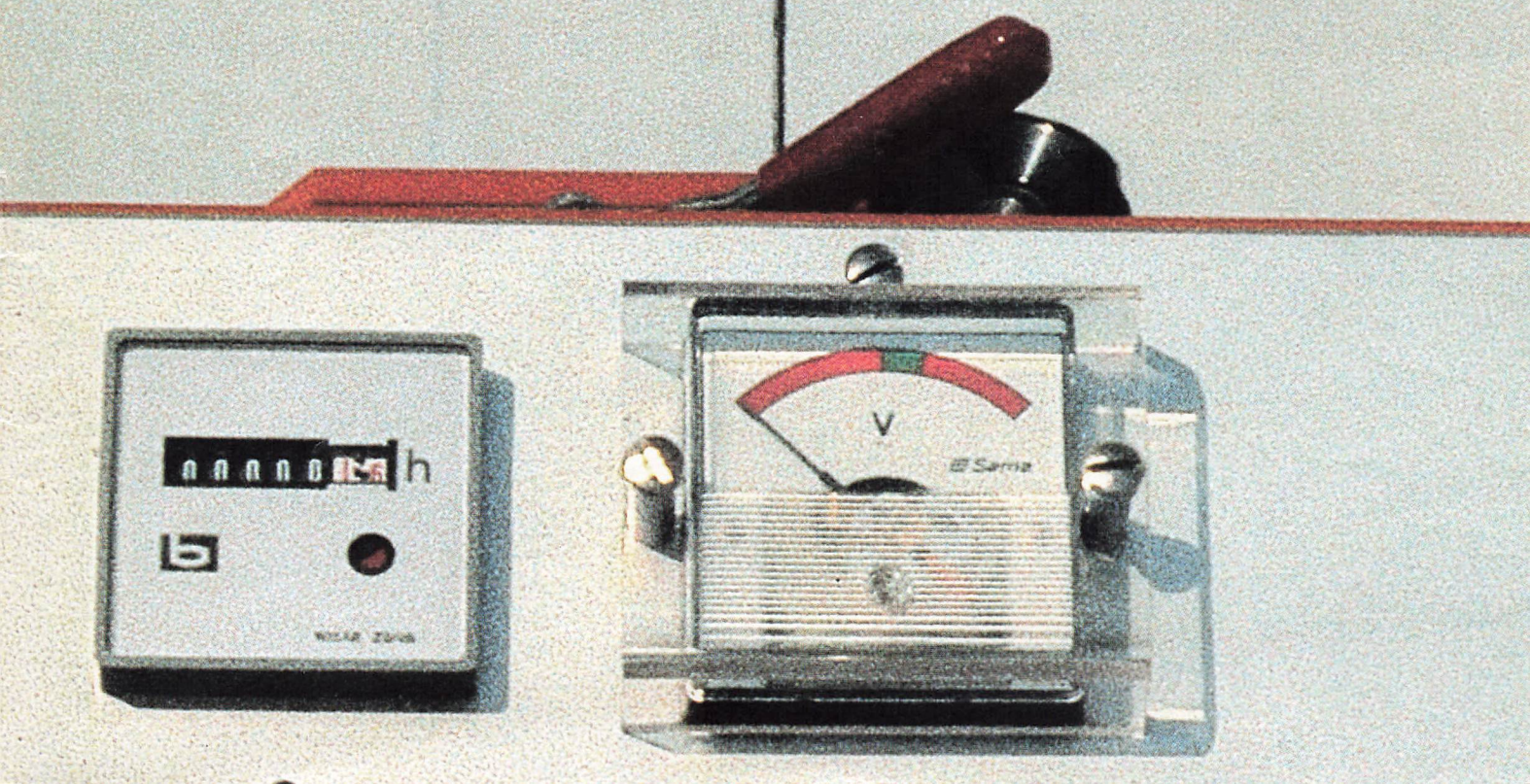
Roofing Spec

$2.00

National Roofing Contractors Association

June 1984

Single ply 1984



WE REROOF WHAT OTHERS JUST COVER UP

GAFTEMP® INSULATION

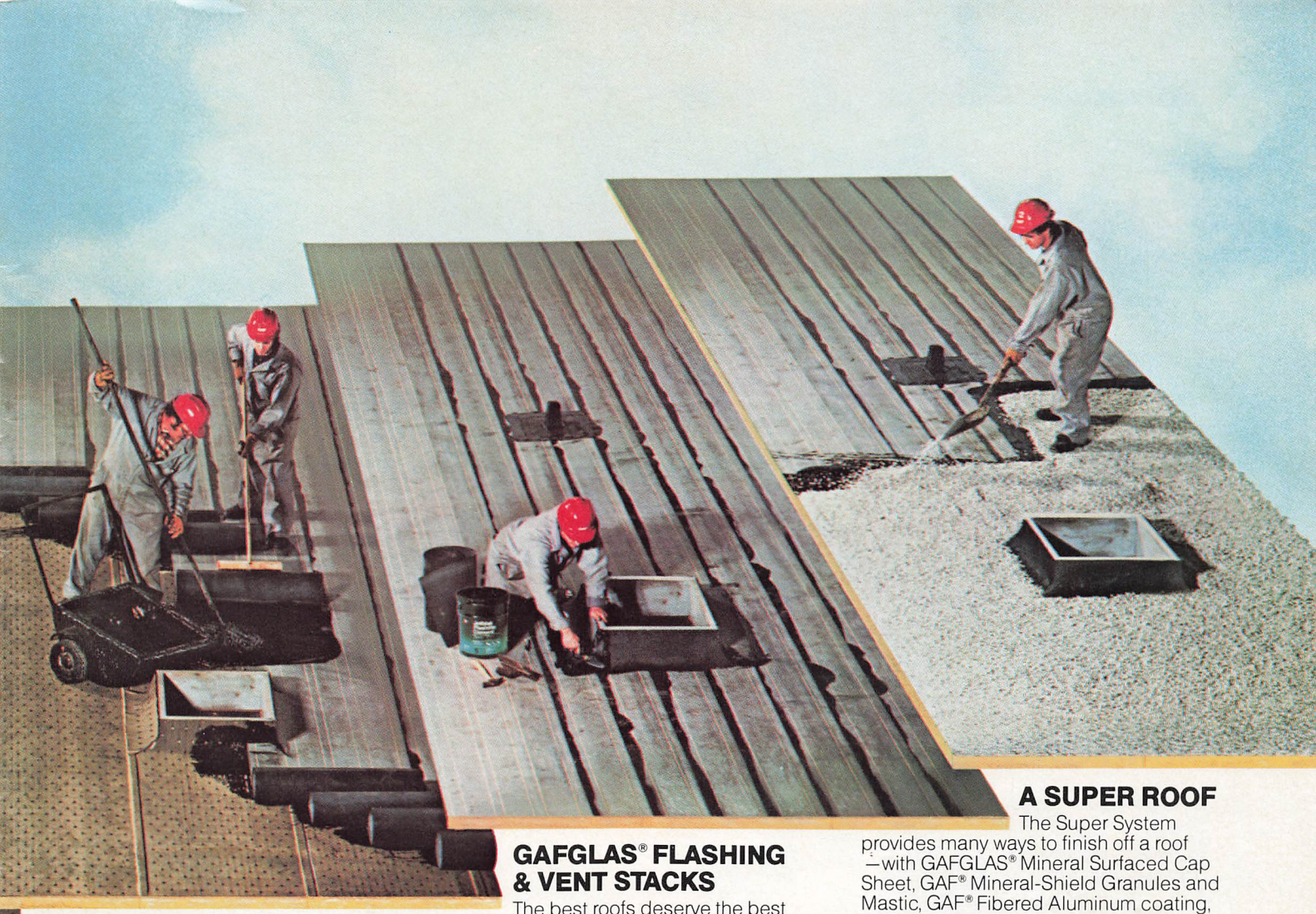
GAF offers one of the widest lines of roof insulation products in the industry. Under the GAFTEMP® name, you'll find six different insulations to choose from as the important first step of the Super System. Here, we're starting with GAFTEMP Isotherm insulation, a non-composite board made up of asphalt-coated facers bonded to a core of isocyanurate foam. No lower "U" value is available in any other FM Class I rated product of equivalent thickness. It's lightweight, easy to handle, and fast to install.

