May 1981

the roofing spec

National Roofing Contractors Association

$2.00

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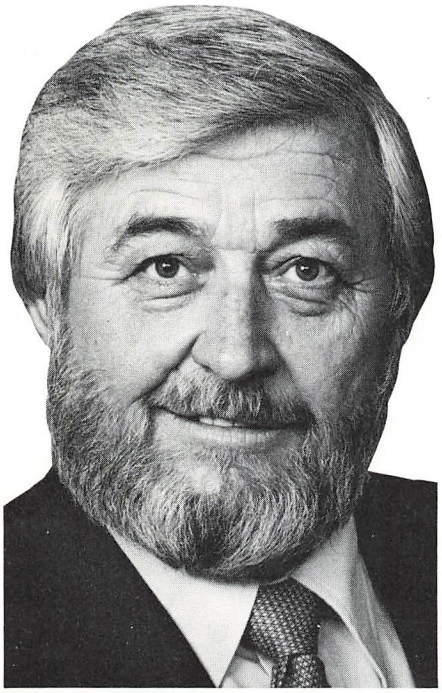

"The Conglas Conshield System readily adapts to both new and maintenance roofing. Conshield has allowed our company to expand its offering of quality cold process applied roof assemblies. The use of heavy 35 lb. fiberglass sheets has provided us with a system that is easily applied with a smooth, clean appearance. We'll promote Conshield at every opportunity."

George Dillingham

President
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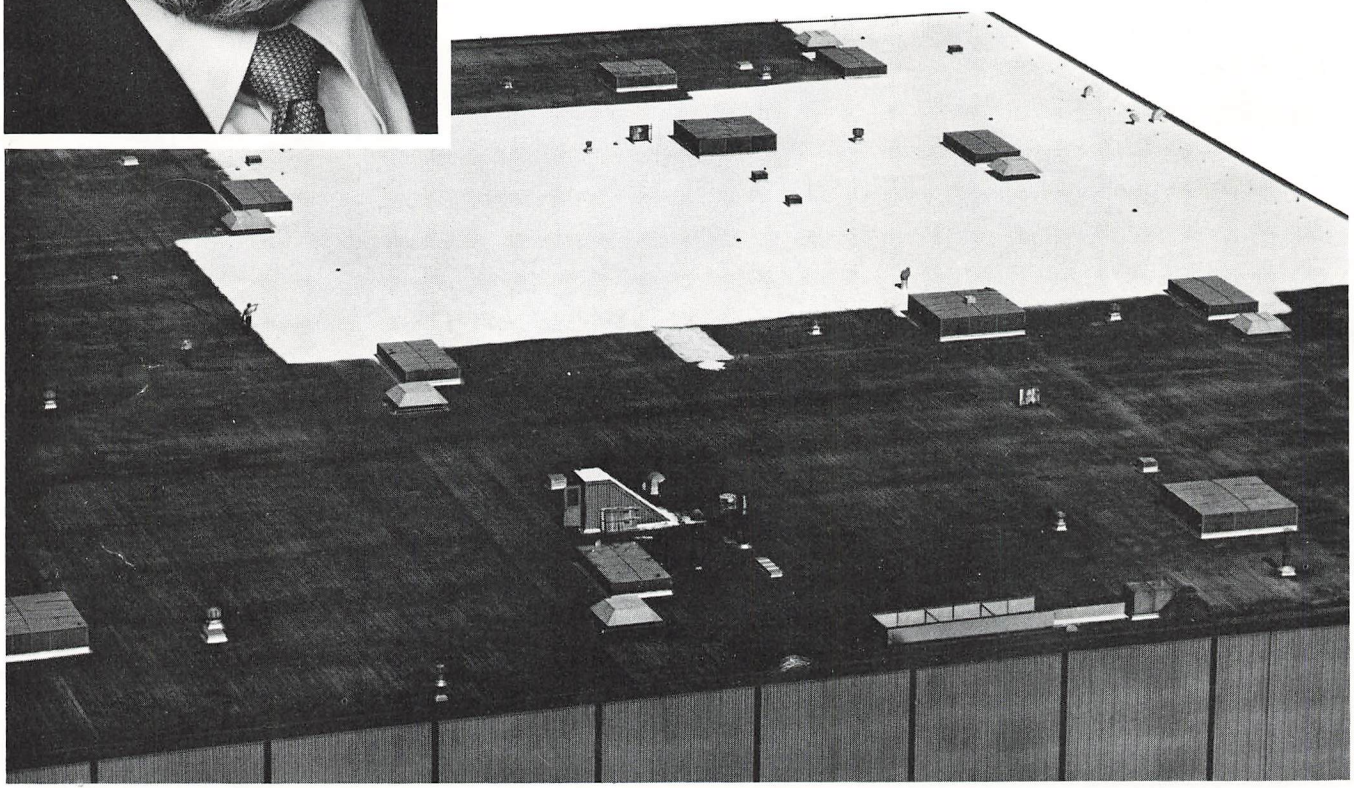
Los Angeles, California



Conglas Conshield Roofing System being applied to the roof of Northrop Aircraft Division Building in Southern California.

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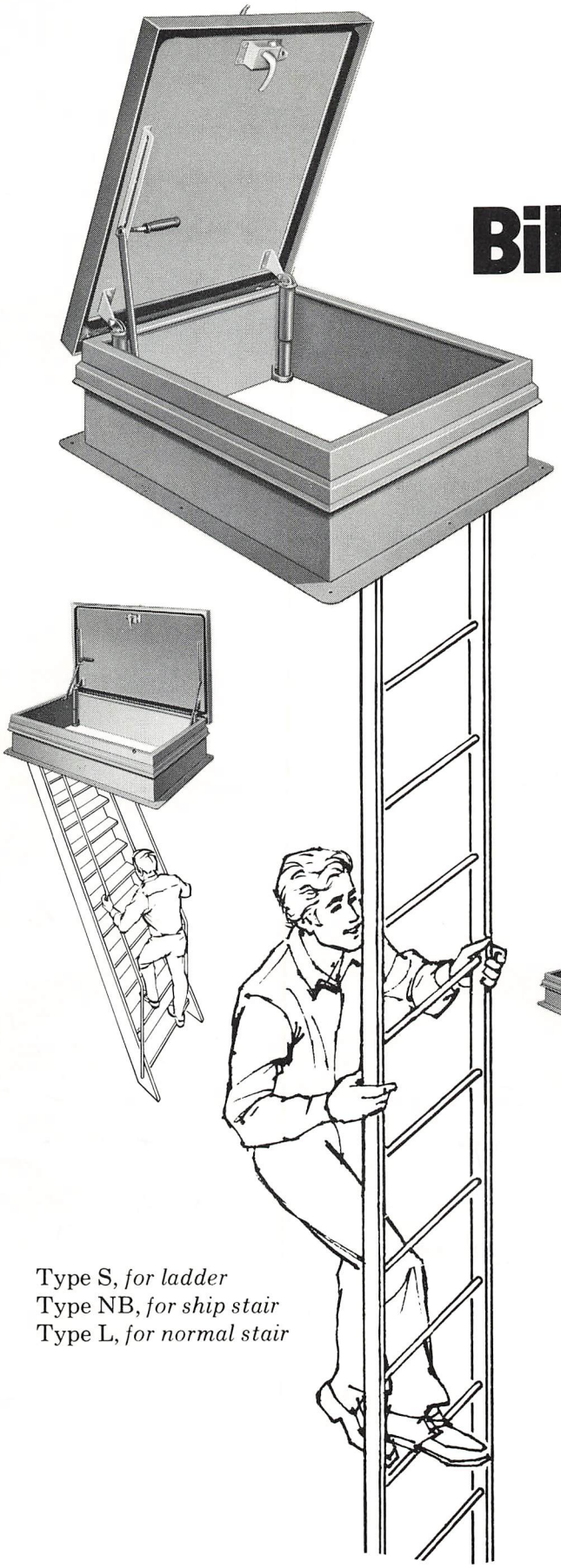
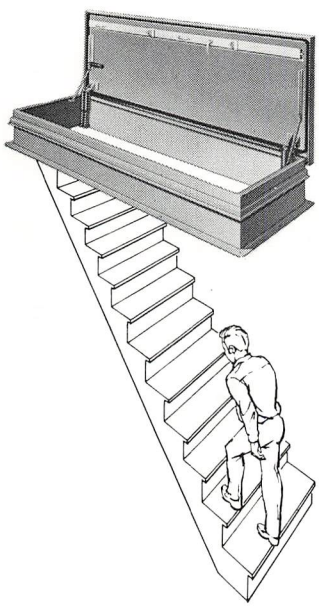
The standard of the industry.



Type S, *for ladder*
Type NB, *for ship stair*
Type L, *for normal stair*

When your specifications call for performance proven Bilco roof scuttles you are specifying the brand that assures lasting satisfaction for your client. Good design, rugged construction, and smooth, easy operation are the qualities that have firmly established Bilco roof scuttles as the standard of the industry.

The Type S Scuttle, for ladder access, is an example of our concern for building quality and value into every Bilco product. Constructed of heavy gauge material, it is insulated and gasketed for complete weathertightness. In operation, compression spring operators float the cover upward and it locks automatically in the open position. The convenient operating handle affords effortless one-hand control in closing and latching the cover while the other hand remains securely on the ladder.



Standard sizes in steel or aluminum for ladder access, ship stairs or normal stairs are always in stock for prompt shipment. Special sizes are also available in single leaf or double leaf design.

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Their value is measured by the satisfaction they give.

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At last.

Tough, Class-I, single-ply roof insulation that weighs next to nothing.

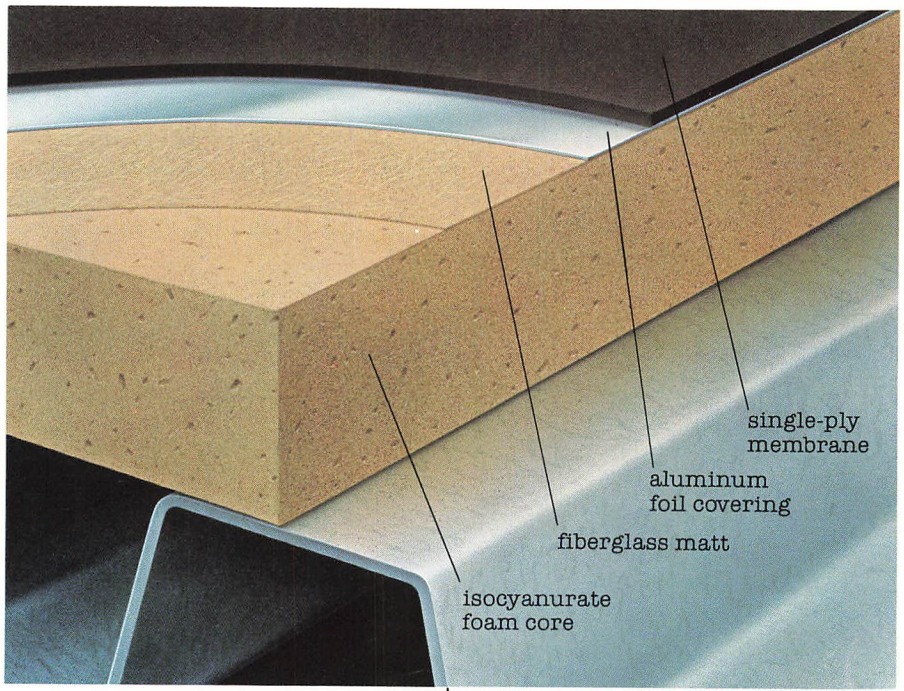
Rmax invented it. And we call it Ply-I.™

It took a lot of heavy thinking to come up with a revolutionary new lightweight roof insulation designed specifically for single ply roofs. But that's just what we did. And we call it Ply-I.

By taking a rigid isocyanurate core and permanently sealing it within a bonded foil/fiberglass matt covering, we've developed a product that not only offers the highest insulating efficiency available, but also offers a Factory Mutual Class-I rating as well. Quite simply, it's the lightest, most efficient product of its kind for single ply roof applications.

So you can use Ply-I directly over steel roof decks, without additional layers of gypsum or perlite fire-rated base layer.

Its tough, fiberglass-reinforced construction gives it superior tensile strength and uplift resistance, and virtually eliminates any foil-to-foam delamination. And because of its foil covering, no slip sheet is required between the insulation and the membrane.



Specifying lightweight Ply-I will reduce delivery costs, installation time and production delays on the job site.

Give us a call or write for more information.

No matter how you look at it, using Ply-I on your next roofing job can only help you come out on top.

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The case for BUR

Much has been written lately, in this magazine and elsewhere, about the remarkable dynamics of the roofing marketplace today. No one questions, any longer, the emergence of new commercial-industrial roofing materials; the questions today are, rather, to what extent they will occupy the market in five years, ten years, and beyond. And, some of the published estimates are staggering.

Bearing this in mind, it is healthy to take a look at the built-up roofing industry today because we fear that too many people have written BUR off as a thing of the past.

The death rumors are exaggerated.

For openers, the wide majority of flat roofs being applied and repaired today are...built-up roofs. And, there is more to the story than an industry reluctant to change with the times. Consider:

- With the exception of one or two ill-conceived products, built-up roofs have performed remarkably well over a long period of time. Given all of the things that can cause a roof to fail, the track record is impressive.
- The technology in built-up roofing is sophisticated and improving. The article in this issue by Wayne Tobiasson documents the kinds of extensive investigations that are ongoing.
- There is a competent and trained work force of built-up roofing mechanics. This is not to imply, of course, that all built-up roofs are applied expertly, but rather that we may not yet understand the consequences of misapplication of newer materials.
- The European experience is beginning to suggest that the alternatives to BUR do indeed have problems of their own. We must be careful to avoid the same mistakes made there. There will be problems with single-ply materials: not all, of course, but the ravages of time, temperature and moisture just simply won't spare every new product out there.

The lesson of all of this is very plain: we must measure our steps carefully, relying all the while on that with which we are familiar, and make changes only when we know that the changes will serve our long-term purposes well.

Ideas, notes and random thoughts

A memo to U.S. business from Dr. Richard L. Lesher, president, U.S. Chamber of Commerce: As President Reagan and his administration struggle with the problem of cutting wasteful government, needless regulations and tax rates, all of us must expect to end up bent out of shape a little.

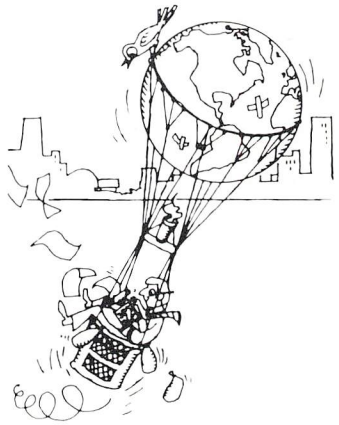
The American business community can help by acknowledging that federal spending cuts are going to affect us all if we expect to turn around the government bureaucracy that is sapping our lives.

We should all affirm our support for President Reagan's proposed cuts in government programs and regulations as the kind of medicine needed to cure the economic sickness we suffer.

Business: a means only—"If you think about it carefully, the fact is that business is a means to an end; it isn't an end itself. And if you accept that premise, then that defines your social consciousness issue completely. I don't mean to say that we ought to respond to every do-gooder that comes down the pike...But on the other hand, it is insane to think you can run plants without being concerned about the safety of your people or their health, or that you can ship defective products and stay in business...

"So I wouldn't draw a distinction between the bottom line (profits) and social consciousness. The two go together."—Irving S. Shapiro, chairman of the Dupont Co. since 1974, who soon will retire, in a *Washington Post* interview.

4-day week urged—A vigorous campaign to amend a federal law to permit government contractors to work four 10-hour days rather than the present five eight-hour days is being launched by the Associated Builders and



Contractors (ABC). The Walsh-Healy Act says government contractors must pay overtime for work in excess of eight hours in any one day. According to ABC's government relations department, the Department of Labor and many employers are finding that "flexible time" and "compressed time" lead to productivity gains.

Foundation Friends

New Friends of the National Roofing Foundation are:

Empire Roofing Co.
Tulsa, OK
Ray Johnson

Cook Enterprises, Inc.
Howell, MI
John C. Cook

Roof Mechanics, Inc.
Wichita, KS
James T. Wiesen

Hamilton Roofing Co., Inc.
Lubbock, TX
Owen Hamilton

Standard Roofing & S/M Works, Inc.
Lake Worth, FL
Leslie G. Knopf

Milton E. Thompson & Sons
Hialeah, FL
Milton E. Thompson, Jr.

Pioneer Roofing Co.
Phoenix, AZ
Joseph C. Bueche

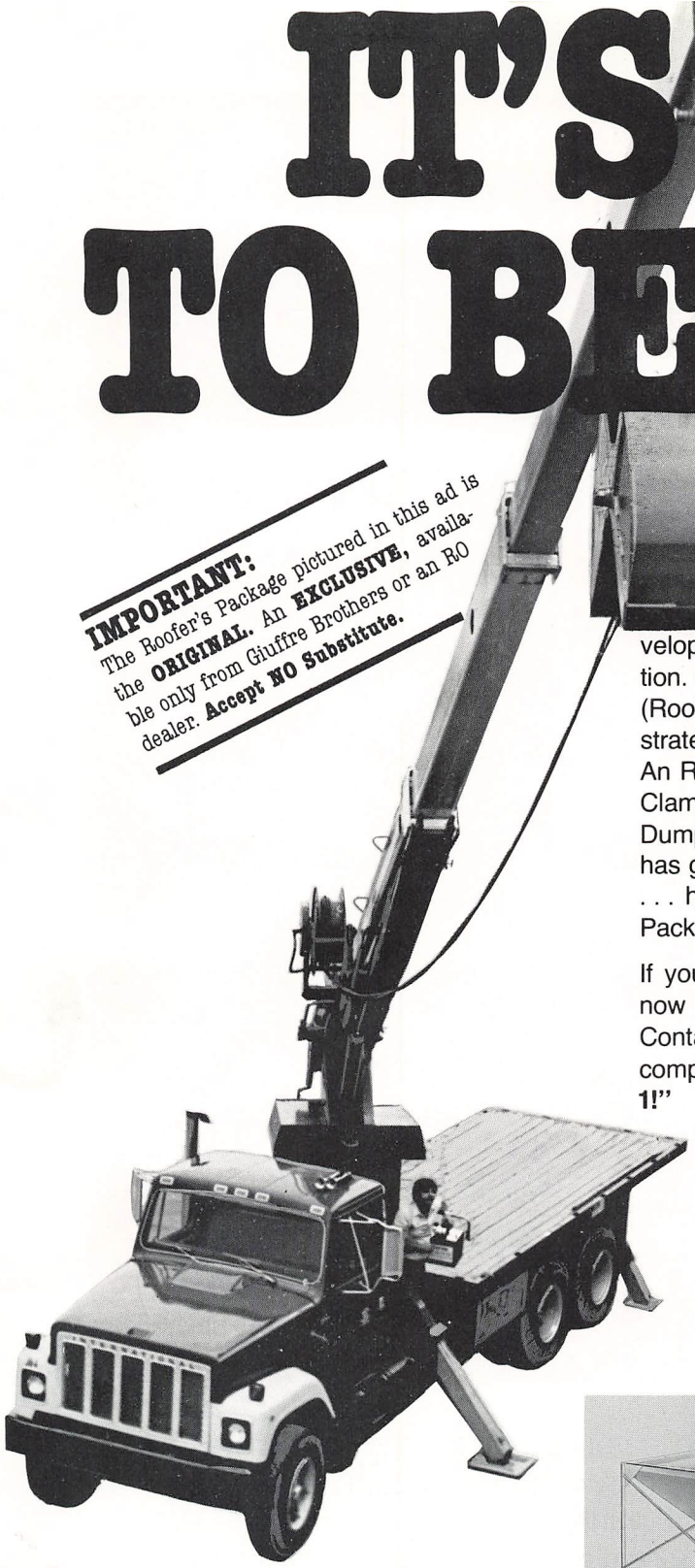
The Lawson Rfg. Co., Inc.
San Francisco, CA
Frank E. Lawson, Sr.

Capitol Hill Office for Sheet Metal and Air Conditioning Contractors National Association (SMACNA)—In a move to facilitate SMACNA's ongoing legislative affairs program, the association has opened a governmental affairs office on Capitol Hill. Lee K. Schwartz, chairman of the Governmental affairs committee, said, "An organization with an office on Capitol Hill is perceived by members of Congress and by the industry as taking governmental affairs seriously." The association is headquartered in Vienna, Va.

Is there a plaintiff in the house? You may not be able to beat City Hall but beginning later this year you will be able to sue Uncle Sam at his expense, if you win. Under a new law known as the Equal Access to Justice Act, individuals and small businesses can be reimbursed for legal expenses in cases they win as either plaintiff or defendant involving the federal government. But the Internal Revenue Service may challenge the law if applied to the U.S. Tax Court.

Underground Space Conference—The American Underground-Space Association will hold its conference and exposition-'81, June 8-10 in Kansas City. The conference will feature sessions by experts from around the world on earth-sheltered and deep-underground construction, urban planning for underground space use and public policy issues. According to the conference promoters, "Subsurface space is an overlooked resource that has enormous potential for simultaneously conserving energy, relieving surface congestion and alleviating environmental problems."

IT'S FUN TO BE NO. 1!



IMPORTANT:
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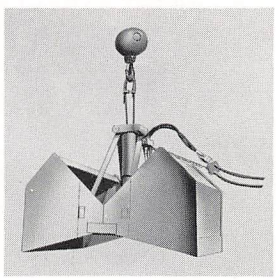
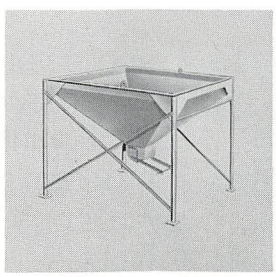
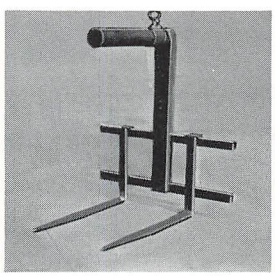
15 plus years of experience, an exclusive equipment package and a long list of satisfied customers . . . that's what makes **GIUFFRE BROTHERS NO. 1** with roofing contractors nationwide. The Truck/Crane package we pioneered and developed is the key to an efficient, economical, labor-saving operation. On-the-job performance is proof positive and repeat business (Roofer's Package owners are usually multiple owners), demonstrates unequivocally market confidence in this unique equipment. An RO 100 foot Stinger Crane, a Ford-GMC or IHC truck, ⅝ yard Clam Bucket, 1½ yard hopper, Pallet Fork and a 3½ yard "Humpty Dumper" comprise a working system that not only performs, but has gained industry-wide acceptance. Ask the man who owns one . . . he'll tell you why there isn't a better, more versatile Roofer's Package available . . . **anywhere.**

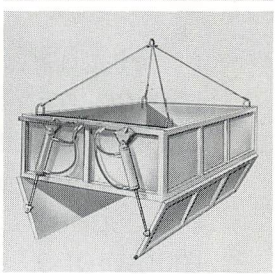
If you aren't using a **GIUFFRE BROTHERS' Roofing Package,** now is the time to rent or buy one . . . and watch profits **GROW.** Contact us direct, (414) 761-2300, or the nearest RO Dealer for complete rental/purchase details. See why, **"IT'S FUN TO BE NO. 1!"**

The **EXCLUSIVE Giuffre Brothers' Roofers Package** includes: a 1½ yard hopper for gravel/stone, a special adjustable pallet fork for shingles/insulation, etc., a ⅝ yard clam bucket and the patented 3½ cubic yard "Humpty Dumper" with hydraulic bottom doors — crane carried for one man operation.









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- **DURABLE EPDM MATERIAL WITH PROVEN RESISTANCE TO TIME & WEATHERING**

RubberGard™ EPDM membrane roofing from Firestone gives new and existing buildings long-lasting protection from water, temperature and atmospheric damage. The rubber membrane comes in sheet sizes up to 40′ x 150′ for quick, low-cost and low-maintenance installation.

Adhesives, sealants, rubber flashings, installation by Firestone-trained applicators complete the RubberGard system. Warrantable for 10 years.

For information on the RubberGard program and technical data, write to: Firestone Industrial Products Company, Noblesville, IN 46060, Attn: S. Kumar. For sales information, contact: Rubber Roofing Sales, Inc., P.O. Box 40308, Indianapolis, IN 46240. Phone toll free 800/428-6182 or 317/848-7570.

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Firestone—
the dependable
roofing people

NATIONAL NEWS

February Construction Contracts at $10.4 billion

Contracts for new construction of all kinds came to $10.4 billion in February, barely 2 percent above the value of new projects started in the same month of 1980, according to the F. W. Dodge Division of McGraw-Hill Information Systems Company.

"Comparison of the current rate of contracting with year-ago values must take into account the fact that construction markets were in the early stage of a severe slide in 1980's first quarter, and it could be happening again," commented George A. Christie, vice president and chief economist for F. W. Dodge.

"The recovery from last year's building recession ended prematurely in November, coinciding closely with the onset of the latest round of credit restraint," the Dodge economist pointed out. "As interest rates soared during the winter months, the seasonally adjusted Dodge Index retreated 16 percent from November's peak of 210 (1972 = 100) to 177 in February. And even though short-term rates are now easing, further decline in construction activity through the spring quarter is almost inevitable," Christie cautioned.

"February's contracting data showed continuing strength in nonresidential building, but revealed weakness in housing and public works construction," according to the Dodge economist. "'While this pattern has become a familiar one over the past year, the latest month's report gave evidence of softness in commercial and industrial building," he said.

Nonresidential building contract value totaled $4.1 billion in February, up 17 percent from the year-earlier amount. Virtually all of the February gain came from institutional building, which included an unusually large volume of hospital/health care projects. The start of New York's $200 million convention center was also a major factor in February's gain in nonresidential building. Commercial and industrial construction contract value, however, was only 3 percent above last February's amount.

Contracts for residential buildings totaled $4.2 billion in February, 4 percent below the "already weak 1980 February value," according to Christie. Recent strength in multi-family building faded in February, the Dodge data showed.

February nonbuilding construction contracting failed to show improvement from previously depressed levels of electric utility and public works construction, it was reported. The value of newly started construction in this category, at $2.1 billion, slipped 9 percent below the comparable 1980 amount.

At the end of two months, the cumulative value of all construction started in 1981 was $20.8 billion, down 1 percent from the total of work begun during the first two months of 1980.

