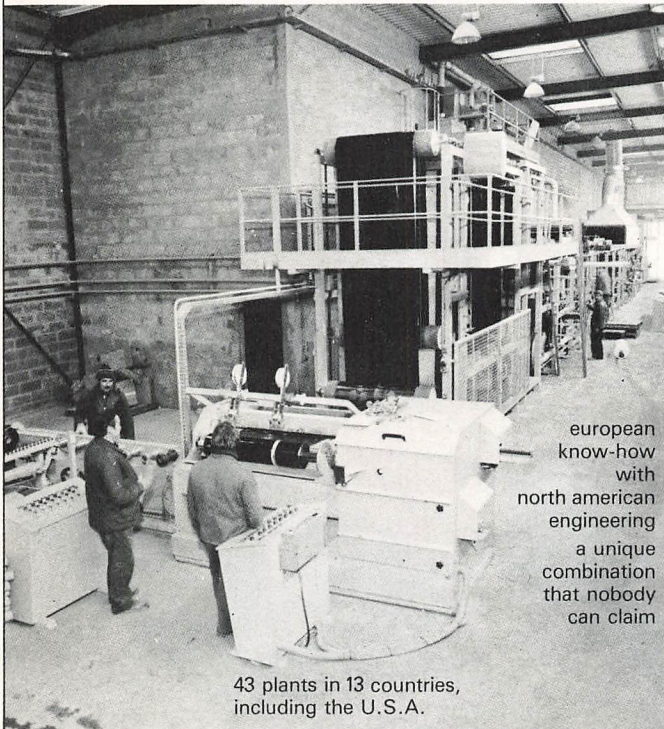
Most construction contract documents today use the short cut of "incorporating" into their text documents or materials that are not physically included with or attached to the contract itself simply by verbally referencing and describing the incorporated material. If this is done descriptively enough such that the parties to the contract both understand what is being included, such materials will be considered legally "incorporated by reference" even though separate from the contract documents. Courts have generally concluded that where the reference is clear and express in its intention to bind the contractor by such extraneous material, and such material was reasonably accessible to the contractor prior to entering into the contract, he will be bound by the terms and conditions of such incorporated material even

though not physically included in the original bid package.

Prime contract documents quite often include reference to an incorporation of certain other standard form documents generally available to persons in the construction industry such as various "industry standards," AIA documents or governmental codes and regulations. A frequently encountered "incorporation by reference" in construction subcontracts is the provision which recites generally that the subcontract shall include all terms, conditions, and other aspects of the prime contract documents.

Consequently, you should make sure that you are well aware of all of the extraneous documents incorporated into but not physically attached to the contract with which you are concerned. For prime contractors this means tracking down all extraneous documents specifically incorporated by reference in the prime contract package. For subcontractors this means not only that, but also tracking down all of the prime contract documents that might relate to or bear upon the subcontractor's performance. If the contractor is going to be bound by these "incorporated" requirements and any additional risks they impose upon his performance, he certainly should be aware of them before committing himself to any specific contractual obligation.

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## Minority Set-Aside Not Fair

**A**Dade County, Miami ordinance reserving certain contracts for metrorail station construction exclusively for minority contractors has been held to violate the equal protection guarantees of the U.S. Constitution. *South Florida Chapter, AGC v. Metropolitan Dade County* (No. 82-2427 Dec. 16, 1982). In a lawsuit brought by white-owned general and subcontractors, the U.S. District Court for the Southern District of Florida ruled that Dade County's practice of reserving certain metrorail contracts for exclusively minority bidding was an unconstitutional means of remedying the effects of past discrimination, for five reasons. First, there were less drastic methods available for obtaining minority participation. Second, the ordinance establishing the set-aside was not limited to a specific time period. Third, there was no reasonable relationship between the 100 percent set-aside and the 17 percent share of minorities in the local population. Fourth, there was no procedure whereby an aggrieved white prime contractor could seek an exception to the ordinance. Finally, the court noted that the set-aside precluded innocent third parties (white-owned contractors) from access to metrorail work.



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## Survey Results

# San Antonio Rates High With Convention Crowd

**N**NRCA was in "Pursuit of Excellence" and found it February in San Antonio.

Convention evaluation forms have been tallied and the results indicate that the 96th Annual Convention & Exhibit was an event well worth attending.

Over 360 evaluation forms were collected at the convention or returned by mail to NRCA headquarters. The breakdown of respondents was: 218 contractors, 76 spouses, 22 suppliers, 14 manufacturers, 8 exhibitors, five unidentified and 21 others.

The blend of seminars, panel discussions, workshops, rap sessions, motivational speakers, social functions and the special charm of San Antonio provided just the right atmosphere for a productive convention.

Dr. Barry Asmus from Boise State University, was rated the best speaker of the four-day event. His speech, "Adapting Your Operation to the State of The Economy," explored reasons why he thought the business future looks bright.

"Dr. Asmus was interested, informative and generally the best session NRCA had," was one of the many comments received.

Several evaluators asked if arrangements could be made to have Asmus return next year in Atlanta for an unprecedented third convention.

Former President Gerald R. Ford and motivational speaker Mike Vance from Mike F. Vance, Inc. Sarasota, Fla. also received high marks

for their presentations.

The concurrent rap sessions, which premiered at the 1982 convention in Los Angeles, were expanded to a full afternoon this year. Topics covered in this popular program included management, elastoplastic, built-up roofing and defending a roofing claim.

This year, NRCA adopted a computer system for printing badges for on-site registration.

"By far, this was the smoothest running registration we've had," said Melody Lejcar, NRCA staff coordinator in charge of registration.

"The computer saved us a lot of time and we moved the people through the line quickly," she said.

Evaluators offered many suggestions for next year's business sessions with an emphasis on such topics as: Single-ply, legal issues, management strategies and computer usage in the roofing industry.

A number of people would also like to see the hours of the trade show extended so that attendees have more time to stop at the 538 booths, a number that increases dramatically every year.

The city of San Antonio was the right location to hold a convention according to the response NRCA received.

"I loved the convenience — the close proximity of hotels to the convention center," said one evaluator.

Another simply wrote, "Return to San Antonio."

In the entertainment category, the

Lone Star Border Fiesta was rated tops. The fiesta offered attendees the opportunity to leave the country without leaving San Antonio. Brightly-colored decorations, lively music and ethnic cuisine provided a sampling of the Texas and Mexican cultures.

"Our Thursday night theme parties have become a tradition, celebrating the uniqueness of each city we're in," said Guy DiCara, NRCA Director of Meetings and Conventions.

A glittering stage and shiny gold tablecloths greeted guests at the culmination of the week's activities, the Annual Dinner Dance. This was another festivity loudly applauded.

The evening's entertainment included The Smothers Brothers, and music by the Paul Elizonda Orchestra. The presentation of the J.A. Piper Award to Sam T. Piper was an emotional experience.

Plans for the 97th Annual Convention in Atlanta already began in San Antonio. With the evaluation forms, the Convention Department has a good idea of what to include in next year's program.

"We're always striving for new ways to educate our members," DiCara said. "That's the focus of all the programs NRCA presents."

One convention-goer summed up the San Antonio event quite simply: "My congratulations to all of NRCA for the best all-around convention in my 17 years of attending."



# Innovation Is Key To Corporate Survival, Engineers Told

U.S. business must revitalize its efforts for innovation in engineering, but it must stop thinking that Japan is the only source of ideas for managing and stimulating such innovation, engineers attending the National Design Engineering Conference in Chicago were told recently.

The speaker, C. Joshua Abend, president of Innovation America, Inc. of Syracuse, N.Y., explained, "American engineering innovation has been around for a long time, but in the past few decades it seems to have been neglected, under-challenged and poorly understood. Companies that seem to need it most have snuffed it out in many cases, and such industries will eventually lose position or expire in the long run."

Abend said that innovation has been overlooked "as a crucial source for building organizational survival. We must give emphasis to the need for innovation turnaround as a prerequisite for corporate turnaround. That takes special skills which are on the cutting edge of successfully adapting to change and it begins with 'human re-tooling'."

On the other side of the coin are those companies that look only to Japan for the methods of managing innovation, he said.

"Other companies have become concerned and are beginning to question the viability of Japanese approaches as the sole answer," Abend said. "They are discovering through disciplines like innovation management and the utilization of more creative problem solving that there can be effective American models which organizations can employ for inducing the re-emergence of innovation within their ranks."

The potential profit from increased innovation in American industry is enormous, Mr. Abend added.

"Can you imagine the collective impact if we could help people become more imaginative or improve company innovative performance by a modest ten per cent?" Abend asked. "What an enormous competitive and economic advantage that would be."

Mr. Abend's consulting firm specializes in designing innovation management programs for American companies.

# Member Awarded As Top Small Business In Memphis

The John J. Campbell Co., Inc., Memphis, Tenn., is the recipient of the *Mid-South Business*' Small Business Award in the 101-350 employees category.

"I was shocked to say the least," said NRCA member Jerry Campbell, president of the firm that he and his father founded in 1971.

Starting with a \$20,000 investment, the company's sales grew to \$650,000 the first year with 50 percent increases in subsequent years.

Although many roofing contractors experienced a difficult business year in 1982, Campbell was able to capture 50 percent of the commercial and industrial market in Memphis and Shelby County.

The contest was sponsored by the banks of Memphis in cooperation with the Chamber of Commerce and the Memphis State University School of Business.

# Member Wins Achievement Award

NRCA member firm Henderson-Johnson, Inc. of Syracuse, N.Y. received an excellence in achievement award from Dow Corning Corp.

The company ranked first for the quality of the silicone/polyurethane roof system it installed.

The roof system consists of a spray-applied polyurethane foam protected by Dow Corning® 3-5000 silicone construction coating. The system's successful installation is dependent upon the expertise of the roofing contractor, according to Dow.

A committee of Dow Corning marketing and technical personnel judged the proceedings.

# Foam Group Starts Contractor Program

The Urethane Foam Contractors Association (UFCA) has established a Contractor Certification Program.

"Now, more than ever before, there is a need for professional sprayed-in-place polyurethane foam contractors," said Francine W. Rickenbach, director of the program. "Participating in the UFCA Certified Contractor Program will help contractors meet this need."

The four main objectives of the program are:

To identify and recognize those companies which, by fulfilling prescribed requirements of experience, meet a professional standard of commitment.

To encourage contractors to

support the professional development of their employees.

To stimulate and provide a standard for the development of professional programs for polyurethane foam contractors.

To enhance the profession of sprayed-in-place polyurethane foam contractors by demonstrating that a realistic standard of professional competence can be clearly defined.

Contractor certification will be issued by the UFCA in an educational program administered by a certification board of UFCA.

More information concerning the program can be obtained by writing to the UFCA Certification Director, UFCA, 300 Arcade Square, Dayton, Ohio 45402.

Now available from NRCA is a worker training program — **Kettles, Tankers and Bitumen Heating**. This four-part audiovisual program covers everything workers need to know for correct bitumen heating and operation and maintenance of heating equipment.

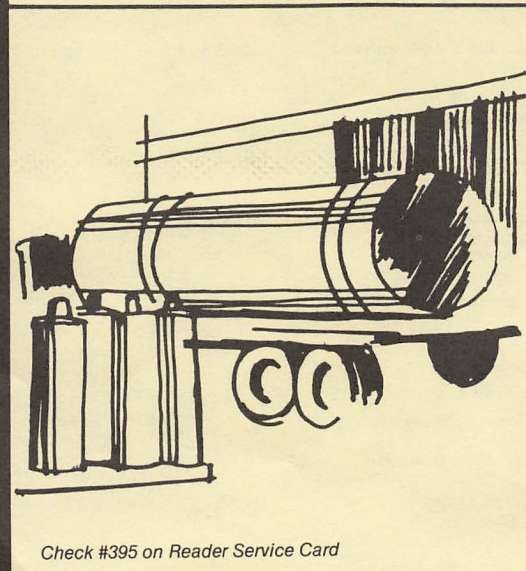
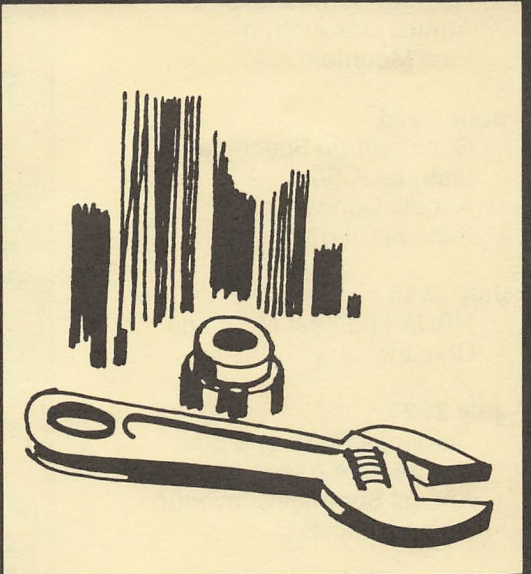
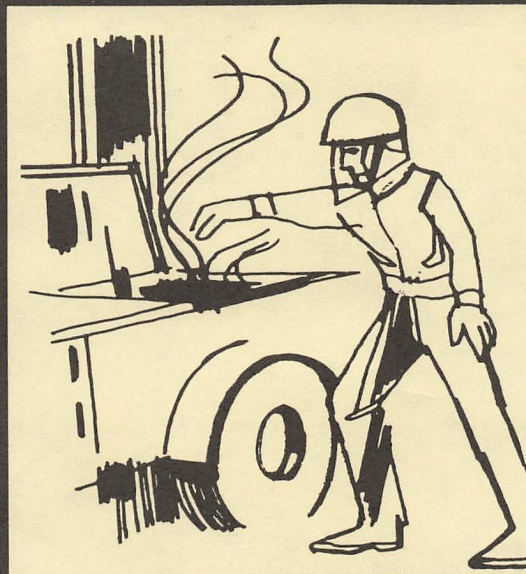
The program, with over 300 slides and a 40-minute soundtrack, depicts the correct procedures for kettle set-up and loading, safety considerations, thawing lines in cold weather, pump operation, the importance of preventive maintenance, and much, much more.

In addition, a comprehensive workbook contains a complete outline of the program with quizzes and tests to gauge worker knowledge.

The program can be used for earning field worker credit in NRCA's Accredited Roofing Contractor program, good for up to five-hours credit.

For more information on **Kettles, Tankers and Bitumen Heating**, contact Alan Grayson, NRCA Director of Education, 8600 Bryn Mawr Ave., Chicago, Ill. 60631.

# Kettles, Tankers, and Bitumen Heating



**EVT**



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# NRCA Officers & Directors

## Coming Events

### June 23-27

Tennessee Association of  
Roofing Contractors  
Annual Convention  
Pine Mountain, Ga.

### June 24-26

Construction Specifications  
Institute (CSI)  
Annual Convention  
Kansas City, Mo.

### July 13-16

NRCA Mid-Year Meetings  
Chicago, Ill.

### July 21-24

Carolinas Roofing & S/M  
Contractors Association  
Annual Summer Convention  
Hilton Head, S.C.

### August 4-6

Alabama Roofing S/M, Heating  
& A/C Association  
Annual Convention  
Gulf Shores, Ala.

### August 18-21

SMARCA Roofing Contractors  
of Minnesota  
Annual Convention  
Grand View Lodge,  
Brainerd, Minn.

(For inclusion of events, address  
all correspondence to: *Roofing  
Spec* "Coming Events," 8600 W.  
Bryn Mawr Ave., Chicago, Ill.  
60631.)

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# Recovering Roofs With Single Ply

by Kurt L. Carlson  
Roofing Systems, Inc.  
Rockford, Ill.