GAFTITE FASTENERS

An important part of the GAF® Super System roofing is the GAFTITE Roof Insulation Fastening System. It's the time-saving, and the money-saving, way to lock insulation down to stay. No more bitumen or other adhesives. No more hot mopping. No more nailing. 50% less labor. Quick and easy installation with half as many fasteners as most traditional nailing methods. Fewer problems during installation and after, with positive protection against wind uplift, vibration, and construction movement. Factory-Mutual Approved Systems.

GAFGLAS® STRATAVENT® (Vent Ply)

The GAF® GAFGLAS® Vent Ply roofing System has been engineered to reduce the destructive effects of moisture vapor trapped beneath the surface of a built-up roof. Granules on the underside of Stratavent Base Sheet provide venting for any trapped moisture vapor. Moisture won't rot, shrink, or expand it. It's easy to apply and can be specified for any type of roof deck. Since it's rolled out dry, it yields significant savings in asphalt and labor. Carries the U.L. Type G 2 BUR label.



GAFGLAS® PLY 4

GAFGLAS® PLY 4 glass ply roofing sheet is the *superior* membrane for all built-up roofs in all climatic zones. You'll like the ease of application. It's light in weight and rolls out fast, so your labor costs will be lower. It has high tensile strength, great dimensional stability, and resists blistering, fishmouthing and rot. Interply adhesion is excellent. GAFGLAS® PLY 4 roofing sheet meets Fed. Spec, SS-R-620B Type III requirements, and exceeds ASTM D2178 Type IV. It carries the U.L. Type G 1 BUR label.

GAFGLAS® FLASHING & VENT STACKS

The best roofs deserve the best flashing—GAFGLAS® Flashing. The specially formulated long fiber glass mat and heavy asphalt coating give maximum protection from the elements and insure long lasting strength and durability. It's easy to install using GAF® Jetblack™ Flashtite Cement, the asphalt plastic cement that's unequalled for longlasting adhesion. And for maximum moisture protection, you'll want to install GAF® Vent Stacks that let warm air and vapor from the sun-heated roof out, and keep cool outside air from coming in.

A SUPER ROOF

The Super System provides many ways to finish off a roof —with GAFGLAS® Mineral Surfaced Cap Sheet, GAF® Mineral-Shield Granules and Mastic, GAF® Fibered Aluminum coating, GAF® Weather-Coat Emulsion, or GAF® Special Roofing Bitumen or Roofing Asphalt and aggregate. Whichever way you choose, you'll have a Super Roof that solves problems, and not just a cover-up.

Reroofing is more than just covering up an old roof with material. It requires a carefully executed plan of determining specific problems, selecting the correct products, and placing the system down with proper application procedures. At GAF, we pride ourselves in reroofing with a time-proven built-up roofing Super System. Shown here are only a few of GAF's roofing products, which also include complete single-ply roofing systems and residential asphalt roofing shingles.

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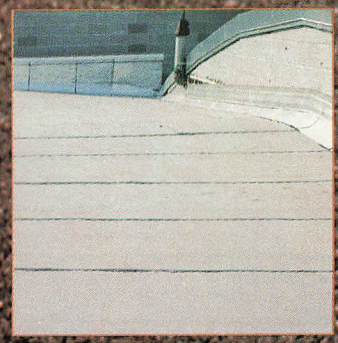
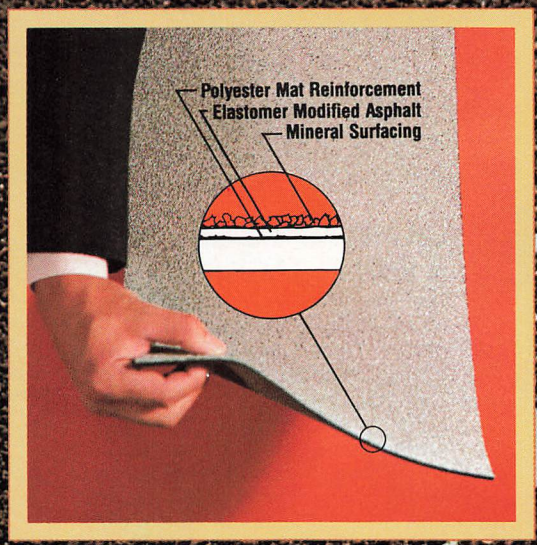
GAF® super system
BEST EVERY STEP OF THE WAY

Parafor 50 LT

Siplast quality in a single ply elastomer modified bitumen roofing system.



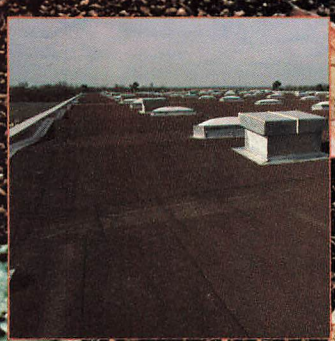
Siplast's world of experience has been applied to the single ply needs of the roofing industry. The result is PARAFOR 50 LT, a single ply system that gives architects and specifiers a better choice. Siplast engineers and chemists have developed an elastomer modified bitumen that provides needed elongation and elasticity characteristics together with excellent resistance to the sun's ultraviolet rays, thermal shocks and extreme low temperature. They have also included a polyester mat to give the material both strength and a puncture resistance seldom found in a single ply.