MONTHLY SUMMARY OF CONSTRUCTION CONTRACT VALUE

Prepared by F. W. Dodge Division
McGraw-Hill Information Systems Company

	Feb., 1981 (000,000)	Feb., 1980 (000,000)	Percent Change
Nonresidential Building	$ 4,085.2	$ 3,484.6	+17
Residential Building	4,205.6	4,364.9	−4
Nonbuilding Construction	2,114.4	2,333.1	−9
Total Construction	$10,405.2	$10,182.6	+2
	2 Mos., 1981 (000,000)	**2 Mos., 1980 (000,000)**	**Percent Change**
Nonresidential Building	$ 8,193.6	$ 7,769.2	+5
Residential Building	8,402.8	8,416.8	—
Nonbuilding Construction	4,211.6	4,936.6	−15
Total Construction	$20,808.0	$21,122.6	−1

DODGE INDEX
(1972 = 100, Seasonally Adjusted)

December 1980	193
January 1981	185
February 1981	177

RSTC recommends field practice on aggregate use

The Roofing Systems Technical Committee (RSTC), made up of representatives of the Asphalt Roofing Manufacturers Association (ARMA) and the National Roofing Contractors Association (NRCA), is recommending to industry specifiers and users a field practice on aggregates for built-up roof surfacing.

The group at a recent committee meeting was concerned that #6, #7, and #67 coarse aggregates (as described in ASTM Standard D 448 Standard Specification for Standrd Sizes of Coarse Aggregate for Highway Construction) are widely available throughout the United States for roofing purposes, but they are not all currently included as acceptable surfacing materials for built-up roofing materials in the standards of the American Society For Testing and Materials (ASTM). The inclusion of all these materials has been recommended to ASTM, and they are expected to be added to D 1863, standard specifications for Mineral Aggregate Used in Built-Up Roofs, when the ASTM Committee D-8 meets in June.

Until further notice, the RSTC recommends that ASTM D 448 aggregate gradation sizes #6, #7, and #67 be considered acceptable material for built-up roofing. The formal resolution of RSTC states:

Aggregate for surfacing for built-up roofing.

1. The ASTM D 1863 and D 1864 specifications for aggregate surfacing material and moisture content are currently under study and we have petitioned for revision.
2. Until such time as these specifications are revised, ASTM D 448 aggregate gradation sizes #6, #7, and #67 are acceptable material providing that:
   - **a)** The aggregate has no more than 3% moisture by weight.
   - **b)** The aggregate meets all other requirements of D 1863.

AIA focuses on energy use

The energy crisis presents an opportunity for general contractors to work closely with architects as a team to meet the challenges of this decade by "reaching for the sun" to help solve America's energy problems, R. Randall Vosbeck, FAIA, president of The American Institute of Architects, told those attending the 62nd annual convention/exposition of Associated General Contractors of America (AGC), March 16.

He noted, "The AIA has targeted all of 1981 as a time to think long and hard about energy. Energy is at the heart of almost all of the AIA's major undertakings this year—or, more accurately, the relationship between energy and design." This relationship is reflected in the AIA's theme for 1981, "A Line on Design and Energy."

Vosbeck said the AIA is convinced that "the building industry as a whole can play a major role in freeing our nation's dependence on nonrenewable resources. It's a belief fueled by the fact that nearly 40 percent of energy produced in this country is consumed by buildings.

"Design has a key part in transforming the public's perception that the building team is part of the problem into the public's confidence that all of us—the builder, the engineer, the contractor and the architect—are the leaders in reaching for a solution," Vosbeck emphasized.

The Alexandria (Va.) architect, who leads the 37,000-member national professional society, explained this solution must tackle the problem of energy in the built environment "right at the first stages of the building process." He said such considerations as siting, orientation, form, materials and colors must be focused on "carefully and creatively to make maximum use of the free and abundant energy."

Solar energy meeting May 26-30

People representing every facet of the solar energy movement will gather May 26-30 at the Philadelphia Civic Center for Solar Rising, the 1981 Annual Meeting and Product Exposition of the American Society of the International Solar Energy Society (AS/ISES).

AS/ISES members include architects, engineers, builders, planners, scientisits and specialists in solar power and energy conservation.

In addition to programs of general interest, Solar Rising will include a number of special attractions aimed at specific professions and disciplines. For example, builders, developers and contractors can attend workshops and seminars on residential and commercial applications of solar technology.

The two major themes of Solar Rising are "Solar in Cities" and "The Commercialization of Solar Energy." The heart of the annual meeting is its technical sessions, highlighted by the presentations of papers by top specialists from all over the world.

For more information, contact AS/ISES, Research Institute for Advanced Technology, U.S. Hwy. 190, West Killeen, Tex. 76541 (tel: 817/526-1300).

RIC/TIMA develops procedure

The Roofing Insulation Committee of the Thermal Insulation Manufacturers Association (RIC/TIMA) has developed a roof insulation specimen conditioning procedure.

It was adopted to provide a uniform conditioning procedure prior to measuring thermal resistance of roof insulation. While there are several conditioning procedures in

TOP PERFORMER IN CHICAGO.

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CERTAGLASS® ROOFING PLY SHEET CHOSEN FOR WORLD'S TALLEST APARTMENT BUILDING.

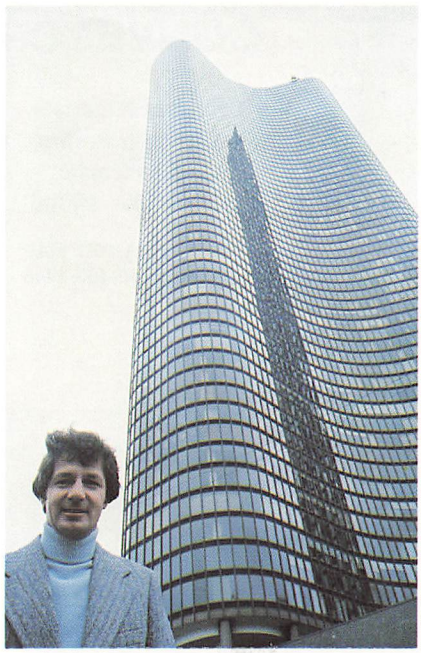
When Van Doorn Roofing was given the assignment of re-roofing Chicago's fabulous 70-storey Lake Point Tower, they selected CertainTeed's top performing fiberglass based ply sheet, Certaglass.

"We know that Certaglass has met the challenge of more than five years of the toughest field and lab tests," says Bill Van Doorn. "We felt it's just the right roofing material to successfully weather Chicago's bitter, snowy winters and hot, humid summers."

Not only in Chicago, but across the country demanding roofers are putting their confidence in Certaglass for important jobs. They've discovered that Certaglass substantially reduces the chance of curling, cupping, blistering, buckling, and fishmouthing, and that it demonstrates superior weathering and greater resistance to moisture intrusion. Built on fiberglass mat reinforced with textile yarn, Certaglass stands up to stresses, strains and sudden temperature changes beyond published and currently proposed BUR standards.

Equally important, Certaglass is easy to handle. It lays flat and stays flat, and has excellent inter-ply adhesion with no bleed-through problems.

See for yourself how well Certaglass will perform on your next important job. Get full details from your Certaglass Certified Distributor or your CertainTeed representative. Or write us on your letterhead.



LAKE POINT TOWER
Chicago, Illinois

Roofing Contractor, Bill Van Doorn (above), Van Doorn Roofing, Inc.

Architect: John Heinrich

CertainTeed

CertainTeed Corporation, P.O. Box 860, Valley Forge, PA 19482

use, no recognized industrywide method currently exists. RIC/TIMA recommends this conditioning procedure as the industry standard.

Basically, the procedure calls for placement of a roof insulation specimen into a controlled environment for a period of six months. After that time, the specimen is removed and tested for thermal conductance according to the applicable thermal transmission test method.

According to William H. Hill, vice-chairman of RIC/TIMA, "The Committee is working towards the development of accurate *in-place* thermal performance data on roof insulations. Our ultimate goal is to create an in-roof evaluation method. Until such work can be completed, we recommend the use of the RIC/TIMA specimen conditioning procedure."

ARMA names Marshall western manager

William J. Marshall has been named western regional manager for the Asphalt Roofing Manufacturers Association (ARMA).

Marshal, a professional engineer, succeeds S. M. Lewis, who is retiring after more than a half-century in the asphalt roofing industry. He had been ARMA's western regional manager for the past nine years.

Lewis will serve as a consultant to ARMA with the primary responsibility of preparing a history of the asphalt roofing industry, Mongold said.

Marshall formerly was manager of technical services for Kaiser Cement & Gypsum Corporation, Oakland, a company he was affiliated with for more than 20 years.

Marshall received a Bachelor of Science degree in civil engineering from Swathmore College and a Master of Science degree in civil engineering from Harvard University.

Marshall will operate from an office in Huntington Beach, Calif. The association's national headquarters are in Washington, D.C. The organization's membership includes most of the nation's manufacturers of fire-retardant asphalt shingles.

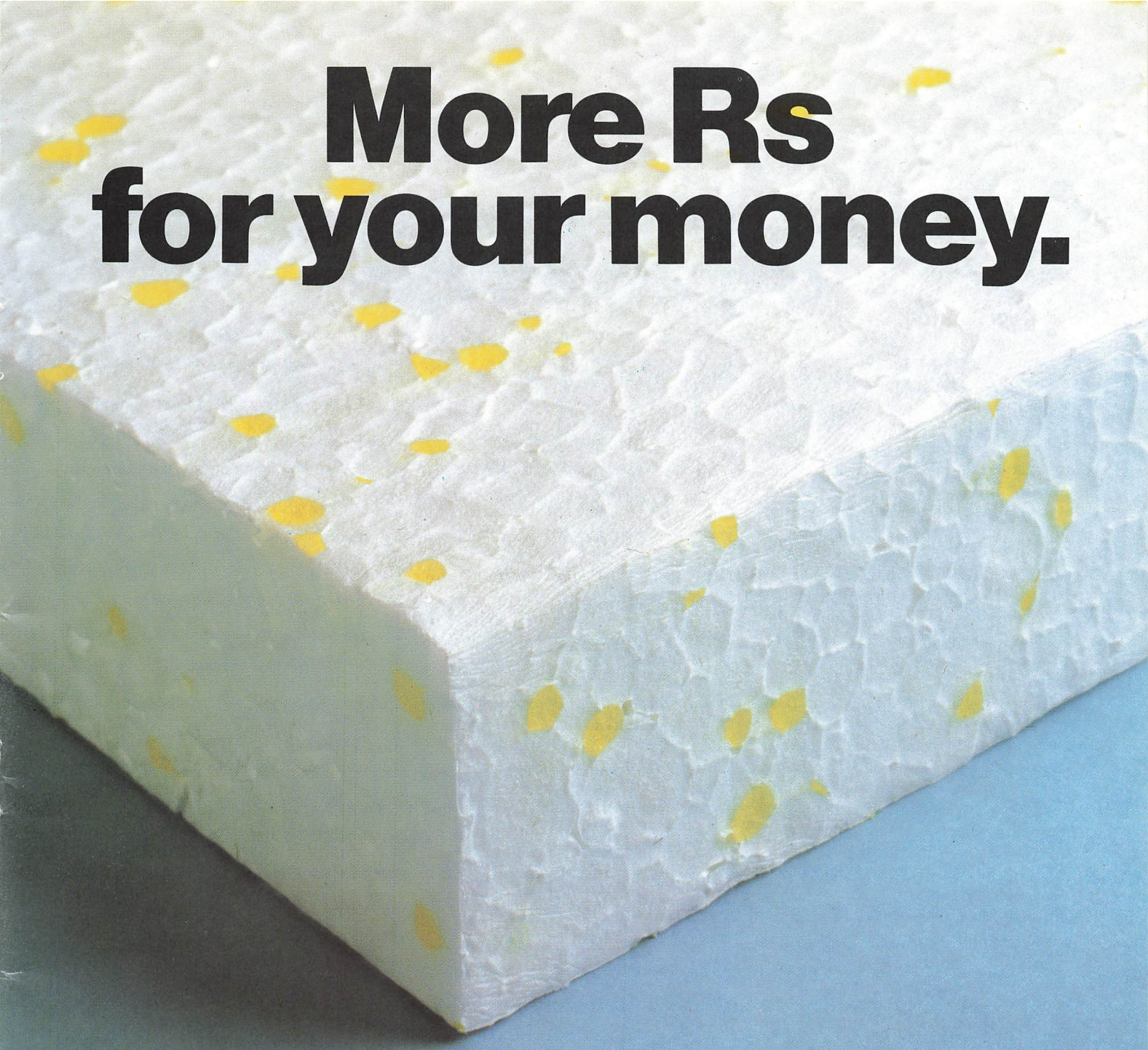
Partyka chosen UFCA president

Don Partyka, president of Acme Protective Coatings, Inc., Newark, Ohio, is the new president of the Urethane Foam Contractors Association. He will serve until January 1982 when newly-chosen president elect Ron King, vice president and general manager of Anco Insualtion, Inc., Baton Rouge, Louisiana,, will assume the office.

Both officers were elected at UFEX-6, the association's sixth annual exposition and convention, Jan. 19-23 in Orlando, Florida.

Other UFCA officers elected at the meeting are: vice president, Hubert Coon, General Supply Company, San Antonio, Texas; secretary, Jack Jones, Acoustical Spray Insulators, Allentown, Pa.; treasurer, Joe Klein-Kracht, En-Tech, Inc., Louisville, Ky.

In addition to the officers, board of directors members elected by the association are regional chairmen Lee Gilbert, Gilbert Foam Insulation, Jersey Shore, Penn.; Larry Szrom, Applied Coatings Technology, Orlando, Fla.; Dave Moenning, Moenning Insulation and Coatings, St. Louis, Missouri; Clem Sherek, South Texas Urethanes, Edinburg, Tex.; Don Lenaker, Circle Arrow Urethane Systems, San Bernardino, Calif.; and Carlo Leonettie, Fiberchem, Inc., Seattle, Wash., Associate Member Executive Committee Director.



More Rs for your money.

New Sure-Seal® EPS roof insulation

Today, more than ever, you must get the greatest roof insulation value possible for your money. That means EPS insulation—which gives you a higher R value at a lower cost than any other sheathing material available. And comparisons with the most commonly used insulation materials prove it.*

Sure-Seal® EPS is also lightweight, easy to cut and easy to install. Available with fiberboard backing, it's perfect for new or re-roofing applications over all types of roof decks, under most types of single-ply membranes. And it's strong enough to withstand nominal abuse without losing its effectiveness. What's more, we can warranty Sure-Seal® EPS for up to 10 years when used as a component in the Carlisle single-ply roofing system.

*Please call or write for more information on Sure-Seal® EPS and our competitive pricing analysis.

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CARLISLE

Association leaders develop ongoing dialogue

Mutual respect and a desire to share knowledge and concerns is how NRCA executive vice president Fred Good characterizes the developing relationship between the roofing contractors association and the American Institute of Architects (AIA).

Over the past year key leaders from NRCA started and are continuing a dialogue with AIA leaders. "The intent," said Good, "is not only to gain a mutual understanding of positions and problems but also to bring about the kinds of cooperative action that solve problems as well as create better understanding."

Good, along with NRCA President Bill Kugler, past president Mel Kruger, and Technical and Research Committee co-chairman John Bradford, made an initial contact last June when they went to Washington for a get-acquainted meeting and dinner with AIA officials. Representing AIA were Charles Schwing, president; Randall Vosbeck, president elect; Elmer Botsai, past president; David Meeker, Jr., executive vice president; and James Scheeler, group executive for program development.

At this meeting, the men discussed the roofing industry and opportunities for the two groups to benefit from each other. This meeting was followed by a full-day session at AIA headquarters in Washington when NRCA's Kugler, Kruger and Good met with AIA's Schwing, Vosbeck, Meeker and Scheeler.

The NRCA trio, bringing with them appropriate materials, explained the association's technical services program, the development of the *Roofing and Waterproofing Manual* and educational activities within the Roofing Industry Educational Institute (RIEI). The three also reported on roofing industry activities which have a bearing on the architect and the design profession.

Since that meeting, various members of the AIA official family have attended the RIEI programs, and all of the AIA officials mentioned above were invited to the NRCA convention in Phoenix.

Following the NRCA convention and after release of the *NRCA Roofing and Waterproofing Manual,* Good contacted Vosbeck who had in the meantime become AIA president. On one of his scheduled trips to Washington, Good met with Vosbeck at the AIA headquarters and presented to him a complimentary copy of the manual. Copies were also brought along for Meeker, Scheeler and the AIA library.

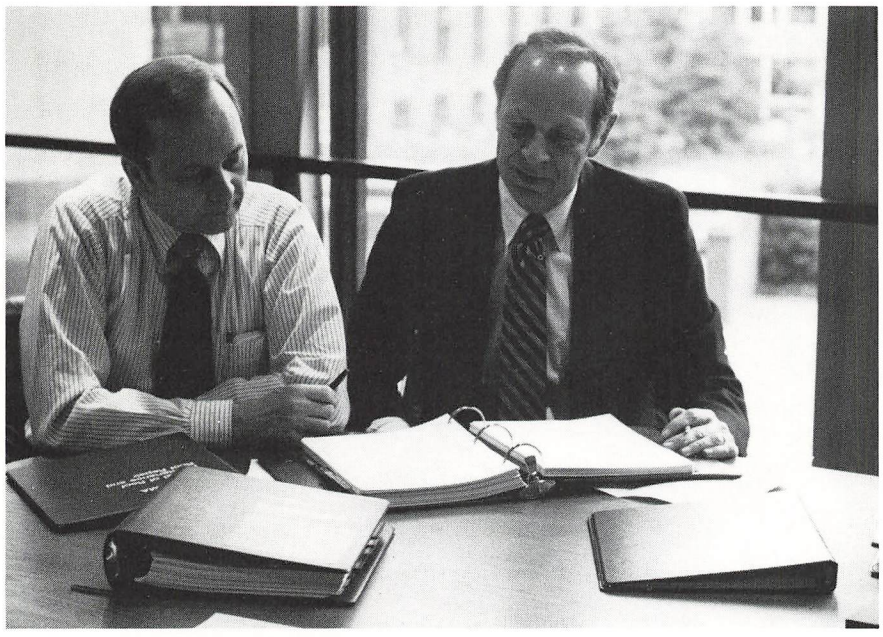
Two weeks later when Good and Kugler were in Washington on business, they again visited AIA headquarters and met with Meeker and Scheeler. "From these last two meetings," said Good, "action is developing and steps are being taken that are most promising in the continuing relationship of AIA and NRCA."

Since that time, the NRCA Manual has been submitted to the AIA Practices Commission for review and recommendation to the AIA Board of Directors. Said Good, "We are optimistic that the AIA board will endorse the manual at its meeting in May. This would be an exciting and most important step forward for NRCA and specifically for the acceptance of the NRCA Roofing Manual."

Other immediate results of the dialogue include:

- The March 25 issue of the *AIA MEMO* carried an announcement of the availability of the roofing manual.
- AIA's group executive for program development attended the April 9 Built-Up Roofing Conference in New York City.
- The *AIA Journal* will carry an article on roofing industry activities.

All of this activity, said Good, "is positive and indicates a strong future for an ongoing cooperative effort by the architects organization and NRCA.



NRCA executive vice president Fred Good (right) shows AIA President Randall Vosbeck the *NRCA Roofing and Waterproofing Manual.* Key leaders from the two organizations have developed an ongoing dialogue.

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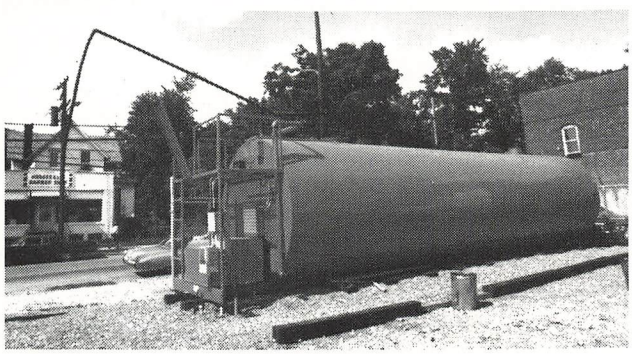

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The book that NRCA built

Cecil B. DeMille should have been there.

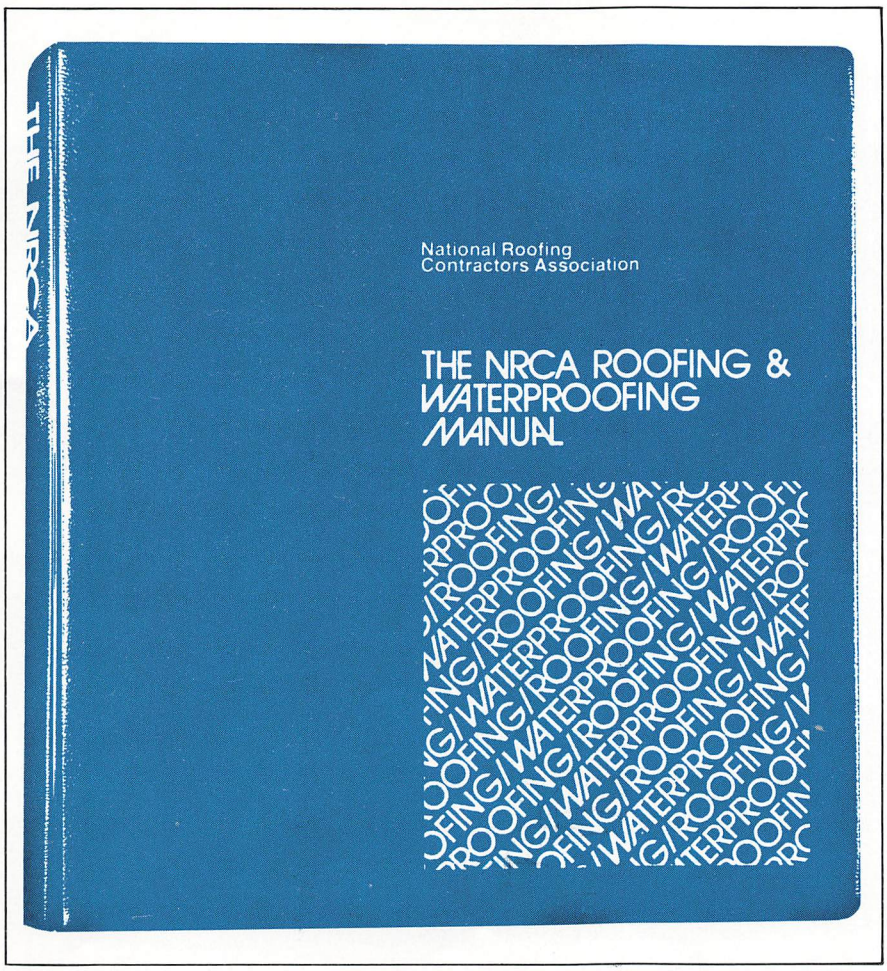
- *A cast of thousands*
- *Years in the making*
- *The biggest names in the business...*

What started out to be a simple revision of the 1970 edition of the NRCA Roofing Manual mushroomed into the biggest book NRCA ever built—500 pages, including eight tabs and more than 200 pages of illustrations.

The specifications for building the manual were simple:

1. Tell contractors, architects, engineers, designers, specification writers and all other industry-related personnel how to design and install good roofing and waterproofing systems.
2. To tell it in simple, easy-to-understand terms.
3. Provide drawings that will illustrate the words.
4. Pay meticulous attention to technical accuracy.

As the various committees began revising the old manual, they quickly surmised that a completely new manual was needed. Ergo, Bill Kugler became the chairman of the Manual Development Committee. Under his direction, committees were established to gather material and write each of the sections of the manual.



- Larry Mullis of Interbay Roofing Co., Inc., Seattle, Wash., chaired the Waterproofing Committee.
- Rich Rosenow of Hans Rossenow Roofing Co., Chicago, directed the Steep Roofing Committee with assistance in the following areas:
  Slate and Clay Tile Roofing—Steve Krupnik of Krupnik Bros., Inc., Glen Burnie, Md.; Bud Ruff of Charles F. Ruff & Co., Inc., Baltimore, Md.; and Seth Warfield of Jack's Roofing Co., Bethesda, Md.
  Concrete Tile Roofing—Johnny Zamrzla of Western Pacific Roofing Corp., Lancaster, Calif.
  Asphalt, Wood Shingle and Wood Shake Roofing—Bob Sorenson of Sorenson Roofing, Eola, Ill.
- John Bradford of Bradford Roofing & Insulation Co., Billings, Mont., directed the development of the Construction Details.
- Jack Williams of Twin City Roofing Inc., Wahpeton, N.D., headed the development of HARK.
- Bill Cullen, formerly of the National Bureau of Standards, and Dick Fricklas, director of the Roofing Industry Educational Institute (RIEI), provided special and invaluable technical assistance in the development of the Built-Up Roofing Manual and HARK.
- Other contributors included Factory Mutual, Underwriters Laboratories, ASTM and leading manufacturers.

In speaking of the new manual, Bill

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Continuity . . . staying power . . . good for the long haul . . . whatever words you use to describe a history of success—that's what Koppers has to offer. Ever since 1915 Koppers coal tar built-up roofing and waterproofing systems have been going on the rooftops of America. Its unique combination of properties—resistance to moisture and oxidation, as well as its cold-flow self-healing characteristic—holds maintenance to a minimum, making it a product for the times, a boon to building owners.

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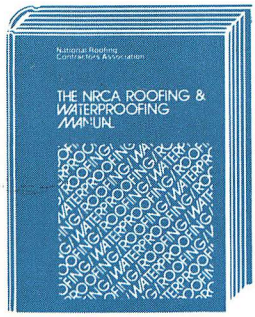


Kugler says, "*The NRCA Roofing & Waterproofing Manual* will fill an important need in the industry for an independent, non-proprietary, state-of-the-art document covering the intricacies of roofing and waterproofing practice. Specifers and contractors can use the manual to obtain current information and construction details pertinent to good roofing and waterproofing practice."

The manual is really a complete library in one volume. It contains:

- The NRCA Built-Up Roofing Manual
- The NRCA Waterproofing Manual
- The NRCA Steep Roofing Manual
- Handbook of Accepted Roofing Knowledge (HARK)
- The NRCA Construction Details
- The NRCA Technical Bulletins
- Glossary
- Appendix

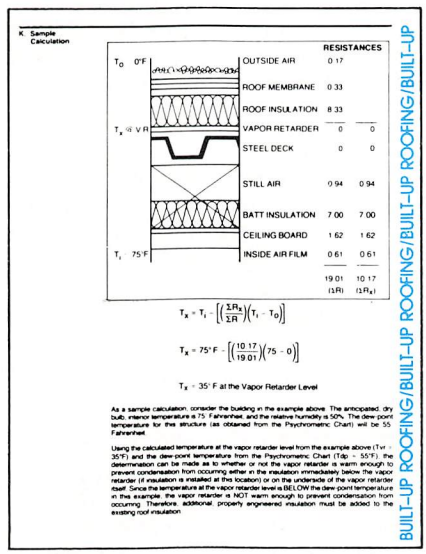
Built-up roofing

The Built-Up Roofing Manual contains the most comprehensive and technically detailed information NRCA has ever compiled on the art of hot-applied commercial and industrial roofing. Nine types of roof decks, five types of vapor retarders and nine types of roof insulation are described in terms of their physical properties, requirements, precautions and application procedures. In addition, 25 types of roof membrane materials, including asphalt, coal tar bitumen, felts, fabrics, prepared roofing materials and aggregate surfacings are described in terms of their physical characteristics and preferred use. The ASTM standards to which each material must conform are also listed for each material.