**W**ith improved materials, specifications, and installation procedures, elasto/plastic roofing is becoming the reroofing system of the 1980s. In recent years, single-ply roofing grew from a demand for better performance in reroofing systems, especially those systems with additional insulation. Elasto/plastic materials greatly reduced our age-old problems of movement, moisture, and thermal shock.

Before the 1970s, single-ply membranes were specialty products, designed primarily for subgrade waterproofing. Though some roof installations were attempted, material performance was, at best, questionable. Early butyl rubber and polyvinyl chloride membranes were weakened with age by ultraviolet rays and lacked sufficient tear resistance. During installation the quality of workmanship was often poor as application techniques and details were still being developed.

Today, the development of new single-ply materials and specifications and the modification of older systems continues. With all the various materials and systems available, *selection* of the best material and specification are two of three primary factors for achieving longterm performance with cost and energy efficiency. The third primary factor in reroofing is the quality of workmanship.

In selecting a single-ply system for reroofing, different materials with separation sheets or insulation have been developed to recover the many types of existing roof and deck design. We have had longterm experience using four basis elasto/plastic materials:

- EPDM
- PVC
- Modified Bitumen
- Reinforced Neoprene

These materials have been specified in different thicknesses measuring from 32 to 160 mils. Specifications for application of the materials have been with ballast on loose-laid sheets, adhesive to fully-adhere, and mechanical fasteners. Each material has worked best with one of the application methods.

## EPDM AND PVC SYSTEMS

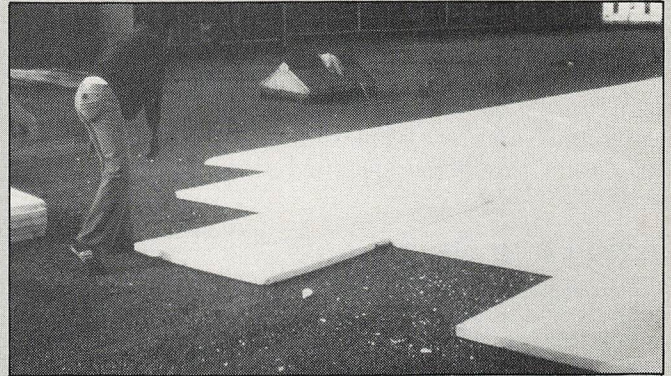
In recent years, the majority of single-ply roofs have been EPDM and PVC, sheets loose-laid with ballast. Roof and design characteristics or limitations that are considered for reroofing with the ballasted systems include:

- Roof Slope - less than 2''/1' slope.
- Roof Weight - holding power of at least an additional 8-12 psf of dead load.
- Chemical Contamination - roofs free of possible chemical contamination - liquid or vapor.
- Roof Traffic - roofs without traffic.
- Wet Substrates - roofs less than 25 percent wet.
- Additional Insulation - roofs requiring additional insulation.
- Large and Open Roofs.

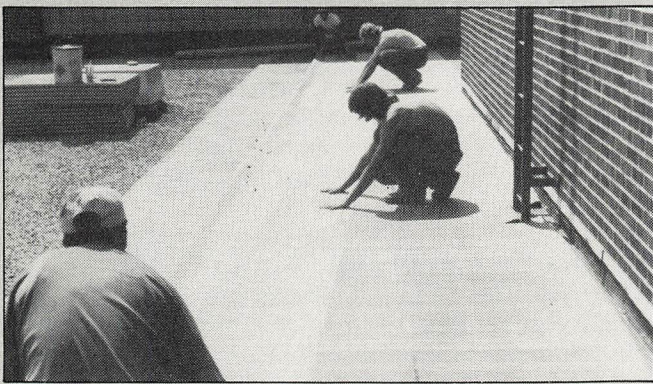
These characteristics or limitations will be discussed in order.



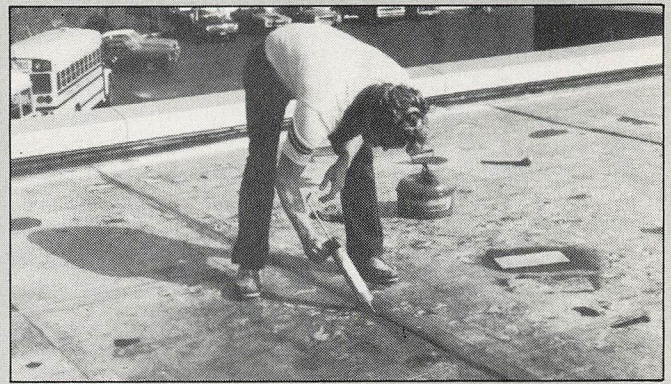
The old roof is prepared for an overlayment of single ply by vacuuming off the old roof aggregate.



Expanded polystyrene insulation is laid out on the old roof.



Roofing mechanics roll out the new EPDM roof membrane.



A mechanic applies sealant to the edge of a membrane lap.

### **Roof Slope**

Roof slope cannot exceed two inches per foot for ballasted systems since all materials are loose laid.

### **Roof Weight**

Ballast is applied at a rate of eight to 12 pounds per square foot depending on potential wind uplift. Higher buildings or unprotected roofs usually require more stone or even patio blocks within ten feet of the perimeter. Prior to consideration of the ballasted roof, the specifier or owner must determine the load limitations. A structural check will usually require the building plans, the weight of existing and new roofs, and plans of future additions or load changes. Weight of the loose gravel or felts to be removed from the existing roof should also be considered.

### **Chemical Contamination**

The third factor in considering single-ply ballasted systems is chemical attack. Certain chemicals emitted from roof equipment or vents will damage the EPDM or PVC membranes. The following materials can damage EPDM or PVC membranes: chlorinated solvents, aliphatic hydrocarbons, aromatic hydrocarbons, lacquer solvents, lubricating oils, fuel oil, gasoline, asphalt, creosote, benzene, hexane, ethers, kerosene, mineral oil, naphtha, ekolene solutions, dioctyl phthalate and strong acids and bases.

Any chemicals that are deposited on the roof surface must be submitted to the roofing manufacturer for analysis prior to reroofing. Roofs with limited areas of solvent or oil emission, may be protected with metal or neoprene sheeting substituted in contaminated areas if approved by the manufacturer. Neoprene may be mixed and spliced with EPDM sheets, and metal with PVC.

### **Roof Traffic**

Roofs with extensive foot or cart traffic should not be considered for reroofing with ballasted EPDM and PVC systems. These membranes are very susceptible to puncture damage, and low density, polystyrene insulation may be crushed. Roofs with normal or minimal traffic should have three-foot walkways to roof drains and to units that will require cleaning or maintenance.

### **Wet Substrates**

Recovering roofs that are water-saturated is bad practice. Although loose-laid systems will often distribute and vent moisture laterally, the drying time may be years. In that time period, roof decking, old materials and new insulation may deteriorate beneath the membrane.

### **Additional Insulation**

In selecting a reroofing specification, the owner's primary consideration is usually cost. Loose-laid systems

continued on following page

# Recovering Roofs

continued

can utilize the inexpensive polystyrene insulation over asphalt roofs. However, coal tar pitch or recoated roofs emit fumes that may disintegrate polystyrene. Over these roofs, urethane, isocyanurate, glass fiber or perlite insulation should be specified in place of the polystyrene.

## Large and Open Roofs

On large, open areas of roof where flashings are minimal, the loose-laid EPDM or PVC system with additional insulation is very cost effective. On smaller areas or roofs with a high percentage of flashings, the loose-laid systems can be very expensive. New two-part metal fascia and flashing systems have recently been developed to reduce perimeter flashing costs. Still, other systems are more cost efficient.

In addition to following manufacturing specifications and details, the specifier can add some requirements and emphasize others to improve the quality of installation.

In a loose-laid application with polystyrene insulation, ensure that a dry asphalt base sheet is adhered over small areas of wet mastic patches or coatings. Insulation that is loose-laid should be installed in two layers with the joints broken to reduce energy loss. If the insulation is used just as a separation sheet, 1/2 inch fiberboard or one inch polystyrene in a single layer will suffice.

Membrane thickness should not be less than 45 mils, and secure perimeter fastening of the membrane is essential. Membrane attachment should be completed daily using manufacturers' and Factory Mutual approved details. Fastening strips must be level with the top of insulation and securely attached to the deck or vertical walls. Where built-up flashings have pulled away from the walls at the top or base joint, they should be removed to ensure a secure attachment.

Roof drains, membrane splices, flashing corners, roof tie-ins, and counter-flashings require special attention in reroofing. Drains should be cleaned and all gravel scraped back. Drain heads should be checked for cracks, ring and clamps replaced, and a minimum four inch seal of water-cut-off mastic trowelled beneath the membrane and clamping ring. All membrane and flashing splices require a bead of sealant as they are completed. Flashings at corners of roof curbs or walls must be overlapped and fully spliced a minimum of three inches (four to six inches recommended). Areas for permanent roof tie-ins should be scraped of gravel, the membrane mechanically attached to the roof deck, and a splice completed to neoprene or metal that can be stripped into the built-up roof with steep asphalt and three plies of roofing felt. At a roof tie-in, the single-ply membrane should always be on the high side of the slope and never in a valley or ponding area. The only exceptions to this rule are specialty-type projects where roof valleys are recovered. Counter-flashings will vary in different reroofing applications. Normally, existing counter-flashings will be removed, reset and resealed. Termination bars are often unreliable in old walls or curbs and may require

future maintenance. If used, a quality installation and bar design should be specified. Minimum standards for bar design include:

- Material - Aluminum
- Thickness - 1/8 inch
- Width - one inch
- Length - 10 feet plus
- Fastener spacing - six inches
- Fasteners - Sleeve-type or screws

The last phase of installation is the placement of the ballast. Graveling should be completed daily or as required to hold the membrane and insulation in place. Urethane insulation may curl if not weighted down soon after application. Loaded, motorized gravel carts will compress and damage the lower density polystyrene insulation. Higher density insulation, additional insulation, or a top layer of fiberboard should be used to insure a consistent insulating value. Distribution of the ballast is important, particularly at the perimeter. A distribution of one thousand pounds per square should be assured within ten feet of the outside edges or walls.

## MODIFIED BITUMEN SYSTEMS

The fastest growing and most versatile single-ply material is the modified bitumen. In reroofing, this system is fully adhered either directly to the old roof, to a separation sheet or to insulation. Roof and deck characteristics that are best for reroofing with adhered modified bitumen are:

- Flat or Sloped Roofs
- Roofs with Weight Limitations
- Roofs with Chemical Contamination or Traffic
- Roofs not requiring Additional Insulation
- Roofs with Flashings

These characteristics or limitations will be discussed in order.

### Flat or Sloped Roofs

Some modified bitumen membranes will adhere tightly to existing roof felts on steep sawtooth or vertical walls without mechanical fastener support. Elastomeric sheets reinforced with fiberglass and polyester are heated with torches to melt and adhere the modified bitumen to the felts.

### Weight Limitations

In reroofing, modified bitumen sheets are best applied in conjunction with a layer of thirty pound felt or base sheet. The base sheet is first applied over the existing roof or additional insulation with steep asphalt or mechanical fasteners. Loose and embedded gravel is removed if no insulation is to be added. Total weight of the adhered system is usually less than two pounds per square foot. In reroofing gravel roofs, the net result can be a load reduction of one or two pounds per square foot.

### Chemicals & Traffic

The surface of modified bitumen is exceptionally du-

nable. It is unaffected by many chemicals that attack other single-ply materials, and the roof itself may serve as a traffic walkway. Its chemical resistance is the same as a built-up roof. A coating of emulsion may be added on some sheets to achieve a UL Class A rating, or gilsonite roof paints may be applied to color the grey membrane. A standard clay base emulsion (non-fibrated) provides a satisfactory surface when applied at a rate of approximately three gallons per 100 square feet with soft bristle brushes. The emulsion dries within two hours, but may be damaged by heavy rain within 12 hours after application. If a gilsonite paint is to be applied over the emulsion, the emulsion must first be allowed to set for thirty days. The paint can be applied at a rate of approximately one gallon per 100 square feet with rollers.

### **Roofs Without Insulation**

Modified bitumen systems are most competitive when applied directly over roofs without additional insulation. Before application of the modified bitumen, the existing roof surface requires the following preparation:

- Wet insulation in the existing roof system must be removed.
- Embedded and loose gravel should be scraped and vacuumed.
- The roof surface must be leveled of high ridges or blisters and repaired.
- An asphalt, quick-dry primer should be applied (one gallon per square) to provide good adhesion. Over coal tar roofs, a coating of steep asphalt may be added to reduce pitch fumes.
- If the substrate is damp in areas or lacks good inter-ply or insulation attachment, a coated base sheet should be added with mechanical fasteners.

The modified bitumen membrane is then torch-applied over the roof mat and flashings. Installation is simple and cost efficient.

When reroofing with additional insulation, the contractor may apply the insulation directly over the embedded gravel with a solid pour of steep asphalt or mechanical fasteners. In all cases, the perimeter should be mechanically attached in accordance with Factory Mutual recommendations. Insulation used with the system should be a felt backed urethane, glass fiber, perlite or fiberboard as used with built-up roof systems.

Over damp substrates, roof vents may also be used. The deck may be pierced if interior venting is acceptable.

### **Roofs With Flashings**

Over roofs with high percentage of flashing, modified bitumen systems can be very efficiently applied. The roof membrane doubles as the flashing. All types of built-up flashings may be adhered without mechanical attachment at the base-joint or termination. Modified bitumen is tied in to built-up roofing by simply heating and adhering the sheet to the adjacent roofing felts. Again, no mechanical attachment or special tie-in

materials are required. Tie-ins are so efficient that modified bitumen is used often for small repair areas or partial roof sections. For example, valleys on sawtooth or barrel type roofs may be covered with a secure tie-in to the slope and flashing.

In specifying modified bitumen for reroofing, the specifier may again add some requirements and emphasize others to improve the quality of installation. When covering old roofs with insulation, a moisture survey or careful inspection should be made to determine the amount and degree of wet insulation. Water saturated insulation (25 percent +) must be removed, and damp areas should be vented. Roof vents or interior venting will usually work with fiberglass insulation. For other insulating materials, damp areas may be covered with a channel vented base sheet, strip-mopped in place with steep asphalt or mechanically attached with non-rust fasteners. Some modified bitumen warranties will not cover future problems caused by a moisture or movement condition of the original roof.

Other conditions of the existing roof that should be checked include perimeter and field attachment, roof drains, and flashing attachment. If the attachment of the roof perimeter of the old roof itself is questionable, a coated base sheet or layer of insulation should be mechanically fastened through the old roof and roof deck. Roof drains should be checked for cracks. Built-up flashing must be securely fastened to walls and curbs prior to adhering the modified bitumen. Deteriorated wall or projection flashings should be removed.

When adhering modified bitumen directly to old roofing felts or flashings, a quick-dry, asphalt primer should be applied first to ensure good adhesion. The primer must be dry before application of the modified bitumen or burning may result. When installing insulation with modified bitumen, mechanical attachment is recommended where possible. Specifications should be provided by the insulation manufacturers. The insulation, coated base sheet and modified bitumen should be applied together. Phased construction is not recommended.

### **NEOPRENE SYSTEMS**

One of the oldest single-ply materials is neoprene sheeting installed with mechanical fasteners or adhesive. Substrate characters that are best suited for this system include:

- Sloped Roofs - greater than 2''/1' slope
- Roofs with Weight Limitations
- Roofs with Chemical Contamination
- Roofs Requiring Additional Insulation

### **Sloped Roofs**

Mechanically attached systems with neoprene perform best over sloped roofs with wood or steel decks. Sheets are normally fastened with steel nailing strips, spaced according to the slope of the roof. Reinforced

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continued on following page

# Recovering Roofs

continued

neoprene is also resistant to tearing from wind flutter.