PARAFOR 50 LT is engineered in such a manner as to give architects and specifiers great design flexibility. It can be applied with hot asphalt, cold adhesive or by torch to all slopes with drainage and over all standard roof decks and insulations.

PARAFOR 50 LT combines strength and flexibility with superior resistance to sun, freezing temperatures and other traditional causes of roof degradation. In addition, the granular surface of PARAFOR 50 LT gives you a choice of a wide variety of colors in a lightweight single ply that needs no gravel. It is guaranteed for a full ten years.

siplast



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Roofing Spec

Vol. 12, No. 6
June 1984

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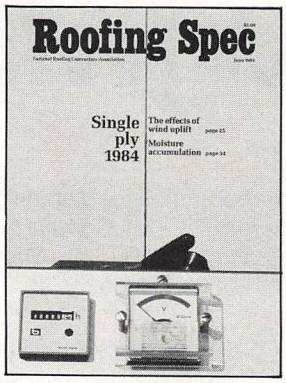
Constance Arkus, Assistant Director of Communications
Martin Eastman, Managing Editor



Single-ply materials and equipment take their place in the roofing market

Photo courtesy of Sarnafil Inc.

NATIONAL ROOFING CONTRACTORS ASSOCIATION
8600 Bryn Mawr Avenue
Chicago, Illinois 60631
(312) 693-0700

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Departments

Features

Advertisers

Ideas, notes and random thoughts

Add the mayo... Dr. P.C. Shea, Atlanta uses mayonnaise to remove hot tar from burned patients' skin, according to *The Wall Street Journal.* "The condiment makes the removal process much less painful although some patients complain about smelling 'like a ham sandwich,' " says Dr. Shea.

Stay In Tune is the theme of NRCA's 98th Annual Convention & Exhibit to be held at The RiverGate Convention Center in New Orleans, Feb. 10–13, 1985. Already, 631 booths (out of 680) have been sold. The housing block includes four hotels: the Monteleone, the Hilton, the Sheraton and the Holiday Inn Crown Plaza. The Hilton will be the headquarters hotel.

The membership momentum is pushing NRCA ranks close to the big 3000! NRCA has added 395 new members to its roster since July 1983, bringing the total to an impressive 2,819.

The Public Relations Board, Inc., Chicago will be handling PR duties for the Professional Roofing Contractor program. The PR Board is developing a marketing book for roofing contractors. Gulf State Advertising Agency, Inc. is in charge of advertising for the campaign.

Effective June 1, Wayne I. Mullis, Universal Roofers and Builders, Phoenix began serving his term as NRCA president for 1984–85. Officers include: Senior Vice President Robert "Country" Harrison, Greenville Roofing Co., Greenville, S.C. and Vice Presidents Larry Carlson, Carlson Roofing Co., Inc., Rockford, Ill.; Charles "Rusty" Griffiths, Jr., Binghamton Slag Roofing Co., Inc., Binghamton, N.Y. and Donald McNamara, F.J.A. Christiansen, Milwaukee. Zachary Ellis, Z. Ellis Roofing Co., Inc., Kenner, La. was named vice president for a one-year term, assuming Harrison's duties.

The Fourth Annual National Roofing Legal Resource Center (NRLRC) Seminar will be held Sept. 21–22 at The Williamsburg Hospitality House, Williamsburg, Va. The following topics will be presented: claims for work disruption; what every supervisor should know about strikes and pickets; payments—what to do when you don't receive them; the new AGC standard form contract; reroofing considerations; and how to prepare for negotiations. Seminar details will be mailed early summer.

The Second International Symposium on Roofing Technology will be held at the National Bureau of Standards (NBS) in Gaithersburg, Md., Sept. 18–20, 1985. The symposium, "Roofing Materials and Practices—A Decade of Change and Future Trends," is sponsored by NBS, NRCA and the International Union of Testing and Research Laboratories for Materials and Structures (RILEM). Contact NRCA for a brochure: 8600 Bryn Mawr, Chicago, Ill. 60631; 312/693-0700.

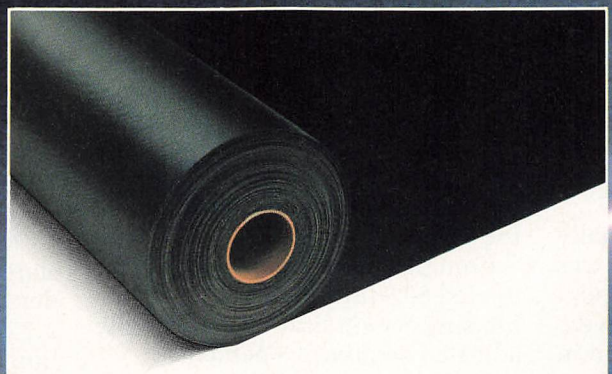
OSHA has revoked 153 provisions of its general industry job safety standards because they were legally unenforceable and, in certain cases, repetitive. Some of the provisions relate to cranes, derricks, explosives, ladders, scaffolds and protective equipment. OSHA said the deletion will streamline and clarify the agency's regulations without endangering worker safety and health.

The U.S. is a nation of small companies according to President Reagan's report, "The State of Small Business." Almost 100 percent of American enterprises employ 500 or fewer workers. These same firms contribute 42 percent of sales and 38 percent of the American GNP and employ 47.8 percent of the private, nonagricultural workers. Small companies also generated 2.6 million of the four million new jobs since 1981. The Research Institute of America also notes that changes in personal income tax rates or indexing will affect not only individuals but owners of small businesses. Copies of the report can be obtained by writing to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

There is only one rule for being a good talker: learn how to listen.

Christopher Morley

ONE LEAK AND YOUR PROFITS COULD GO DOWN THE DRAIN.



If you're called back to repair a roof you installed, you might as well say good-bye to your profits and your customer goodwill. Callbacks are expensive. That's why Firestone makes sure its licensed installers receive all of the materials and expert support they need to assure a profitable, water-tight, long-lasting installation every time. A Firestone roof starts with our own EPDM single-ply membrane, carefully checked throughout the manufacturing process to assure high quality. We provide the training and technical support you need for even the most difficult installations. And once the roof is down, a Firestone Field Technical Representative will inspect the roof to make sure your crew did the job right...so callbacks are minimized.

With membranes as wide as 50 feet, Firestone EPDM roofing goes down fast. It's easy to handle and install, whether it's adhered, ballasted, mechanically anchored or installed with our exclusive FasTrac™ system. Fast installation means more roofing jobs in less time. The bottom line is a lower installed cost for greater profitability on every job.