Some of the more complex aspects of roofing for both contractors and designers are the calculations for heat flow and moisture control so important for ensuring that a roof provide moisture resistance and thermal insulating qualities. To assist designers and contractors in this part of roof design and installation, the manual includes detailed discussions of:

- The fundamental principles of moisture vapor flow
- The theory of vapor migration
- Relative humidity and condensation
- Moisture control
- The self-drying roof concept
- Calculation of temperature at the vapor retarder level
- Calculation of the dew-point temperature (using the Psychrometric Chart included in the manual)
- Design criteria for roof insulation
- Heat flow calculations (k, C, R, and U values)
- Sample calculations

The theoretical chapters of the manual are illustrated with charts and diagrams to provide contractors and designers with visual representations of the theories and calculations described



Diagrams in the manual illustrate complex design calculations.

in the text. In some sections, complete design calculations for sample roof-ceiling systems are provided as guidelines for designers.

Probably the most valuable part of the "Built-Up Roofing Manual" is the section of "Specification Plates." Included in this section are 16 sample roof specifications complete with detailed specification plate diagrams. The "Specification Plates" have been divided into the following categories for easy reference:

- Temporary roof and vapor retarder specifications
- Insulation specifications
- Specifications for the application of roof membranes over nailable roof decks
- Specifications for the application of roof membranes over insulated roof decks
- Specifications for the application of roof membranes over concrete roof decks

The three generic types of roof membranes specified for use in the "Specification Plates" are:

- Asphalt organic felt roof membranes
- Asphalt glass fiber felt roof membranes
- Coal tar bitumen organic felt roof membranes

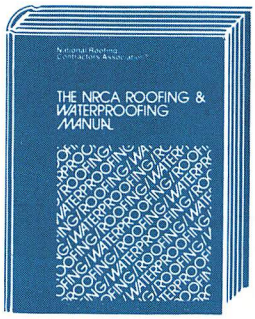
The "Specification Plates" have been included in the manual for use by architects, designers and contractors when a generic roof specification is desired.

Also part of the "Built-Up Roofing Manual" are sections on "Synthetic and Special Roof Membrane Systems." Information is included on:

- Elastomeric Roof Membrane Systems
  1. Ethylene Propylene Diene Monomer (EPDM) Systems
  2. Polychloroprene (Neoprene) Systems
  3. Polyvinyl Chloride (PVC) Systems
- Plastic Roof Membrane Systems
  1. Modified Bitumen Composite Self-Adhering Sheet Systems
  2. Modified Bitumen Reinforced Composite Sheet Systems
- Cold-Applied Roof Membrane Systems
  1. Glass Fiber Reinforced Asphalt Emulsion Systems
  2. Cold-Applied Mastic Systems.

Each of the roof membrane systems are described in terms of their physical materials and properties, requirements, precautions and application procedures.

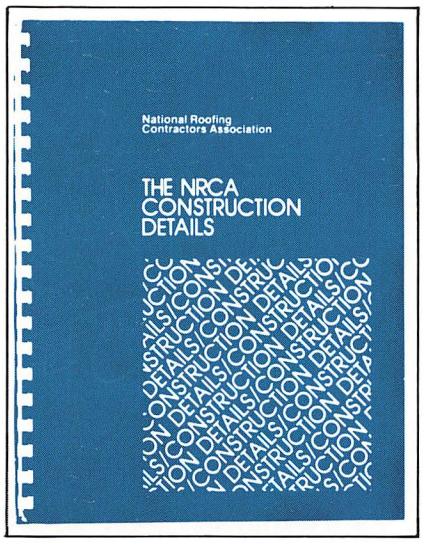
The last part of the "Built-Up Roofing Manual' covers Factory Mutual and Underwriters Laboratories. The text provides a discussion of the purposes, tests, ratings and documents of each agency. Addresses of each agency's



main office and field offices are provided.

Construction details

The second tab in the manual is the "NRCA Construction Details." Specific information about flashings, wood nailers and HVAC equipment are included in its foreword. Twenty-six construction details pertinent to built-



up roof installation are included in this section.

These "Construction Details" have been adopted for use by many roofing material manufacturers as well as by the American Institute of Architects' *Graphics Standards*.

HARK

The "Handbook of Accepted Roofing Knowledge" **(HARK)** follows the "Construction Details." **HARK** has become a best seller since its publication in a pocket size edition in January 1980. The Handbook includes basic, practical information about the principles and practices of built-up roofing. Originally, it was intended to be used by contractors, architects, owners and designers on the job site or in meetings for quick reference. The booklet has become so popular, however, that it has been included in a regular 8½ × 11 format in the complete manual.

Many people mistakenly assume that **HARK** is a miniature version of the "Built-Up Roofing Manual." While it does offer much of the general information covered in the "Built-Up Roofing Manual," it also includes other information. For example, the chapter in **HARK** on "Deck and Structural Design" informs designers how to determine deflection slope and drainage provisions for various deflection conditions. Also included are chapters on "Inspection and Maintenance" and "Notes to Owners and Designers."

Many contractors have purchased copies to distribute to business associates, and contractors and designers alike report that the booklet has been "the best thing they've found for resolving disputes and answering questions." As a handy booklet containing the "meat" of built-up roofing knowledge, **HARK** is a must for all industry personnel.

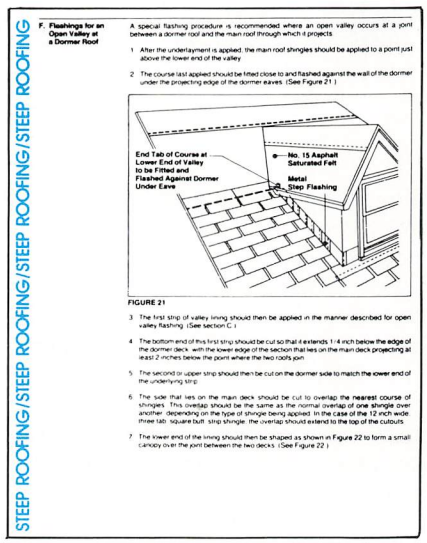
Steep roofing

As if the format of the manual weren't complex enough already, along comes "Steep Roofing" with its own five separate sections.

- Asphalt Roofing
- Clay Tile Roofing
- Concrete Tile Roofing
- Slate Roofing
- Wood Shingle and Wood Shake Roofing

Each section of the "Steep Roofing Manual" discusses the materials used in each type of steep roofing practice as well as requirements, precautions and application procedures. More than 100 illustrations depict the various applications of steep roofing products. Each section contains detailed information for hip, ridge, eave and valley applications, flashings, and nailing procedures.

Rich Rosenow, chairman of the Steep Roofing Committee, says, "This part of the manual is designed for the residential roofing industry, and our intent is to provide criteria for the design and construction of steep roofing systems."



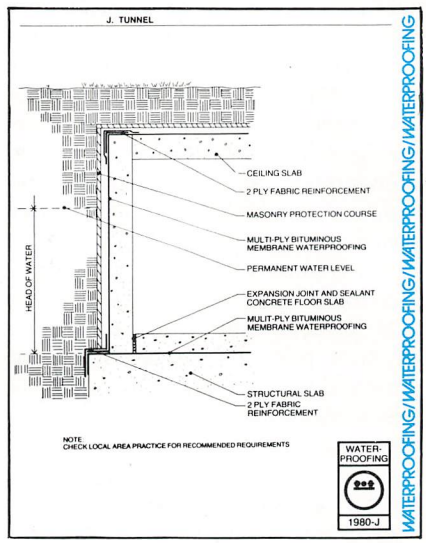
Detailed application procedures are described and illustrated for all types of steep roofing products.

Waterproofing

Introduced as NRCA's first *Waterproofing Manual,* the waterproofing portion of the manual contains information on:

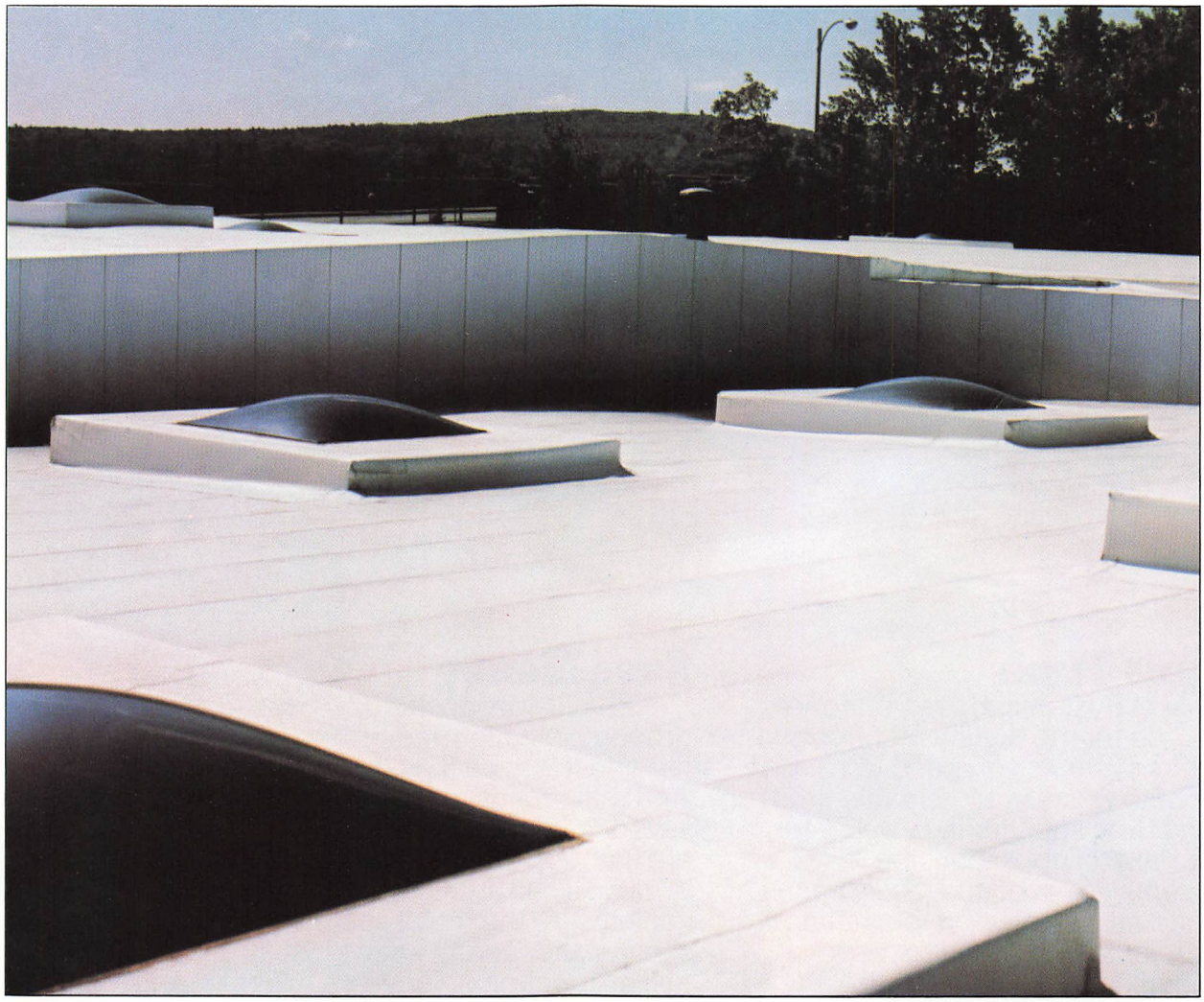
- Surfaces
- Hot-Applied Systems
- Cold-Applied Systems
- Preformed Membranes
- Interior Waterproofing
- Protective Coverings
- Drainage Systems

Each section of the "Waterproofing



Waterproofing applications are illustrated in 16 Waterproofing Details.

...the material difference in single membrane roofing



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Cooley Roofing Systems' CoolTop 40 is a white, 40-mil. CPE extrusion coated polyester roofing membrane designed for mechanical fastening as a single membrane system (patent applied for).

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It's the most utraviolet and ozone resistant material available in single membrane roofing. It is highly chemically resistant . . . compatible with most existing materials, including asphalt; usable around many corrosive liquid or gaseous chemicals that may be in the environment.

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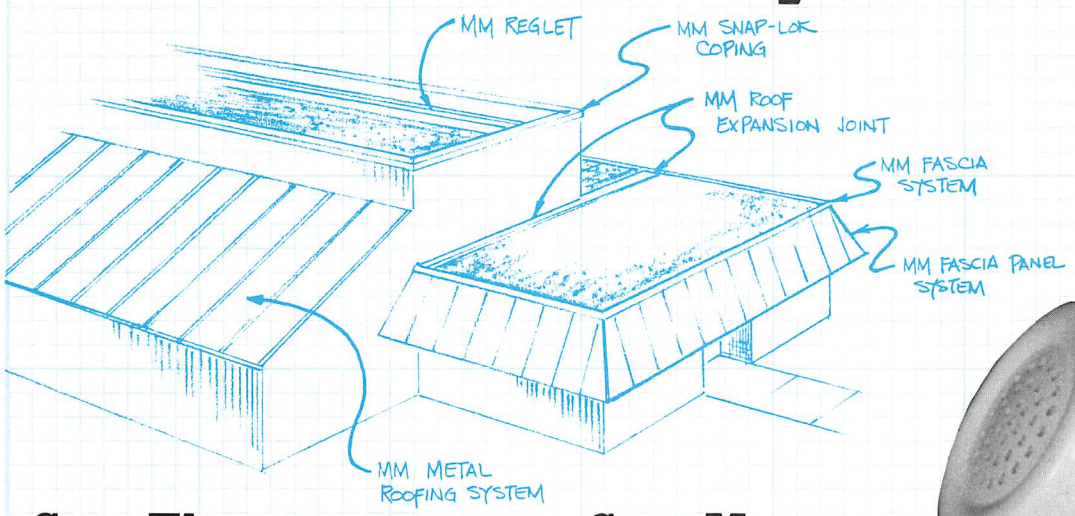

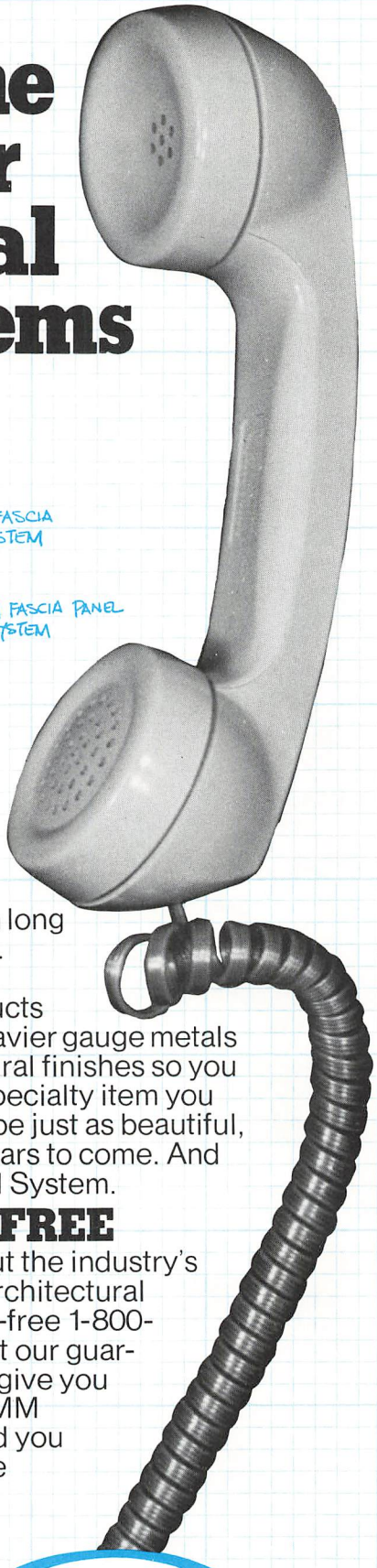

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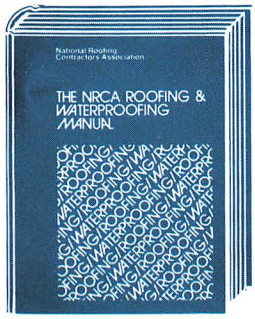


Manual'' discusses the materials used in waterproofing practice as well as requirements, precautions and applications procedures. The text includes 16 waterproofing details designed to illustrate installations in all areas of the country.

Larry Musil, chairman of the Waterproofing Committee, says of the manual, ''We've tried to make the manual applicable to all areas of the country. This, of course, caused some problems since Virginia, for instance, will not encounter the same environmental stresses, such as earthquakes, that Washington state experiences. We have endeavored throughout to consider the environmental stresses of all geographic regions of the country, and I believe the new manual establishes criteria for the application of waterproofing systems.''

Technical bulletins

To give industry personnel a picture of the progress NRCA has made in technical areas in the last several years, the Manual Development Committee decided to include the series of NRCA Technical Bulletins, which have been issued periodically since September 1977. Among those included in the manual are bulletins on the topics of:

- Equiviscous Temperature (EVT)
- Thermal Performance Criteria for Roof Assemblies
- Installation of Polyurethane Insulation

Glossary

No manual would be complete without a detailed Glossary. The NRCA Glossary (which is included in the pocketsize edition of **HARK**) has been adapted from major industry and government publications with input from NRCA's Executve Committee and technical staff. It contains important definitions, formulas and references to pertinent *NRCA Construction Details*.

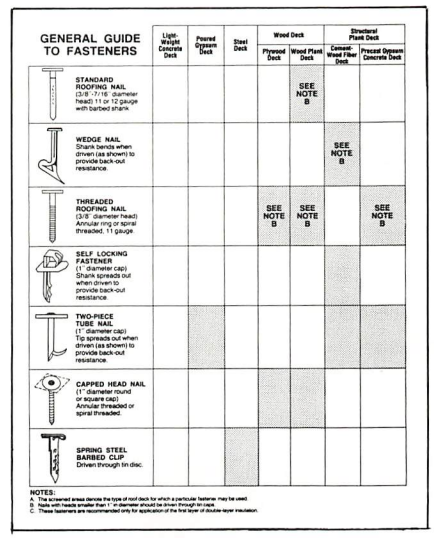
Appendix

The Appendix, essential in using the manual correctly, contains special procedures for determining the dryness of the roof deck, venting recommendations, the NRCA ''Roof Curb Criteria,'' conversion charts, and a ''General Guide to Fasteners.'' Of particular importance is the fastener guide since all of the built-up roof specifications require fasteners selected from the ''General Guide to Fasteners.''

Continuing...

The publication of this comprehensive document is by no means an end, but a beginning; for the printed word serves no good purpose on the shelf or gathering dust in a warehouse waiting to be delivered. The primary goal for the manual has always been to provide information to industry personnel on good roofing and waterproofing practice.

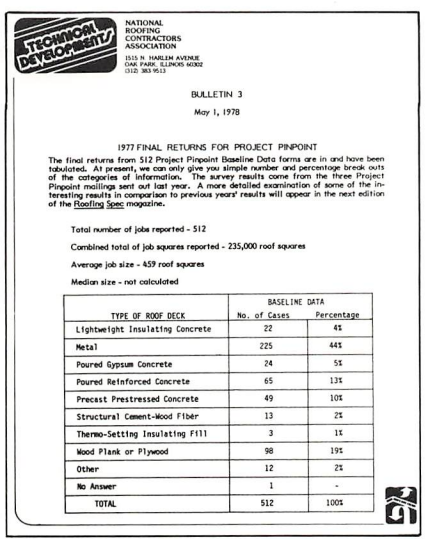
In an era of energy conservation, the manual might help save money on costly design and installation errors; it might save or minimize costly future roof repairs; and it might serve to inform all of those involved in and associated with roofing of the important details of their trade. It might be an awfully good book to have around.



GENERAL GUIDE TO FASTENERS	Light-Weight Concrete Deck	Poured Gypsum Deck	Steel Deck	Wood Deck: Plywood Deck	Wood Deck: Wood Plank Deck	Structural Plank Deck: Cement-Wood Fiber Deck	Structural Plank Deck: Precast Gypsum Concrete Deck
STANDARD ROOFING NAIL (3/8"-7/16" diameter head) 11 or 12 gauge with barbed shank.					SEE NOTE B		
WEDGE NAIL Shank bends when driven (as shown) to provide back-out resistance.						SEE NOTE B	
THREADED ROOFING NAIL (3/8" diameter head) Annular ring or spiral threaded. 11 gauge.				SEE NOTE B	SEE NOTE B		SEE NOTE B
SELF LOCKING FASTENER (1" diameter cap) Shank spreads out when driven to provide back-out resistance.							
TWO-PIECE TUBE NAIL (1" diameter cap) Tip spreads out when driven (as shown) to provide back-out resistance.							
CAPPED HEAD NAIL (1" diameter round or square cap) Annular threaded or spiral threaded.							
SPRING STEEL BARBED CLIP Driven through tin disc.							

NOTES:
A. The screened areas denote the type of roof deck for which a particular fastener may be used.
B. Nails with heads smaller than 1" in diameter should be driven through tin caps.
C. These fasteners are recommended only for application of the first layer of double-layer insulation.

The Appendix includes conversion charts, venting recommendations, and the General Guide to Fasteners.



TECHNICAL DEVELOPMENTS

NATIONAL ROOFING CONTRACTORS ASSOCIATION
1515 N. HARLEM AVENUE
OAK PARK, ILLINOIS 60302
(312) 383-9513

BULLETIN 3

May 1, 1978

1977 FINAL RETURNS FOR PROJECT PINPOINT

The final returns from 512 Project Pinpoint Baseline Data forms are in and have been tabulated. At present, we can only give you simple number and percentage break outs of the categories of information. The survey results come from the three Project Pinpoint mailings sent out last year. A more detailed examination of some of the interesting results in comparison to previous years' results will appear in the next edition of the Roofing Spec magazine.

Total number of jobs reported - 512

Combined total of job squares reported - 235,000 roof squares

Average job size - 459 roof squares

Median size - not calculated

TYPE OF ROOF DECK	BASELINE DATA No. of Cases	Percentage
Lightweight Insulating Concrete	22	4%
Metal	225	44%
Poured Gypsum Concrete	24	5%
Poured Reinforced Concrete	65	13%
Precast Prestressed Concrete	49	10%
Structural Cement-Wood Fiber	13	2%
Thermo-Setting Insulating Fill	3	1%
Wood Plank or Plywood	98	19%
Other	12	2%
No Answer	1	-
TOTAL	512	100%

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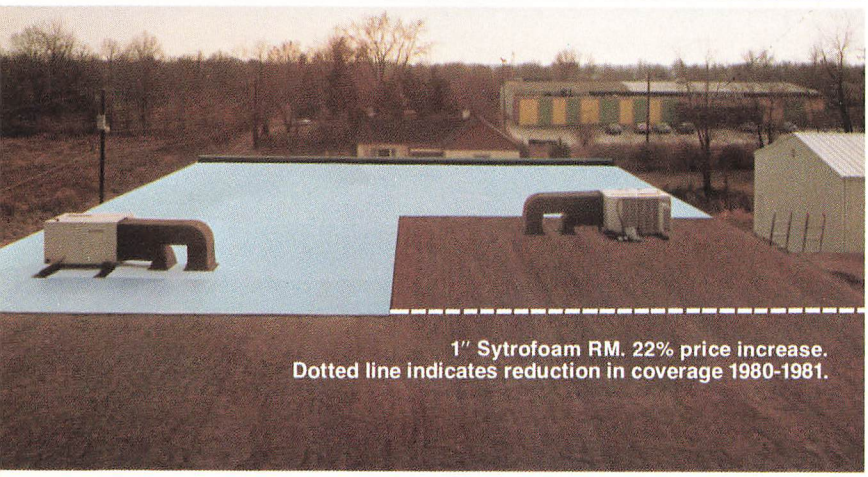
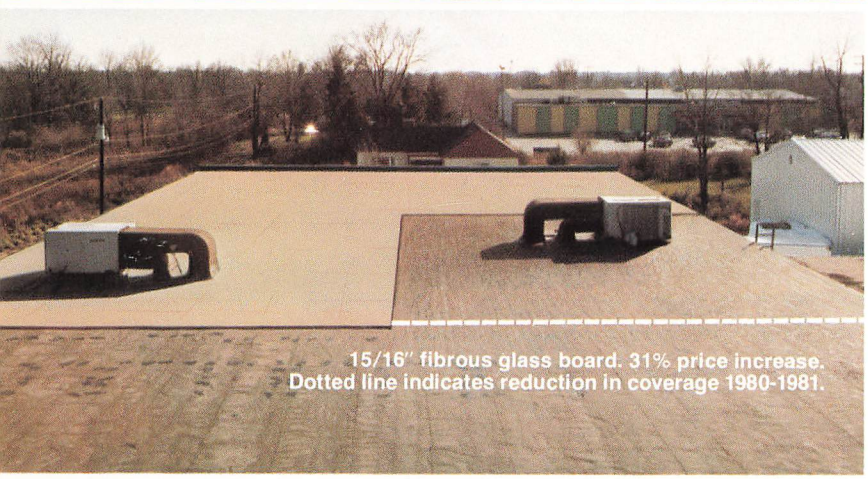
New Figures—
Even more R's for less $ in 1981

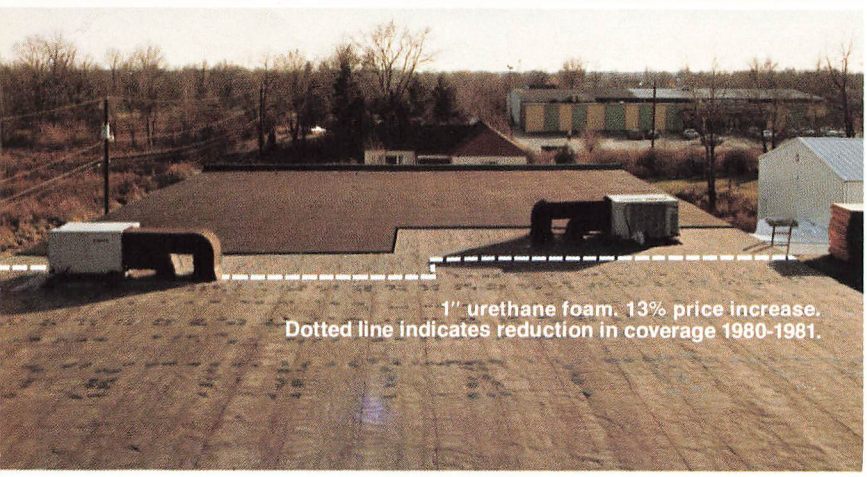
2″ EPS. Small price decrease.