## Weight Limitations

The neoprene roofing system weighs less than one pound per square foot. It may be applied directly over smooth-surfaced roofs or with insulation. Composite urethane insulation in large sheets may add stability to light-weight metal decks when mechanically attached with screws and plates.

## Chemical Contamination

Neoprene sheeting has better resistance to chemicals than EPDM or PVC membranes. In addition, some neoprene materials will not support a flame and may be applied with a UL Class A rating.

## Additional Insulation

Mechanically fastened roof systems work best with high density roof insulation. Composite urethane or fiberboard insulation is recommended. With these materials, fasteners will not likely loosen, and buckling or curling of insulation is not a problem. Roof insulation is attached in accordance with the insulation manufacturer's specifications. Over existing roofs on metal or wood decks, one screw and plate for every two square

feet is required. On gypsum or tectum decks, one tube-lock fastener every three square feet is needed. Fastener heads or plates should be covered with a patch of neoprene or rubber tape to protect the membrane for potential puncture damage.

When specifying a mechanically fastened system, ensure that the existing roof and insulation are completely dry and that the roof deck is intact for secure attachment. In addition to the recommended grid coverage, metal bars or nailing strips should be fastened over both sheets on all field splices. Nailing strips are best covered with narrow strips of uncured neoprene flashing. The same material is fully-adhered over any built-up wall flashings on curbs or parapets with mechanical termination required beneath the base joint and at the top of the flashing.

During the past two years, several new single-ply materials have been introduced in the reroofing market. Different methods of attachment have been tried. Many products and specifications have failed, others have been changed, and some are working. In reroofing where the variables for failure are greatest, a single-ply system can be the best roof available provided the proper material and specification are selected, and the workmanship is excellent.



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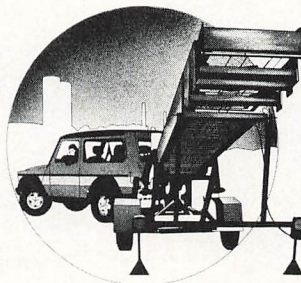
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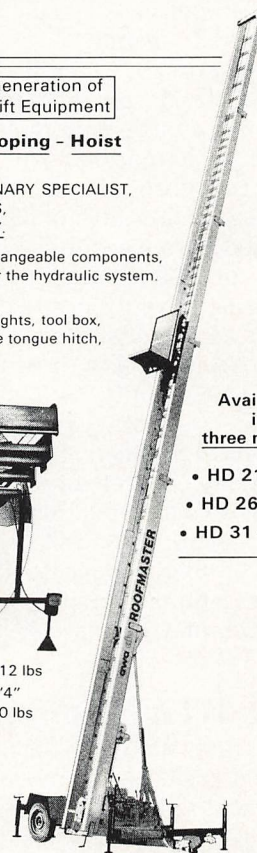
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PHOTO: Roof terrace over mammoth service area of Middletown (Ohio) Hospital.

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For two days in April outside of Washington, D.C. the roofing industry gathered to hear 12 experts present their findings on the state-of-the-art in . . .

# Roofing Technology

by Michael Beightol

**F**or the last 25 years, the National Roofing Contractors Association (NRCA) and the National Bureau of Standards have been hard at work strengthening the technical and research abilities of the American roofing industry. The highlight of this special arrangement occurs every other year when industry experts — contractors, architects, manufacturers, designers, researchers and technicians — gather to discuss the latest in roofing technology.

This was again the case April 14 and 15, 1983 as nearly 400 people met at the National Bureau of Standards (NBS) facility in Gaithersburg, Md., for the Seventh Conference on Roofing Technology co-sponsored by NRCA and NBS.

A variety of topics were addressed, ranging from preferred application tolerances for bituminous built-up roofs to the pros and cons of sprayed-in-place polyurethane. Despite the diversity of topics, the underlining theme in each address was the change and improvements taking place in the industry today.

NBS Director Ernest Ambler said in opening the conference, "high technology also exists in the roofing industry."

"It's important not to overlook roofing technology in favor of currently popular activities such as silicon chip development," Ambler said.

Single-ply roofing grabbed the lion's share of conference topics. Of the 12 presentations, six dealt with single-ply roofing systems and/or application techniques; three addressed built-up roofing; two discussed insulating roofs; and one presentation dealt with the advantages and disadvantages of sprayed-in-place polyurethane foam roofing systems.

## The European Experience

During the last 10 years, a multitude of new roofing systems, mostly high-polymer sheets and bitumen polymer sheets, have debuted in Europe, according to Emile Farhi, of the French Centre Scientifique at Technique du

Batiment. These new systems have largely replaced conventional hot or cold-applied roofing systems in Western Europe, but different systems have gained greater acceptance than others due to largely regional preferences.

Farhi identified three determining factors, other than economics, for the diversity in new roofing technology. Those characteristics include:

- Roofing contractors' attitudes toward new installation techniques.
- Existing technical codifications concerning responsibilities and guarantees.
- Manufacturers' support roles.

Farhi mentioned the differences between countries by highlighting the preference in France for membranes with installation techniques similar to that of traditional built-up bituminous membranes. In Germany, contractors are more familiar with the specialized techniques for field-seaming and lean toward single-ply membranes.

Currently, however, there is a technical osmosis taking place among Western European nations which will likely result in more widespread use of all good-performing systems, Farhi said.

## The "American" Experience

Western Europe isn't the only place where new roofing technologies have shaped the future. Richard J. Wallace, Daniel Construction Co., said in the United States the performance of single-ply roofing systems depends upon installation procedures, design concepts and material selection. In fact, Wallace believes the future of single-ply depends upon the following three criteria:

- Continued technical training of roof designers and roofing system installers.
- Designer and manufacturer knowledge of field practices, including the interdependence of single-ply roof components and the systems components' dependence on the substrate.

□ The marketing of only proven materials and systems tested both in the lab and in the field.

Although single-ply roofing systems were introduced to the American market shortly after World War Two, owners and designers initially resisted acceptance of these materials. Like in Europe, single-ply has only been accepted in the last several years, Wallace said.

Because of the upswing in acceptance of single-ply roofing systems, Wallace said it is especially important that manufacturers, designers, contractors and owners work together to prevent future failures and ensure increasing confidence in the new systems.

## Single-Ply Stress

While single-ply usage has continued to proliferate in the United States and abroad, one area that hasn't been adequately addressed is the subject of single-ply lap stress. Rene M. Dupuis, Structural Research, Inc., has studied this subject extensively and presented his findings in a talk titled, "Analysis and Design of Adhesive Lap Splices for Elastomeric Single-Ply Membranes."

Research to date has resulted in improvements in materials and adhesives formulations — primers and self-adhering tape, Dupuis said.

For the most part, plastomeric single-ply sheets have exhibited good lap-splice strength. In many instances during an ultimate tensile stress test, failure occurs in the membrane itself, and not at the lap joint.

According to Dupuis, modified-bitumen single-ply sheets can be spliced in a number of ways, but the most common methods are by using hot asphalt as an adhesive or by torching membranes together. Both methods generally perform well, he said.

Dupuis stated that the third group of single-ply membranes, ethylene propylene diene monomer (EPDM), are a cured or chemically cross-linked material. EPDM sheets present unique needs for field splicing because "they lack the welding or fusion action of plastomeric or modified-bitumen sheets."

Dupuis' test results indicate a need to use a low elongation — working stress level concept for evaluating the performance of adhesive lap splices on EPDM sheets. He recommended special design criteria to be followed, including:

□ Adhesive lap splices should have a minimum safety factor of 2.0 against temperature-induced loads. (For higher elongations it should increase to 4.0.)

□ Lap splices should be wide enough for a 50 percent strain-energy reserve capacity compared with an equivalent gauge length of unspliced membrane.

□ Lap splices should keep 75 percent of the strain energy at low elongation levels.

□ Because strain energy of aged EPDM membranes increases, so should lap splice adhesives.

□ Future design work on this subject should quantify performance levels based on strain-energy reserve, not an absolute strain-energy value.

## Uniform Terms

"Long term performance (of single-ply systems) can be achieved by using the proper materials installed by

craftsmen guided by good application tolerances," said Thomas Brown, Hr., Wright-Brown Roofing Co., in a talk titled "Application Tolerances of Single-Ply Roofing Membranes."

Brown decried the lack of definite terminology to guide contractors in correctly installing single-ply systems. Terms such as "clean," "dry" and "sound" are nebulous because they don't mean the same thing to everyone involved with the design, manufacture and application of a roof. Brown pointed out the need for uniformity in all the terminology used in the specifications printed for the correct installation of varying roofing systems.

Brown also suggested that all single-ply membranes somehow be identified with a logo, trademark or identifying symbol to assist years after installation in determining which system is on a roof.

Brown warned that without uniformity in tolerances and language, the courtroom may soon become the place where decisions are made concerning the reasonable tolerances for installing single-ply membranes.

## BUR Perspective

Richard Baxter of the Carolina Roofing Service, Inc., is well known in the roofing industry for his expertise on the correct application of bituminous built-up systems. At the conference he pointed out that over the better part of this century there have been no universally accepted application tolerances for bituminous built-up roofs, and without any specific criteria it has been to the manufacturers' advantage to use a "sliding scale" for judging roof performance.

Baxter also warned that in today's litigious society, the industry can't afford to have technical decisions made by juries in courtrooms. It is in the industry's best interest to set tolerances that not only represent the most practical standards for workmanship, but also assure satisfactory membrane performance for building owners, roofing consultants and material manufacturers, Baxter said.

Baxter suggested the following areas be considered for tolerance adoption:

□ Insulation board joint gaps.

□ Elevation differences of adjacent insulation boards.

□ Percent interply mopping weights.

□ Percent interply mopping voids.

□ Felt headlaps.

□ Embedded aggregate weight.

General agreement within the industry on the suggested subjects for tolerance consideration would provide applicators with readily attainable criteria for membrane construction, according to Baxter. Owners will also have an index for measuring the quality of roof construction, and consultants would have guidelines for accepting or rejecting roofing membranes based on representative sampling, Baxter said.

Finally, manufacturers would be provided "with acceptable material quantities to ensure satisfactory service of their individual roofing membranes and reduce

continued on following page

# Tech Conference

continued

confusion among applicators regarding acceptable quantities of material to be installed.”

## New BUR Fabrics

Organic, asbestos, glass fiber and now, spunbonded polyester fabrics as reinforcing felts for bituminous built-up roofs. Seymour Sands of the E.I. DuPont de Nemours and Co. presented his ideas on the usage of polyester felts to solve two major problems that occasionally occur with more conventional membranes — splitting and flexural fatigue cracking.

Sands said that compared to organic and glass fiber reinforced membranes, the polyester membranes have a breaking strain that is up to 20 times that for conventional membranes; and flexural fatigue resistance ranges from 100 to 1000 times as high.

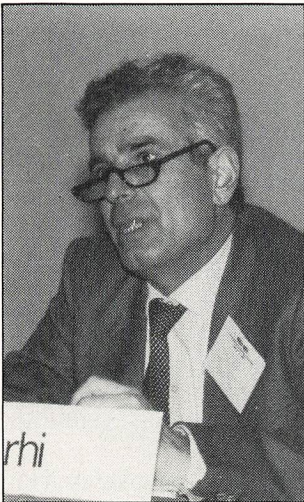
There are current limitations to this new membrane, however, and Sands was careful to point out that polyester fabric membranes are cold-process, not hot-applied membranes.

“Spunbonded fabrics cannot be hot-mopped via

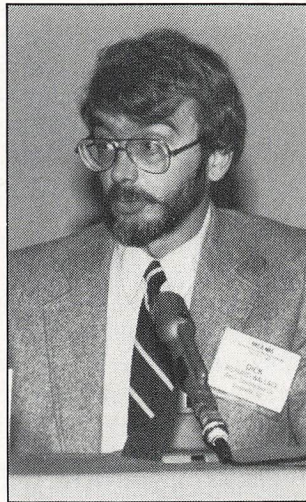
ble, readily conforms to the irregular surfaces of a roof being recovered.

## EPS, PUF and the rest

Other topics discussed at the conference included: “Application of EPS Insulation For Optimum Performance in BUR and Single-Ply Roofing Systems,” by David L. Johnston, ARCO Chemical Co; “Sprayed-In-Place Polyurethane Foam Roofing Systems, Pros and Cons,” by Robert L. Alumbaugh and Spencer R. Conklin, Naval Civil Engineering Laboratory; “A Methodology for Developing Tests to Aid Service-Life Prediction of Single-Ply Roofing Membranes,” by Walter J. Rossiter and Robert G. Mathey, National Bureau of Standards; “Recovering Existing Roofing With Single-Ply Membranes,” by Kurt L. Carlson, Roofing Systems, Inc; “In-Place Thermal Aging of Polyurethane Foam Roof Insulation,” by Sam F. Muhlenkamp and Steven E. Johnson, Owens-Corning Fiberglas Corp; and, “Specifications for Roofing and Industrial Asphalts,” by V.P. Puzinauskas, The Asphalt Institute.



Emile Farhi  
Centre Scientifique et  
Technique du Batiment



Richard J. Wallace  
Daniel Construction Company



Rene M. Dupuis  
Structural Research, Inc.



Seymour Sands  
E.I. DuPont de Nemours  
and Company

standard BUR practice,” Sands said. Temperatures of 450° to 475°F cause dimensional changes in the spunbonded fabrics.

(Sands did mention a polyester-reinforced membrane roof system that was constructed with Type II asphalt applied at 400°F. The test roof has not undergone any dimensional changes. It is now three-and-a-half years old and is problem free.)

Sands explained that there are several uses for the polyester-reinforced BUR system: For recovering existing membranes; as a new membrane; or as a replacement for an old roof where a tearoff is needed.

In addition to the spunbonded polyester, Sands also discussed spunlaced polyester. Spunbonded fabrics are generally too stiff to conform to all the contours of a re-roofing job. Spunlaced polyester, being a lot more flexi-

“The Seventh Conference on Roofing Technology has been abundantly useful and forwardly looking,” said NRCA Past President Robert Linck of the Warren-Ehret-Linch Co., Philadelphia, in his closing remarks. “We’ve been told we don’t really know where we’ve been, where we are or where we’re going. But we have been told where it is we need to be.”

**Editor’s note:** A handsome, 61-page, handbound book, *Proceedings of the Seventh Conference On Roofing Technology*, is available from NRCA for only \$15. The book contains all of the papers presented at the conference. To order the book, contact NRCA, 8600 Bryn Mawr Ave., Chicago, Ill. 60631. *Roofing Spec* will reprint excerpts of papers not covered here in future issues.