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Firestone

Division of The Firestone Tire & Rubber Company

March contracts lose steam

Contracting for new construction reached a new high during 1984's opening quarter but lost some of its momentum in March, according to the F. W. Dodge Division of McGraw-Hill Information Systems Co.

The March reversal, a seasonally adjusted setback of 4 percent, was due to declines in homebuilding and public works construction that were only partly offset by a solid gain in commercial and industrial building.

March construction contracts totaled $17.6 billion, bringing the seasonally adjusted Dodge Index of construction contract value down to 144 after two prior months at 150 (1977 = 100).

According to George A. Christie, vice president and chief economist for Dodge, "1984's first quarter was the best three-month period on record for the Dodge Index, as the housing market rode the crest of its cycle while commercial and industrial building, which typically lags housing, was still on the way up.

"Rising interest rates are likely to dampen homebuilding in 1984's second half, but we're looking for a strong volume of nonresidential building throughout the balance of the year."

Contracts for residential building totaled $8.8 billion in March, as the housing market showed a seasonally adjusted decline of 7 percent.

"Multi-family building has been the source of most of the recent volatility in housing starts and was the reason for March's decline," according to the Dodge economist. "By contrast, single-family starts have been holding steady at just over a million units ever since interest rates leveled off early in 1983. Now that rates are rising again, this will be the part of the housing market to watch."

Although both Dodge and Commerce Department data show approximately the same strong average rate of homebuilding for 1984's first quarter (1.9 million units or more), Christie noted that Dodge figures show a smoother monthly pattern through the winter than Commerce data indicate.

Dodge data show that housing starts peaked in February at just under 2 million units (vs. Commerce's 2.2 million) and retreated to 1.7 million in March (vs. 1.6 million). Most of the variance results from different methods of seasonal adjustment, the Dodge economist explained.

March contracts for nonresidential building totaled $5.8 billion. After adjustment for seasonality, the latest month's newly started commercial, industrial and institutional building activity advanced 8 percent from February's rate.

In March, a strong gain in contracting for stores and warehouses paced the month's 11 percent increase in commercial and industrial building while institutional building (schools, hospitals, etc.) remained unchanged.

"The closely watched office building market gave no indication in March that its collapse was imminent," Christie pointed out. Newly started office projects in 1984's first quarter were holding very close to last year's high volume. "In 1983, the office boom moved out of the Southwest and spread to the rest of the country. This is where the action still is in 1984," he said.

Contracts for nonbuilding construction, at $2.9 billion, dipped 17 percent (seasonally adjusted) in March, as utility work remained dormant and public works construction declined 21 percent.

At the end of the first quarter, the value of all new construction started in 1984 was $45.4 billion, a gain of 17 percent over the same 1983 period.

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

	March, 1984 Construction Contract Value (000,000)	Seasonally Adjusted Percent Change From Previous Month
Nonresidential Building	$ 5,849.1	+ 8
Residential Building	8,806.5	− 7
Nonbuilding Construction	2,921.0	−17
Total Construction	$17,576.6	− 4

	3 Mos. 1984 (000,000)	3 Mos. 1983 (000,000)	Cumulative Percent Change
Nonresidential Building	$15,374.5	$13,775.0	+12
Residential Building	22,153.0	17,967.8	+23
Nonbuilding Construction	7,897.3	7,077.6	+12
Total Construction	$45,424.8	$38,820.4	+17

DODGE INDEX
(1977 = 100, SEASONALLY ADJUSTED)

January 1984	150
February 1984	150
March 1984	144

Trades agree to stay on their own turf

Roofers and sheet metal workers have addressed the problem of jurisdictional disputes in a resolution passed by the two trades' unions.

The jurisdictional problems arose with the newer elasto/plastic roofing materials, which with their nontraditional application techniques have allowed the two trades to move in on each other's turf, according to the resolution.

A provision of the document states that, "Each craft shall continue to apply the work that traditionally has come under the jurisdiction of that trade, regardless of the type of material used or the product supplied."

The two unions also agreed to "insist that their respective affiliated local unions comply with the terms of this adopted resolution."

continued, page 11

OSHA asks for comment on proposed asbestos rules

Public comment on proposed asbestos exposure regulations is being invited by the Occupational Safety and Health Administration (OSHA).

OSHA had issued an emergency temporary exposure ruling Nov. 4, but the U. S. Court of Appeals for the Fifth Circuit struck down the ruling after failing to find need for emergency action.

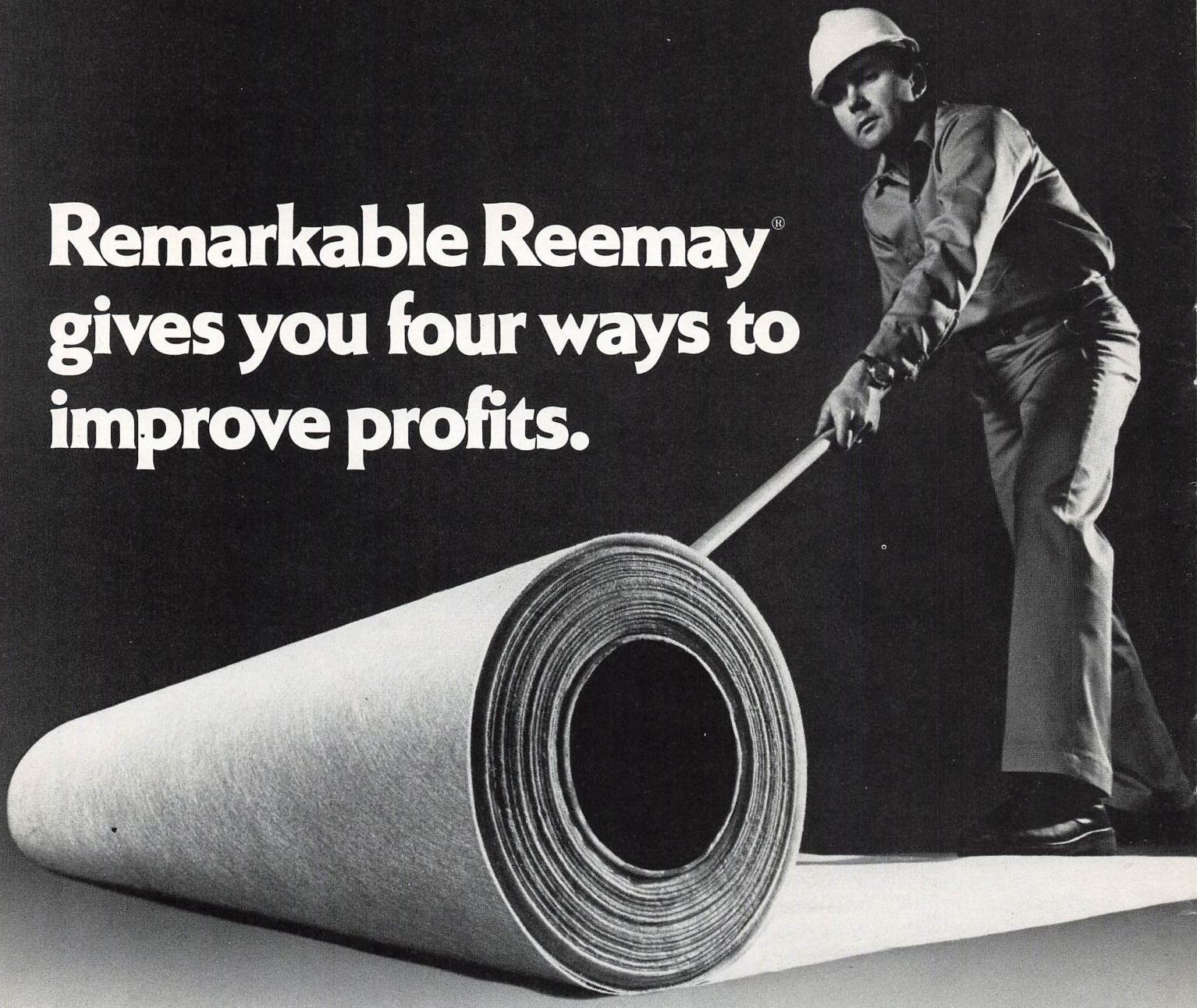
The new proposal lists two asbestos fiber exposure limits, two fibers per cubic centimeter (f/cc) of air or .5 f/cc as an eight-hour time weighted average. Comments are requested on which limit is more appropriate and feasible. The current regulations limit exposure to two f/cc.