1″ Sytrofoam RM. 22% price increase.
Dotted line indicates reduction in coverage 1980-1981.



15/16″ fibrous glass board. 31% price increase.
Dotted line indicates reduction in coverage 1980-1981.



1″ urethane foam. 13% price increase.
Dotted line indicates reduction in coverage 1980-1981.

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Year after year, dollar for dollar, you get more roof insulation with EPS than with any other material. Not only more coverage, but better R values, too.

Compare the numbers roof to roof. Two inches of EPS insulation typically costs about 24¢ per square foot and has an R value of 7.8. One-inch Styrofoam RM insulation has an R value of only 5.0, yet costs 10¢ more per square foot! For the same money, two-inch EPS gives you a superior R value, and — as seen in the updated photo — it covers 49% more roof!

Two-inch EPS has a greater R value than 1″ urethane foam (R = 6.2) while covering 62% more area. And EPS insulation also provides more than twice the R value of 15/16″ fibrous glass board (R = 3.8) and covers 49% more area for the same cost! And the figures get better all the time.

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Get more, spend less with EPS.

MATERIAL	COST/ SQ.FT.*	% CHANGE 11/79-11/80	R VALUE	COVERAGE (@ $1170)
2″ EPS	23.4¢	−2	7.8	5000 sq. ft.
1″ Sytrofoam RM	33.9¢	+22	5.0	3451 sq. ft.
15/16″ fibrous glass board	34.8¢	+31	3.8	3362 sq. ft.
1″ urethane foam	37.8¢	+13	6.2	3095 sq. ft.

*Estimated average manufacturer's published price per square foot based on a random survey of roofing contractors conducted by the Bureau of Building Marketing Research, November 1980. Actual prices may vary.

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ARCO Polymers, Inc.

Subsidiary of Atlantic Richfield Company
Pipeline to plastics.
Manufacturer of DYLITE™ expandable polystyrene.

The European roofing experience

What can you expect when six American roofing contractors take six days to visit five European countries to learn about roofing in other countries? Read on for the answer.

It all started at the 1980 NRCA convention in New Orleans when several roofing contractors sat at a table in the exhibit hall discussing items of mutual interest. Several European contractors joined in on this discussion; and before long, according to Western Pacific President Johnny Zamrzla, "An offer was made by our European friends that should we care to travel to Europe, they would be most happy to share first-hand their roofing operation."

An offer like that was hard to refuse. So it was—five months later, June 14—that Zamrzla, Burton Karp, Wayne Mullis, John Bradford, Melvin Kruger and Monte Upshaw were heading for Europe. Although all six are active in NRCA, this was not an NRCA-sponsored trip.

The group came back having learned more than they expected and anxious to share their information with their American colleagues. They did that with a presentation on "The European Roofing Experience" at the 1981 NRCA convention in Phoenix.

California-based Peter Van Dijk of Dutchglas Roofing Systems was the group's go-between organizer for the trip; and Zamrzla, also California based, assumed the roll of coordinator for the group. Their instructions to Van Dijk, said Zamrzla, were that they wanted "to visit with roofing contractors, to see as many roofs as possible and not tour manufacturing plants."

In his introductory remarks on the tour at the convention, Zamrzla cautioned the audience: "Please keep in mind that those contractors we visited may not be representative of the entire European roofing industry. Their opinions of single plies and/or conventional systems may also not be representative of the entire roofing industry."

Many of the contractors that the group visited, said Zamrzla, are large by our standards; and they are most concerned about guarantees and performance of the systems they install. Consequently, most contracting firms are conservative in their approach to the roofing systems they install.

The larger contractors, explained Zamrzla, have from 16 to 22 branches of operations, employing 2,000 plus employees. The smaller contractors, he said, employ 100 to 120 applicators. A larger contractor produces sales in excess of $100 million annually.

The six arrived at the Amsterdam airport early on a Sunday morning; and until they left six days later, they were on the go almost constantly, sightseeing the first day and visiting contractors the rest of the time.

The contracting division of Cindu-Key & Kramer hosted them in Holland. The company's head Gijs Key had arranged the entire European itinerary. The company's volume is approximately $50 million generated through 15 branch offices, employing 1,500 field personnel, throughout Holland. The company also manufactures roofing felts and asphalt, distributes roofing equipment and has interests in the United States.

'...the group found the trip "to be one of the most personally rewarding of our business careers."'

In providing an overview of the trip at the convention business session, Melvin Kruger, a former NRCA president and head of L. E. Schwartz & Son, Inc., Macon, Ga., said the group found the trip "to be one of the most personally rewarding of our business careers."

In Holland, the first country visited, branch managers conducted tours on job sites. Some observations Kruger shared with the audience on the Holland experience were:

- Considerable time is spent working with architects to provide sound installations.
- They believe in the conservative approach to roofing; they work toward providing quality installation for long-lasting systems.
- Multi-ply systems are always preferred, and they view negatively systems without safety factors. Estimate of the single-ply market in Holland is five percent.
- Roofers in Holland are paid a guaranteed annual wage, rain or shine. Dismissal of employees is virtually impossible. After four years with a company, two years of severance pay is required to terminate.

From Holland it was on to Belgium. ATAB, the country's largest roofing company, hosted the Americans. ATAB is the umbrella organization for Albitum, which deals in conventional systems, and for Resiplast, which deals with nonconventional systems. The Albitum division employs 150 roofers and has sales of approximately $8 million.

Resoplast's technical director reviewed with them the history of single-

ply systems in Belgium, noting that overall experience has been poor with usage down to virtually zero.

Next on the agenda was Germany where the Ruberoidwerke Company, a $75 million concern based in Hamburg, hosted them. The company, with 18 branch offices and approximately 2,000 employees, manufactures products but considers itself primarily a contractor. Its managing director, Dieter Thun, heads the German Roofing Contractors Association.

Again single-ply systems were discussed, said Kruger. They learned that PVC is the most popular of the single-ply systems; however, overall, single-ply usage, which is currently holding a 15 percent share of the market, is declining.

They were told, said Kruger, that PVCs marketed in Germany are reinforced and/or 1.2 minimum thickness. The .8 mm materials basically failed. Further, said Kruger, they were told that cooperation from PVC manufacturers on problem situations has been unsatisfactory.

The firm of Briggs Amasco Limited hosted the six traveling contractors in England. The firm is the English roofing products division of the TARMAC Group, a $1.5 billion corporation. One hundred people at the headquarters oversee 500 white collar employees in 23 branches throughout the United Kingdom. Each branch is a profit center completely staffed with separate managers for mastic asphalt and felt roofing; total volume is $80 million. Although the Briggs Amasco Limited does manufacturing, it is primarily a contractor. No elasto/plastic work is done by the company, and virtually none is being done in the United Kingdom, according to what the Americans were told.

The final country visited was France where Spapa, the French division of TARMAC, hosted the group. Spapa and Briggs Amasco Limited together represent what is probably the largest roofing operation in the world, said Kruger. Spapa, which has a volume of $100 million, does not do elasto/plastic work; and its commercial director indicated that these materials are not used in France.

Observations

While pointing out the difficulty of forming definitive conclusions from a six-day visit to five countries, Kruger nevertheless said the group believed their time was well spent and the trip was a "true learning experience." Also, the group, said Kruger, ended up with a consensus of opinion on the following:

- European roofing felts and asphalt are of heavier weight and reinforced far more than materials marketed in the United States. Kruger noted that the contracting arm of the companies works closely with the manufacturing divisions, being aware that both lose if the roofs fail.
- All firms visited showed commitment to multi-ply installations of bituminous materials of high quality.
- The firms visited expressed a lack of confidence in the use of single-ply installations. The Dutch, Belgium, and German groups have experienced failures with all types of loose-laid and attached elasto/plastic materials. The English and French have stayed away from them entirely. Present estimated market shares are 15 percent in Germany, Norway, and Austria; 25 percent in Switzerland; five percent in Holland; and virtually zero in Denmark, Belgium, France and the United Kingdom. However, modified bitumen materials are being used with a base ply of glass felt.

All firms visited showed commitment to multi-ply installations of bituminous materials of high quality.

Job sites

Honing in on specifics, Monte Upshaw of Fidelity Roof Co., Oakland, Calif., and Burton Karp of Eagle Moisture Protection Corp., West Hartford, Conn., reported on the materials used on jobs visited in Holland and Belgium; while John Bradford of Bradford Roofing & Insulation Co., Billings, Mont., and Wayne Mullis of Universal Roofers & Builders, Inc., Phoenix, reported on jobs in the other three countries visited. A chart summarizing what they saw on each project accompanies this article.

They saw 14 different products on six projects in Holland and Belgium. They also heard one of Central Europe's largest contractors review his experience over the past 10 years with single-ply roofing systems.

According to what they were told, Central Europe's single-ply experience, in brief, is as follows:

- Butyls started out big in the early 1970's and then steadily declined.
- PIB was the second system most commonly used; and that, too, has steadily declined.
- PVC was third, rose sharply in the early 1970's and has fallen off almost as quickly as it rose.
- PET started off weakly and diminished quickly.
- EPDM never seemed to get off the ground.
- Modified bitumen started slowly and has made the most consistent and steady rise.

Modified bitumens

One of the first jobs visited was an oil refinery in Belgium where they inspected the installation of some modified bitumens. The system was a perlite insulation solidly mopped to a primed concrete deck. A coated glass sheet was applied in hot over the perlite, and a modified bitumen slate-surfaced cap sheet was torched on.

The American contractors noted that the day was wet enough to have closed down most jobs in the United States, but the workers were using the torches that they had for the modified bitumen sheets to dry off the deck. Said Upshaw, "It seemed to be a natural procedure." Also, he added, "Blister-

Jobs visited—in brief

PROJECT	DESCRIPTION OF MATERIALS	APPLICATION
Highway Job Dusseldorf, Germany	1. Hyload "60"—Coal Tar Pitch and PVC Polymer sheet reinforced with inert fibers	Pour and roll in hot asphalt
	2. Saturated organic felt approx. 30#	Pour and roll in hot asphalt
	3. Quilted copper sheet construction joint reinforcing	Pour and roll in hot asphalt
	4. Asphalt 95/40	
School Cologne, Germany	1. Asphalt primer	Rolled
	2. Foamglas insulation	Pour coat of hot asphalt
	3. Coated woven glass felt. Glass fibers woven into a reinforcing base	Pour and roll in hot asphalt
	4. Coated glass fleece felt non-woven glass mat reinforcing	Pour and roll in hot asphalt
	5. Polystyrene insulation 3" × thickness × meter held together at top with organic felt	Pour coat of hot asphalt
	6. Polyester reinforced modified asphalt metal clad base flashing	Torched in place
Bus Terminal Cologne, Germany	1. Polystyrene insulation (expanded)	Loose Laid
	2. PVC membrane (60 mil) unballasted	Fastened to discs
	3. PVC coated discs	Screwed to deck
Office Complex London, England	1. Fiberglass insulation (high density)	Pour coat of hot asphalt
	2. Mastic Asphalt	Trowelled to screeds
	3. Sheathing paper (seperation sheet)	Loose laid
Warehouse London, England	1. Woven Glass felt vapor retarder	Sprinkle pour of hot asphalt
	2. Fiberglass insulation (without mopping surface)	Pour coat of hot asphalt
	3. Woven glass coated felt	Pour and roll in hot asphalt
	4. Coated asbestos felt	Pour and roll in hot asphalt
	5. Light colored chipping	Pour coat of cold mastic
	6. Mineral surface glass base flashing	Pour and roll in hot asphalt
Shopping Center London, England	1. Coated Glass felt (vapor retarder)	Sprinkle coat of hot asphalt
	2. Polyisosyanurate Insulation	Pour coat of hot asphalt
	3. Button punch glass	Solid pour coat of hot asphalt
	4. Polyester modified asphalt felt (125)	Pour and roll in hot asphalt
	5. Polyester modified asphalt felt (325)	Pour and roll in hot asphalt
	6. Polyester modified metal clad base flashing	Pour and roll in hot asphalt
	7. White chipping	Pour coat of cold asphalt mastic
Medical Facility Amsterdam, Holland	1. **CPE** (Chlorinated polyethylene) glass fiber fleece reinforcement (approx. 60" sheet)	Attached to deck with cold mastic adhesive in serpentine pattern. Seams adheared with different adhesive (not heat welded)
	2. **PVA** (Polyvinyl alcohol) synthetic fiber reinforced asphalt coated sheet (approx. 40 lbs.)	Applied in hot asphalt 110/30 on primed concrete surface deck
	3. **Vented Base Sheet**—glass fiber reinforced asphalt coated base sheet with ¾" holes, 4" on center	Serpentine mopped to urethane insulation. Next layer mopped solid to base sheet
	4. **Cap Sheet**—slate surfaced asphalt coated fiber glass reinforced. Approx. 60 lbs/square feet	Applied in hot on walls and deck over vented base sheet on urethane insulation
	5. **Modified Bitumen Flashings**—Slate surfaced glass reinforced sheet	Torched into place at perimeter flashings and equipment and mount curbs
	6. **Asphalt 110/30** 110 = the centigrade degree melt point (approx. 205 degree F melt point). 30 = the penetration of the asphalt; the U.S. most common usage is approx. 15.	This asphalt material was used on flat as well as vertical surface
Bus Maintenance Facility Amsterdam, Holland	1. **Silicon release tape**—silicone coated paper tape	Applied directly to the deck insulation joints to minimize joint stress on membrane and to prevent drippage
	2. **Glass ply sheets**—asphalt coated approx. 25 lbs. per sq. feet	Applied in multi-ply system in 110/30 asphalt but on a one on one basis usually, and not shingled in.
	3. Cold adhesive—cut back asphalt adhesive	Applied to finished surface of membrane to receive slate surface broadcast into the adhesive.

Table continued

European roofing experience - continued

PROJECT	DESCRIPTION OF MATERIALS	APPLICATION
Heineken Brewery Hillegom, Holland	1. **Urethane Insulation**	Secured to sheet deck with self-tapping screws through tin discs, 3'' diameters.
	2. **Vented base sheet**—glass fiber reinforced asphalt coated base sheet with ½'' hole 2-3'' on center	Set directly over urethane insulation in serpentine pattern
	3. PVA (polyvinyl alcohol)—synthetic fiber reinforced asphalt coated sheet (approx. 40 lbs.)	Applied in solid application of asphalt over vented base sheet—pour and roll method.
	4. **Cap Sheet**—Slate surfaced asphalt coated fiber glass reinforced. (Approx 60 lbs. per square foot.)	Set in application of hot asphalt 110/30—pour and roll method.
Oil Refinery Antwerp, Belgium	1. **Perlite Insulation**	Set in hot asphalt on a primed concrete deck.
	2. **Glass ply sheet**—coated asphalt fiber glass reinforced ply. (approx. 35 lbs. in weight)	Set in hot asphalt squeezed application.
	3. Modified bitumen cap sheet	Torched into place
Rail Transportation Storage Bldg., Antwerp, Belgium	1. E.P.D.M. (Ethylene Propylene Diene Monomer 30'' thickness	Applied in cold adhesive in serpentine fashion over insulation on a steel deck.

ing of roof membranes was practically non-existent on any part of our tour.''

EPDM

While they were told that EPDM has practically been eliminated from the Central European market, the six did see an EPDM job, which one of their host companies had applied several years ago. Because the system, which was still under a guarantee, had developed problems, the company was servicing it. The EPDM was not of the same formulation as marketed in the United States.

Upshaw and Karp showed a slide of the job. Dark wavy lines, which were caused by a stain that penetrated through the sheet of the adhesive, could be seen on the material. The system was a partially bonded system, and its failure was due to small openings that had developed in the laps from wrinkling.

Multi-systems

One of the largest and most interesting projects the group visited was a medical facility in Amsterdam. It was about 60 percent complete when they saw it, and they inspected four different systems and about 10 different materials.

The first system was a plastic CPE (chlorinated polyethylene) sheet material backed with fiber glass to provide stability. This was applied directly to a plywood deck between skylights with a cold modified asphalt adhesive under pressure. The seams were caulked after the material had been laid, and the material was counter-flashed with a butyl sheet.

The second system on the project was an inverted roof assembly system. The insulation was almost identical to materials marketed in the United States. The insulation was applied on one ply of PVA (polyvinyl alcohol), which is an asphalt-coated synthetic fiber, weighing approximately 40 pounds. It was mopped into an application of 110/30 asphalt on a primed concrete deck. This one ply was the complete membrane. The contractor expressed reservations about such a thin roof membrane, but he said the decision had been made by the owners.

The third system was on the parapet walls which were insulated to prevent a cold bridge from developing at the flashing between the roof and the wall. Because the wall is not adaptable to the inverted assembly, the membrane was installed over a polyurethane insulation.

The fourth system used a mineral (slate) surfaced cap sheet which is similar to what is used in the United States but is manufactured with a lighter glass mat and 25 percent more asphalt. A glass-reinforced base sheet was applied, then a PVA reinforced sheet and then the cap sheet.

The next project the group visited was a newly constructed bus maintenance facility. The materials used were a release tape, a glass ply sheet, 110/30 asphalt cold adhesive surfacing and granules. The release tape is a silicon-coated paper applied to minimize the joint stress on the membrane and to prevent the asphalt from dripping through to the area below. The material is made in Japan. Three layers of 35-pound glass-reinforced, asphalt-coated roofing sheet were applied in asphalt 110/30. Next a cold asphalt adhesive was applied and slate granules broadcast into the coating, similar to a system in the United States.

The Americans then went to the Heineken Brewery which had been roofed over a seven-year period. The same basic system was continuing to be used as was used for the first roofs. Urethane insulation was mechanically fastened to a steel deck with self-taping screws penetrating a tin disc and the insulation. A vented base sheet was used over which a cindermat was applied and then the cap sheet. All of this was set in 110/30 asphalt.

At Delph in Holland, the group visited Cekadak headquarters where they saw a training school for roofers and an asphalt packaging plant.

They observed asphalt pumped into long plastic bags (100 feet long and 2 feet in diameter). These bags float on water in a long shallow tank. During the night cool water is sprayed on the bags; and in the morning, the cooled bag is cut into three-foot sections for handling. The blocks of plastic-wrapped asphalt are put into kettles whole—without stripping off the wrappers—and heated for application.

Sunken highway

In Germany, the first job they saw was a sunken highway running through Dusseldorf. Ruberoidwerke, their host in Germany, had the contract to waterproof the walls and the floor. The specifications called for two products which were unique to the U.S. contractors but which are available in the United States. The first was a bridge waterproofing product manufactured by Ruberoid in England under the brand name of Hyload. It is a very dense compound of coal tar pitch and PVC polymer which has been reinforced with inert fibers. Made in several

thicknesses, the one used for this project was Hyload 60. It was installed using hot asphalt with the pour and roll method of application. The roll was started at the bottom of the wall, and hot asphalt was continuously poured along the "V" created by the roll as the material is rolled up the wall.

Over the Hyload, the Germans installed from three to five plies of an organic felt which appeared to be about the same weight as 30-pound organic felt in the United States. This was applied using hot, unmodified asphalt with a softening point of about 200 degrees fahrenheit and a penetration of 40.

Commenting on this project, Bradford said, "With so many sophisticated ply materials available to them, it seemed incredulous to us that they would use organic felt in their waterproofing system."

Another unfamiliar item they saw on the job was a quilted copper joint cover which was installed into the built-up membrane on a flat plane at the vertical expansion joints which occurred approximately 50 feet on center. The quilting in the copper allowed for the movement of the structure.

Glass fleece membranes

The American group found that most of the roofing products used in Europe to produce built-up roofing membrane were either glass fleece or woven glass membrane but bear little or no resemblance to the glass felts available from U.S. manufacturers. Nearly all glass felt in Europe is coated and looks much like the coated base sheets in the United States.

In many cases, European specifications call for the laminating one-on-one of two or three plies of these coated glass felts, and then they are installed by the pour and roll method with plenty of hot asphalt.

Nearly every job the Americans saw with a built-up membrane over insulation had a button-punched glass base sheet installed loosely over the insulation. This was followed with additional plies of felt installed by the pour and roll method. By using the venting base sheet, said Mullis, they've had no blistering problem over insulation.

School building

A school building they visited in Germany had three different decks: 338 squares of reinforced concrete, 486 squares of lightweight concrete and 169 squares of deep rib steel. While there, they saw the crews applying the roofing to the reinforced concrete deck which would ultimately be used as a parking facility. The specification called for primer, one layer of 60mm foamglas in a pour coat of hot asphalt, one layer of woven glass membrane and finally one additional layer of the heavier glass fleece membrane. Each of these sheets was laid one-to-one, employing the pour and roll method of application. The surface was then hot coated, using the same grade of asphalt as was used throught the system. Prior to the concrete topping, two layers of a foil separation sheet would be applied by others.

On the lightweight concrete deck, the specifications called for a primer, covering joints betwen the pre-cast lightweight slabs, installing a layer of polystyrene insulation with a factory-cut slope of about two degrees, one layer of glass fleece membrane with button-punched holes, one woven glass membrane and one glass fleece membrane, a flood coat of hot asphalt and a five-eighths inch to one-and one-fourth inch gravel surface.

The Americans questioned putting a built-up roofing membrane directly on polystyrene insulation; however, said Mullis, these people were confident that this system would be able to withstand the expansion and contraction of the insulation without adverse consequences.

"With so many sophisticated ply materials available, it seemed incredulous that they would use organic felt in their waterproofing."

The steel deck was also primed, over which was installed in hot asphalt a vapor retarder membrane consisting of two glass fleece sheets laminated together at the factory with a layer of aluminum foil between them.

Mullis commented that the insulation product used "intrigued us all." It was polystyrene about three to four inches thick, cut in strips about six inches wide by one meter long. These strips, said Mullis, were held together at the top by one layer of saturated organic felt. The material is rolled up and secured for shipping and handling; and when it is applied, it is simply unrolled into a hot pouring of asphalt. The membrane used on this project was one woven glass and one slate-surfaced glass fleece membrane.

PVC

The next job the group visited in Germany was a PVC-attached membrane on a 1585-square roof of a bus terminal. Since the host company no longer applies PVC, it had made arrangements with one of its competitors to show the Americans this project. The roof deck was steel with high ribs, with a thin layer of polystyrene insulation laid to level the deck, then a glass fiber sheet, the thermal insulation and the PVC membrane which was 1.5mm. The PVC was secured to four inch diameter disks which were screwed through the insulation into the deck. The PVC sheet was unballasted and left exposed.

While the American contractors agreed that the workmanship appeared quite good, Bradford noted that German roofers have some of the same problems that U.S. roofers have. They noted that some of the drains were high and not enough slope was apparently provided in the valleys between drains.

Asphalt mastic roofing

Moving on to England, the men saw a roofing system which was unique to most of them. It was the asphalt mastic roofing system. The roof, approxi-

mately 900 squares, was on an office complex in the Westminster section of London. After two years and over $3 million, the job, which was a reroofing, was just being completed.

The original roof had been done some three to four years previously and due to a number of problems had failed. The reroofing was following the same specifications as the original with only the insulation being changed to a different fiber glass with a greater density.

The asphalt mastic specification consisted of two lifts of hot troweling-consistency mastic composed of limestone flour and about 10 percent asphalt over the rigid fiber glass insulation. The material came to the job site in chunks which were melted in a kettle with an agitator. Workers—in chain-gang style—conveyed the mastic in approximately two-gallon pails to the roof.

The molten viscosity of the mastic approximated plaster. Each layer is applied by trowel with screeds to insure thickness. The first lift of 15mm was applied over glass fiber insulation. This material was 10 percent asphalt and 90 percent solids. Two layers of sheathing paper applied to a 20 to 25mm thickness were installed before the final lift which was eight percent asphalt and 92 percent solids. A 10-mil reflective coating was applied and concrete block walkways were installed for foot traffic. The weight of the finished system is 90 kgs/square meter.

Bradford noted that this type of roofing has been successfully used in England for perhaps 250 years with some roofs still in service after 120 years. Special crews exclusively do this type of work which is extremely slow.

In England we found more specifications which would be considered conventional to us than we did anywhere else in Europe.

In France, the group saw the same type of roofing being applied on a Renault car park garage; however, the contractor used much more mechanized means of heating and material handling than his English counterpart. The material arrived at the French job site in a preheated tanker truck which dumped the mastic asphalt into luggers. The luggers were hoisted on to the roof, placed on a small tractor and taken to the point of application. At that point, workers transferred the mastic to small buckets to hand carry the rest of the way. They hand troweled it to the screeded thickness. The French specification called for three lifts of mastic asphalt with each lift being of a different formulation of limestone flour, asphalt and other aggregate additives.

Conventional roofing

It was in England, said Bradford, "where we found more specifications which would be considered conventional to us than we did anywhere else in Europe."

For example, a school they saw under construction had a concrete deck on the major classroom area. There was one layer of insulation followed by three plies of asbestos-saturated felt with a gravel surface. Workers used the pour and roll method to lay the felt and embedded the gravel in a cold-applied mastic.

Also in England, the American contractors looked at a warehouse under construction having a vapor retarder of woven glass ply which had been sprinkle poured to the steel deck. The fiber glass insulation had been applied with a poured can of hot asphalt. The membrane consisted of three felts laid one-on-one: woven glass coated, asbestos and coated glass. Over the final ply, workers applied a mastic and embedded in it white chipping.

The final job they viewed in England was a shopping center. The deck was of deep rib steel. Workers had installed a coated glass vapor retarder in pour coat on the ribs of the steel. Over that went a layer of one-and one-half inch polyisosyanurate insulation, and then a button-punched venting base sheet of woven glass was applied in a solid pour coat of hot asphalt.

A light polyester reinforced coated sheet was installed in hot, followed by a heavier polyester ply felt. The surface was followed by a heavier polyester ply

European field trip

While the trip of the six American roofing contrctors to five European countries was not an NRCA-sponsored event, all six are active in the association; and as past president Mel Kruger said, "All of us were aware that none of this would have been possible had it not been for our involvement with NRCA."

So it is, then, that through NRCA, the six shared their experiences with their colleagues and resolved to establish an ongoing liaison between the European and American roofing industries.

"Our association is highly respected in European circles and is recognized as the voice of the U.S. roofing industry," said Kruger. Every group they visited, he said, enthusiastically endorsed an ongoing dialogue; therefore, he said, "We suggest that in a world where London is only three hours farther away from Atlanta than is Phoenix that it would be a shame if we missed the opportunity to establish a liaison between our markets."