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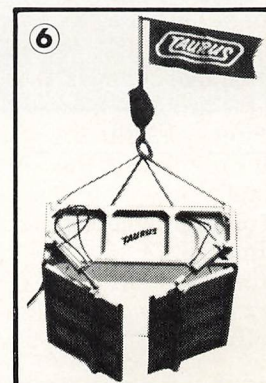
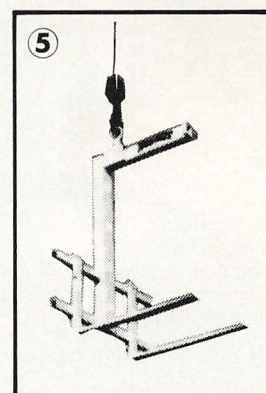
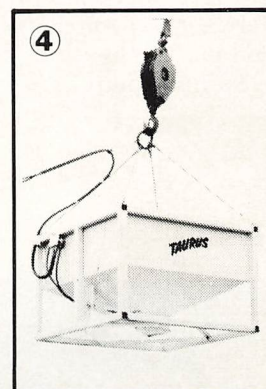
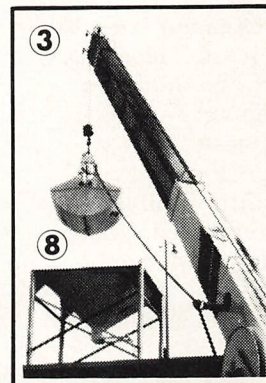
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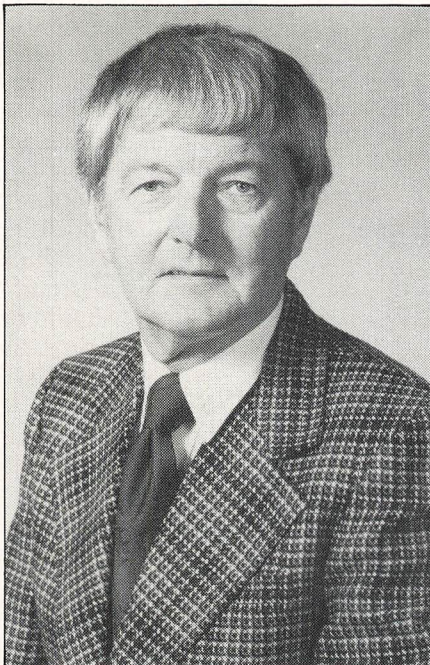
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# The Pros and Cons of Sprayed-In-Place Polyurethane Foam Roofing Systems

by Robert L. Alumbaugh & Spencer R. Conklin  
Naval Civil Engineering Laboratory



Spencer R. Conklin



Robert Alumbaugh at the Naval Civil Engineering Laboratory checking the aging characteristics of various polyurethane roof tests.

**S**prayed polyurethane foam (PUF) roofing systems have been successfully applied to virtually every type of roof deck and substrate in all climates. Their worldwide use includes areas subject to hail, over buildings housing coolers or freezers, over laundries (high humidity areas), and in tropical, subtropical, and desert areas with intense solar radiation and/or high humidity. Admittedly, application of PUF in such varied conditions has not been trouble free, a fact attested by many horror stories. Durable sprayed PUF roof systems can be achieved, however, through proper material selection, substrate preparation, and application.

Sprayed PUF roof systems, properly designed, applied and maintained, with recoating after eight to 12 years, should provide at least 20-year service lives. They offer the following advantages:

- light weight
- relatively strong, high-quality insulation
- excellent adhesion to all types of roof decks
- complete filling and sealing as expanding PUF reaction is completed
- self-flashing
- adaptability for taper to slope
- adaptability to irregular roof surfaces
- easy maintenance and repair
- elimination of joints by its monolithic, seamless nature

The need for proper material selection, substrate preparation, and application has been demonstrated by extensive investigations performed by the Naval Civil Engineering Laboratory (NCEL). Other laboratories have also conducted studies of these materials.

This paper accordingly presents the pros and cons of specifying sprayed PUF roof systems. As noted above poor PUF roof system performance can usually be attributed to improper materials or improper application. The following discussion analyzes the requirements for good foam materials and proper application procedures for these versatile roof systems.

## The Learning Curve

Sprayed PUF roof systems were introduced some 15 to 20 years ago. As with most new materials, there were many misconceptions about the PUF, the protective coating systems and their application parameters. These systems were promoted by some as a panacea for roofing problems. As a result, many ill-conceived, improperly specified and improperly applied jobs were sold to unsuspecting building owners. Equipment for foam application was relatively new, and sometimes undependable. The foam industry was in its infancy, near the bottom of the learning curve. Many early applicators neither understood nor appreciated the potential and versatility of these materials.

During the past 15 years, the industry has progressed far along the learning curve. Today's equipment, materials and application techniques are far superior to their original counterparts. At least part of this progress can be attributed to the increasing influence of the Urethane Foam Contractors Association (UFCA). Following the lead of NRCA, UFCA has been publishing information directed toward educating the industry in the proper selection and application of foam and coating materials.

## Proper Selection and Application

Sprayed PUF roofs are not suitable for all reroofing jobs — notably roofs with continuous ponding water. Where foam appears to be the best choice for a specific project, a number of factors concerning materials selection and application procedures require close scrutiny, discussed in the following section.

A number of physical characteristics are required for sprayed PUF to perform to its optimum capability. When PUF was first marketed, a density of 2 pcf or less, with a compressive strength of 25 to 30 psi, was the industry standard. Experience has shown that a 2.5 to 3.5 pcf density foam, with a minimum compressive strength of 40 psi, produces better roof systems. Compressive strength is a more important factor than the density, because foam with a higher compressive strength is less subject to mechanical damage than foam of lower strength.

For optimum results, foam lifts should range between 1/2 inch and one inch thickness. If applied too thin, developing stresses can cause delamination. Too thick an application may impair the foam's physical properties. Minimum thickness for a good PUF roof should be no less than one inch; roofs thinner than one inch generally do not perform well. Foam should have definite terminations, without feathering.

Cell structure of the sprayed foam should be of a small and uniform size which is easily achieved. Irregularly shaped cells or cells of widely varying size may indicate spraying over a wet substrate. They may also indicate improper application techniques or poor materials. Moreover, the closed-cell content of the foam structure should be 90 percent min. by volume. Lower values result in reduced insulating value and inferior physical properties.

The surface texture of a sprayed foam roof has a significant effect on system performance. Surface textures are designated as smooth (most acceptable), orange peel, coarse orange peel, verge of popcorn, popcorn or treebark. The latter two are totally unacceptable.

Popcorn and treebark surfaces are not acceptable for

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# Foam Roofs

continued

two reasons: (1) the foam comprising the surface texture is generally of poor quality, and (2) the rough surfaces are almost impossible to coat without producing pinholes in the coating. Foam with unacceptable surface textures should be removed and the defective areas properly refoamed.

## Coating Requirements

Because of its rapid degradation on exposure to sunlight, polyurethane foam must be protected by a suitable elastomeric coating. The authors' experiences suggest that early failure of many PUF roof systems though properly specified and applied, can be attributed to too thin a coating. As a result, NCEL currently recommends 30 mils as the minimum dry-film coating thickness. Some generic types of coating systems may require even greater dry-film thicknesses.

There are a number of high-quality coating systems that, when applied properly at the proper dry film thickness, will assure a long service life for PUF roofing systems. These include urethanes, silicones, acrylics, butyls, neoprenes, and hypalons.

These coatings may be subdivided further into permeable (breathing) and impermeable (non-breathing) coatings. (Where the potential for a strong moisture drive exists, such as buildings housing freezers or roofs with some ponding water problems, a high quality, well-applied impermeable coating must be used.)

There is some question within the industry about the best coating material. Currently, the catalyzed or two-component urethanes, the silicones, and the acrylics are the most widely used materials for PUF roofs. All the coatings listed above have their own unique advantages. The coating system best suited for a particular roof should be selected.

When foam was first introduced as a roofing material, a wide variety of coating systems were used to protect the foam. These include house paints, asphaltic materials, and cementitious types. Experience has shown that many of these materials fail very rapidly (often within 6 months) because they lack the required flexibility.

Although the importance of foam surface texture has already been discussed, it is particularly important for the coating phase of the roof construction. Rough surface textures obviously have more actual surface area than smoother surfaces and consequently require more coating to achieve the required 30 mils minimum dry-film thickness. A coating that provides a 30 mil dry-film thickness on a smooth surface at an application rate of three gallons per square may require over four gallons per square when applied to a verge of popcorn surface. If surface texture is not considered, the consequently defi-

cient coating thickness will lead to premature coating failure.

After the foam has been applied, there is a limiting time during which the basecoat must be applied. When the basecoats are applied too quickly after foaming, coating solvents can affect the PUF's surface integrity, or foam off-gassing can cause the coating to pinhole. If too long a period passes between foaming and coating, and the foam surface is degraded by sunlight, the coating may not adhere to the foam. No more foam should be applied on a given day than can be reasonably basecoated the same day. If unanticipated delays do occur, the elastomeric coating should be applied no later than 72 hours after foaming. Foam should cure a minimum of 2 hours before applying the basecoat.

Mineral roofing granules are frequently sprinkled into the wet topcoat of silicone and acrylic elastomer coatings at the rate of 50 pounds per square. The granules will improve the following surface properties:

- abrasion resistance
- resistance to bird pecking
- weathering characteristics
- fire resistance
- aesthetics

Properly sprayed granules should thus extend the useful life of a PUF roof system.

## The Total Roof System

Information provided so far has dealt primarily with individual components of the sprayed PUF roof system. However, it is the total system, PUF and coating, that de-

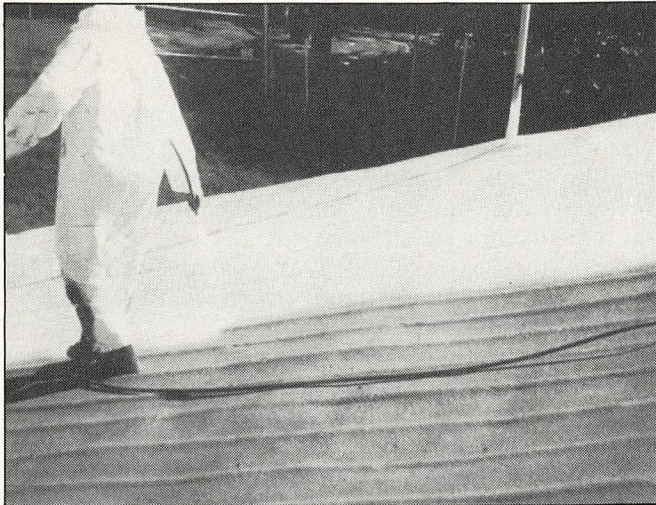
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***When sprayed polyurethane roofs were introduced 15-20 years ago there were understandably many misconceptions.***

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termines its performance. NCEL has been pursuing research to establish performance criteria for sprayed PUF roof systems. Important properties — e.g., coating adhesion to the foam, impact resistance, moisture resistance, and the coating tensile properties — are monitored as the systems age. When tests are completed, an attempt will be made to correlate the results with the systems performance and, if possible, establish performance criteria for specifying new systems.

In an era of escalating energy costs, one of the most important characteristics of a PUF roof is its excellent insulating properties. The excellent insulating efficiency



Application of Elastomeric Coating Over Foam.



Spraying Polyurethane Foam.



Spraying Polyurethane Foam on Metal Roof Deck.  
(U.S. Navy photos)



Application of sprayed-in-place polyurethane foam on the Tacoma Dome, Tacoma, Wash.  
(Photo courtesy of United Foam Contractors Association)

of PUF can be attributed to the capture of the fluorocarbon blowing agent in the closed cells during the formation of the rigid foam. This provides an initial thermal conductivity (k-value) of 0.11 to 0.14 BTU/hr-ft<sup>2</sup>-°F/in., the lowest k-value for any of the common insulating materials. However, concern has been expressed that the thermal conductivity will decay as the PUF roof system ages and the fluorocarbon gas migrates from the cells and is replaced by air. NCEL has investigated this aspect of sprayed roof systems by collecting over 60 samples of weathered PUF roofs from five different geographical areas in the U.S. and Pacific areas. These samples, which varied in age from 1 ¼ to 1 ½ years, were returned

to the Laboratory and their thermal conductivity determined. Results are summarized in Table 1. These data generally validate the value given for aged PUF in the ASHRAE Handbook,  $k = 0.16$  BTU/hr-ft<sup>2</sup>-°F/in. Even when the k-values increase above 0.16 BTU/hr-ft<sup>2</sup>-°F/in., it is still equal to or better than most insulating materials.

One aspect of PUF roof systems that has gained much notoriety is their fire safety properties. Foam roofing material will burn like any other organic roofing material. Most building codes consequently require a Class II

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# Foam Roofs

continued

foam, or better, i.e., a flame spread of 75 or less when tested in accordance with ASTM E-84 or Underwriters Laboratories (UL) 723. A more important consideration is the fire safety characteristics of the total sprayed foam system as determined by UL or Factory Mutual (FM) testing. The authors contend that sprayed PUF roof systems should meet the same UL or FM fire safety criteria as conventional roofing, i.e., FM Class I, or UL 790 for top of the roof fires and UL Subject 1256 (Roof Deck Construction Classification-RDC) for fires originating within a building.

There are numerous foam roof systems with a UL 790 classification. However, there has been concern about applying foam directly to metal decks because of poten-

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***With a minimum of maintenance, and periodic recoatings, a polyurethane roof should last at least 20 years.***

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tial propagation of fire within the building by the off-gassing foam as it burns. NCEL has conducted a great deal of fire testing of foam roof systems applied directly to metal decks at Underwriters Laboratories. These tests have been most successful. Results have shown that the fire safety of PUF roof systems applied over metal decks is comparable, if not better than, fire acceptable insulated built-up roof systems on metal decks. One additional advantage of foam in such a fire is that it does not melt and drip into the fire. Foam merely decomposes in place as it burns.

The NCEL tests at UL have resulted in more than 35 PUF systems classified under RDC No. 136 for use over Butler metal decks, and 10 systems under RDC No. 181 for use over corrugated metal. Additional systems are

now being classified for direct application over fluted metal decks.

## Roof Decks

As previously noted, PUF roof systems have been used successfully over virtually every type of roof deck, including wood, concrete and metal decks, and over existing dry built-up roofs. Each has its own peculiar requirements for a satisfactory job.

As the most basic rule for a satisfactory substrate: **PUF should not be applied directly over a wet BUR.** Such an application will lead to early failure.

PUF systems have been used successfully over roof deck slopes from vertical to dead level. They are particularly useful on roof decks that have special configurations and in some cases may be the only system that can satisfactorily waterproof such roofs. Although PUF has been used successfully on flat roofs, there have also been many problems. In many cases, these problems can be attributed to improper materials, improper application or application over a wet conventional roof system. However, application to dead level roofs or roofs with serious ponding water problems leaves little margin for error regardless of the type of roof system. A minimum slope of at least 1/4 inch per foot is always recommended. Where ponding water may be a problem, a high quality impermeable coating rather than a permeable coating should be used.

Vapor retarders may also be required for PUF roofs. A good rule of thumb is to use a vapor retarder under a PUF roof if it appears to be required for a conventional roof system.

## Application

There is no substitute for the proper application of a PUF roof system. Proper application is easily accomplished by an experienced foam mechanic. There are a few cardinal rules, discussed below.

All necessary repairs to the existing roof or roof deck should be made prior to applying primer or foam. Prim-

## Foam Group Says Future Bright

**O**ur industry is seeing an upturn in business right now.

As is the case with the entire construction industry during these rough economic times, we have experienced a slump in new roofing and new interior wall insulations.

However, we have seen our membership and our industry suppliers become more aggressive in their marketing approaches and in their specification written and in conceptualizing sales, to the end that our industry has not seen the dramatic decline that some other industries have experienced.

Furthermore, due to the diversification of the spray-applied poly-

urethane foam insulation industry, we have seen our members supplement their businesses with jobs other than roofing — such as with more and diverse tank work, packaging, cold storage, and insulation work in the oil, aerospace and nuclear power fields.