Among the other issues on which OSHA invited comment in its Feb. 10 *Federal Register* notice were:

- To what extent, if any, the regulations should be modified for trades with transient work forces such as construction.
- Whether the evidence associating asbestos exposure to medical problems is scientifically valid.
- Whether different asbestos fiber types should be regulated differently.
- Whether special provisions and regulations should be devised for the construction industry.

An informal rulemaking hearing is scheduled for 10 a. m., June 19 at the Department of Labor.

Remarkable Reemay® gives you four ways to improve profits.



REEMAY® Roofing Fabric by Du Pont is superior to felts in four key ways that reduce your costs.

2 times stronger

REEMAY is twice as strong as fiberglass felt. It holds together over seams and joints. You install a more durable membrane and reduce call-back costs.

9 times lighter

Lightweight REEMAY cuts labor costs because it goes down faster, easier. Cuts freight costs significantly, too.

20 times more stretch

REEMAY elongates 43% its normal size, while fiberglass breaks at 1.8%. That means REEMAY adapts to extreme heat, cold and ponding weight. You get a more failure-proof roof and reduce call-back costs.

REEMAY vs. FELTS	Organic Felt, 15 lbs.	Fiberglass Felt	REEMAY S-2024
1 **Strength,** pounds	1	10	22
2 **Weight,** pounds/100,000 sq. ft.	45,000	36,000	4,050
3 **Elongation,** percent	1.5	1.8	43
4 **Flex-life,** cycles-to-failure	2	100	100,000
All materials tested in 3 plies in asphalt.			

1,000 times more flexible

REEMAY exceeds 100,000 flex cycles without cracking. Fiberglass felts fail at 100 in the same test. Over years of freeze/thaw cycles, REEMAY holds up. You get a long lasting, reliable roof.

Used with most common cold mastics, for single-ply or built-up roofs, remarkable REEMAY Roofing Fabric gives you a more trouble-free, more profitable roof. Contact a distributor from the list at right for name of a dealer near you. And for more information, call (302) 999-5077 or write Du Pont Company, Room G-39978, Wilmington, DE 19898

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NATIONAL NEWS

continued from page 9

Extortion appeal rejected

The U. S. Appellate Court has rejected the appeal of a Roofers Union local business manager.

Paul W. Gibson, business manager for Roofers Local 33, was convicted in a jury trial of attempting to obstruct work at a construction site by means of extortion.

According to testimony heard at the original trial, the business manager attempted to extort payment from Thomas A. Guilderson, co-owner of Advanced Industrial Systems, Inc. (AIS), a Massachussetts roofing company.

During a phone conversation, Gibson offered to insure that Guilderson would experience no harassment from the union at a certain labor construction site even though AIS was a non-union company.

A tape of a conversation between the two men was offered as evidence at the trial. The tape was made by Guilderson at the request of the FBI. An unclear word on the tape was used by both sides to prove their case. Gibson claims he was only suggesting there might be "problems," or legal union activities at the site if Guilderson didn't pay up. Guilderson claims that Gibson was actually threatening "violence" on the tape. The jury agreed with Guilderson.

The appellate court rejected the five issues raised by Gibson on appeal, saying that Gibson meant to threaten violence whether he actually used the word or not. "We think the jury could properly infer that Gibson's use of the word 'problems' plus his demand for a payoff to solve the problems was deliberately calculated to raise the specter of violence," the court stated in its ruling.

SPRI offers new publications

The Single-Ply Roofing Institute (SPRI) has prepared three new publications for the single-ply industry, according to Jay Mommsen, executive director of the organization.

The *Guide to Specifications*, prepared by SPRI's technical committee, is the "biggest project we have going," according to Mommsen. The first volume, which covers materials, was released June 1.

The three-ring-bound publication is divided into three volumes. Volume 1 describes generic materials and ASTM test methods. The second volume contains a glossary and a directory of SPRI members. The third volume covers single-ply applications.

Volumes 2 and 3 will be released later this summer.

Also just produced by SPRI are *Single-Ply Roofing Systems: A Guide for Ballast Specifications* and *Insurers Performance Criteria and Test Methods for Single-Ply Sheet Membrane Roofing Systems and Insulated Steel Deck Construction.*

More information on the organization is available from SPRI, 1800 Pickwick Ave., Glenview, Ill. 60025.

Goodyear raises prices

Goodyear has raised the price of all styles, gauges, types and colors of its Versigard rubber roofing membrane, including flashings, by 3 cents per square foot, the company said.

The price increase became effective effective May 15. It will not affect roofing systems' accessories, said Ned G. Kendall, general manager of the company's Roofing Systems Division.

Kendall said higher raw materials' costs necessitated the price increase.