By the time the six presented their program on the "European Roofing Experience" at the NRCA convention in February, Kruger could tell those attending the session that the cooperation was underway. Under the auspices of the Roofing Systems Technical Committee (RSTC) and with the cooperation of European contacts, asphalt samples from Holland, Belgium, Germany and England had been obtained and tested for comparison with commonly used asphalts in this country.

A chart was developed defining the differences in the material, generally showing that European asphalts have less temperature susceptibility judged on softening point/penetration relationships than American mopping grade asphalts.

felt. The surface was flood coated with mastic and finished with white chipping.

Summary

The six contractors agreed that the onsite visits allowed them to obtain a real insight into the philosophy and experience of the European commercial roofing market.

The were surprised to find a "general diminishing interest in plastic film roofing such as PVC and EPDM and an increasing amount of interest in the modified bitumen polyester or polyvinyl alcohol reinforced materials," said Bradford.

They noted that the modified bitumens have only been in service in Europe for five years at the longest, and they question how these products would be accepted in the American market. Said Bradford, "The standards of workmanship in Europe and the demands for high production in the U.S. may not make these products compatible with our current labor force, and major philosophical changes may be necessary if we are to prosper with these new European products."

Bradford, Mullis, Upshaw, Karp, Zamrzla and Kruger are convinced that the interchange of ideas they had last June, and are continuing to have, will have a positive effect on the roofing industries of both continents.

The six traveling contractors in their touring outfits: Wayne Mullis, Johnny Zamrzla, Mel Kruger, Burton Karp, Monte Upshaw and John Bradford.

On several evenings, the six Americans dined with their European hosts.

results in positive actions

The noted differences would expect to result in:

1. Less brittleness and higher penetrations at low temperatures.
2. Possibly less flow at higher temperatures.
3. Probably higher EVT's.
4. Somewhat less sensitive EVT.
5. Somewhat higher manufacturing costs.

The testing, said Kruger, indicated that one grade appears to be the same type as our Type II or III asphalt; the other grades are plasticized asphalts. With more plasticizers and penetration improvers which are required to achieve the temperature susceptibilities shown in the tested samples, we can expect higher manufacturing costs, said Kruger.

RSTC plans further study. A task force has been established to further analyze these results and to set up a testing program with a small amount of "European" asphalt developed in this country by a major asphalt company.

Because the European asphalt has a high melt point and high penetration qualities, effort in this area is important. Said Kruger, "I am sure that you can see the possibility of positive advancement on asphalt technology from this effort."

In addition to the asphalt study, the NRCA leadership is reviewing ways and means to further benefit from the European experience. At the NRCA convention, the six contractors who visited Europe met with European contractors attending the convention. This meeting of the NRCA/European Group Task Force took several actions including:

1. NRCA and the International Waterproofing Association will join each other's organization. While no exchange of funds is necessary, said Kruger, announcement of this to the international roofing community will be of significance.
2. Information will be forwarded to NRCA on the IWA, particularlly in the following areas of interest:
   a. Application techniques on membranes over urethane insulation.
   b. Agrement Board approvals and/or disapprovals.
   c. Requirements for use of PVC materials.
3. NRCA requested that IWA forward any information on market shares or performance history of the various European elasto/plastic products now being marketed in the United States.
4. The two groups will meet again at the 1982 NRCA convention.

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__RC-15 Preventative Law for Roofing Contractors: Steps Roofing Contractors Can Take to Reduce the Likelihood of Being Involved in Litigation—*Stephen M. Phillips*

__RC-16 NRCA Research & DOE Program—*Panel*

__RC-17 Introduction to Elasto-Plastics—*Charles Bechtel*

__RC-18 The Warning Line System Today: Its Relevance to the Roofing Contractor—*Panel*

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The roofing spec SUPPLEMENT
For Members Only
Vol. 1, No. 4 May 1981

Your Association

NRCA/ASTM Coordinating Committee

by Robert LaCosse
NRCA technical services manager

The NRCA-ASTM Coordinating Committee does as its name implies: coordinates NRCA activities within the activities of the many ASTM (American Society for Testing and Materials) committees, subcommittees and task groups which involve roofs and roof assemblies.

Working with the NRCA Technical and Research Committee, the coordinating committee makes sure that NRCA positions promoted within the ASTM committees are in line with the association's official positions.

Bob First of Clevenger Roofing and S/M Co., Lima, Ohio, chairs the committee; and I serve as NRCA's official representative to ASTM.

Initially, NRCA's involvement with ASTM was with the following two committees:

- Committee D08, Roofing, Waterproofing and Bituminous Materials.
- Committee E06, Performance of Building Constructions.

Milton Olson, a former NRCA president from Omaha, Neb., was for many years NRCA's representative on Committee D08 and worked with other contractors active in ASTM. Among those active with Olson were Bob First; Bill Kugler, current NRCA president from Denver, Colo.; Ray Johnson, Tulsa, Okla.; and Paul Morris, Kansas City, Mo. These contractors also worked on E06.21.03 Committee on Roof Assemblies (CORA) to finalize the proposed Standard Practice for Roof System Assemblies Employing Steel Deck, Pre-formed Roof Insulation and Bituminous Built-Up Roofing.

As the use of insulation in roof assemblies increased, NRCA, in 1979, joined three additional committees:

- Committee C16 on Thermal and Cryogenic Insulating Materials.
- Committee C24 on Building Seals and Sealants.
- Committee E05 on Fire Standards.

A year later, in 1980, because of the increased use of elasto/plastic in roofing assemblies, NRCA joined:

- Committee D11 on Rubber and Rubber Like Materials.
- Committee D20 on Plastics.

These two committees have jurisdiction over standards covering physical properties and test methods for many of the elasto/plastic materials.

With NRCA's expanded involvement in ASTM comes the need for roofing contractors to serve on committees. This is especially important because a large number of producers, consultants and general interest groups are already well represented on the committees. Roofing contractors as "users" must make sure their voices are heard within this large group as ASTM prepares standards and test procedures dealing with roofing.

Many slots on committees need filling. Consider, for example, Committee D08. Currently, that committee has 11 subcommittees and over 30 task groups working on roofing product standards and test procedures.

To help it fill positions on ASTM committees, NRCA has called on its affiliate associations; and the associations have responded. Seventeen representatives of affiliate associations from the Midwest, Chicago, Northeast, Western Pennsylvania, Philadelphia and vicinity, Miami Valley (Ohio) area and Washington state attended a committee meeting this past January to select committees on which they wanted to be active. Additionally, committed to ASTM activities but unable to attend the meeting were the Roofing Industry Promotion Fund (Warren, Mich.) and the affiliates from Santa Clara County and Greater St. Louis. As a result of the meeting, several other affiliates have indicated an interest in getting involved in this cooperative effort. Any other affiliates interested should contact NRCA's technical services department.

As indicated earlier in this article, the NRCA-ASTM Coordinating Committee is involved in the work of seven committees. Those committees are described briefly below:

1. Committee C16 on Thermal and Cryogenic Insulating Materials

(a) Subcommittee C16.22 on Organic and Nonhomogeneous Inorganic Thermal Insulations.

(b) Subcommittee C16.24 on Health and Safety Hazard potentials.

(c) Subcommittee C16.32 on General Test Methods.

This committee promotes knowledge, research and the standardization of test methods, including setting criteria for laboratories performing these tests. It develops specifications, practices and definitions for thermal and cryogenic insulating materials, products, systems and services. The committee is also concerned with protective coating and covering materials and systems which are used to preserve thermal and cryogenic insulating performance.

2. Committee C24 on Building Seals and Sealants

(a) Subcommittee C24.80 on Building Deck Waterproofing Systems

(b) Subcommittee C24.86 on Solar Collector Seal Applications.

This committee concentrates its

attention on materials, products, systems and services used for the sealing of building joints and those traffic decks that are considered part of a building complex. Building seals and sealants include caulking compounds, putty, elastomeric compounds, glazing compounds, preformed gaskets and sealing tapes for joint applications; and membranes and liquid-applied elastomeric sealing compounds for surface application.

3. Committee D.08 on Roofing, Waterproofing, and Bituminous Materials

(a) Subcommittee D08.02 on Prepared Roofings, Shingles and Siding Materials.

(b) Subcommittee D08.03 on Surfacing and Bituminous Materials for Membrane Waterproofing and Built-Up Roofing.

(c) Subcommittee D08.04 on Fabrics for Bituminous Roofing and Waterproofing.

(d) Subcommittee D08.05 on Solvent Bearing Bituminous Compounds.

(e) Subcommittee D08.09 on Bituminous Emulsions.

(f) Subcommittee D08.18 on Polymeric Materials for Roofing and Waterproofing.

(g) Subcommittee D08.20 on Non-Structural Roofing Systems.

This committees' expertise is bituminous and polymeric materials for roofing, waterproofing and related industrial uses.

4. Committee E05 on Fire Standards

(a) Subcommittee E05.11 on Building Construction.

(b) Subcommittee E05.13 on Large Scale Test.

(c) Subcommittee E05.14 on Roofing.

(d) Subcommittee E05.31 on Terminology.

(e) Subcommittee E05.33 on Editorial.

This committee implements ASTM policy on fire standards. It also develops, revises and approves fire standards used to analyze the fire performance of materials, products and systems within their actual environents as well as under controlled conditions. The committee also administers and evaluates fire research programs.

5. Committee E06 on Performance of Building Constructions

Subcommittee E06.21 on Serviceability.

(1) E06.21.02 Task Group on Wind-Uplift Test for Roofing Systems.

(2) E06.21.03 Task Group on Roof System Assemblies (CORA).

(3) E06.21.04 Task Group on Control of Water Vapor and Flow by Capillary Action.

(4) E06.21.07 Task Group on Roof System Assemblies Employing Poured In-Place Insulation Fills.

This committee develops standards for building (including housing) constructions, elements, connections and assemblies both under actual and simulated conditions. The committee takes into consideration building codes and other authorities with whom it has liaison for ASTM.

6. Committee D11 on Rubber and Rubber-Like Materials

This committee has 26 subcommittees, making the need for roofing contractor members especially great. The committee deals with rubber and rubber-like materials, the compounding ingredients used in the materials and the products that result. The committee's research includes investigating the properties of these materials.

7. Committee D20 on Plastics

As with Committee D11, NRCA just joined this committee last year and must become active in its 18 subcommittees. Its scope is plastics, including their raw materials, components and compounding ingredients. The committee also concerns itself with finished products made from plastics, such as sheets, rods, tubes, pipe, cellular materials and molded or fabricated articles.

Business should get better break

by Robert L. Leggett
NRCA Washington representative

Over 1,000 contractors—primarily from the sheet metal and mechanical subcontracting specialties—attended the 1981 Construction Industry Legislative Conference sponsored by the National Construction Industry Council in Washington in March.

At this year's session—unlike other years—a particular plan was *not* developed to help out the construction industry through Washington legislation. Rather, the 1981 conclave's purpose was to generate expectations for an improved business climate on Capitol Hill.

Nobody could attend all the sessions since many of them were simultaneous, but they all seemed to have a similar theme "that with the new administration, business should get a better break."

To be sure, it was pointed out at most sessions that while business-oriented Republicans had control of Senate committees, labor-oriented, liberal Democrats controlled most of the House committees. Exceptions were noted.

On the Senate Labor Subcommittee, while the numerical edge appears to be 9-7 in favor of business-oriented Republicans, ideological experts believe that committee member Senators from Vermont and Connecticut were mavericks and not always predictable, thus the committee stands an even 8-8.

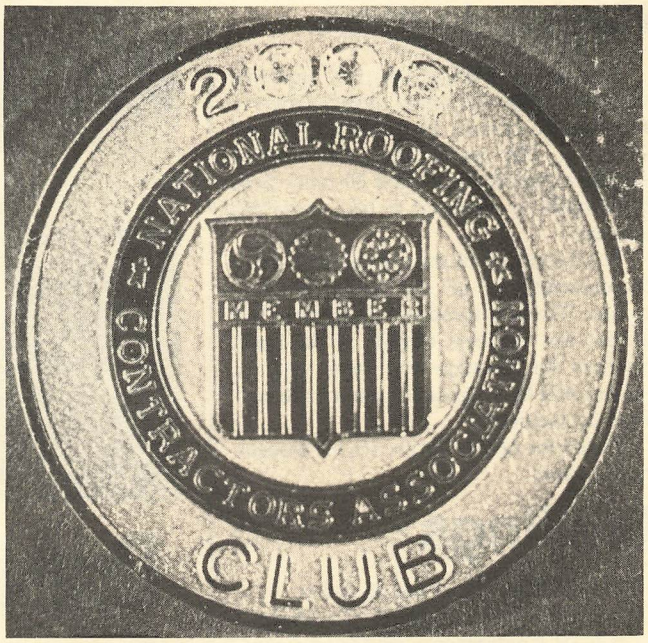
On the House Labor Subcommittee, there was some skepticism about the replacement for Chairman Frank Thompson of New Jersey. Some speculated that the new chairman from California, my friend Phil Burton, was an unknown quantity. Congressman John Ashbrook of Ohio cleared up the momentary confusion, speaking to the labor management panel. He pointed out that Burton had qualities he admired, but not the philosophy. Burton, he said, was tenacious, an innovator, a man who does his own staff work and, many times, a man who gets his way. Burton has generally been credited with the black lung multi-billion dollar legislation that helps sick coal miners.

The bottom line, most speakers agreed, was that it was nice to have a conservative-oriented administration. Neither the Senate, nor the House, will lay over and play dead while major laws are repealed. It was the consensus that surely labor could make no further legislative gains in the current Congress considering: first, the general conservative House coalition of Republicans and Democrats; second, the Republican-dominated Senate; and third, the Reagan veto power.

What this means, of course, is that amendments to the minimum wage law, the Davis-Bacon Act, E.R.I.S.A., and the Longshoremen and Harbor Workers Act might be difficult to effect unless some of the special interests involved are interested in horse trading. Nobody had anything in mind that they were willing to give up.

On a separate issue of industry tranquility, invited guest Bob Georgine, president of the Construction Industry Trades Department of the AFL/CIO, expressed concern that an era of labor management detente may be expiring—expressing fear that a new anti-union attitude was sweeping the country. Over 60 percent of all work is not labor organized. Georgine expressed some interest in construction management certification legislation inferentially, if the effect would be to bring more employers to the bargaining table. He was of the view that management could not agree on a certification bill even if labor was neutral. Georgine alleged that large corporations were splitting off into union and non-union segments.

2000 Club award



A three-diamond lapel pin goes to 2000 Club members who recruit 25 members to NRCA. Wayne Mullis, Universal Roofers and Builders, Inc.; Charlie Raymond, Giffen Roofing Co.; and John Carruth, Jr., Carruth Roofing Co., Inc., were the first recipients of the prestigious pin, shown above.

The 2000 Club is open to NRCA members who recruit five members. For more details, contact Dave Honaker at NRCA headquarters.

NRCA notes

Hdqtrs. to move

The NRCA Board of Directors approved the move of the associaton's headquarters to the area of O'Hare International Airport, Chicago. The move from the existing facilities, which are located 20 miles from the airport, is expected to take place this summer.

The directors took this action based on the recommendation of the Building Committee. The new location will provide easy access for members coming to the headquarters for meetings and visits, and the offices will have expanded library and conference facilities.

Watch for further details of your association's move.

Mailings

Recent NRCA mailings included:

- Convention Evaluations (1st Mailing)
- BUR Conference (2nd Mailing)
- RSTC
- Manual Update
- *Roofing Spec* (April)
- *Congressional Review*
- Convention Evaluation (2nd Mailing)

New members of 2000 Club

Venting of built-up roofing systems

by Wayne Tobiasson
Cold Regions Research and Engineering Laboratory

Editor's Note: *The following is excerpted from a paper presented by Mr. Tobiasson at the 6th Conference on Roofing Technology sponsored by the National Bureau of Standards and the National Roofing Contractors Association, April 30-May 1. The complete text, including references, is published in the Proceedings of the* ***Sixth Conference on Roofing Technology,*** *available from the NRCA.*

Why vent a roofing system?

Vents are openings installed to allow air or a liquid to escape from somewhere. Roofing systems are vented to permit escape of moist air since the components of roofing systems, notably insulation, are deteriorated by moisture

It is relatively easy to ventilate a cold attic below a gabled residential roof since a large air space is available. It is far more difficult to ventilate a compact roofing system (i.e. one where little or no air space exists between the components). The primary components of a compact roof are the membrane, the insulation and the deck. A vapor retarder may also be present, usually on the warm side of the insulation.

For one or more of these components, venting might achieve some of the following objectives:

1. To permit release of moisture *during* construction.
2. To permit subsequent drying of a wet-applied component.
3. To prevent accumulation of moisture.
4. To remove moisture that has accumulated.

Venting can only achieve some of these objectives, and then only under certain circumstances.

What objectives can by met by venting of membranes?

The only valid objective of venting a hot-applied bituminous built-up membrane is to remove excess moisture on or in the felts during construction (i.e. Objective 1 above). Small amounts of moisture trapped within a membrane can result in blisters and other flaws that promote premature membrane deterioration. Many roofing felts are perforated to allow moisture to escape *during* hot mopping of the membrane plies. Newer permeable glass felts also allow for venting during construction.

There is no way that a built-up membrane "itself" can be vented to satisfy Objectives 2, 3 or 4 listed above. Consequently, if blisters develop between the felt plies, installing vents is not the solution.

What objectives can be met by venting of decks?

Steel, precast concrete, timber, plywood and most other decks are installed essentially dry. As long as these decks are not sealed on their bottoms, they will tend to stay dry by self drying into the building below. Consequently, nothing can be gained by venting such decks during construction, or over a period of years.

"Green" cast-in-place concrete decks contain moisture that must subsequently be removed. However, most of that moisture escapes during the curing process prior to installation of the roofing system. The amount of moisture present in a cured concrete deck will usually be so low that it is of no great concern. Consequently, cured concrete decks seldom create moisture problems. They should not be sealed at their base since downward drying by evaporation into the air within the building is desirable. Concrete decks dry more slowly when cast on corrugated steel forms which remain in place. If roofing is applied to such a deck while it is still wet, and no vapor retarder is placed above the concrete, deck moisture may move upward into the insulation (perhaps wetting it).

Other wet-applied decks, such as concrete decks made with insulating lightweight aggregates, contain large quantities of water that may persist for a relatively long time. Roofing components are commonly placed on such decks

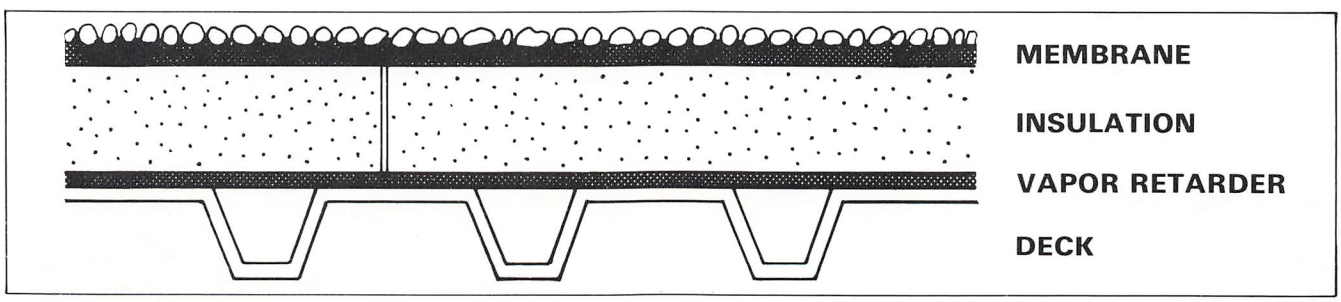


FIGURE 1
Cross-section of a compact roof.

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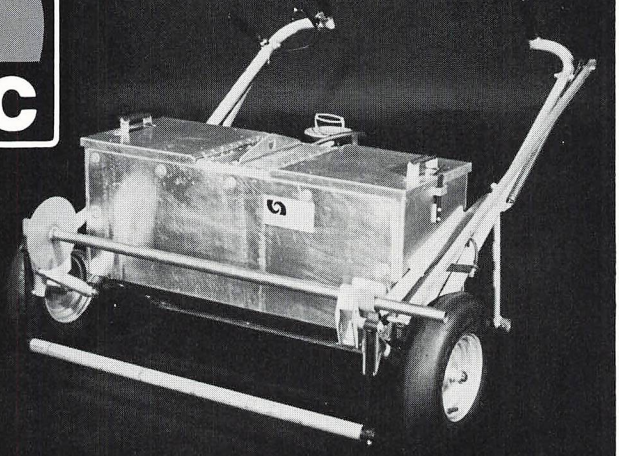

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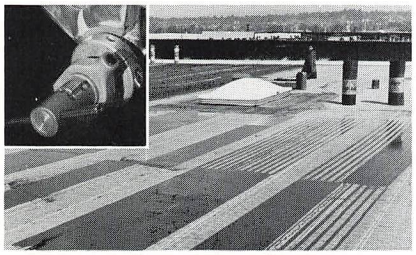

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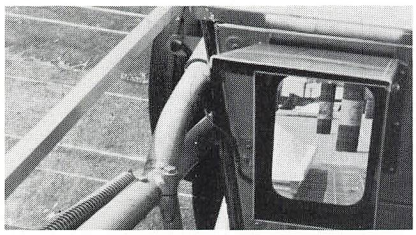

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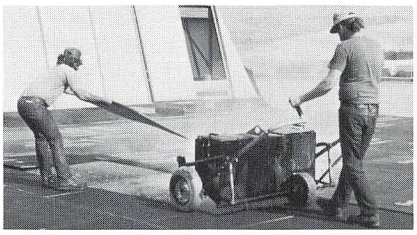
*Names available on request.



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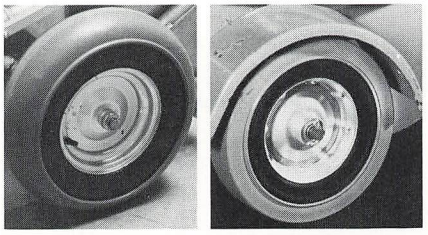

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while they still contain a lot of water. Slotted steel forms or moisture-permeable form boards allow downward drying of such decks.

If a bituminous membrane is to be placed directly above a wet-applied deck that still contains moisture, it should not be hot mopped to the deck. As the deck dries from below, shrinkage cracks are likely to occur. If the membrane is adhered to the deck, cracks may progress upward through the membrane. Consequently, membranes should be spot adhered or, preferably, mechanically fastened to wet-applied decks that contain moisture.

Since it is likely that the membrane's bottom surface will sometimes be wet from deck moisture, a coated base sheet or other product not adversely affected by moisture is required there. In an attempt to dry wet-applied decks from their top surface, special venting base sheets have been developed. Grooves or granules on their bottom surface create air passages through which moisture can move laterally to the edge of the roof or to a breather vent where the bottom side of the base sheet is vented to the exterior. Such sheets are mechanically fastened to the deck.

Because there is not much of a driving force for moving moisture laterally in a roof, I doubt that venting base sheets promote much drying. I have discussed this matter with several individuals and their collective field experience suggests that some lateral drying may occur. Nevertheless, I do not think it is appropriate to consider that vented base sheets will dry a wet material below. For most buildings in the contiguous United States, the magnitude of downward drying during warmer portions of the year greatly exceeds the upward wetting potential during colder portions. Consequently, the annual tendency is to promote downward drying of a wet-applied material. Because of the importance of downward drying, vapor retarders or other seals should not be located *below* wet-applied decks.

Some individuals argue that a venting layer is essential above a wet material to avoid the creation of blisters in the membrane above. If the membrane is solid-mopped to the substrate but contains skips and other unbonded "holidays," blisters may develop. However, membranes should not be solid-mopped to wet-applied decks as stated above. I see no possibility of blister formation *between* a mechanically fastened membrane and a wet deck.

If insulation boards are to be placed above wet-applied decks, a vapor retarder should be installed first to prevent moisture in the deck from migrating into the insulation. Vapor retarders (like membranes) should not be solid-mopped to wet decks containing moisture, and their lower ply must be of moisture-resistant material.

What objectives can be met by venting of wet-applied insulations?

Wet-applied insulation begins to dry during installation. Since such insulation must be relatively dry to be thermally effective, it is imperative that additional drying occurs after a membrane is placed on it. As with wet decks, the most

effective way to dry a wet-applied insulation is downward into the building. However, with a mechanically fastened venting base sheet as the bottom ply of a built-up membrane above, some drying from the top may occur. Again, it seems wrong to assume that a venting base sheet will allow a wet insulation to dry significantly. Consequently, it is wrong to seal the bottom of wet-applied insulation since most drying should occur downward from that surface. If, for some reason, the bottom is sealed, I doubt that a venting base sheet above will significantly dry a wet material over many years.

Is there a need to vent dry insulation boards during installation?

Recent problems associated with membrane blistering over urethane insulation indicate the need for venting above this material during membrane installation. The National Roofing Contractors Association suggests use of either a layer of fiberboard, perlite board or fibrous glass insulation or installation of "the base ply so as to allow for venting." Except for urethane, insulation boards do not require venting during installation of the roofing system.

Is there a need to vent insulation boards since they may inadvertently contain excess moisture when installed?

No insulation board is installed "bone dry," but the amount of moisture picked up from the atmosphere during shipment and storage should not adversely affect the performance of the insulation—providing, of course, that proper shipping and storage techniques have been used. If the insulation has been exposed to rain or stored above damp ground under an impermeable polyethylene wrap, it may contain excess moisture when installed.

During the summer, any moisture in insulation in most roofs tends to be driven down into the space below. Just as it is usually much easier to dry a wet-applied insulation from below, it is usually much easier to dry wet insulation boards downward into the building. Consequently, vents are not needed for this purpose, provided that downward drying is possible.

A vapor retarder located below the insulation essentially eliminates downward drying. This is one reason why vapor retarders should not be used unless dew point-vapor flow calculations clearly indicate that they are necessary. The NRCA recommends considering vapor retarders in areas where the outside, mean January temperature is below 40 degrees Fahrenheit *and* the interior relative humidity during the winter is 45 percent or more.

Proponents of vents urge their installation in a roofing system containing a vapor retarder for the following reasons:

1. To rid the insulation of any excess moisture (not only installed moisture but any that subsequently enters).
2. To prevent pressurization of the insulated space, which is sealed on the bottom and sides by the vapor retarder and on the top by the membrane.

Before the advent of coated base sheets and fibrous glass felts, the No. 15 felts used as the bottom ply of a bituminous built-up membrane could deteriorate from relatively small quantities of moisture that condensed on the bottom surface of the membrane and were absorbed by the felts. Membrane riding at insulation joints was often caused by moisture from below. Coated felts and glass felts are resistant to moisture, and their increased use in recent years has greatly reduced this type of problem. If moisture-susceptible felts are used as the membrane's bottom ply, it is important to prevent moisture condensation there. This is very difficult to assure. Rather than using felts that are moisture-susceptible, it makes far better sense to install membrane systems that can survive even if wet at their base. When a membrane can resist moisture attack from below, far more moisture can accumulate in the insulation at the membrane underside without creating serious roofing problems.