Hubert Coon, president  
Urethane Foam Contractors  
Association

Location	Permeable Coatings		Number of Samples		Imperm. Coatings		Overall Average		No. of Samples
	Average				Average				
	k-value	Age (yrs)	Perm.	Imperm.	k-value	Age (yrs)	k-value	Age (yrs)	
CLIFTON, N.J.	0.170 ± 0.010	5.0	8	8	0.146 ± 0.008	5.0	0.158 ± 0.015	5.0	16
DENVER, CO	0.191 ± 0.012	7.1 ± 2.9	5	2	0.180 ± 0.016	10.1 ± 0.5	0.188 ± 0.013	8.0 ± 2.8	7
SUBIC BAY, R.P.	0.175 ± 0.013	5.2 ± 1.0	6	—	—	—	0.175 ± 0.013	5.2 ± 1.09	6
GUAM, M.I.	0.195	5	1	—	—	—	0.191 ± 0.005	8.3 ± 2.9	3
PORT HUENEME, CA	0.153 ± 0.024	5.0 ± 2.4	17	11	0.165 ± 0.017	6.6 ± 0.9	0.154 ± 0.021	5.7 ± 2.1	28
TOTAL	0.164 ± 0.023	5.8 ± 3.4	37	21	0.156 ± 0.017	7.3 ± 3.0	0.163 ± 0.022	5.8 ± 2.1	60

TABLE 1: Average k-Values and Ages of Weathered PUF. (k = BTU/hr-ft<sup>2</sup>-°F/in.)

ing may or may not be required depending on the job circumstances. Although foam has excellent adhesion to most substrates, wood or concrete may require priming for waterproofing, metal may require an anticorrosive primer, and a BUR membrane may be primed to encapsulate any residual material not removed during the cleaning operation. When primers are required, they should be those recommended by the foam manufacturer.

Prior to priming or foaming, the roof deck or substrate should be properly cleaned of all dirt, dust, oil, grease, ice, frost, or other contaminants. One of the most fundamental requisites in the successful application of sprayed urethane foam is that the foam be applied only to a dry surface. The rule is absolute, because freshly sprayed foam reacts very vigorously with liquid moisture.

During the foaming operation, all applicators should wear rubber-soled, flat heelless shoes to prevent damage to the foam prior to reaching its optimum properties. Also while foaming, improperly metered or other poor quality materials should not be sprayed on the roof when adjusting equipment. Such materials should be sprayed into disposable containers and removed from the roof. If equipment malfunction occurs during the spray operation, resulting in an improperly proportioned mixture, the poor quality foam must be removed and the area refoamed.

Probably the greatest disadvantage of the PUF system is its high dependence on weather conditions. PUF should not be applied under the following conditions:

- when rain is imminent
- when roof surface is above 120°F or below 50°F
- when wind speed exceeds 12 mph (unless wind-screens shield the spraying area)
- when wind speed exceeds 25 mph (with wind-screens)

when substrate temperature is within 5°F of dew-point temperature

Observance of the above rules is required to keep the chemical reaction unaffected by moisture, by retardation at low temperature or acceleration at high temperature. Thus the limitations on ambient temperature and application during precipitation. Excessive wind speed can ruin surface texture and cause overspray. Moisture and overspray are the most common causes of interlaminar blistering.

Inflating an airbag over the roof, to promote a controlled, isolated environment is another way to avoid weather-caused problems.

Because of the sensitivity of freshly applied foam to liquid moisture, some believe that foam cannot be satisfactorily applied in a humid environment, such as the southeastern part of the United States or in tropical areas. The authors disagree; they have seen many fine PUF roofs in humid areas. The key to humid-climate PUF construction is the last rule listed above: assuring that dew-point temperature is at least 5°F above substrate temperature during application. Otherwise, moisture on the surface being sprayed will impair foam quality.

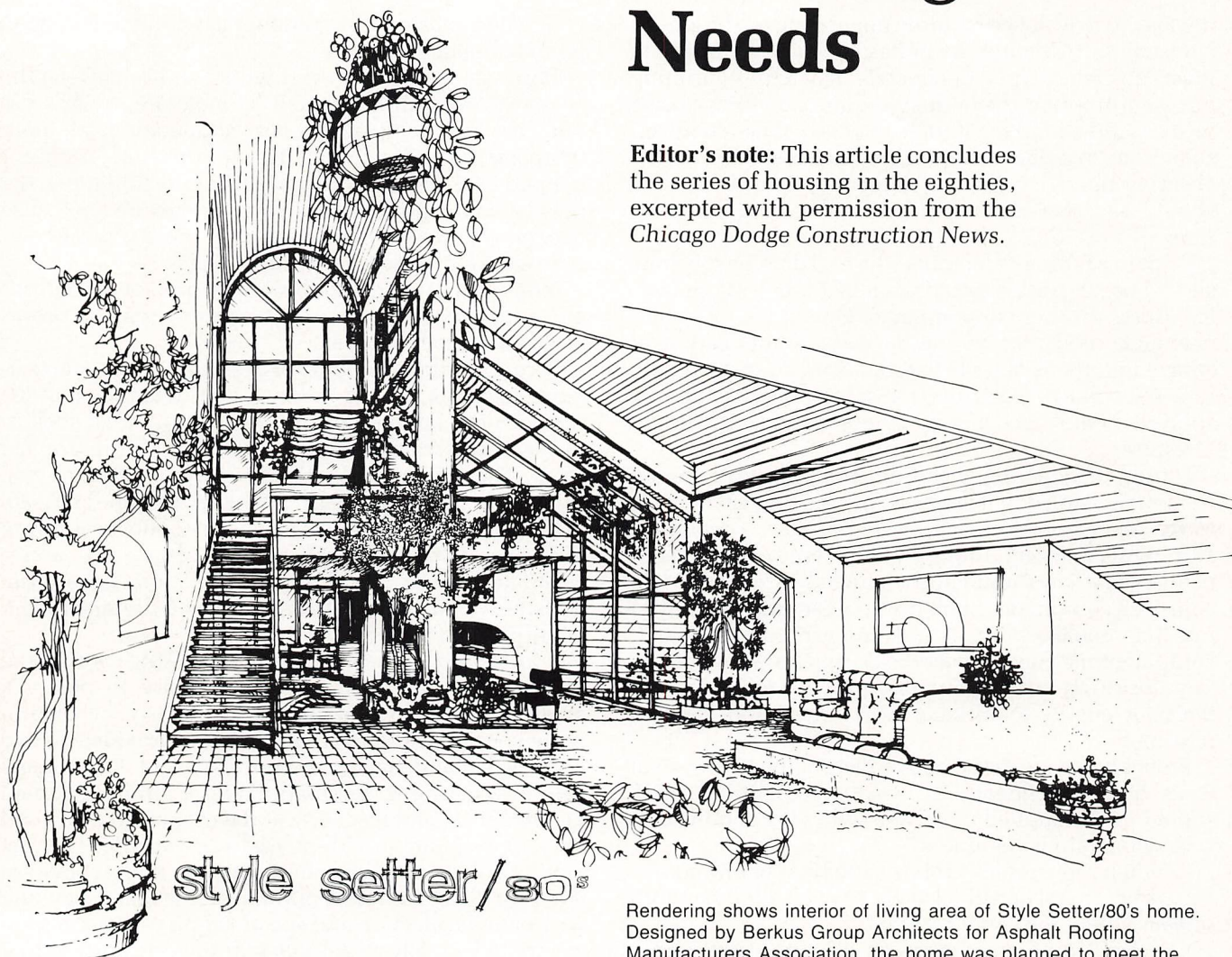
Information has been presented detailing many of the procedures and requirements necessary to obtain a good, durable foam roof. Sprayed foam roofs, when properly specified, properly applied and provided with a low-level maintenance should last eight to 12 years before recoating is necessary. With a minimal annual maintenance, and recoating at the proper cycle, a good foam roof should provide at least a 20-year life. The vast majority of the recommended practices given above are not difficult to institute. Following these practices along with careful selection and specification of materials appropriate for a job, PUF roofs will provide outstanding service.



How Soon The Revolution?

# Housing Industry Changes To Meet Growing Needs

**Editor's note:** This article concludes the series of housing in the eighties, excerpted with permission from the *Chicago Dodge Construction News*.



style setter/80<sup>®</sup>

Rendering shows interior of living area of Style Setter/80's home. Designed by Berkus Group Architects for Asphalt Roofing Manufacturers Association, the home was planned to meet the lifestyle of the coming decade.

Leopold A. Goldschmidt is president of Wildrose Springs Inc., a developer/builder in the Chicago area. Goldschmidt is a professional city planner and has done consulting work throughout the United States for federal, state and local governments. His education includes a master's degree from the University of Chicago; post-graduate work in economics at the University of Copenhagen, Denmark, and studies at Denmark's Royal Academy of Architecture. Goldschmidt is the author of numerous reports, articles and speeches.

**T**he savings in time and money would be substantial if workers stayed at home because of advancements in in-house computer hookups to the central workplace.

Consider the recent increases in the cost of public transportation, the rising cost of maintaining streets, highways and expressways — most of which are sized to accommodate rush-hour traffic — and the private costs of car ownership.

The conclusion is clear: rush-hour traffic consumes a disproportionate share of our transportation expenses and of our personal time.

Obviously, there is disagreement as to how soon improvement and change will take place, and to what extent the electronic revolution will shape our lives in the immediate future.

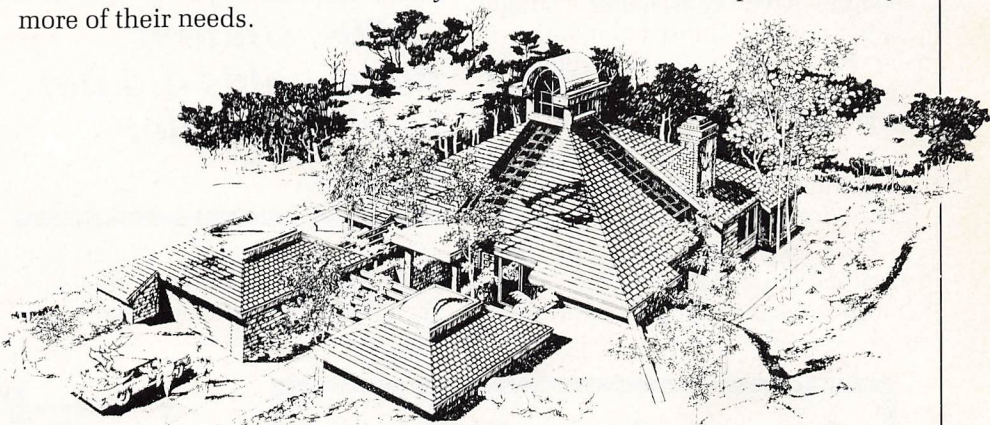
After all, people do have social needs and seek the companionship of family, friends and business associates. Work is more than a means of making money; it is also human contact. Besides, we still feel unaccustomed to computers, video screens and other electronic gadgets. We like to see things on paper, to hear a human voice and see a human face.

Nevertheless, the electronic revolution will offer new opportunities and alternatives. We face new, legitimate questions: Do we really need to commute during rush hour to distant places of work five days a week? How much of our entertainment do we want to come directly in-

to our home?

There is evidence that people are beginning to take advantage of new opportunities and alternatives. Beginning in the 1970s more families moved to rural areas and to small towns on the outskirts of metropolitan areas. The U.S. Census Bureau expects the trend to continue, resulting in increased distances between home and work, and between home and other activities.

As people move farther out, they will do more things at home. They will look to their homes to satisfy more of their needs.



Style Setters/80's home, sponsored by the Asphalt Roofing Manufacturers Association, incorporates many features expected in homes of the future. Designed to house two or more unrelated families or adult households, the Style Setter emphasizes contemporary architecture, innovative energy conservation techniques, exceptional recreational amenities and fire-resistant roofing of three-dimensional fiber glass-based asphalt shingles. The house, located in Upland, Calif., was designed by Berkus Group Architects and built by Lewis Homes.

## Larger Homes Trend

Demographics will reflect favorably on the housing industry. We believe the average family size will increase during the 1980s. We also believe that as the baby-boom generation matures, it will trade up to larger homes in the tradition of previous generations.

We are not even convinced that smaller households lead to smaller homes. Throughout the 1970s, there was a steady decline in the average size of households. There were more single-person households, more single-parent households, and families had fewer children.

Thus, while the U.S. population increased by some 23 million people, total households increased by 20 million, almost one new household for every additional person.

This decline in average household size is often cited as a reason for the observed decrease in size of the average home during the past two years and for more decreases to come.

We look at the record of the 1970s, however, where a steady decline in average household size was accompanied by a steady increase in the size of the average home. For most of a decade, smaller households did not lead to smaller houses.

Indications point to a new trend toward larger households. The 36 million women of the post-war baby-

boom generation are reaching child-bearing age. In fact, demographers tell us that another baby boom is in the wings.

A second phenomenon of the 1970s was a dramatic jump in the divorce rate, from 20 percent of all marriages at the beginning of the decade, to 40 percent at the end. It follows, logically, that every divorce splits a household and produces a demand for at least one additional housing unit.

In any event, people will expect more from their homes in the years to come, and more activities will take place there.

## Affordable Homes

This conclusion brings a final question: How are people going to af-

continued on following page

# Housing

continued

ford such homes? Often the analysis starts with a comparison of rising incomes with rising housing costs. It continues with the observation that housing costs have increased faster than incomes, and ends with the conclusion that more families are being priced out of the housing market. A corollary conclusion is that the single-family home is dead; only a small and wealthy minority can still afford it.

Although this has been a typical conclusion for some twenty years, people have consistently bought larger homes — mostly single-family homes — often at high mortgage interest rates and with more amenities attached to them.

There are several possible explanations for this apparent contradiction.

First, two-thirds of all American families already own a home. During most of the past decade, the value of

these existing homes has increased faster than the cost of new homes. Comparisons of incomes with housing costs have typically ignored assets — the large and increasing equity that most people have in the home they already own.

We have also noticed a dramatic change in the way young people organize their lives. The procedure in the past was to get married early and have children immediately. Now it

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**For most of the 1970s, smaller households did not lead to smaller homes.**

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seems that the couple's primary goal is to establish themselves financially. Often, both husband and wife

have a job, and the combined income of these families tend to be substantially higher than those of one income families.

One of their first goals is the purchase of a home. The initial purchase may be a one- or two-bedroom condominium, but once they have climbed on the bandwagon of home ownership, the couple will emulate previous generations and trade up.

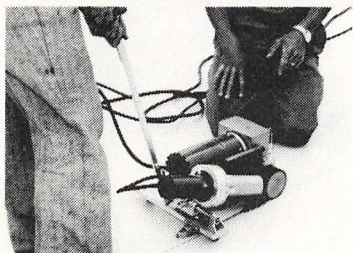
We may also see a new trade-off between housing costs and transportation costs. If used to be that people had large cars and small homes; now they tend to have smaller cars and live in larger homes. As more activities take place at home, there may be less of a need for multiple car ownership, and we may again see the one-car family.