Goodyear joins Firestone, General Tire & Rubber and Uniroyal which announced similar price increases previously.

continued on following page

Sub association elects Grieve president

Eugene A. Grieve, manager Architectural Quality Assurance for PPG Industries, Inc., was unanimously elected president of the American Subcontractors Association (ASA) during the group's annual meeting. His term will begin July 1.

Grieve plans to expand ASA's already active educational program during his one-year term. "My goal as ASA president is to make an expanded educational program available to more subcontractors than ever before," he said.

Grieve plans to achieve his goal by adding to ASA's family of publications and launching a nationwide series of workshops and seminars on subcontract negotiations, productivity, safety, controlling personnel and insurance for subcontractors.

Other posts were also filled at the national meeting. A. E. Marchbanks was elected first vice president; Jesse M. Pickett, Jr. was elected second vice president; John T. Parker was elected treasurer; and M. R. Sullivan was elected secretary.

Masonite merges with U.S. Gypsum

United States Gypsum Co. (U.S.G.) and Masonite Corp. are planning a merger which will expand U.S.G.'s line of building products, according to the gypsum company's chairman, Edward W. Duffy.

U.S.G., a Chicago-based company, is the world's largest manufacturer of gypsum and gypsum-based products. Masonite, also of Chicago, manufactures hardboard products, furniture components, commercial interiors and home improvement products.

The merger will cost U.S.G. about $380 million. The Masonite Board of Directors recommends that its stockholders accept the offer.

All litigation has also ended between the Masonite Corp. and General Felt Industries, Inc. In the agreement, which is subject to court approval, Masonite agreed to buy back all 630,000 Masonite shares owned by General Felt, while General Felt agreed not to buy any more shares or try to seek control of Masonite for two years.

NAPHCC letter urges strong BAT

A letter supporting a strong Bureau of Apprenticeship Training (BAT) has been sent to Washington by the National Association of Plumbing-Heating-Cooling Contractors (NAPHCC). The letter, sent by Executive Director Charles Lavin, went to several congressional committees.

A strong federal BAT would insure uniformity among apprentices, according to the letter. In addition, local apprenticeships would be protected from politically motivated state apprenticeship councils.

In the letter, Lavin also stressed the Association's support of both union and non-union training programs.

continued on following page

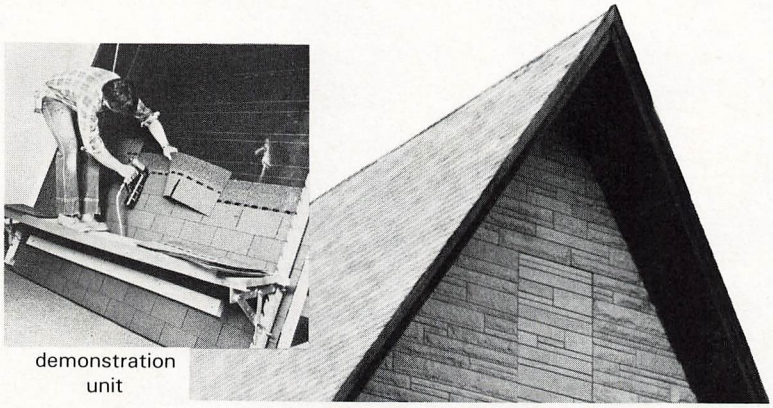
Chicago public TV auctions solar home

Chicago's public television station, WTTW/Channel 11, will be auctioning off a solar home valued at more than $140,000 as part of its annual fund-raising efforts. The home, donated by Regan & Associates, is the largest item ever given to the Channel 11 auction.

The house's passive-solar heating system concentrates heat from sunlight in a two-story solarium. The heat is moved throughout the house by natural and mechanical means.

Terry Regan, of Regan & Associates —Solar Design and General Contractors, is the designer and contractor for the house. He has designed and built seven passive solar homes in the Chicago area and has plans to break ground on four more in the near future. His designs combine centuries-old techniques such as house orientation and window placement with state-of-the art insulation and glass.

Regan also secured the building materials, which were donated by several businesses.



demonstration unit

Genstar Corp. splits division into two new companies

The Genstar Corp. has divided its Genstar Building Materials Co. into two new entities. The companies will be the Genstar Roofing Products Co. and the Genstar Gypsum Products Co. The two companies will operate independently with separate marketing and sales forces.

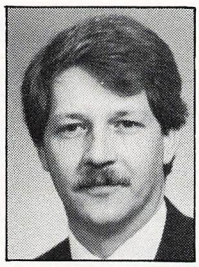
According to Genstar, the new organization will permit better focus on individual product lines. "We intend to concentrate on improving our manufacturing plants, adding new products, improving customer service and stengthening our position in the various markets," said J.A. West, executive vice president of the parent company.

Genstar Roofing Products Co. will manufacture and market Flintkote asphalt roofing and related products.

Associate News

Promotions and additions at Manville


William S. Young


Robert S. Long

Manville Corp.'s advertising and roofing systems departments have announced several personnel changes.

William S. Young was named group manager and Robert S. Long was selected advertising manager for Corporate Advertising and Sales Promotion. Young previously served as senior advertising manager for Manville, and Long was employed by Wyse Advertising as an account executive.

Manville's Roofing Systems Division made the following staff changes: W.H. "Al" Shelden was promoted to district engineer for the Rocky Mountain District; Edward F. Umbreit was named Louisville and Cincinnati sales representative; David F. Mumaugh was appointed Lubbock, Texas associate sales representative; and Mark Feichtenbiner was selected Chicago associate sales representative.

U.S. Intec advances 12

U.S. Intec, Inc. has appointed three vice presidents, seven district sales managers, one technical services manager and one area operations manager.

The three vice presidents include: Bailey King, sales; Craig Noble, technical services; and Ken Latiolais, plant operations.

District sales managers, in charge of supervising sales, training and inspection, are: Michael Spence, North Central; Craig LeTulle, Southeast Texas; Paul Turner, Pacific Northwest; Robert Marcipan, Northern California; Robert Patterson, Mountain States; Daniel Connors, Florida; Sam Adair, West Texas; and Jerry Keenan, Mid-Atlantic.

Mark Hatten was named manager, technical services and J. Martin Costello was selected manager, Canadian operations.

O-C names five managers to new posts

Owens-Corning Fiberglas Corp. has appointed five employees to new positions at the company's corporate headquarters in Toledo.