In some situations enough moisture accumulates in the insulation to create other problems: e.g., loss of thermal resistance, loss of strength, delamination, and susceptibility to freeze-thaw deterioration.

Infrared surveys I have conducted on roofs across the country over the past five years uncovered wet areas around essentially all breather vents encountered on roofs. Although not conclusive evidence, this experience does suggest that breather vents are not drying out wet areas as intended. Repeated infrared surveys some months apart and core samples for verification purposes have shown that in most instances, the size and moisture content of wet areas do not shrink. Slight drying trends occasionally have been noticed for fibrous glass insulation. This insulation is quite permeable and should be better able to rid itself of moisture than other insulations, since air can flow through it. However, it is not drying any better than perlite insulation in the controlled venting tests at CRREL. (Note, however, that few of those tests allow cross ventilation.)

Although some very slow drying of some wet insulations may be possible, I doubt that venting is an effective means of drying wet insulation. Since it is extremely difficult to dry wet insulation trapped between a membrane and a vapor retarder, it is critically important to install the insulation dry and prevent it from geting wet during its service life. That is easy to say, but hard to accomplish in our fallible "Murphy's-law" world. It thus seems prudent to assume that some wet insulation exists or will exist in most roofs sometime during the building's service life. Since air expands when heated, creating significant pressures on a confined space, particularly a moist, confined space, the second reason for venting listed above (i.e. to prevent pressurization) is promoted by many individuals.

Pressurization of the air and water vapor within membrane flaws causes interply blisters, but venting the space below the membrane can have no effect on such pressures.

Frankly, I am not too worried about pressurizing the space between the membrane and vapor retarder because, in our fallible world, it is virtually impossible to build a perfectly sealed membrane-vapor retarder system. Current roofing practices provide many opportunities for pressure release, particularly at flashings and penetrations. Although the pressurization mechanism is there, it seldom has a chance to cause problems since safety valves are inadvertently built into essentially all roofing systems. Evolution of new roofing systems and practices that eliminate these inadvertent safety valves could create pressurization problems, and some means of venting might be necessary to overcome them.

Since no membrane is perfectly bonded to insulation over its entire surface, some individuals are concerned that pressures and, therefore, blisters may develop where skips

exist at the membrane-insulation interface. Only a few individuals say they have ever encountered a blister at this interface. I never have. Obviously, a breather vent some distance from the unbonded spot would not prevent pressurization at the spot. A venting base sheet could, but current practice does not require one since there is little evidence of blistering at the membrane-insulation interface even though many roofs contain wet insulation.

If it is assumed that my "safety-valve" explanation is inadequate and pressure release is necessary between a membrane and a vapor retarder, some additional factors should be considered. Pressures cannot be sustained locally in fibrous glass insulation because of its high vapor permeability. Since all the edges of each fibrous glass insulation board are not sealed, it is unlikely that localized pressures could accumulate in individual boards. Therefore *if* it is necessary to vent fibrous glass insulation to avoid pressure buildup, only one vent should be needed for each sealed area rather than the recommended practice of one vent for every 10 squares of roofing.

Most other board insulations cannot release pressures created rather rapidly by the sun. For such materials the path of least resistance for pressure release probably involves the gaps between boards. Therefore, it seems appropriate to install any breather vent so that it interconnects with insulation board joints rather than simply cutting it into the middle of a board of closed cell material. (I haven't figured out how excess pressure can get from a problem area to the network of seams, and this is one reason why an effective way of providing pressure release within most insulations still escapes me.)

Is there a need to vent insulation applied between a built-up membrane and a vapor retarder to avoid creation of a vapor trap?

No vapor retarder is an absolute barrier to vapor flow. (That is why the roofing industry favors the word "retarder" to "barrier.") Inevitably, some moisture will pass the retarder and enter the insulation. Since the vapor permeability of a built-up membrane is near zero and,therefore, somewhat lower than that of the vapor retarder, a moisture trap may be created. By venting the insulation, the potential vapor trap can be avoided.

Venting makes good sense for residential walls and ceilings where it is difficult to achieve vapor retarder continuity because of plumbing and electrical penetrations, etc. In such construction, air leakage paths are created along which large quantities of moisture enter insulation that is often quite permeable. Ventilating these places is an admission of the adverse effect of air leakage and the difficulty of achieving vapor retarder continuity.

Things are different for compact roofs. Far better vapor retarders can usually be created and far fewer penetrations are encountered. Even when vapor retarder continuity is breached, the relatively low air permeability of roof insulation boards (fibrous glass boards excepted) inhibits lateral

flow of moisture. Consequently, flaws in a vapor retarder are often not as harmful in compact roofs as for other building systems.

For most buildings in the U.S. that require vapor retarders, the moisture that enters a roof during the cold season has ample opportunity during the warm season to turn around and go back out the way it entered.

Vents tend to create air leakage paths that may cause more mositure to accumulate in the insulation than would accumulate if the insulation were tightly sealed on top.

For textile mills, swimming pools, and other high humidity buildings located in very cold regions, the downward drying ability during warm periods may not be greater than the ability to wet roof insulation during colder periods. To avoid moisture problems in such buildings, they must be provided with very tight vapor retarders, so the amount of moisture that accumulates in the roof insulation during its service life is below acceptable limits.

As an insurance measure it may also be wise to attempt to vent the insulation of such buildings. This might require a "breathable" membrane, a venting base sheet or fibrous glass insulation directly below the membrane. As stated previously, it is unlikely that such venting provisions will remove much moisture, but over the life of such a facility, venting provisions should help to keep the insulation dry if the vapor retarder is a good one. To achieve continuity for such a vapor retarder, it must be sealed to the membrane at all edges and penetrations. To use conventional vapor retarder techniques and an increased number of vents to prevent such problems seems wrong.

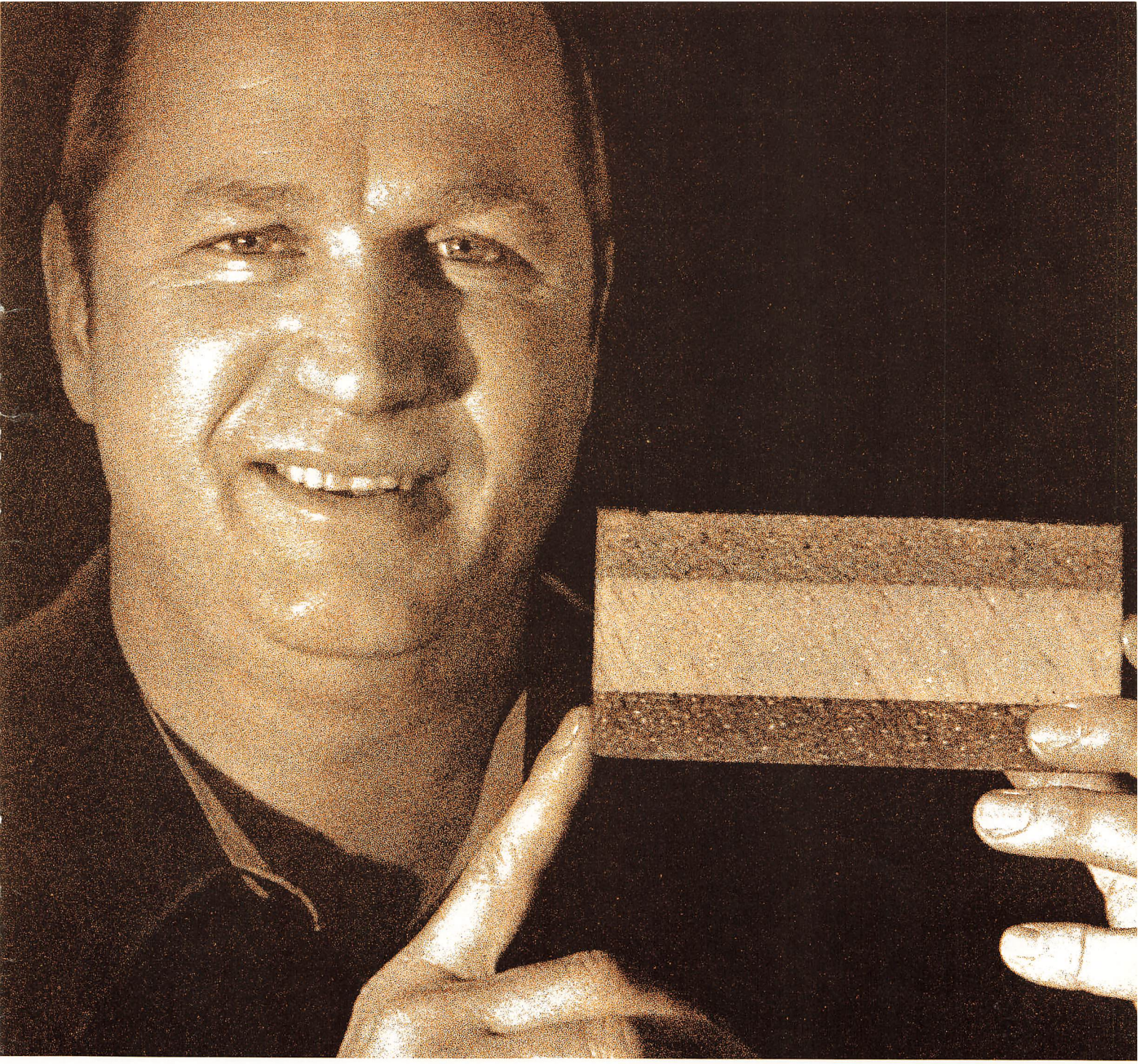
Compact roofs are more problematic in cold regions than in temperate areas. Years ago, after studying the textbooks, calculating vapor drives and such, I was convinced that inadequate vapor retarders were the main culprits. After surveying many roofs in cold regions with infrared cameras, I have been surprised to find that almost all wet insulation is caused by water that enters from the exterior through membrane flaws at flashings and penetrations. Vapor retarders are generally doing a good job of holding back internal moisture. Current vapor-retarder techniques and practices seem to suffice in most situations.

Many roofs built with such vapor retarders are not vented either at their perimeter or by breather vents of one sort or another. I have found no evidence of extra problems for such roofs. Consequently I find it hard to accept the NRCA recommendation that roofs with vapor retarders should have one, one-way breather vent for every 10 squares of roof. This recommendation places vents about 32 feet on center all over the roof and adds just that many more chances for flaws where *external* moisture (the biggest problem) can enter a roofing system.

Can vents dry out wet insulation?

As stated previously, there is little evidence to indicate that edge vents or breather vents can dry out wet insulation.

We have had some success using a shop vacuum cleaner to



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remove liquid water from fibrous glass insulation. About 60 gallons of water were removed from a 180-square foot wet area which dropped the average moisture content of the fibrous glass from 208 percent to 21 percent (dry weight basis). This increased the insulation's thermal resistance from 24 percent to 83 percent of its dry value. We also drew heated air through the insulation by creating intake and exhaust holes within the wet area but this did not promote much additional drying.

Although there appear to be options for draining fibrous glass insulation, I understand that the glue that adheres the glass fibers is weakened by prolonged wetting. Consequently, while thermal properties appear to be recoverable, other important properties may not be. Double-drained roofs thus seem appropriate when fibrous glass insulation is used.

I have heard many glowing stories about how breather vents dry wet insulation. Further investigation, however, usually reveals that cessation of leaks is usually the only evidence that the breather vent did the job. Almost no before-and-after water content evidence is available. The few breather vent applications I have sampled were still wet, but patching of membrane flaws done in conjunction with the installation of the vents appeared to have prevented entry of additional water and thus stopped the leak. I expect that credit for solving such problems should go to the patch, not to the breather vent.

Summary

The accompanying table summarizes the information presented in this paper. The following rules of thumb are offered:

1. Bituminous built-up membranes should be vented during construction to allow excess moisture to dissipate.
2. Do not rely on venting above wet-applied decks or wet-applied insulations to dry them.
3. Allow wet-applied decks and wet-applied insulations to dry into the space below.
4. To make roofing systems less vulnerable to moisture problems, avoid using moisture-sensitive materials for the bottom ply of a membrane.
5. There is no reason to vent the insulation of a roof lacking a vapor retarder. In fact, venting such roofs may do more thermal and moisture harm than good.
6. When a vapor retarder is required, focus money and efforts that might be spent on vents to improving the quality of the vapor retarder.
7. Do not expect to be able to encapsulate insulation in a vapor tight, pressurizable envelope. Consequently, do not worry too much about creating excess pressures within the roofing system (except within the membrane itself).
8. Do not expect to be able to dry out wet insulation in compact roofs by venting.
9. Some drying of wet fibrous glass insulation is possible by draining away water.

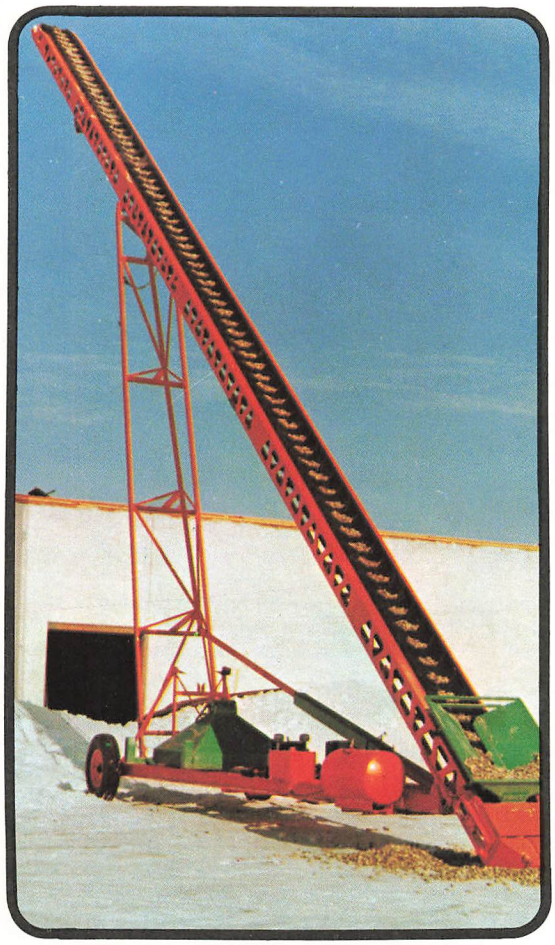
After discussing the venting question over the past two years with many individuals involved with roofing, I disagree with the widely held view that vents are needed when a vapor retarder is installed to keep a dry system dry and avoid pressurization. I do agree that it is very difficult to dry insulation above a vapor retarder once it gets wet; and, like many others, I recommend removing wet insulation in such roofs..

The NRCA venting recommendation (i.e., one, one-way vent per 10 squares) was developed from the collective experience of many roofing consultants and contractors with many years of experience in the roofing industry. I remind you that my willingness to eliminate specific ventilation features above roofs with vapor retarders conflicts with current industry recommendations.

Will venting work?

		DECKS		INSULATIONS				
					NO VAPOR RETARDER		W/VAPOR RETARDER	
Objective	**Membrane**	**Wet-Applied**	**Other**	**Wet-Applied**	**Fibrous Glass**	**Other**	**Fibrous Glass**	**Other**
Release during installation	Yes	No	No	No	No	No**	No	No**
Subsequent drying of wet-applied components	No	Perhaps a little*	No	Perhaps a little*	Perhaps a little*	Probably no	Perhaps a little	Probably not
Prevent accumulation a) of internal moisture	No	No	No	Probably not	Probably not	Probably not	Probably not	Probably not
b) of external moisture	No	No	No	No	No	No	No	No
Remove moisture that has accumulated	No	Perhaps a little*	No	Perhaps a little*	Perhaps a little*	Probably not	Perhaps a little	Probably not

**But downward drying can accomplish this far more effectively.*
***Except "Yes" for urethane insulation to prevent membrane blistering.*



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Project Pinpoint data show trends

Look at the Project Pinpoint data for trends and not necessarily for making hard and fast statements about the way things really are. That's the advice of NRCA general manager Bill Good, who pointed out that Project Pinpoint is the only data base of its kind.

Response from contractors for 1980 was lower than each of the previous four years; however, data received appeared to be fairly realistic. Upon full review by NRCA's Technical and Research Committee, co-chaired by John Bradford, Billings, Mont., and Ray Johnson, Tulsa, Okla., selected areas will be explored further so that statistically valid conclusions can be drawn.

NRCA initiated Project Pinpoint in 1974 by sending to its contractor members Problem Job forms on which to report their difficulties with particular roofing materials. The association asked them—as it continues to ask them—to complete a form every time they encountered a problem. Later that same year, NRCA requested baseline information, asking contractors to complete a baseline form for each job completed in a one week period. Now contractors are asked to complete baseline forms for all jobs completed.

Baseline data provide information on what materials are being used and how often. The data are entered into the computer in 25 different categories so comparisons can be made.

Because problem jobs may not have been completed in the reporting year, that information is not directly comparable to the baseline information for the same year. However, trends can be seen by looking at the baseline and problem data over a several-year period. This article looks at seven categories over a four-year reporting period.

Decline in new construction

The data show a decrease in new construction and a one percent decrease in reroofing from 1979 to 1980. At the same time, the average job size in 1980 showed an eight percent increase from the previous year. This is not surprising to NRCA Technical and Research Committee co-chairman John Bradford.

Bradford, who is president of Bradford Roofing and Insulation Co., Billings, Mont., said a decrease in new construction for 1980 is generally accepted. Those who did well last year, he said, were contractors who had a good reroofing business and/or worked on large jobs.

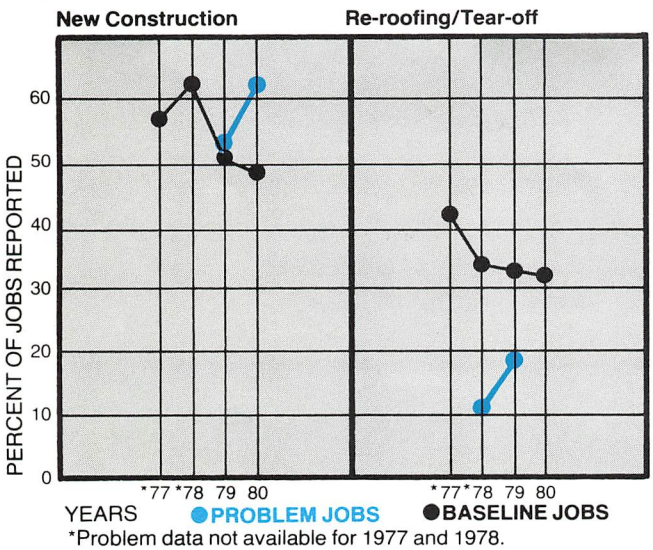
Overall the problem data revealed both new construction and reroofing showed higher percentage of problems for 1980 compared to 1979. The big difference is in contractors' responses to the "no answer" category. In 1979, 19 percent did not indicate a project type on their problem reporting form; in 1980, only one percent gave no answer.

Problem data should be viewed in light of how old both the roof and the problem were when reported. The data showed that 26 percent of the problems occurred on roofs installed less than one year from time of reporting, while 28 percent were on roofs installed one to two years ago.

Seventeen percent of the problems reported were on roofs two to five years old; 16 percent were on roofs five to 10 years old; and 10 percent were on roofs over 10 years old. According to the data, 44 percent of the problems were taken care of in the year they were discovered; 30 percent were handled one to two years after the problem occurred; and nine percent, two to three years later.

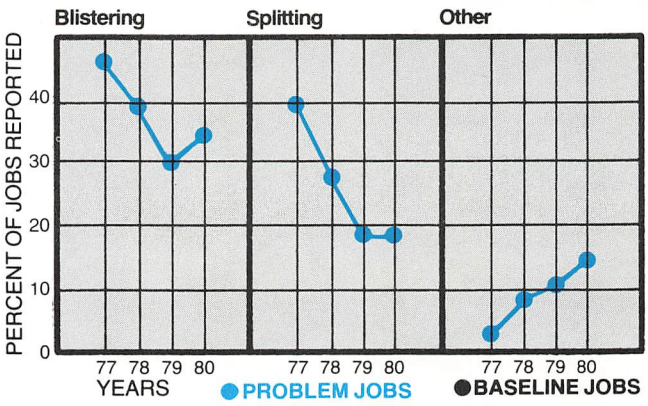
Chief characteristics of the problems reported in 1980 were blistering and splitting. Blistering accounted for 35 percent of the problems, a slight increase over 1979 but a decrease from 1978 and

PROJECT TYPE

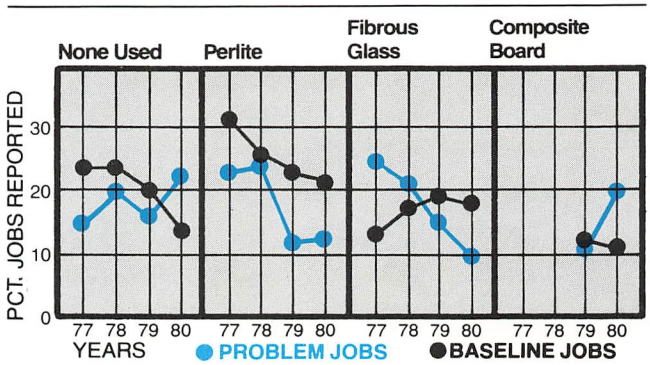


*Problem data not available for 1977 and 1978.

CHIEF VISIBLE CHARACTERISTIC OF THE ROOF PROBLEM



TYPES OF INSULATION



1977. Splitting was noted in 19 percent of the problems for 1980; this was the same percentage as the previous year but considerably lower than the 28 percent reported in 1978 and the 40 percent reported in 1977.

In commenting on these results, Bradford noted that blistering is a well-known problem, particularly over urethane. He pointed out that NRCA has issued two technical bulletins on the problem (No. 4 and No. 7) and will release a third one shortly. He believes contractors are understanding the problems involved and are taking steps to alleviate the situation.

Another type of blistering is interply; and that, said Bradford, should be on the decline because of the increasing use of fiberglass membranes.

As to splitting, Bradford is also optimistic the problem will decrease. He explained that splitting frequently is manifested on coated sheets and asbestos, and these two products are being used less often. The data show that asbestos was used on only seven percent of those jobs reported as being completed in 1980; this compares to a 24 percent usage in 1977. Approximately 20 percent of membrane problems reported in 1980 involved asbestos.

Other problem characteristics reported were ridging, seven percent; buckling, four percent; ply separations, nine percent; slippage, three percent; blow-off, one percent; and "other," 15 percent.

Insulation type

The data, as could be expected, showed an increase in use of insulation for the third year in a row. Only 14 percent of the jobs reported as being completed in 1980 did not have insulation; this compares to 23 percent both in 1978 and 1977.

According to the data, insulation types used were fiberboard, 12 percent; perlite, 21 percent; fibrous glass, 18 percent; cellular glass, two percent; polyurethane board, five percent; foamed polystyrene board, eight percent; composite board, 11 percent; and "other," six percent.

The use of perlite showed a 10 percent decline from 1977. Bradford suggested that perlite's use declined because it only comes in three-fourths inch thickness and it is more expensive than fiberboard. The use of fiberboard, which is generally used as a separator rather than as insulation by itself, showed an increase from seven to 12 percent from 1979 to 1980.

Pinpoint data showed that the use of fibrous glass as an insulation type has remained fairly stable over the past three reporting years. Problems associated with its use showed a dramatic decline from 25 percent in 1977 to 10 percent in 1980. Bradford described fibrous glass as a well-accepted product and speculated that it will enjoy continued use.

Composite board, as an insulation type, maintained stable use for 1979 and 1980. Problems reported with the insulation increased from 11 percent in 1979 to 20 percent in 1980.

Coated base sheet

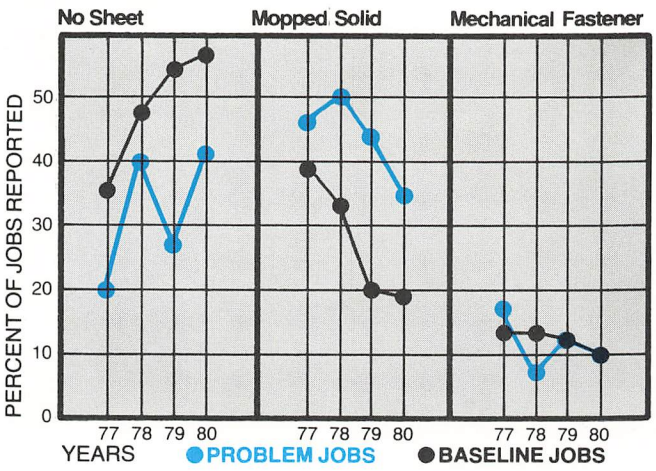
Project Pinpoint data show a continued increase in jobs being completed without coated base sheets. Fifty-seven percent of the jobs reported in 1980 had none; this compares to 36 percent four years previously. Bradford noted that during the 1960s and early 1970s, the use of the coated membrane "turned out to be a total disaster." Consequently, he believes, the reputation of the coated membrane may have carried over to the coated base sheet.

Further, said Bradford, the coated base sheet is being specified less often; instead, two layers of insulation are used in such a way that they serve as a retarder to moisture.