Finally, it appears that many families are prepared to make extraordinary sacrifices to reach their goal of

continued, page 42

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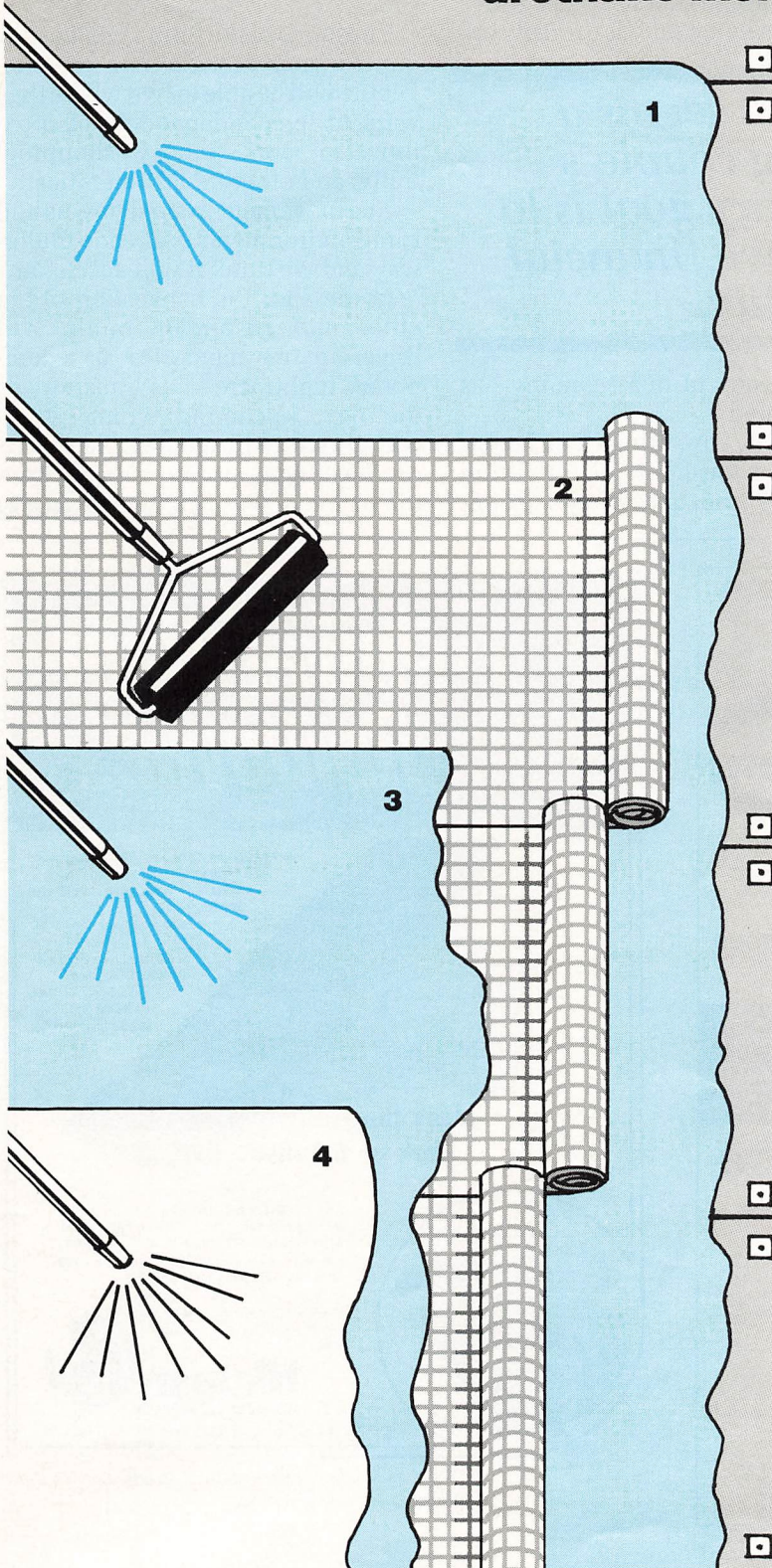
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# Housing

continued from page 40

home ownership. No matter how high the initial mortgage payment, they continue to believe that inflation will bail them out. They also believe that buying a home has always been a good move regardless of interest rates low or high, mortgage funds easy or scarce, inflation, up or down.

People realize that a home is not only a comfortable place to live, but also a good way to save for the future. The home is the only investment you can occupy while it appreciates in value.

## Future Looks Bright

We see a bright future for the housing industry... long range, that is. In the short run, the picture is cloudy.

The upwardly mobile, well-to-do family which tends to buy the larger home is not likely to be in the market under current economic conditions.

High interest rates, the specter of high unemployment, temporary economic hardship and an overwhelming sense of uncertainty are not conditions conducive to making a major financial commitment required for the purchase of a new home. A real increase in home sales is unlikely un-

**Now it seems a young couple's primary goal is to achieve financial stability.**

til confidence in our economy has been restored.

In the long run, things look better. We believe the home of the future will benefit from technology, not on-

ly from the electronic revolution, but also from improved techniques such as self-contained, individual water and waste-treatment facilities, and the home as its own source of electric power via the sun, wind, or whatever.

The home of the future will bestow on its owner a totally new freedom. People will be able to live where they want to live, independent of proximity to work, school, shopping, traffic and other urban amenities.

The movement to small towns and rural environments is already underway and we think it will accelerate.

In the end, the congestion of big cities and rush-hour traffic will linger in our memories as a temporary nightmare — as transitory as the next upcoming winter storm which we will contemplate surrounded by electronic marvels from the inside of our own homes. ☺☺☺

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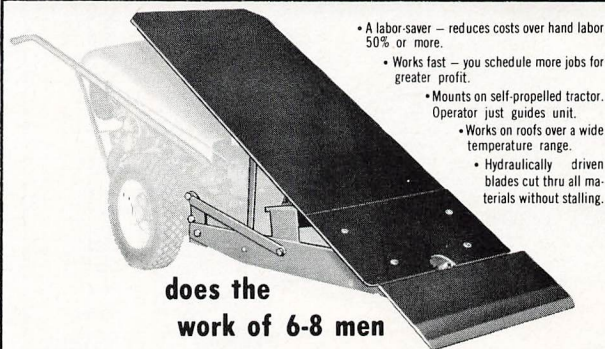
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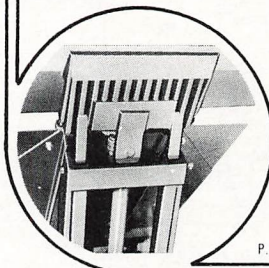
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**B**ecause of the rapid growth of the elastoplastic market in the United States, contractors have many questions that need to be answered concerning the benefits and drawbacks to the various single-ply products and methods of installation.

With that objective, the "Elastoplastic Rap Session" was held at NRCA's 96th Annual Convention & Exhibit in San Antonio last February.

Cyril Tilsen, Tilsen Roofing Co. of Madison, Wis., was moderator of the panel that included Andrew Adler of Eagle Roofing Systems Corp., Dallas, Tex; Kurt Carlson of Roofing Systems, Inc., Loves Park, Ill; William Kugler of United Materials Inc., Denver, Colo. and John Van Wagoner of Prospect Industries, Inc., McLean, Va.

The session opened with a series of slides, vividly depicting the results of poor installation and materials. Examples of proper workmanship and quality products provided an effective contrast. Factors to consider when choosing single ply were also covered in the slide presentation.

During the question and answer period, discussion focused on four areas: fastening procedures, performance requirements, roof traffic and moisture damage.

A Washington state contractor asked about the plate-bonding system of fastening. This led to a discussion about elastoplastic fastening in general.

Adler explained the difference between plate bonding and direct fastening.

"In plate bonding, the rubber sheet is attached by adhesive to a plate system, with nothing penetrating the membrane," Adler said. "The strength of the adhesive is the only cause for concern."

He explained that a frequent problem with direct fastening through the sheet is that the system is "being used on lightweight decks which can't withstand the weight of ballast. This is where we have our most serious deflections."

Adler cited an example of the deflection problem occurring when a bar fastening system is used to fasten the membrane to the deck.

"One manufacturer places a bar

# Contractors Talk Single Ply At Convention Rap Session

down (over the seams) and uses caulking underneath between the sheet and the bar," he said. "There was rooftop traffic, and the deflection caused the caulking to break loose from the membrane."

When exposure of this type occurs, leaking is possible.

Kugler questioned the compatibility between a non-inert substance and fastening.

"To take an elastomeric sheet and rigidly attach it — adhere it to the deck — does not make a great deal of sense," Kugler said. "It makes some sense if you have a wind condition or a weight condition, but the cost of that system compared to a normal-adhered system or modified bitumen is very expensive."

Choosing the material to use, elastomeric, plastomeric or modified bitumen, then selecting partial adhesion or loose-laid and fastened around the edges, are major factors in the roofing decision.

How can the contractor be assured of quality products before using them? Are there any manufacturer guarantees?

Adler explained that there is no way to classify single-ply due to the vastly different chemical composition of each material.

"A manufacturer will not suggest that he's in any particular category," he said. "You can group asphalt into Class I, II, or III, but you just can't do that with elastoplastics."

Van Wagoner suggests that contractors follow the procedure outlined in NRCA Bulletin #12: Take a sample of the membrane shipped to the job site, label the sample and save it. Then, if problems occur later, a control sample is available for comparison.

ASTM is presently developing criteria for vulcanized, nonvulcanized and polyvinyl chloride (PVC) materials.

"Once ASTM comes out with the established standards, then the contractor can go to the manufacturer and ask if his materials meet this criteria," Adler said.

Kugler suggests that contractors refer to the *NRCA Roofing Materials Reference & Guide*. "It's your route through that maze of determining if your product meets performance standards," he said.

The *Guide* lists many of the built-up roofing and elastoplastic sheet-applied roofing membrane products currently distributed in the United States. Background data on the materials and a technical section reporting test results based on referenced standards and criteria are included in the book.

Roof traffic damage was also a complaint of the assembled contractors. One commented about pinhole leaks that were caused by other contracting trades, but didn't show up until several years after installation.

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## ***Pre-job conferences could eliminate misunderstandings.***

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"All of us who make a living as a roofing contractor have suffered from the abuses of other trades," Tilsen said.

He recommended preparing a letter to the building owner, warning about roof traffic and the damage that could be inflicted by other trades on a completed roof.

continued, page 46

# On The Roof...

## “Kid Proofing” Schools A Major Task

A roof suffers many dangers. There's the broiling heat of summer and the brittle cold of winter. And then there's rain, snow and hard-hitting hailstones that can make a roof look like a relief map of the moon.

But, for the roofs on the schools in the Shawnee Mission, Kan. School District there's one threat that tops them all — the kids.

“Kids are very proprietary about their schools, and view them as places where they can do as they please — especially after hours,” Tom Carbajo, school district engineer said. “As a result, kids here have held midnight parties and even staged bicycle races on school roofs — with predictable results.”

Looking for a roofing system that could withstand this grueling punishment led Carbajo to Derbigum HPS, a modified bitumen elastomeric system from Owens-Corning Fiberglas Corp.

“I found that Derbigum could replace the worn out membrane and at the same time keep the good R-values without reinsulating, providing the existing insulation had not suffered moisture damage,” Carbajo said.

This was Carbajo's first experience with Derbigum. Choosing the roofing material was what he calls an “educated gamble.”

“We restored several roofs and waited, in some cases two winters,” Carbajo said. “They haven't changed since the day we left the site.”



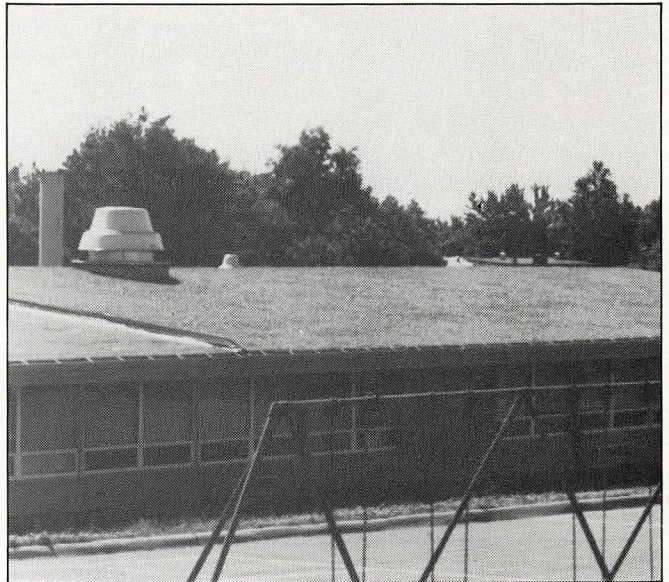
Derbigum, a modified bitumen system from Owens-Corning Fiberglas, is torched on to one of eight schools in the Shawnee Mission, Kansas School District.

In all, the district recovered eight schools with Derbigum. A single ply of Derbigum was torched on to each after first removing all existing gravel, repairing the old roof membrane as required and, when necessary, removing wet insulation and deteriorated felts.

The versatility of the Derbigum system proved to be an added advantage for the school district. They found the membrane could be laid over a variety of substrates.

The Derbigum could also be adapted aesthetically to the different environments the schools were in by having different top coats applied. Some roofs were left uncoated while other featured flood coat and gravel, color coating or mineral shield mastic with 3M granules.

The schools were reroofed by NRCA member firm Sellers & Marquis Roofing Co. The company is an approved Derbigum contractor and has applied over 12,000 squares of Derbigum in the greater-Kansas City area.



The Derbigum membrane on the Brookwood School in Shawnee Mission, Kansas was sprayed with cold mastic and beige mineral granules to match the building's brick.

## Roof System Rolls Out High Thermal Value

Reroofing a South Carolina grade school couldn't have been more elementary for NRCA member firm Space Roofing and Sheet Metal, Columbia, S.C.

By using Manville's new Fes-Core™ high thermal roof insulation and SPM Mechanically Fastened single-ply membrane, the roofing company was able to get the job done with a minimum of time, manpower and equipment.

"Because it is a composite, Fes-Core installs in one step," Glen Mosser, Jr. vice president of Space Roofing explained.

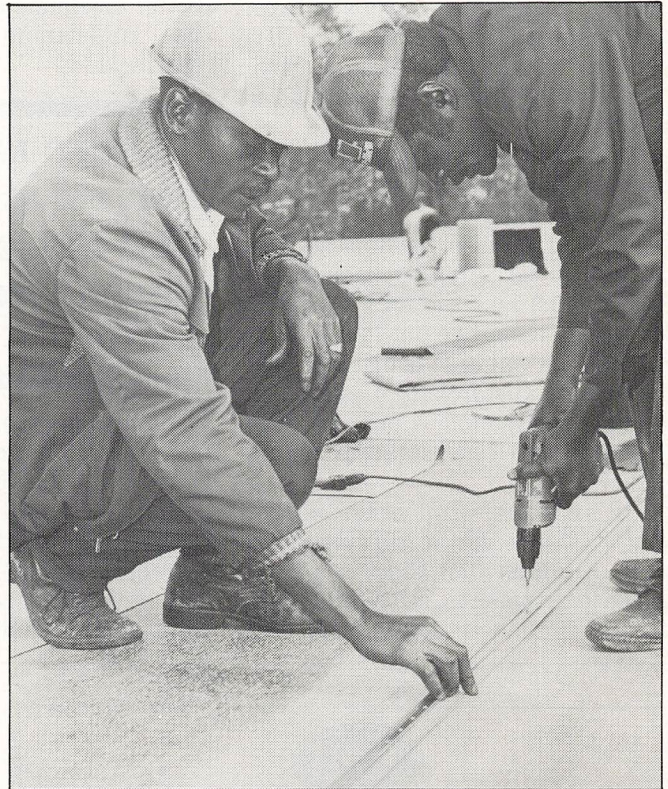
Fes-Core consists of a core of rigid polyurethane foam between two layers of Fesco® Board, and expanded perlite insulation material.

The reroofing specifications called for high thermal value insulation because of the school board's plans to install an air conditioning system at the school.

Space Roofing started the 280-square job with a complete tear-off of existing materials to reduce the weight on the wood plank deck. After removing all the attic vents, panels of Fes-Core measuring three feet by four feet were mechanically fastened to the deck with staggered butt joints.