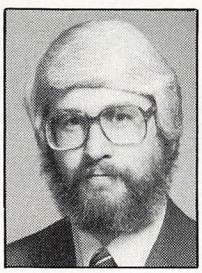
Those promoted include: Albert W. Winterman, marketing manager, Chemical Compounders Section, Fiberglas Composites and Equipment Marketing Division; Glen W. Butler, manager, Regional Sales, central region, Textile and Industrial Operating Divisions; G.E. Church, section manager, Fiberglas Reinforced Plastics Distribution, Consumer and Construction Marketing Division, Industrial Operating Division; Thomas C. Kelly, section manager, Corrosion Resistant Fiberglas Reinforced Plastics, Consumer and Construction Marketing Division; and Marvin C. Ferguson manager, eastern region, Textile and Industrial Operating Divisions.

Gardner taps three sales execs

Brian P. Kearney, Thomas Y. Smart and Larry E. Hibbler have been named sales executives for Gardner Asphalt Corp.

Kearney is responsible for the marketing and sales of Gardner's Bond-R line and specialty products in the Chicago region; Smart is in charge of specialty product sales to the do-it-yourself/home center market; and Hibbler will oversee the entire line of Gardner products in the Southeast.

SYenergy taps two

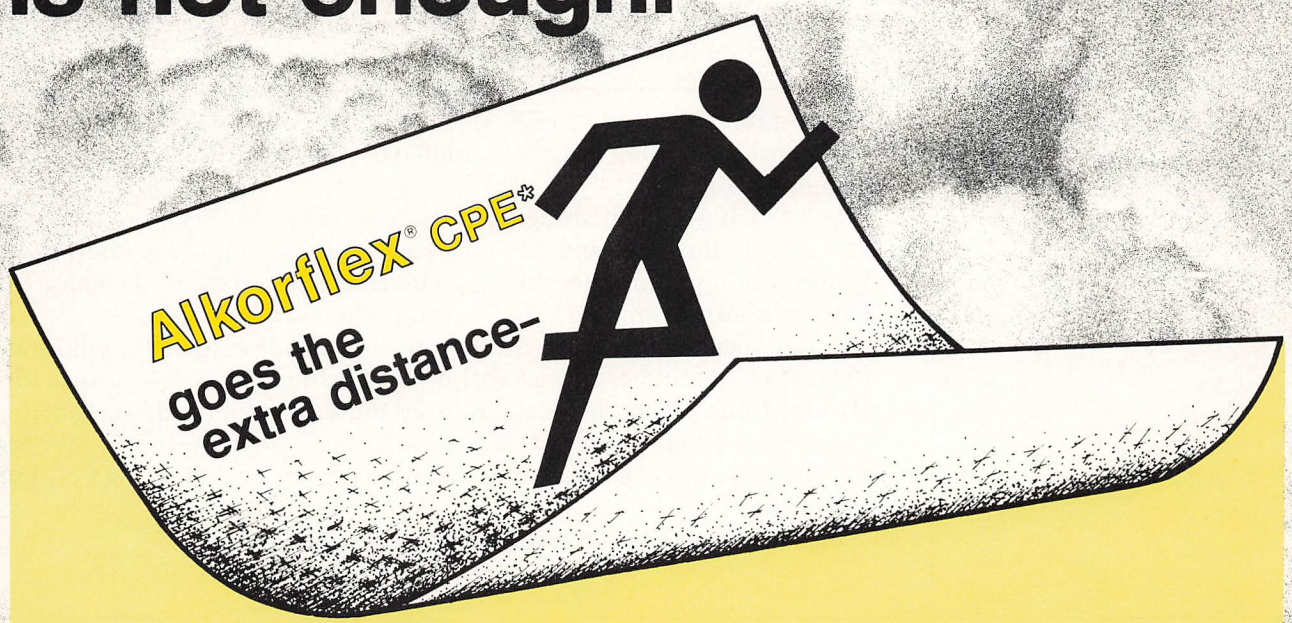

David A. Katseff

David A. Katseff was named vice president, manufacturing, and Donna J. Fontaine was selected manager, finance and administration, for SYenergy Methods, Inc.

Prior to his appointment, Katseff was manufacturing manager. He will oversee manufacturing operations at the company's Cranston, R.I. headquarters and the newly-opened Dallas plant.

Fontaine, who joined SYenergy in 1979, is now responsible for the "inside administration of the company," according to President Joseph J. Vuono.

Sometimes the protection of standard single-ply roofing is not enough.



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Affiliate News

Iowa contractors elect officers

The Iowa Roofing Contractors Association held its annual spring meeting and appointed its 1984 officers.

Elected officials include: President Arnold Kwikkle, Sioux Roofing Co., Rock Rapids; First Vice President Robert Koder, Jr., K & B Roofing Contractors, Inc., W. Des Moines; Second Vice President Gerry Handy, H & S Roofing Co., Spencer; Secretary Jay Crisp, Service Roofing Co., Waterloo; and Treasurer Jary Gaudineer, Barrick Roofers, Inc., Des Moines.

Apprentices reroof California Family Service building

Seven apprentices from the Bay Area Counties Roofing & Waterproofing Apprenticeship Training Program reroofed the Family Service Facility in San Leandro, Calif.

Supervising asphalt shingle application on the facility were M. Duane Mongerson, Beck Roofing Co., Inc., Hayward, director of the Roofing and Waterproofing Apprenticeship program and Leo Juarez, journeyman at The Lawson Roofing Co., San Francisco, apprenticeship instructor.

Apprentices who helped on the project included: John Hamilton and Robert Constantine, Sterling Roofing Co., Burlingame; Walter Govaer, First Western Building Service, Oakland; Carl Buck, Sun Roofing, Oakland; Rich Hiner, Mastercraft Tile & Roofing Co., Inc., Richmond; Bob LaFollette, Star Roofing Co., Inc., Oakland; and Ben Mongerson, Beck Roofing Co., Inc., Hayward.

Beck, Lawson, Mastercraft, and Star are NRCA members.

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How to sell your business —and win

Business owners or managers who are older than 50 or 55 should have a plan for their own futures and that of their companies. There are five choices: 1) develop an offspring or other relative to become the next president and continue the firm; 2) develop some other young employee, not a relative, as a surrogate child for the same objective; 3) hire and develop a middle management group, including an executive vice president or general manager to continue the firm; 4) decide to do nothing—run it as long as your health permits, then let the business go smash or sell it for whatever you can get; or 5) sell under circumstances that provide long-term career, personal, and financial satisfaction. This column presents the fifth option—one which many have sought, but few have found. They did not know how to sell properly.

Many factors are involved, but the most obvious steps—setting a price, finding a buyer, closing the deal, and arranging an employment contract—are relatively easy. Yet these almost invariably lead to a bitter, frustrated, and disillusioned seller. If you sell because your firm is going under, or your health fails and you have no successor, you merely hope to make the best of a bad situation. The disappointment is built in.