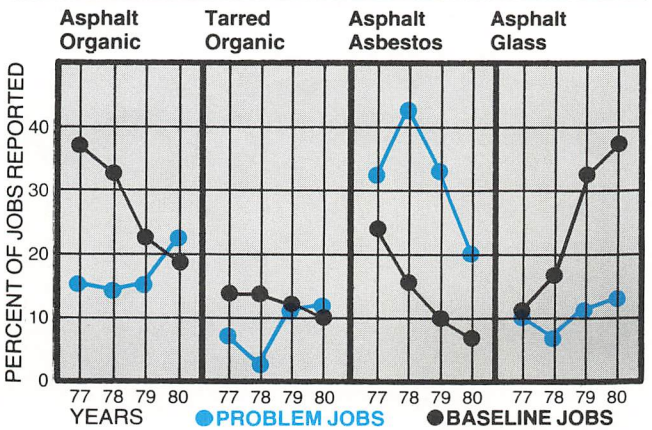
Membrane type

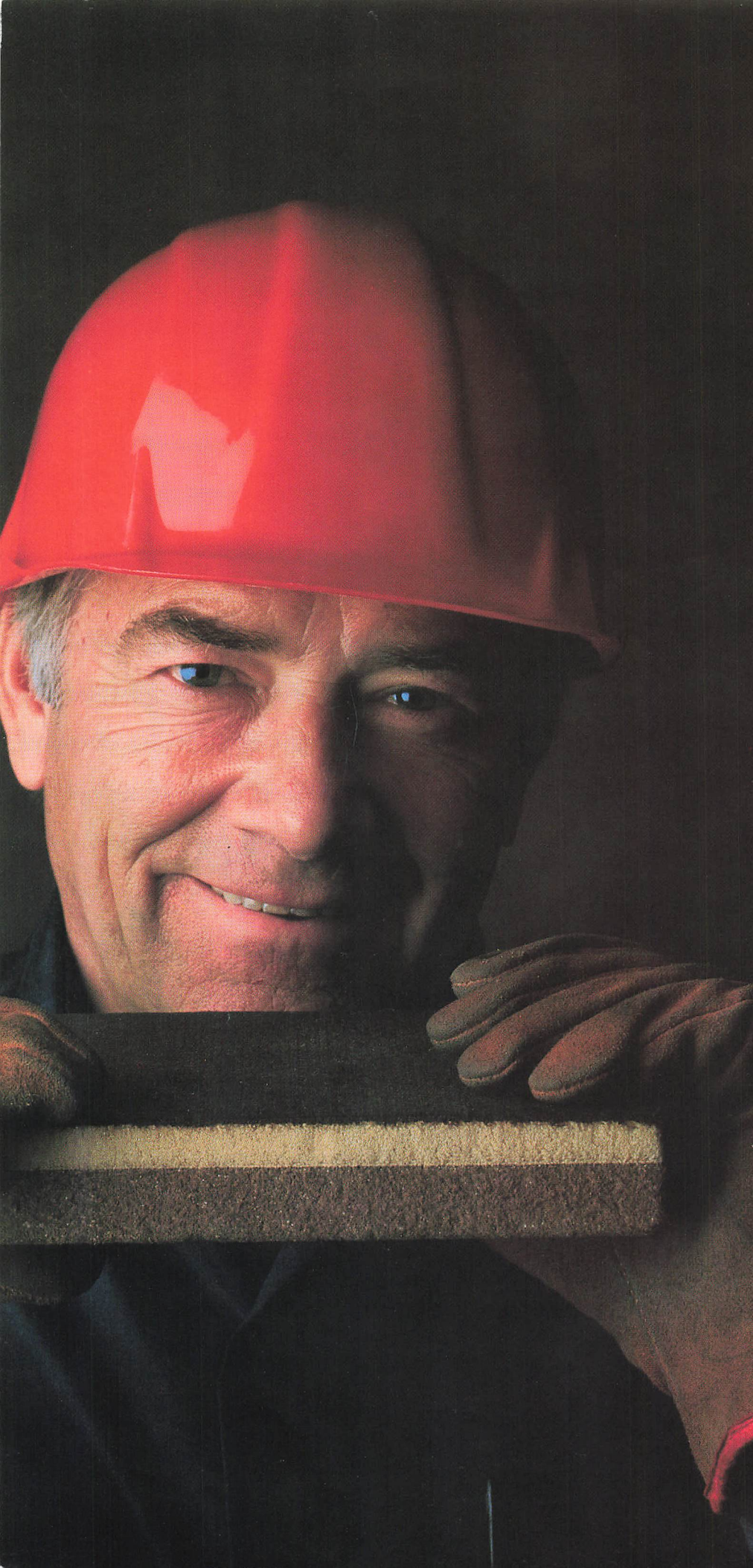
The Montana contractor was not surprised by the data's showing a growing use of asphalt glass, or fiberglass. Baseline data indicate that use for 1980 was at 37 percent, an increase from 11 percent in 1977. Problems with fiberglass represented 13 percent of the membrane problems encountered in 1980; this compares to 11 percent the previous year. Bradford suspects that soon fiberglass will have 50 percent of the membrane market, replacing asbestos

COATED BASE SHEET



MEMBRANE TYPE





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and organic membranes. In the baseline data, #15 asphalt organic was used in 19 percent of the jobs reported in 1980, down from 37 percent in 1977. Asbestos use showed a drop from 24 percent in 1977 to seven percent in 1980.

Number of plies

As might be expected, three-ply membranes were most often used in jobs reported in 1980. Fifty-five percent of the jobs involved three ply in both 1980 and 1979. One-ply membranes were used on 20 percent of the jobs completed in 1980; this compares to 12 percent in 1979 and four percent in both 1977 and 1978.

Two-ply membranes were used on eight percent of the jobs and four-ply on 14 percent in 1980. Two-ply use, while remaining at eight percent in both 1980 and 1979, showed a decline from 11 percent in 1978 and 14 percent in 1977.

The majority of problems reported in 1980 involved three-ply and two-ply jobs; however, Bradford pointed out that one-ply use was too new to be adequately reflected in these data. He was not surprised by the growing use of one-ply membranes. He noted that his company, which he considers to be conservative, probably installed one ply on 20 percent of its jobs in 1980.

While the total percentage of problems reported with single ply in 1980 was only 10 percent, this was double the percentage reported the previous year. This increase, suggested Bradford, is simply due to the fact that more are being installed. Noting that he doesn't know what to expect with single-ply usage, he said, "We just don't have the background. Many of us are literally gambling our life's savings that we're going to have good luck with single ply."

The growing use of glass felts in built-up roofing, asserted Bradford, will eliminate many problems. He attributes the decline in the use of four-ply membranes to the fact that glass fibers are strong and, therefore, that eliminates the need for the fourth ply on jobs which require extra protection.

Slope

Fewer roofs, according to Project Pinpoint data, are being built with no slope. In 1980, baseline data showed that only 14 percent had no slope; this compares to 20 percent the previous year. The most commonly specified slope, according to the data, is "up to one-fourth inch"; 71 percent reported that slope for 1980 jobs. Problems for no slope roofs were reported to be 22 percent in 1980.

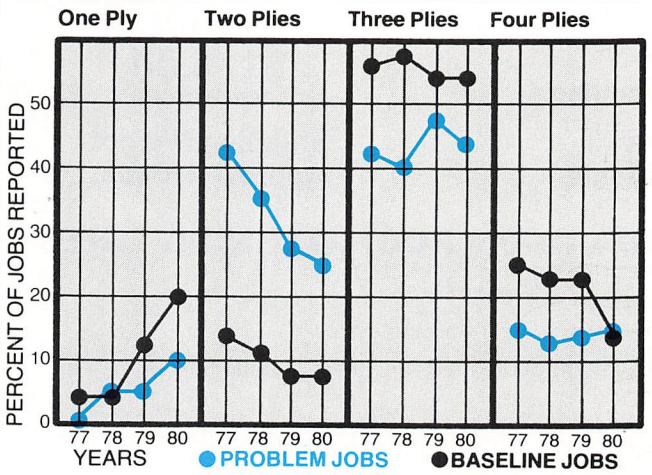
Why the decline in the no-slope roofs? Very simply, answered Bradford, "architects are getting smarter."

Future use

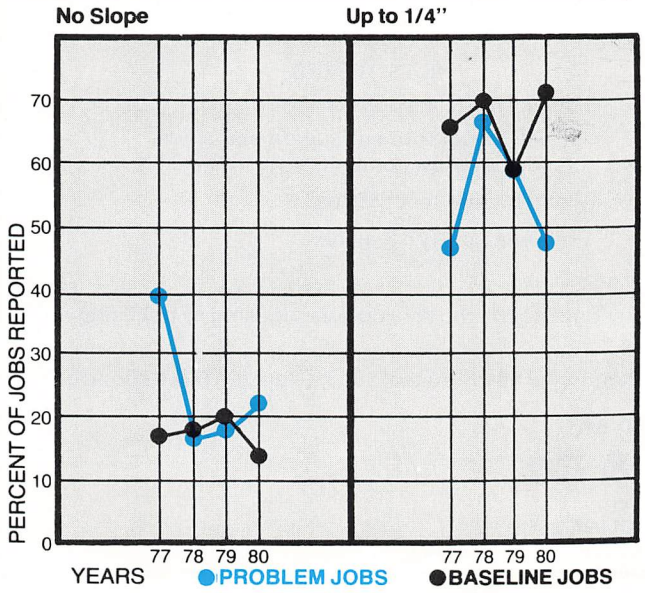
As indicated earlier in this article, NRCA's Technical and Research Committee will carefully review the data from the 1980 results. Comparisons will be made with past years, and problem areas will be studied in detail.

The value of the data grows each year, thus making it most critical that roofing contractors participate fully in completing both baseline and problem jobs. Not only does the information provide general information to the association's technical and research committees, but also provides a basis for alert bulletins and points the way for continued research. Also, members with problem jobs can use Project Pinpoint to receive the names of other NRCA contractor members who have had similar problems and have indicated a willingness to share them.

MEMBRANE, NUMBER OF PLIES



TYPE OF SLOPE



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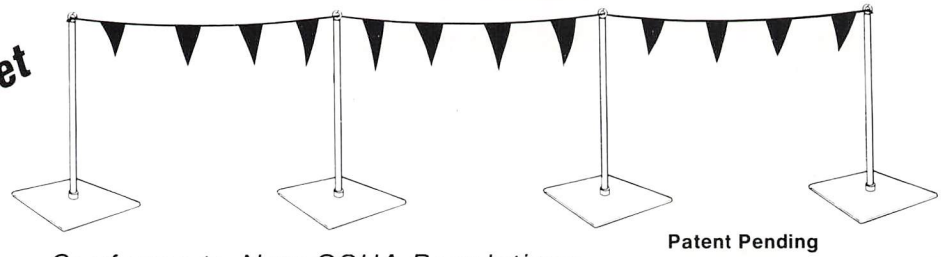

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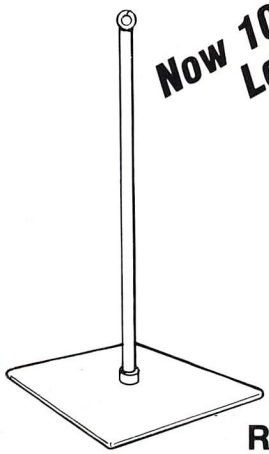

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Taken from: Federal Register Vol. 45, No. 222, Dated Nov. 14, 1980, Page 75618.

"The system is not intended to serve as a positive restraint, but only as a warning system."

Warning lines may be used only on low pitched roofs with a height of greater than 16 feet. Warning lines shall be erected and maintained as provided in this standard.

Warning lines shall be erected around all sides of the work area and at access paths to work and materials storage areas. Warning lines are NOT to be used at roof edge materials handling areas.

When mechanical equipment is not being used, the warning line shall be erected not less than six feet from the roof edge.

When mechanical equipment is being used, the warning line shall be erected not less than ten feet from the roof edge perpendicular to the direction of equipment operation and six feet from the roof edge which is parallel to the direction of equipment operation.

OSHA REQUIREMENT	HILTS TESTED
16 lb. test at 30" on stanchion before tipping over.	19-20 lbs. before tipping over.
Flags or pennants to be 34"-39" from roof surface.	37"-39" from roof surface on stanchion (do not allow pennant to sag below 34")
Flag or pennant line shall have a tensile strength of 500 lbs.	Pennant line test 550 lbs.
Warning line shall be flagged at not more than 6 foot intervals.	Pennants every 13 inches.

The above is only a very brief outline of the published law and should not be the sole criteria for using or not using a warning line system.

It is suggested that you obtain a copy of the Federal Register mentioned above so that you can get the FULL scope of what is required by OSHA.

MANUFACTURED BY

E. L. Hilts & Co.

P. O. BOX 1789
HICKORY, NORTH CAROLINA 28601
PHONE 704-328-8141

Ethylene propoylene diene monomer

Hugh Kenney

by Hugh Kenney
vice president—marketing
Construction Materials Division
Carlisle Tire & Rubber Co.
Carlisle, PA

Editor's Note: *This is the first in a series of articles on the generic elasto-plastic materials.*

Ethylene propylene diene monomer (EPDM) is an elastomer that is sythesized from ethylene, propylene and a small proportion of a diene which provides unsaturation in side chains pendant from the saturated "backbone."

Developed by the Du Pont Company in the early 1960's, EPDM has made great inroads in the roofing industry (in the past three years) and has a promising future.

The built-in chemical bonding arrangement in the molecules of the polymer is what makes EPDM an ideal material for roofing, liquid containment and pollution control. Tests following ASTM standards verify that properly compounded EPDM produces a material which measures well in the areas of ultimate elongation, tensile strength, ozone resistance, heat aging, low temperature-brittleness, water vapor permeability and water absorption—all factors that are necessary for a long-lasting roof.

Vulcanization is the process by which uncured or thermoplastic material is changed into a cured or thermoset material. Vulcanization in the EPDM process is brought about when sulphur is mixed in the compound and molecularly joined to two or more of the molecules in the unsaturated double-bond carbons located in EPDM's side chains. This linkage takes place after the compound is subjected to high heat for a period of time. The actual "backbone" or foundation of the EPDM molecule is always a saturated single bond carbon linkage. The long-term aging characteristics of the compounded EPDM sheet are brought about by these saturated molecules which are locked in place by vulcanization.

As time passes, the effects of ozone, heat, oxygen and other elements tear the double bonds, causing some of the side chains to break loose in the molecule. Long-term weatherability is insured, however, since there are no double bonds in the saturated "backbone" of EPDM.

Manufacturing processes

The EPDM rubber is compounded by a technical group for mixing in a "bamberry." The compounded synthetic rubber is then processed through a calender and fabricated into sheets with a width from 54 inches up to 45 feet and lengths up to 150 feet.

Most of the compounded EPDM membrane used in roofing and reroofing applications is run to a thickness of .045 mills or .060 mills. The .045 mill thickness is normally run in ballasted systems while .060 is used in adhered, unballasted systems. The .045 mill membrane weighs approximately 0.28 pounds per square foot while the .060 membrane weighs approximately 0.4 pounds per square foot.

In most cases, the membrane is compounded black to arrive at the ultimate physical properties of the EPDM synthetic rubber. Most compounds can be color-coated relatively inexpensively with special paints.

Some EPDM membrane manufacturers will supply roofing contractors with specific details for the installation procedure to be used with their membranes. These specs and details are extremely important and should be followed without deviation unless changes are approved by the manufacturer. These specs and details, when followed properly, assure a water tight membrane installation.

Uses of EPDM

While the use of EPDM compounded sheet membrane in roofing applications has increased dramatically in just the past three years, the material has been used for many years as a pond and pit liner and for long-aging molded parts.

EPDM sheet membrane is being used in virtually every type of roofing installation including some very non-conventional shapes. The flexibility of the membrane allows it to conform where more rigid materials could not be used.

The nature of EPDM membrane is such that in many reroofing applications it is not necessary to take off the old roof. This not only reduces the cost but allows uninterrupted use of the facility during the reroofing operation.

EPDM sheet membrane offers unique advantages such as the ability to be picked up and reused where a loose-laid

system had been installed and floors have been added to the building. The fact that factory-fabricated accessories also made of EPDM are available helps overall security and speeds installation procedures.

The ability of manufacturers to supply widths up to 45 feet and lengths up to 150 feet offers the roofing contractor many advantages, even to the extent of enabling some roofs to be completed with a single roll of material. The ability to flash the system with an uncured neoprene membrane further enhances the installation procedures for most contractors.

Physical properties and attributes of EPDM

The physical properties of compounded EPDM membrane offer roofing contractors many advantages in their roofing projects. Two key advantages are its ultimate elongation—the maximum extension of the membrane at the moment of rupture—and its tensile strength—the ability to withstand normal movement in the substrate. Because the EPDM membrane is able to expand from three to five times its size without breaking, it is able to handle the challenge of expansion and contraction caused by dramatic temperature changes. These characteristics also allow the sheet membrane to solve the problem of building movement.

The results of nine experiments conducted between 1966 and 1973 and published in 1976 by the Materials Science Section of the U.S. Bureau of Reclamation noted a range of elongation for EPDM test roofs from 430 to 755 percent. Tensile strength of the nine roofs ranged from 863 g/mm2 to 1,202 g/mm2.

Although there is still some controversy, most manufacturers of EPDM membrane feel that the moisture vapor transmission rate of their product is such that it helps in drying out a wet substrate. The permeability of EPDM enables it to "breathe" enough for trapped water vapor to pass through the membrane. Ponding of water is no factor on EPDM roofs because of the membrane's resistance to water absorption.

EPDM also features a low brittleness temperature. Tests have shown that the membrane can be installed without fractures in temperatures as low as 75 degrees below zero. Reports from the field indicate roofing contractors, especially those in colder climates, have been able to increase their work seasons by several months. Some roofers in these harsher climates now work practically year round.

The inherent strength and durability of EPDM also is found at the other end of the temperature spectrum. In the nine tests published by the U.S. Bureau of Reclamation, ranges of 101 to 116 percent of original tensile strength and 86 to 107 percent of original elongation were retained after EPDM was heat-aged at 240 degrees farenheit for seven days. Heat aging occurs when the roof absorbs energy from the sun and converts it to heat. Roof temperatures of 160 to 170 degrees are not uncommon.

Both lab testing and field use of EPDM as pit and pond liners and as roofs show that properly compounded sheet membrane has the ability to withstand substantial ozone conditions and normal weather aging.

Ozone resistance is perhaps EPDM's biggest strength. This asset was strongly evidenced in a test conducted in our lab in which a membrane was exposed to high levels of ozone for 67,440 hours. During that approximately eight-year time period, there was absolutely no damage to the membrane. No cracking. No blistering. The test was discontinued at that point because we needed the space in the ozone ovens for other materials.

There are also records showing the test of EPDM membrane in such atmospheres as Panama, Alaska, Northern Circle and the Dead Sea Desert. Most roofing contractors do not have installations in these atmospheres, but it is reassuring to know the membrane has functioned and is functioning in these types of atmospheres without problems.

The fact that many EPDM membrane roofs installed in the new surge of one-ply systems are now beyond the initial five-year warranty period and going strong supports the statement of EPDM manufacturers that they do not know how long these roofs will last.

The EPDM membrane offers the roofing contractor the ability to cut his on-the-job accident rate, to lower his insurance costs and to provide a much cleaner, healthier installation atmosphere. Most roofing contractors who have worked with EPDM sheet membrane have indicated that workers are much happier and perceive themselves as working in a safe atmosphere.

Compounded EPDM rubber has proven its weatherability on a worldwide basis in many areas of manufacturing and industry long before coming into widespread use in the roofing industry. As long as the roofing contractor insists on a quality product backed by a reputable manufacturer, the EPDM membrane should continue to serve the contractor, his customer, and the architect without problems.

It may not always be the least expensive system, but in the opinion of many in the roofing industry today, it will always be the most durable system available.

EPDM and the future

More than 60 percent of the contractors interviewed in a recent magazine survey feel single-ply membrane systems will play a major role in the roofing industry's future. In the past three years, numerous roofing contractors have converted their operations to EPDM. Others who devote a portion of their company's work to EPDM say they are pleased with the result and plan to do more one-ply installations in the future.

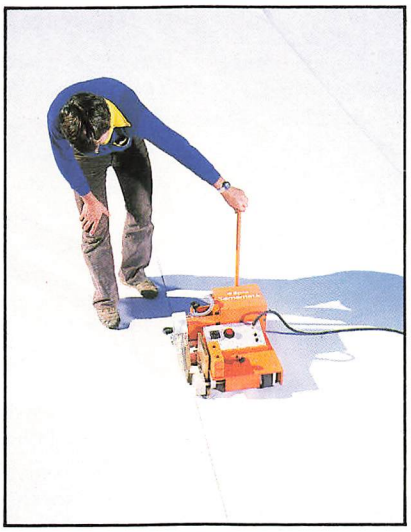
The market for commercial and industrial roofing in the United States currently is 2.4 billion square feet annually. That total is split about evenly between new construction and reroofing. Built-up roofing supplies most of this demand; but one-ply systems, principally EPDM, are making sharp inroads. Total sales of all one-ply systems have increased at a compounded growth rate of 60 percent since 1976. Some estimates indicate that one-ply systems could account for as much as 25 percent of the U.S. commercial and industrial roofing market by 1984, compared with an expected 11 percent during 1980, 6 percent in 1979 and 4 percent the preceding year.

single-ply roofing:
Five reasons why Sarnafil outperforms and outlasts other sheet roofing materials.

1 It won't shrink . . . ever. In conventional, calendered polymeric sheet roofing, longitudinal orientation of the polymer molecules causes shrinkage when the material is exposed to the sun's heat. Not with Sarnafil. It is manufactured by an exclusive process combining plastisol coating with non-woven glass-fiber reinforcement. Calendering is eliminated. In addition, top-grade plasticizers and stabilizers safeguard against embrittlement and shrinkage from aging. Sarnafil is dimensionally stable, and it stays that way.

2 It can't separate or de-laminate. Prolonged exposure to the elements can ruin laminated materials. Plies separate. Protection is destroyed. But not with Sarnafil. This unique non-laminated membrane is a single, homogenous layer with integral reinforcement embedded in the center. It cannot delaminate even under the most severe conditions of temperature, humidity, mechanical stress, or exposure to atmospheric pollutants.

3 It expands and contracts with the structure. Because of the glass-fiber reinforcement, the thermal expansion of Sarnafil closely approximates that of roof decks. When Sarnafil is installed even as a fully adhered membrane, expansion or contraction of the structural deck does not affect either the adhesive bond or the membrane itself. Everything moves at the same rate.



Sarnafil roofing requires no adhesive or sealants at the joints. Material is fused by means of hot-air welding to produce a continuous leak proof membrane.

4 You can use a variety of installation techniques. Sarnafil can be installed in a variety of applications: fully adhered without ballast, loose-laid with ballast, mechanically fastened, and in a protected membrane assembly. Sarnafil is available in a variety of colors besides the standard light gray, and in a variety of thicknesses to accommodate specific conditions, such as walk-on, drive-on, or plant-on roof decks.

5 It can stand years and years of exposure. Sarnafil is so highly stabilized that it can be welded to itself even after years of exposure to solar radiation and weather. So if a new penetration must be made in the membrane even after years of service, a new section of Sarnafil can be hot-air welded to the existing aged sheet with assurance of a watertight seal.

Insist on Sarnafil . . . The only non-shrinking PVC roofing membrane. There's no other single-ply roofing system with the stability, endurance, and reliability built into Sarnafil. It's the ultimate in polymeric roofing membranes. Proven world-wide for almost 20 years under all climatic conditions, with the same basic formulation.

New roof or re-roofing project . . . ballasted or unballasted system . . . big job or small . . . insist on Sarnafil. And be sure. Write for brochure.

Sarnafil ‹U.S.› **inc.**

Canton Commerce Center, Canton, Mass. 02192
Telephone: (617) 828-5400 Telex: 951625

Legal

Document your travel entertainment expenses

The Internal Revenue Code allows an individual to take a deduction for travel and entertainment expenses incurred while away from home in the pursuit of a trade or business. Traveling expenses include travel fares, meals and lodging and expenses incident to travel which are reasonable and necessary and directly attributable to the taxpayer's business. Expenses paid or incurred by a taxpayer attending a convention or meeting may constitute an ordinary and necessary business expense depending upon the facts and circumstances of the case. If a taxpayer takes a trip which is for both personal and business reasons, the travel expenses to and from the destination are deductible only if the trip is related primarily to the taxpayer's trade or business. If the trip is primarily personal in nature, travel expenses to and from the destination will not be deductible; however, expenses which can be allocated to the taxpayer's trade or business can be deducted.

The limitation placed on travel and entertaiment expense deductions is that the deduction will not be allowed unless the expenses are substantiated. The burden of proof is on the taxpayer to show not only that such expenses were incurred, but also that they constitute ordinary and necessary business expenses. Accordingly, it is to the advantage of the taxpayer to maintain adequate and detailed records of travel, transportation, entertainment and similar business expenses. Proper documentation includes amount, time, place, business purpose, and, in the case of entertainment, business relationship. One method for substantiating expenses incurred by a taxpayer is through the preparation of a daily log or record of expenses and the preservation of supporting documents. Detailed records of small expenditures, as for example, tips, are not required. Where records are incomplete or proof is otherwise unavailable, expenses may be substantiated by approximations based upon secondary sources and collateral evidence.

For example, a taxpayer might prove that he was traveling for a certain number of days, but for some reason it was impracticable for him to prove the details of his travel expense. Then the taxpayer can prove travel expenses by showing plane or rail fares or automobile costs on the basis of mileage. Food and lodging costs might be shown by using the average daily rates or costs in the particular community. Although it is possible to substantiate costs without a daily record and without production of all your receipts, the safest route is to set up a program to document those expenses as they are incurred and avoid the problems of trying to do it later.

Subcontractor's check list

Have all the plans and specifications been reviewed? Yes ____ No ____ Including Addendum Nos. _____.

Has the estimate been double checked? Yes ____ No ____

Has the scope of the bid been confirmed in writing on a proposal form to state what is included and what is not included? Yes ____ No ____

Is the bond premium exluded or included? Yes ____ No ____

Is it clear that the general contractor will furnish all temporary facilities at no cost to the subcontractor? Yes ____ No ____

Has the source of the funds been verified? Yes ____ No ____

Have the insurance requirements been verified? Yes ____ No ____

Are progress payments being paid monthly on a date certain _____ which include payments for stored materials on site: Yes ____ No ____; off site: Yes ____ No ____; for the cost _____ or value _____ of stored materials?

What is the retention in the prime contract? _____ What is the retention in the subcontract? _____ Has it been proposed to eliminate retention? Yes ____ No ____

Is final payment paid at substantial completion of the subcontractor's work? Yes ____ No ____

Is there an opportunity for advance payment? Yes ____ No ____

Can the schedule of values include on the first progress payment for the entire bond premiums ____, stored materials ____, shop drawings ____ and mobilization ____?

What is the maximum cash flow to carry the work _____ and for how long according to the proposed schedules of values _____?

Has a neutral subcontract form been proposed to be substituted? AIA A401 (1978 Ed.): Yes ____ No ____ or AGC/ASC (1966 Ed.): Yes ____ No ____?

By McNeill Stokes, NRCA Counsel

(NOTE: This legal column presents information on legal matters of general interest. The text is necessarily generalized, and you are advised to consult with a professional legal advisor before taking any action.)

If the general contractor's subcontract form is used, has it been modified as follows:

____ The general contractor will pay the subcontractor if the owner does not pay the general, for any reason not the fault of the subcontractor.

____ The general contractor will withhold no more retention from the subcontractor than is being withheld by the owner from the general contractor with respect to the subcontractor's work.

____ The subcontractor shall be paid thirty (30) days after substantial completion of the subcontractor's work.

____ If the subcontractor is not paid when due, the subcontractor may stop work upon seven (7) days notice.

____ Have all waivers of lien rights and waivers of bond rights been deleted from the subcontract?

____ Have hold-harmless clauses been limited to the subcontractor's fault by adding the words "provided it is caused by the subcontractor's fault?"

____ Have the clauses which give the general contractors unnecessary remedies to backcharge or terminate the subcontractor been deleted?