The SPM was rolled out over the insulation in sections as large as six feet by 100 feet. The membranes were attached by placing an SPM anchor bar along the full length of each seam and screwing fasteners through the membrane and insulation and into the wood deck. An eight-inch wide SPM cover strip was adhered over the length of the seam for added waterproofing.

To finish the job, SPM bonding adhesive was used to attach the SPM to the top and inside wall of the roof's parapet.



Manville's SPM was installed by placing an SPM anchor bar along the full length of each seam and screwing fasteners through the membrane and insulation, and into the wood deck.

## Shakey's Newest "Topping" Is Spunbonded Polyester

Shakey's Pizza has chosen DuPont's "Reemay" as its favorite topping.

The pizza chain, oldest in the United States, is specifying DuPont's spunbonded polyester roofing fabric for all its restaurants built or reroofed after January 1, 1983. The specification applies to all company-owned pizza parlors and serves as a guide for other Shakey's locations owned and operated under license or franchise agreements.

"Reemay" and cold mastic are suited to our type of business because the process produces no fumes," said Timothy Purpura, Shakey's director of construction. "Our customers can come and go and not even know men are working up there. It's clean, safe and fast."

"Reemay" is a high-strength, light-weight fabric made from continuous 100 percent polyester filaments bonded by heat and pressure. It's used with

cold mastics in built-up roof systems.

Shakey's decided to specify "Reemay" after successfully reroofing five pizza parlors with a sister product of the fabric called "Sontara."

According to Purpura, specifying a "Reemay" or "Sontara" system for reroofing projects helps hold costs down. He believes the fabrics' fast and easy installation cuts time and labor costs.

Purpura is depending on the resilient toughness of "Reemay" to create long-lasting systems for the restaurants.

"It expands and contracts without cracking as the roof changes dimensions," Purpura explained. "And because it's tougher and more puncture resistant it stands up to heavy roof traffic and resists hail damage."

Purpura already has plans to reroof another half-dozen pizza parlors with "Reemay" this year.

# Single-Ply

continued from page 43

On another subject, Adler said he believes in advance preparation.

"We need pre-job conferences, where you get all of the subs (subcontractors) together and tell them: 'We will not backcharge. If you work on the roof and puncture it, just let us know.'"

Adler thinks that it could be the fear of mounting costs that keep other trades quiet.

"The problem is that most subs are scared of the almighty backcharge, so they just kick the rock back over the problem and go on," he said.

Another topic — the disturbing effects of moisture in elastoplastic single-ply systems — posed a problem with no easy solution for the panel.

"It's a matter of physics," Kugler said. "When you're driving moisture up under that sheet, it has no place to disperse to, so it collects and freezes in the winter and turns back

into moisture, working on the insulation in summer."

The bottom line? "We have to be better designers and help the specifier understand the problems," Kugler said.

***"There is not a perfect system, just like there isn't a perfect human being."***

"The systems are designed by people who are not roofing people and don't know the details. Unfortunately, anyone could do the big part in the middle, but the detail work like fasteners is pretty crucial."

Van Wagoner said one of the great advantages of belonging to NRCA is

sharing information about roofing problems.

He explained how he was given the brush-off by a manufacturer who claimed Van Wagoner was the "only one" to encounter a difficulty with a particular product.

Van Wagoner checked with several NRCA members and discovered this wasn't true.

"When I confronted the manufacturer with the information, he became very negotiable," Van Wagoner said.

When choosing a single-ply system, the roofing contractor should pay particular attention to the products used and the method of installation.

"There is not a perfect system, just like there isn't a perfect human being," Tilsen said. "We can't blame the system when workmanship or lack of knowledge of a system is the culprit."

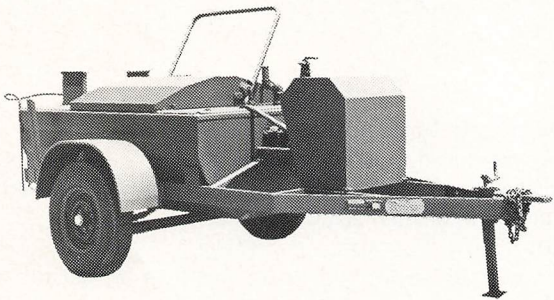


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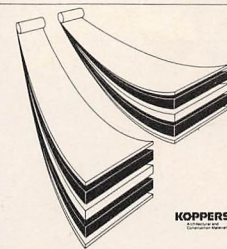
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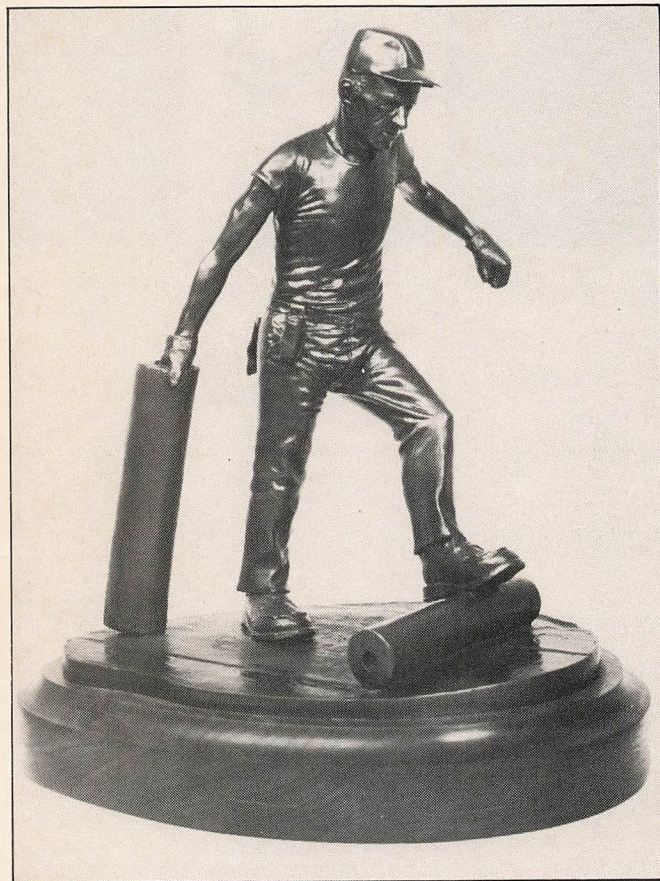
“Louie” A Real Winner

# Foundation Gives Tribute To Legendary Roofer

**Editor's note:** This is a story about a roofing mechanic who, through hard work and personal drive and initiative became a legend in his own time. The trustees of the National Roofing Foundation wish Louis Berube the best of luck in his hard-earned retirement.

The year was 1948. Opportunities for young men and women, willing to put in an honest day's work were luring people from the rural areas of our country to the cities. The post-World War Two building boom was in full swing, and reliable, hardworking men and women were in great demand.

The lure was also strong for a young French Canadian who made his way to the United States to seek a job and earn his fortune. This man, strong in muscle and will,



easily found work on a roofing crew at an Air Force base in the far reaches of Northern Maine.

Starting as an inexperienced helper, the worker quickly developed the necessary traits to become a skilled journeyman. It was said of him, no matter the assignment, the young worker willingly undertook with pride all tasks and accomplished them efficiently and expertly.

Because of his innate ability to organize, lead and accept responsibility, he soon became foreman. Shortly afterwards, he was the lead foreman for the roofing company and an employee to depend on.

A number of unfortunate circumstances forced his employer to close shop, but, after 10 years of dedicated service and experience, it was only a matter of days before the hard-working man was once again employed as a foreman for a new roofing company. It was here he stayed for the next 25 years.

Although it was an old-line company, the new firm was relatively small. But its excellent reputation, among other things, allowed the firm to expand its operations to seven times its original size. The firm's initial secret to growth was due to the foreman's ability at leading and training the roofing crews. In time, the men he trained went on to become foremen of their own crews, imparting the valuable knowledge they learned from the master roofer.

He instinctively anticipated job-related problems before they occurred. It was said that in his 25 years, the foreman had a spotless record in workmanship-related problems. He was indeed, one in a million.

In tribute to this successful roofer leader, and to others like him who have silently been guiding forces in the development of the American roofing industry, a sculpture in his likeness has been presented to the National Roofing Foundation (NRF) from a limited edition casting.

The following individuals have contributed \$5000 each for the “Louie” sculpture — named after Louis Berube, the French Canadian who came to this country 35 years ago:

- Burton Karp, Eagle Moisture Protection Corp., West Hartford, Conn.
- Michael Beldon, Beldon Roofing & Remodeling, San Antonio.
- Eugene Scott, Empire Roofing Co., Chicago.
- John Bradford, Bradford Roofing & Insulation, Billings, Mont.
- William Kugler, United Materials, Inc., Denver.
- John Zamrzla, Western Pacific Roofing Corp., Lancaster, Calif.
- Wayne Mullis, Universal Roofers & Builders, Inc., Phoenix.
- Henrietta Osterholt, Southside Roofing Co., Inc., St. Louis, Mo.
- Thomas Manson, Western Roofing Co., Kansas City.
- Charlie Raymond, Giffen Roofing Co., Miami, Fla.
- Monte Upshaw, Fidelity Roof Co., Oakland, Calif.

In addition to those contributors listed, there is one “Louie” on permanent display at NRCA headquarters in Chicago.



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- **Comprehensive coverages**—Property, liability, automobile, and Workers' Compensation—virtually every coverage you're likely to need.
- **Stability**—This protection is backed by the CNA Insurance Companies, an industry leader that understands the roofing business.
- **Renewal guarantee**—Special alert list protection gives advance warning when a severe loss record endangers insurability. Members have one full year to bring loss experience up to par.
- **Local service**—Your NRCA program provides local claims and loss control services plus the assistance of your local professional agent.

- **Association endorsed**—The involvement of NRCA assures you a direct voice in the program.

Designed specifically for the roofing industry, the NRCA program is the only General Business Insurance your association sponsors.

See why your NRCA-sponsored General Business Insurance Program is the smart answer to your insurance needs. Contact the NRCA Insurance Advisor:

Walter Derk or Dick Lietz  
Fred. S. James  
230 West Monroe Street  
Chicago, Illinois 60606  
1-312/346-3000



The NRCA-sponsored General Business Insurance Program is underwritten by Continental Casualty Company or Transportation Insurance Company, two of the CNA Insurance Companies.



# New Products, Ideas, & Publications

## Dow Now Marketing Insulation System With Built-in Ballast

Effective May 1, Dow Chemical Co. is marketing its XSF-4249 roofing insulation at full commercial sales status.

The design of XFS-4249 incorporates insulation and ballast into one board.

The product is composed of a 3/8-inch factory-applied facing of latex-modified concrete mortar bonded to two or three-inch boards of Styrofoam RM brand insulation.

The two foot by three foot boards feature tongue-and-groove edges.

The insulation weighs only four and one-half pounds per square foot. Dow's XSF-4249 can be used on roof decks with low weight restrictions because it needs no other ballast.

*Check #73 on Reader Service Card*

## New Light-Colored EPDM Lowers Surface Temps

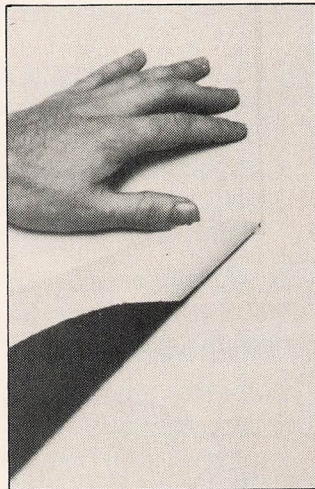
A new, light-colored EPDM membrane from Benoit, Inc. will reduce surface temperature in the summer up to 50 percent.

Sun Shield Ivory is available for both fully adhered and Batten-Fast Benoit systems.

The system includes both cured and uncured matching flashings and tapes, and features sheet sizes up to 40 feet wide.

Sun Shield Ivory carries a 10-year warranty, including discernable color change.

*Check #74 on Reader Service Card*



## Cleaning Made Easy With Water Jet System

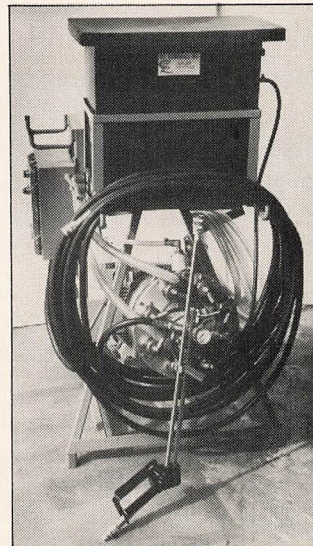
A new compact, lightweight water jet system by CEL Hydraulics, Inc. makes truck, tanker and kettle cleaning a snap.

The water-jetting unit features a Harben diaphragm pump and delivers 10 gallons of water per minute at 5000 PSI pressure. The design permits easy mobility as it may be lifted with a forklift and transported by a truck.

Instead of two men chipping asphalt or tar, one man can clean a 13-ton truck in two days, according to CEL Hydraulics. Asphalt and/or tar buildup can lead to costly repairs of expensive equipment.

For additional information on the water-jetting system, contact CEL Hydraulic Systems, P.O. Box 9779, Atlanta Ga. 30319.

*Check #75 on Reader Service Card*



## Pipe Stands Offered by Miro Industries

The Pillow Block Pipe Stand by Miro Industries, Inc. can be used to support roof-mounted gas pipes, electrical conduit, solar piping and other mechanical piping.

The design of the support absorbs thermal expansion and contraction of the pipe, preventing damage to the roof membrane, Miro claims.

The pipe support stand is rigid PVC with a self-lubricating Teflon base.

The Pillow Block Pipe Stand will accommodate all pipe sizes through four inches.

For a sample of the product, contact Miro Industries, Inc., 1225 Fort Union Blvd., Suite 315, Midvale, Utah 84047.

*Check #76 on Reader Service Card*

## Phillips Fibers Offers New Rufon® Literature

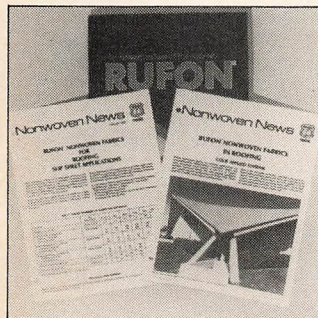
An information kit on Rufon®, a nonwoven fabric used in roofing, is now available from its manufacturer, Phillips Fibers Corp., one of the largest and most diversified producers of needled, nonwoven fabrics in the United States.

The two color folder contains literature and samples that provide information on the characteristics, functions, properties, packaging and roofing applications of this roofing fabric. Three separate "Nonwoven News" publications are included: "Rufon® for Cold Applied Systems", "Rufon® for Stone Separator Mats", and "Rufon® for Slip Sheet Applications."

Rufon® is strong, lightweight, durable and easy-to-handle. Flexible in low temperatures, Rufon® will not separate or delaminate and resists rot and mildew.

Literature packets are available to qualified personnel by contacting: Textile Nonwoven Fabrics Marketing, Phillips Fibers Corporation, P.O. Box 66, Greenville, S.C. 29602.

Check #77 on Reader Service Card



## Polymer Plastics Introduces Fabric Reinforced Roofing System

Polymer Plastics Corp. has capped off its extensive experience in fabric-reinforced installations with the introduction of a four-ply roofing package of fabric and liquid components which it calls "Fibrebrane."

Arthur Noskin, president, said the Fibrebrane system is composed of a core of fiberglass fabric of high strength and dimensional stability embedded between coats of Polybrane 186, which cures to a tough, rubberlike consistency, with a top coat of a new single-component liquid aliphatic urethane called Polybrane 189. The new top coat formulation offers high reflectivity and resistance to weather.

Noskin said installation of the system offers distinct advantages because it employs liquid urethane formulations supplied in single-component form and applied cold. The liquid Polybrane material cures to a tough, seamless membrane which self-bonds to urethane foam insulation and existing roofing and decking substrates. It is self-flashing.

Check #78 on Reader Service Card

## Manville Using High Tech For Glass Mats

Manville Corp. now uses Mettler moisture weighing equipment to produce a durable, fire-resistant fiber glass mat.

A quality glass mat product depends on the manufacturer's ability to measure exact moisture content. With the Mettler equipment, tests determine precisely the amount of urea-formaldehyde binder needed to hold the molten fiber glass compound together.

Test results are then used to accurately calibrate the on-line moisture analyzer.

Prior to using the Mettler system, lab technicians hand weighed the fiber glass mat samples and alternately placed the samples in drying ovens to remove excess moisture.

The Mettler moisture test takes only six minutes, provides consistent results, frees the user from having to make lengthy calculations and removes the opportunity for error, according to a Manville spokesman.

Check #79 on Reader Service Card



## Owens-Corning Wants You To Call The Talking Computer For Insulation Advice

Telephone Tecon and get immediate answers to insulation questions from a computer with a simulated human voice.

Owens-Corning Fiberglass provides the computer service, based on 50 years of insulation economics studies.

Tecon is a system designed to aid in the specification of insulation products and systems to enhance the effective management of energy in an era of high-cost fuels.

In order to plug into the computer, users fill out a worksheet with facts and figures relating to an application. Then a call is placed to Tecon using a Touch-tone phone or adapter. The caller must identify the company and give the inputs for the program selected.

Depending on the inputs — money, material or service factors — the corresponding answers could be economic thickness of insulation in inches, payback period in years and months, savings in dollars per year, or heat loss and surface temperature data.

Then, according to Owens Corning, callers will know in exact numbers how much insulation to specify in order to manage energy resources most cost-effectively.

For more information on the Tecon service, contact the mechanical division of Owens-Corning Fiberglass Corp. at Fiberglas Tower, Toledo, Ohio 43659.

Check #80 on Reader Service Card

# Classified Ads

Place a classified ad in *Roofing Spec* for 50 cents per word. There is a minimum charge of \$20. Boxed or display advertisements are available in the classified section for \$40 per inch (one inch minimum). Ads using blind boxes available at no additional charge to NRCA members; non-members add \$10.00 to total order. Send ad copy and payment to: Advertising Manager, *Roofing Spec*, 8600 Bryn Mawr Ave., Chicago, Ill. 60631

## GUIDE MAKES SPECIFYING EASY

The new *NRCA Roofing Materials Reference & Guide* is the perfect library companion to the *NRCA Roofing and Waterproofing Manual*. The *Guide*, updated three-times-annually, lists important technical data for both BUR materials and single-ply membranes. For more information, contact NRCA, *Roofing Materials Reference & Guide*, 8600 Bryn Mawr Ave., Chicago, Ill. 60631.

## ACQUISITION WANTED

Diversified roofing concern in Northeast New York seeks to acquire medium-sized roofing firm. Primary interest in single-ply operations with strong management to remain. Replies will be held in strictest confidence. Reply to Box 5A.

## MANAGER SOUGHT

Single-ply operations of large, well-established firm in Albany, New York area. Estimating and managing industrial, commercial and institutional projects through completion. Send resume and salary requirements to Box 5B.

## SUNBELT COMPANIES SOUGHT

We have cash to buy roofing and sheet metal companies in the Sunbelt. They must have minimum sales of \$1,000,000 and some profit. Will tailor buyout to suit seller. Send replies to Box 6A.

## HYDRAULIC ROOFING CRANE FOR SALE

Giuffre Stinger Roofer Special Hydraulic Truck Crane, 8 Ton Cap., 74 ft. hook height, 1/2 yd. hyd. clam bucket, 4 sets of nylon belts and many extra's mounted on a 1979 Ford Louisville with 16 ft. steel body 22,000 miles, like new. Want to sell fast \$39,500. Call Don 414/761-2300.

## FOREMEN WANTED

A New England company in Connecticut is taking applications for foremen. Must be experienced in commercial built-up and single-ply roofing. Excellent compensation for the right person. Send written resume to Box 1055, Hartford, Conn. 06143.

## POSITIONS AVAILABLE

We require several "take charge" men who are thoroughly conversant with single-ply installations. Want contact with men who have extensive hands-on experience with lay-out and installation of single-ply elasto/plastic roofing as pertains to large industrial and government reroofing applications. Outstanding opportunity for sincere, mature, well grounded men to secure their future with a company who feels confident and optimistic about the roofing industry. Call or send resume. Let's talk. T.R. Davis, Inc., P.O. Box 9591, Richmond, Virginia 23228. 804/329-1688.

## ROOF MANUAL

Simple condensed language — 40 pages — a big help in passing state exams — 40 pages — measuring — cold process — safety-equipment — details various types of roofing — waterproofing — repairs — etc. \$9.75 post paid — R.M. Co., P.O. Box 986, El Toro, Calif. 92630.

## CRANE FOR SALE

NATIONAL CRANE, 8 ton Model, 94' sheave height, high speed winch, 1980 Int'l 1824 truck, 16' bed, Ideal ROOFERS CRANE. \$46,000. 312/447-3169.

## WORKER TRAINING AID AVAILABLE

The new NRCA audiovisual program — Kettles, Tankers, and Bitumen Heating — is now available. It's the perfect way to train roofing mechanics in the correct usage of kettles and tankers, and the best way to heat asphalt for proper installation. Contact NRCA, Education Dept., 8600 Bryn Mawr Ave., Chicago, Ill. 60631.

## FOR SALE

For Sale: Complete pumping unit — 5th wheel trailer, 185 CFM Sullair compressor, 2-45/1 Graco pumps with 150' of hose each, 600# granule hopper with 150' of hose, ladder and hose racks. 40 Gal. Aux. gas tank. Also one M-B Stripper machine, with a full set of decals. Call Lowe Roofing, Inc., Box 405, Spearfish, S.D. 57783. 605/642-4081.

## PERSONNEL WANTED

IKO, an independent manufacturer of roofing shingles, is continuing to expand its United States markets. We are looking for aggressive, enthusiastic, self-starting sales representatives in many marketing areas to help us to continue with our rapid growth. Applicants should have a strong background in roofing sales. We offer salary, bonus, car, expenses and benefits. Send resume to David Leet, IKO Manufacturing Inc., Hay Road, Edgemoor, Wilmington, Delaware 19809.

## ROOF INSPECTOR WANTED

Roof Engineering, Inc., a consulting engineering firm, has positions open for roof inspectors. Applicants shall have a minimum of ten years experience in built-up roofing and experience in single-ply systems. Applicants shall forward a complete resume to Roof Engineering, Inc., P.O. Box 335, Hobbs, New Mexico, 88240.

## ADVERTISE FOR NEXT TO NOTHING

A classified ad in *Roofing Spec* is the cheapest way to make yourself heard. Sell off unused or unwanted equipment, solicit new employees, look for a new position or just sound off!! Only 50¢ a word, \$40 an inch, and the roofing world is yours.

## PRODUCT PROMOTION MANAGER

Celotex, a major producer of products and materials for the construction industry, has an opening for a Product Promotion Manager in the commercial roofing area to achieve increased market concentration of designated products.

A Degree in Marketing or Business Administration or equivalent training is required, plus 5 to 7 years progressive marketing and salary experience to develop expertise in dealing with architectural firms. Experience must include ability to train sales reps and have demonstrated leadership qualities. Technical expertise in built-up roofing is required.

Complete benefit package. Apply by sending resume, including salary history, to Employment Manager.



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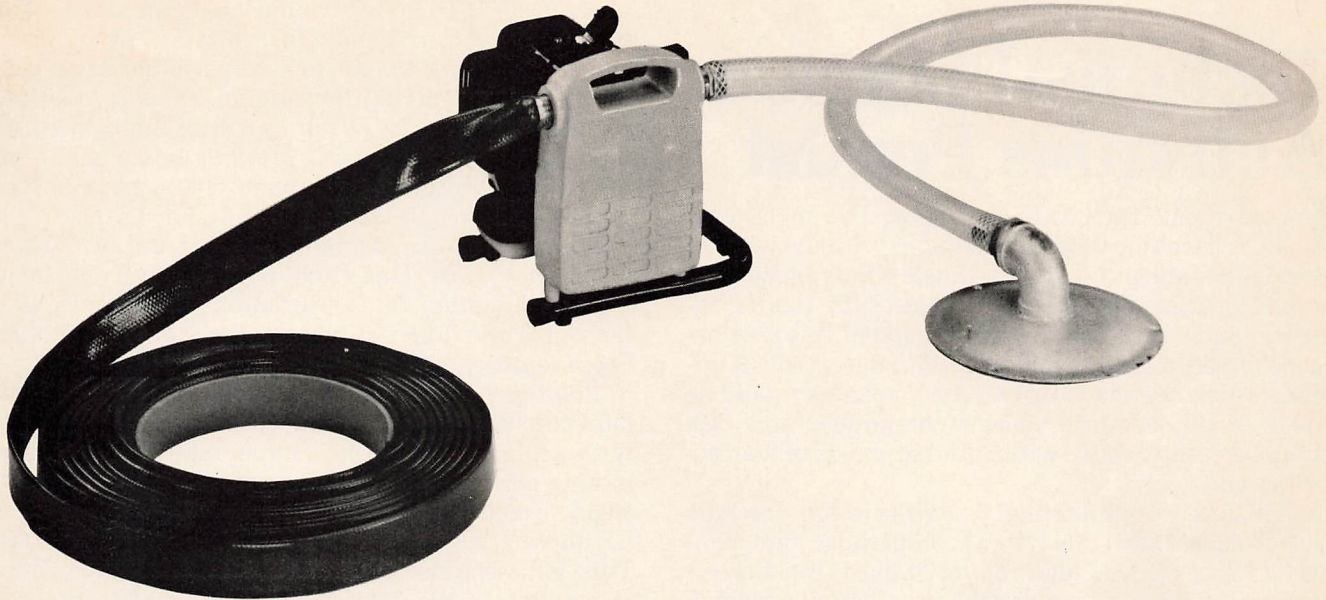
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# Tech Talk

By Bob LaCrosse, CAE  
Director of Technical Services

## Technical Liaison Activities Persist

In previous "Tech Talk" columns, I've mentioned NRCA's technical liaison activities with many other associations and groups to coordinate efforts and resolve mutual problems for the betterment of the roofing industry. Such efforts have been expanded this year because of past accomplishments. With a new NRCA administration commencing on June 1, readers should be clued in on technical liaison committees and task groups presently active with a brief summary of their activities and goals:

□ *NRCA/Air-Conditioning & Refrigeration Institute Liaison Committee:* this group is preparing a joint manual on "Rooftop Air-Conditioning Units" to include recommended construction details, installation, servicing and maintenance to avoid future problems with unit leaks. Also, the Sheet Metal & Air-Conditioning Contractors National Association (SMACNA) may become involved in this effort due to the inclusion of ducts and duct liners in the joint manual.

□ *NRCA-ASTM Coordinating Committee:* This committee, with help from NRCA affiliates, continues to work with the many ASTM committees to protect the interests of roofing contractors and other members. Some of the main concerns are ASTM Committee C16 on Thermal Insulation, Committee C24 on Building Seals and Sealants, Committee D8 on Roofing, Waterproofing and Bituminous Materials, Committee D11 on Rubber, Committee D20 on Plastics, Committee E5 on Fire Standards and Committee E6 on Performance of Building Constructions.

□ *Building Codes Committee:* Although this committee functions within NRCA and was initially established to study existing building codes of national consequence as they relate to the industry and roofing industry practices, close liaison has been established with the Building Code Committee of the Asphalt Roofing Manufacturers Association (ARMA) on revisions to the model building code groups affecting the roofing industry. Also, close liaison has been established with NRCA affiliates in seeking assistance in proposed building code changes affecting roofing contractors in their geographic areas. The affiliates are also assisting on code changes involving the model building code groups, as well as proposed code changes of the city, suburban and state code authorities.

□ *NRCA/Midwest Roofing Contractors Association/The Society of the Plastics Industry EPS Block Molders Group Liaison Committee:* This group developed a re-

search program of field and laboratory studies to evaluate the use of expanded polystyrene insulation (EPS boards) in roofing systems. The study will answer questions raised on the behavioral response of EPS boards when used in both conventional built-up roofing systems and elasto/plastic (single-ply) systems. The study, being conducted by Structural Research, Inc. in Madison, Wis., was initiated in April, 1982 and should be completed in the Spring of 1984.

□ *NRCA/FM/UL/Kemper Liaison Committee:* This committee, consisting of NRCA and MRCA representatives, continues to assist Factory Mutual in revising Data Sheets involving the roofing industry, working with Underwriters Laboratories with relationship to acceptance for products used in roofing assemblies and the Kemper Insurance Company with regard to their Guide for Roof Assemblies.

□ *NRCA Air Force Manual Revisions and BUR Tolerances Task Force:* This group is preparing a revision of a manual written by Construction Consultants, Inc., Detroit. The efforts are continuing directly with Air Force representatives.

□ *Roofing Systems Technical Committee (RSTC):* This joint committee of NRCA and ARMA meets twice yearly to explore areas where mutual efforts can improve roofing performance and make recommendations with steps needed to make such improvements.

□ *Roofing Insulation Technical Committee (RITC):* This joint committee of NRCA and Roof Insulation Committee of the Thermal Insulation Manufacturers Association (RIC/TIMA) also meets twice yearly to develop ways to improve the application and performance of polyurethane insulation in roofing assemblies.

□ *RSTC Joint Task Group on Base Sheet Attachment to Plywood Decking:* This joint task group, with representatives from NRCA and ARMA (through RSTC) and the American Plywood Association (APA), is finalizing details for acceptable BUR applications mechanically fastened to plywood decks to replace solid mopping of base sheets by Factory Mutual, Underwriters Laboratories and other specifying groups. Tests to commence shortly by APA at UL for listing in the UL Building Materials Directory.

□ *NRCA/NBS/RILEM International Symposium on Roofing Technology:* This group is made up of representatives from NRCA, the National Bureau of Standards (NBS) and International Union of Testing & Research Laboratories for Materials and Structures (RILEM). It is preparing and finalizing plans for the International Symposium at NBS in September, 1985.

Other areas where there is important technical liaison activities being carried on by NRCA involve work on Cold-Applied Systems, Joint International Committee on Single-Layer Roofing, International Waterproofing Association as well as work with the American Society of Heating, Refrigerating & Air-Conditioning Engineers, Building Thermal Envelope Coordinating Council and the Construction Specifications Institute, to name a few.

Future liaison involving technical activities are contemplated with the Single-Ply Roofing Institute, Roof Coatings Manufacturers Association and The Asphalt Institute.



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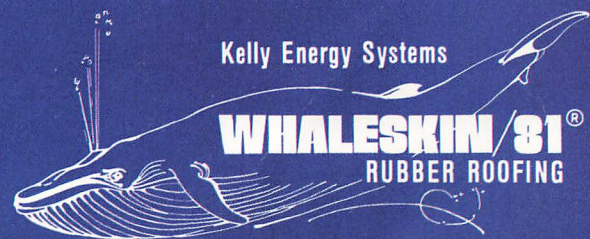
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