____ Have no-damage-for-delay clauses been deleted?

Is the scope of work incorporated in the subcontract exactly as it was in the proposal? Yes ____ No ____

What is the procedure for changes in the scope of work and how will the subcontractor be paid for changes? _____

_____

If their unit prices are applicable, is there a quantity variation clause? Yes ____ No ____

If underground work is involved, is there a changed condition clause? Yes ____ No ____

Is there a no-damage-for-delay clause that would waive the subcontractor's right to damages for delays? Yes ____ No ____

Are liquidated damages imposed on the subcontractor for delays caused by the subcontractor? Yes ____ No ____ How Much _____.

What is the time of performance of the subcontractor's work?

_____

Is their an excusable delay clause? Yes ____ No ____

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That's where Veral's excellent reputation of durability comes in. With over 20 years of experience and millions of squares presently in place, this handsome metal clad system has well established its record over a wide range of climatic and substrate conditions.

The Veral system includes two sheet components, Veral and Irex, a heavy glass base sheet.

Veral is a composite sheet combining a woven glass reinforced high-melt asphalt base with a protective metal foil facing. It's available in aluminum, copper and chemical resistant stainless steel, giving you plenty of design flexibility.

And because both plies contain quality high-melt asphalt, you have the application alternative of torching or mopping.

Whichever you choose the final assembly is the same ...stunning.

And we make sure it stays that way.

Because asphalt and metal expand at different rates, Siplast embosses small control channels into the metal facing. A thin layer of low-melt asphalt is factory applied beneath these channels, allowing the metal to move, at the control joints, independently of the high-melt asphalt base. This patented design has given Veral its long history without buckling or splitting.

Veral roofing and flashing systems can be used over most decks and roof insulations. They combine the time proven waterproofing characteristics of quality asphalt, and the stability and strength of glass fiber, with the protection of metal foil.

With this kind of durability we guarantee it against leaks for 10 full years.

That's why specifiers find Veral their ideal choice. Because looks aren't everything. It just so happens Veral can cover you with them.

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Affiliate News

Seattle group hears Zamrzla

NRCA President Elect Johnny Zamrzla was the guest speaker at a joint meeting of the **Roofing Contractors Association Industry Fund, Seattle, Wash.,** and the Construction Specifications Institute in April.

Zamrzla reported on the trip he and five other roofing contractors took to Europe last year to view firsthand the European roofing experience.

The evening's program also included the showing of NRCA's slide presentation, "Specify to Satisfy." Spec writers were invited to submit specifications for critique by a panel of contractors. After the meeting, the panel members answered questions.

Exchange program in Chicago

The **Chicago Roofing Contractors Association** will work with member contractors to develop an exchange program. Contractors who have an over abundance of materials or "odd-ball" materials are invited to list these materials with the CRCA office. This information then will be made available to interested members.

California assn. holds educational program for investigators

Members of the **Associated Roofing Contractors of the Bay Area Counties** held an educational session on roofing for the investigative staffs of several Northern California offices of the Contractors State License Board. The focus was on problems that are not the fault of the roof but which are often blamed on the roof and the roofing contractor.

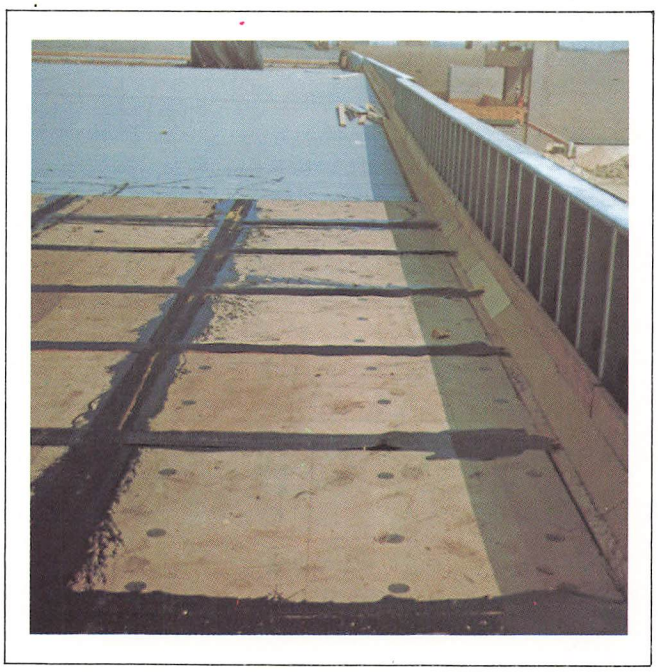
The purpose of the session was to help those responsible for investigating consumer complaints to have a better understanding of good roofing practices and procedures so in turn they can do a better job of serving the consumer while at the same time being fair to the roofing contractor. Future sessions of this type will be held periodically.

Among the speakers were John Maloney, registrar of contractors, California State License Board; Bill Finch, retired superintendant from Elliott & Elliott, Oakland; Chet Morris, Alcal Roofing and Insulation, Redwood City; Frank Lawson, Sr., Lawson Roofing Co., San Francisco; and Herman Little, executive director of the Associated Roofing Contractors of Santa Clara and San Benito Counties.

Maloney, one of several high level License Board officials in attendance, noted that the Agency as part of the Department of Consumer Affairs represents the consumer but that investigators should "call it as they see it." The staff should not be known as either "consumer-people" or "contractor-people." His experience, he said, has been that good contractors want to be and want the industry to be properly regulated.

NEWCOMP™

ROOF INSULATION



NEWCOMP Composite Roof Insulation is a modified urethane/isocyanurate foam core, integrally bonded during manufacture to a base of ¾ inch perlitic material. Bottom facer is a tough (organic) asphalt-saturated felt. The urethane/isocyanurate foam core with organic facer allows the roofer to *place the foam side down over metal roof decks,* or non-combustible decks, presenting the *perlitic material topside as the foundation to receive the BUR.*

NEWCOMP is the only composite insulation board approved by Factory Mutual for Class 1 Construction when applied as hereinabove stated. Other composite/urethane insulations must be installed with the foam side up to receive Factory Mutual Class 1 Construction approval.

Laboratory and field testing reveals that the top layer of perlitic material provides a moderate heat-sink to prevent excessive temperature build-up. *By integrally bonding the perlitic material during manufacture, the additional expenses of field lamination are greatly reduced. An estimated savings is approximately 25-30% of the total BUR system.*

NEWCOMP MUST BE INSTALLED WITH PERLITIC SURFACE UP TO RECEIVE BUILT-UP ROOF SYSTEM.

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Factory Mutual
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Patent Pending

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SISTEEL® A non-composite roof insulation approved as a component of Factory Mutual Class 1 Insulated Steel Roof Deck Construction and Factory Mutual 1-90 Wind Resistance Classification when applied in accordance with FM Loss Prevention Data Sheet 1-28.
FM Serial No. J.I. OA3A8.AM.

SISDECK® Standard urethane roof insulation, Factory Mutual approved for use over non-combustible decks. Not recommended for use over steel decks when FM Class 1 approval is required.
FM Serial No. J.I. OE2A8.AM.

SISDECK®GF(N) Standard urethane roof insulation, integrally bonded to stable, non-shrinking, non-asphaltic glass facings. Factory Mutual approved for use over non-combustible decks. Designed especially for the new generation single ply elastomeric systems, either loosely laid or with ballast. FM Serial No. J.I. OE2A8.AM.

SISCOMP® A composite/urethane roof insulation approved as a component of Factory Mutual Class 1 Insulated Steel Roof Deck Construction and Factory Mutual 1-90 Wind Resistance Classification when applied in accordance with FM Loss Prevention Data Sheet 1-28.
FM Serial No. J.I. OE2A7.AM.

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Studies have been performed by Shelter's Research and Development Department testing the compatibility of our products, with both organic and inorganic felts, applied with hot bitumen (ASTM D-312 Type I, II, III, or IV) and/or coal tar pitch. Excellent bonding characteristics, with good cohesion between insulation (facer) and felts, resulted with all materials tested. Application of felts was according to manufacturers' recommendations. Shelter shows no discrimination among felts meeting minimum Federal Specifications and/or ASTM Standards.

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Associate Member News

Customer advisory board for insulation

Large industrial insulation contractors and distributors from across the country assembled in Kansas City recently to participate in the first Customer Advisory Board meeting conducted by the Insulation Group of **CertainTeed Corporation.**

The board, established to encourage more productive communications between supplier and user, reviewed CertainTeed's 500° and 850° Snap*On fiber glass pipe insulation products. The group also discussed in detail each customer's specific needs and how the manufacturer can best satisfy them.

"By getting the opinions of this select group of contractors and distributors, we hope to find out what works best for all our insulation customers," said Paul Lenor, vice president of sales for CertainTeed's Insulation Group.

When the company plans the introduction of a new product, the board will also play a role in the product's development, Lenor said. Company board members will examine all features of the product with the contractors and distributors to see what works and what does not.

CertainTeed plans to meet semi-annually with its board members to discuss new products and trends.The company expects to rotate board members "to assure new ideas," Lenor said.

Other possible plans include meetings with product end-users in attendance, and meeting which will involve specifiers, architects, and engineers.

Barra opens new headquarters

Barra Corporation of America, Inc., U.S. distributor of Braas Rhenofol® roofing systems, has opened a new corporate headquarters in West Caldwell, N.J.

According to Barra President Colin Murphy, the new facility was designed to accommodate the company's main warehouse as well as its technical service and sales operations. In addition to the West Caldwell facility, Barra also has sales and service facilities in Chicago, Atlanta, and Albuquerque, N. Mex.

Benoit enters one-ply market

Benoit, Inc., a marketer in the commercial roofing industry, has announced its entry into the single-ply roofing market with Benoit EPDM Roofing System. (EPDM stands for Ethelene, Propelene, Diene, Monomer, the rubber elastomer content of the membrane.)

The sheets are available up to 32 feet 10 inches wide and are manufactured without the use of talc. The field seams are easily completed with a totally unique double-faced, self-vulcanizing tape. In a short period of time the tape vulcanizes creating one monolithic EPDM sheet over the entire roof area.

A similar tape that does not self vulcanize is used to attach the membrane to metal gravel stops, gutters, etc. The use of double-faced tapes with talcless EPDM rubber eliminates the many problems associated with the use of solvent cleaning, adhesives and seam sealer which require a high degree of workmanship.

Loadmaster announces change

Controlling interest in Dallas-based Dalin Associates, manufacturer of **Loadmaster Roof Deck Systems,** has been purchased by C. L. Nunley, one of the firm's two principal shareholders.

Nunley announced the change in ownership and added that the corporate name has been changed from Dalin to Loadmaster Systems, Inc.

President of Loadmaster, Nunley said that John Simms, who has been with the company as national sales manager since 1975 has been named vice president. The company has filed to do business as Loadmaster Roof Deck Systems.

Nunley acquired shares held by Dale A. Lehr to obtain majority ownership of the firm. Less than a decade ago, the two men invented and developed a roof decking system. First installed in 1971, the Loadmaster Roof Deck System is used extensively today on commercial buildings such as schools, shopping centers and warehouses.

Loadmaster is a modular, dry-installed roof deck system that includes high-tensile steel as its base, an optional middle layer of rigid polystyrene insulation, and final layer of high-density mineral board in modular sections.

Celotex names Rowe field mgr.

Thomas A. Rowe has been named field product promotion manager, industrial insulation and specialty products, of **The Celotex Corporation,** Industrial Products Division.

In his new post, Rowe is responsible for Thermax industrial insulation, asbestos products and felt specialties.

Robert Powell, who formerly served as field product promotion manager for industrial insulation and specialty products, has been given responsibility for high temperature insulation products and accessories.

PVC membrane on GTE laboratory

USM Weather-Shield Systems Company, a subsidiary of United States Mineral Products Co., supplied its Flexhide® LR-50 PVC roofing membrane for the new GTE Automatic Electric Laboratory in Phoenix.

The Weather-Shield mechanically fastened system, featuring Flexhide® LR-50 membranes, is a total system designed for waterproofing and weatherproofing the roofs of new and existing structures.

The Roof Top Engineering Company, 4244 East Elwood St., Phoenix, installed the Weather-Shield System. The firm is a Weather-Shield professional licensed contractor, specially trained for the installation of watertight Flexhide® membranes.

According to Todd Quinn, general manager of USM Weather-Shield Systems Co., "the installation of Flexhide® LR 50 for the GTE roof is an integral part of the new lab's total system design for energy efficiency."

Perlite Institute meeting May 25-30

Perlite Institute, Inc., will hold its 32nd annual meeting May 25-30, 1981, at the Europe Hotel, Killarney, Ireland.

Additional information on the Annual Meeting may be obtained by contacting Robert Milanese, Managing Director, Perlite Institute, Inc., 45 West 45th Street, New York, N.Y. 10036.

New Members

The following have been approved for NRCA membership between March 1 and April 1, 1981.

CONTRACTORS

- **Anderson & Shah Roofing Inc.**
  303 Mound Road
  Joliet, IL 60436
  Paul Shah

- **Buckley Roofing Co., Inc.**
  3601 N. Hydraulic
  Wichita, KS 67219
  William Buckley

- **Cal-Ore Coatings**
  3873 Rio Vista
  Klamath Falls, OR 97601
  Roy Price

- **Commercial Roofing Contractors Inc.**
  40 Keith Valley Rd.
  Horsham, PA 19044
  William J. McCloskey, III

- **C. L. Deemer Roofing & S/M Co. Inc.**
  P.O. Box 133
  506 Park Place
  Fremont, OH 43420
  Bernard M. Hoffmann, Jr.

- **Division Seven Inc.**
  P.O. Box 18781
  Memphis, TN 38118
  Bryon Sherrod

- **Donaldson Roofing Co. Inc.**
  16702 Bobcat Trail
  Cypress, TX 77429
  Bill Donaldson

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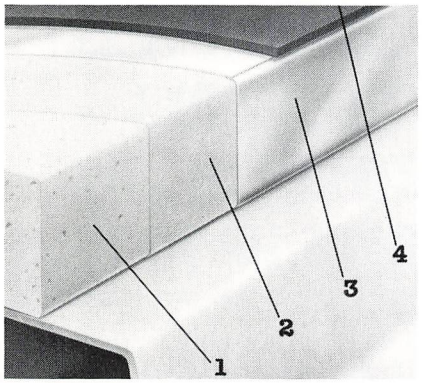
New products, ideas, publications

Insulation for single ply



RMAX Ply—I developed for single membrane roofing: 1. Isocyanurate foam core; 2. fiberglass mat; 3. aluminum foil; 4. single-ply membrane.

RMAX, Inc., announces availability of RMAX Ply-I, an insulation product developed specifically for single-ply membrane systems. RMAX Ply-I's distinguishing feature is its Factory Mutual Class I rating without a composite board layer.

RMAX Ply-I is manufactured with fiberglass reinforced foil on both sides of the product for added strength and dimensional stability. No foil slip sheet is required between the insulation and the single-ply membrane when RMAX Ply-I is used.

RMAX Ply-I is available in a variety of thicknesses and lengths. R-Value of the product is R-8 per inch of thickness.

Computerized management system

A new computerized construction management system, designed to control job costs and to track profitability of construction contractors and subcontractors, was introduced by Digital Equipment Corporation's Retail Products Group.

The new system, available exclusively through the company's 25 computer stores nationwide, has been independently reviewed, compliance-tested and verified by Peat, Marwick, Mitchell & Co., Certified Public Accountants.

Designed to run on the low-cost WS78 word/data processor, Digital's Construction Management System contains four modules: job costing, accounts payable, accounts receivable, and payroll. The system will manage and store records for up to 545 vendors, 345 employees, and over 250 customers.

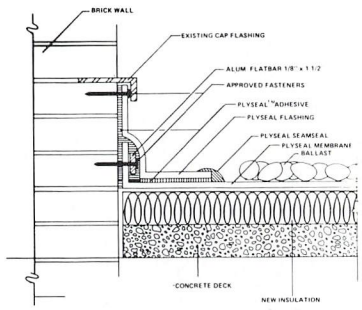
With WS78 word/data processor, video display terminal with keyboard and command keypad, 180-character-per-second printer, COS-310 operating system, and training for two operators, the system is priced at $17,345. With letter-quality printer instead of the 180-cps matrix printer, the system retails for $17,745.

'Roof-on-the Roof' system

Span Systems, Inc., Mountain Lakes, N.J., is marketing Spandome "roof-on-the-roof" to permit repair of roofs in rainy weather.

Resembling a large umbrella without the stem, the lightweight Spandome can be set up by a few men in a few minutes and moved to new locations as work underneath progresses. These structures can be re-used for many years and according to the company, will pay for themselves in a few months of use.

Elastomeric membrane



A low cost, easy-to-apply elastomeric roofing membrane for industrial and commercial applications is being introduced by Plymouth Rubber Company of Canton, Mass.

Plymouth Rubber Plyshield® is a 32 mil reinforced neoprene, single ply roofing membrane that gives with deck movement and resists extreme thermal shock to increase roof life. Plyshield® can be easily applied directly over the existing roof without having to rip off the old system, and it is unaffected by ponded water.

Offered for ballasted loose laid or fully adhered applications, Plymouth Rubber Plyshield® can be applied over domes, barrels, peaks and typical flat decks, whether concrete, steel, or wood. Unaffected by −30° to 170°F temperature changes, the UV-resistant membrane is supplied in 58"W rolls and 10' × 10', 15' × 100', or 20' × 100' panels. Damaged areas can be easily patched.

Two-way air conveyor

Eliminator, Inc., Denver-based manufacturer of roof vacs, has introduced the Mark X Turbo two-way air conveyor.

According to Robert Dolby, president, the Mark X is the most powerful roof vacuum and gravel blower ever produced. He said the Mark X, which has been job tested on over 10,000 squares before its introduction to the market, will vacuum over 1,000 feet and blow gravel up to 14 tons per hour.

Equipped with a powerful turbo-charged 137 HP diesel engine, the machine can vacuum gravel from the ground for blowing. It is adaptable for use with tank or as twin hose vacuum.

Insulation tool

The DEKFAST Product Group of Construction Fasteners, Inc., recently introduced a stand-up installation tool for installing DEKFAST insulation fasteners.

Dekfastool is designed as an extension to a standard electric screw driver (recommended 2000 RPM).

Allowing the operator to stand up reduces

TAKE TWO TO RELIEVE STRESS.

There's a lot of stress when you get to the top. To the top of your building, that is. Especially on your roofing membrane. Owens-Corning has a remedy for it: use two layers of insulation instead of one. That's because in a single layer of roof insulation, gaps of up to 3/16 inch can occur between the insulation boards. And these gap locations provide the greatest potential for membrane stress.

The second layer of insulation can contribute to reducing stresses to the membrane and, therefore, to longer roof life. It's installed over the bottom layer, with the joints offset and the bottom layer gaps covered. By eliminating the continuous vertical gaps that extend from the roof deck to the built-up roof in this way, you can reduce membrane stress by as much as 10%.

But double-layer insulation does even more than that. It also increases the energy efficiency of your building. By eliminating continuous vertical joints with double-layer insulation, you'll have less heat loss or gain than you would with just a single layer. So naturally, you'll save money on heating and cooling your building.

For more information, write A.X.W. Meeks, Owens-Corning Fiberglas Corp., Fiberglas Tower, Toledo, OH 43659.

OWENS/CORNING FIBERGLAS TRADEMARK®

the fatigue created by the usual bending and stooping when using only the electric screw driver.

Financial Management for Contractors

A comprehensive, step-by-step guide to analyzing and improving a contractor's profit situation, *Financial Management for Contractors* explains in depth the fundamentals, techniques, and terms of financial management—using examples devoted exclusively to the contracting industry (McGraw-Hill, $22.50).

Written by the staff of The Fails Management Institute, this authoritative work covers all aspects of vital financial questions, from reading and understanding financial statements to the most advantageous use of capital to the collecting of money owed to the contracting company.

With thorough descriptions of the factors that influence a firm's profit and loss, the guide shows how profits (or losses) are documented and demonstrates how to increase profits through the application of proven budgeting and cash flow principles.

Some of the many topics examined are determining a satisfactory return on investment; using capital, either debt or equity, most effectively; calculating the real cost of interest rates; departmentalizing operations; and evaluating one's own abilities in financial decision making. Numerous case studies are used to clarify and amplify the principles and techniques involved.

Coming Events

MAY	
11-15	Roofing Industry Educational Institute Seminar, Detroit
19-21	Roofing Industry Educational Institute 2-day Seminar, Denver
31-June 4	Western States Roofing Contractors Association Annual Convention, Reno
JUNE	
1-5	Roofing Industry Educational Institute Seminar, Philadelphia
3-6	Florida Roofing, Sheet Metal & Air Conditioning Contractors Assn. 59th Annual Convention, Orlando
4-11	Western States Roofing Contractors Association, Reconvened Convention, Acapulco
11-14	Tennessee Association, Biloxi, Miss.
15-19	Roofing Industry Educational Institute Seminar, Denver
JULY	
15-18	Roofing Contractors Association of Georgia Summer Convention
16-18	NRCA Mid-Year Meeting, Chicago
AUGUST	
21-22	National Roofing Litigation Center (NRLC) Litigation Conference, Continental Plaza Chicago
SEPT.	
21-24	International Roofing Symposium, Brighton, England

The roofing spec

CLASSIFIED

Place a classified ad in *Roofing Spec* for 25 cents per word. There is a minimum charge of $10.00. Boxed or display advertisements are available in the classified section for $20.00 per inch (one inch minimum). Ads using blind boxes available at no additional charge to NRCA members; non-members add $5.00 to total order. Send ad copy and payment to: Advertising Manager, Roofing Spec, 1515 N. Harlem Ave., Oak Park, IL 60302.

ASPHALT TANKERS FOR SALE

1977 Taurus JTK 13 Ton Tanker mounted on 1973 Ford 900 Cabover.
Three 6 Ton Day Tankers.
All pieces are in excellent condition.
Write Box L, *Roofing Spec.*

INFRARED ROOF SURVEYS

BEFORE YOU BID, get all the information you need to place the best competitive bids for reroofing. Know exactly where and how much wet insulation needs replacement.

OFFER FOLLOW-UP SURVEYS to increase your customer satisfaction on new and reroof work.

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FOR SALE

Used cold applied roofing equipment, completely enclosed in 18 foot van truck, good condition. Call for description and photos: 1-912-236-0346.

Gravel-Vac, like new, tandem wheel trailer, 1500 hours. Asking $24,500.00 (Can). Contact Williamson Roofing, 1-519-681-0780.

SLATE ROOFS

"A handbook on data on the constructing and laying of all types of slate roofs." Written in 1926 and now reproduced. Completely relevant today. Many details. Send $7.95 to Vermont Structural Slate Co., Inc., P.O. Box 98, Fair Haven, Vermont 05743.

PERSONNEL WANTED:

International Roofing Co. Inc. located in Beloit, Wisconsin 53511, is interested in hiring EXPERIENCED ESTIMATORS, SUPERVISORS, and FOREMAN. All should be thoroughly experienced in new and reroofing of commercial, industrial and all phases of government work, travel necessary. Send resume and desired salary to P.O. Box 816, Beloit, Wisconsin 53511.

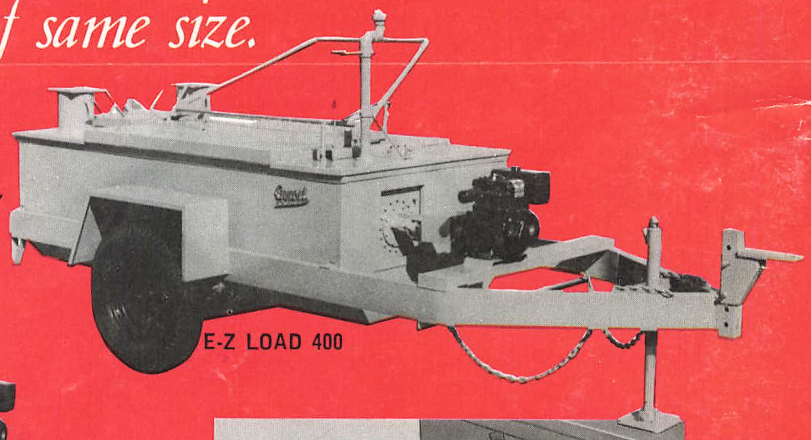
DRY-APPLIED ROOF LEVELER AND INSULATION

"THERM-O-DECK" is easy to use, providing positive, permanent results in correcting low spots, irregularities, etc., and building up a slope for proper drainage on old or new decks. Insulating "K" factor = 0.46. Simply tamp in place and cover. Shipped anywhere in 75 lb., 4 cu. ft. bags. Write Brouk Co., 1367 Kingshighway, St. Louis, Mo. 63110. Member: NRCA.

e-z load kettles

melts more hot per hour than any other kettle of same size.

loading height only 40″

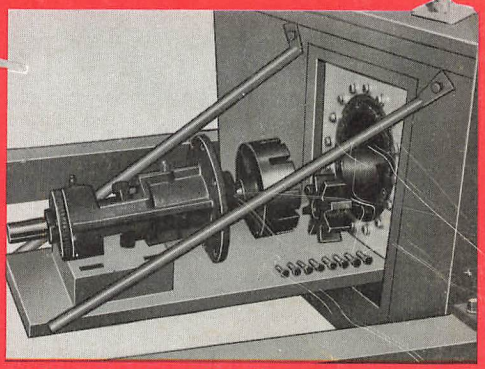


E-Z LOAD 400

loading height only 42″

E-Z LOAD 600

- Equipped with Easyout Submerged Gear Pump!
- Patented Heat-Riser cuts morning heat up time in half.
- Cover with break-away-lever-action makes opening a cinch!
- Heavily insulated!
- Equipped with adjustable tow hitch and double safety tow chains.
- Adjustable screw jack—the easiest way to keep kettle level.
- Heavy channel frame goes full length of kettle!



Easyout Submerged Gear Pump is easily serviced from outside the kettle. Pump never needs pre-heating because it's submerged in the hot. Pumps to 150 ft. plus at 35 GPM.

There are more Aeroil Kettles in service than any other make.

Aeroil's reputation for making roofers kettles that out produce and out live all others is legendary, now the E-Z LOAD Kettles are our newest legend. There's no question that these kettles can economically and efficiently supply a big crew on a big job . . .

but did you know

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(Kerosene or LP-Gas)

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E-Z LOAD 600	600 gal.	196″	85″	(4) 7.00x15 8 ply	42″	40 gal.	3800 lbs.
E-Z LOAD 400	400 gal.	180″	76″	(2) 7.00x15 8 ply	40″	30 gal.	2300 lbs.

Aeroil Products Company, Inc.

69 Wesley St., South Hackensack, New Jersey 07606 • 201-343-5200

(USPS 942-900)

the roofing spec

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OFFICES:
1515 N. Harlem Ave.
Oak Park, IL 60302
Telephone: 312/383-9513

Staff

William Good, CAE, *Executive Editor*
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