But when you work with your accountant, attorney, banker, broker, and buyer and still wind up embittered, then something is wrong. Talk to three people who sold out and two of them will be unhappy. Fortunately, you need not join them if you sell, nor dread selling for fear of joining them.

Talk to three people who sold out and two of them will be unhappy.

The answer lies in deciding what you want from the sale. The selling price is only part of what you want. First, decide if you want to stay on or leave. Even if the buyer wants you to remain, you cannot sell out and continue as president in the same way you have in the past. You will find that your authority is sharply limited on setting policy, making decisions, and spending money. And you will have to account for every decision and indecision, your profits (or lack of them), for studies, reports, forecasts and so on.

So take a long look forward. And backward. Decide what you enjoyed most when the business was smaller (selling, engineering, etc.). Propose to the buyer that you retain your title of president for appearances, but that you spend six months training a general manager of his choice and then move over and head up the department you know and like best. With an employment contract on that basis, you are out of the hot seat. Never remain responsible for seeing your own forecasts come true.

Lay aside the question of how much money you can get. First decide what you want it for and what you will do with it. Then you can decide between stock or money, cash or terms, short payoff or extended terms. These all affect what you should be asking for and what you are likely to get.

Selling for stock

If you take stock, you hold it; most buyers' stock purchases involve tight restraints on how much of it can be sold each year. There is little point in selling for stock that you can't sell and that yields dividends too small to live on. All you have done is increased your estate and your heir's taxes.

There is no possible way to accurately predict the future for any stock, or the economic climate, inflation rates, even your own future needs. The stock of a privately-owned firm has virtually no value. And without control, you cannot vote in those dividends you may need to live on, or continue them if

continued, page 23

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continued from page 21

they have been paid in the past.

Any stock in a private company is very difficult to sell; you may not even be able to borrow against it. The best advice is to say no to a buyer who offers stock in an unlisted or over-the-counter company. If the buyer is a big company, listed on one of the exchanges, no is still a good answer because you do not know what the stock will be worth next year or in 10 years.

If you must sell for stock, insist on a market-value protection clause. Any time their stock falls in value or it does not increase by at least 7 or 8 percent annually, they will issue to you sufficient additional stock for your holdings to maintain at least the value of cash in a savings account. Always be tough when talking stock offers; stock is not money and money—security and income—is what you need.

Selling for cash

Cash appears so advantageous that it is always popular with sellers, and its neatness similarly appeals to well-heeled buyers. But unfortunately, the only tangible benefit to the seller is usually ego satisfaction. Because a cash price is always lower than for terms, and unless the seller has made himself an expert in some type of investment, he finds it difficult to put his cash to work efficiently enough to offset the current inflation rate and still secure reasonable safety.

Suitable cash buyers are much more difficult to find, and it takes longer to make a sale. But if you still want cash, here is how to go about it.

Your first step is to decide what you have to sell and then how to make it more valuable. If at all possible, plan your sale about three years in advance; you will need all of that time to do a thorough cosmetic job on your company. You will play up its value and virtues, demonstrate convincingly its profit-making ability and its potential and make it as attractive as possible.

Three years is not excessive time; five would be better. The buyer will judge your business partly from numbers and partly by what he sees. The cosmetic treatment involves gradually converting the financial reports (and results) from home-brewed to prospect-acceptable. Its purpose is to prove that your business is a money-maker worth buying.

Term sale

A typical long-term sale, arranged to take full advantage of all modern techniques, might set the price 150 to 200 percent of a reasonable figure for a cash sale. The best arrangement when the purchase is spread over a period of years calls for payments that are variable or tied to the inflation rate.

If you must sell for stock, insist on a market-value protection clause.

You sell, yet you receive essentially the same income as if you kept the business, with the spendable income actually increased because the proceeds are capital gains rather than interest, which is ordinary income. If our inflation continues, each annual payment can be tied to the cost of living, so that the purchasing power of the payments remains constant or actually increases.

There are numerous advantages in a term sale of this kind, as compared to a cash or short-term sale. There is less difficulty finding buyers with sufficient investment cash. Cash is rapidly becoming a scarce commodity, but ambitious, well-managed businesses are plentiful, and they can be attractive to buyers if the cash outlay is small enough to be practical and appealing to them. Second, you get a substantially higher price for the long-term sale.

The key to satisfaction in a long-term, low down-payment sale is the contract between buyer and seller. Not the contract or agreement that sells the business, but the contract that extends proxy votes on the seller's stock to the buyers, so that they can effectively run the company. You employ a combination of three contracts.

The first is the sales agreement, which sets the sales price, the interest rate or inflation rider on the unpaid balance, and timing and amounts of the payments. The second is the employment contract which fixes your duties and salary, how long you stay on, and limits your activities should you leave. Both contracts are contingent upon the third, an unconventional one which extends proxies to the buyer, so that he has a free hand in managing the business. But it also imposes restrictions which the buyer must fulfill to maintain that vote.

Payments must be made in cash and made on time. There are limits set on withdrawals of money from the company, on changes in customer and supplier arrangements without your approval, and payroll additions are limited. Debt should also be subject to your approval. Any violation of this proxy contract cancels the proxy agreement, the purchase agreement and the employment contract.

In short, a violation of this third contract wipes out the entire deal—anything the buyer does after the violation is outright fraud or theft; you can recover damages without difficulty. Violation and cancellation puts you back in control of the firm (to the extent of your percentage of the outstanding stock). If at that time you own a minority, then you have already received more than the business was worth, so your protection was still complete.

This column was prepared by Frank M. Butrick, business broker and consultant. A copy of the full report from which this was excerpted is available from the Independent Business Institute, P.O. Box 159, Akron, Ohio 44309. Include a self-addressed, stamped envelope with your request.

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The effects of wind uplift on single-ply

by Stanley Warshaw, president, Sarnafil Inc.

According to market analysts, the single-ply roofing industry should be in the middle of a "shake-out" predicted years ago. Instead, new products and modifications to existing ones continue to appear, presumably because manufacturers perceive and are trying to answer new system performance needs. In short, manufacturers continue to make Herculean efforts to capture an increasing share of the multi-billion dollar roofing materials market.

Too often, in the interest of profit, these manufacturers develop the cheapest products and systems that will pass the minimum criteria of existing test methods. To make matters worse, the test methods themselves may not be appropriate for single-ply systems, as they are based on built-up roofing technology. In view of the frequency with which some single-ply manufacturers introduce "new" products and systems, it seems that minimally passing these test criteria is not enough to guarantee longevity.

Selling a membrane properly reformulated for desired performance is not the only requirement. Manufacturers must also develop installation methods that can manage the dynamics of the structure to which the membrane is attached.

In addition, both products and systems must be economically justifiable. The roofing material, its attachment mechanism and installation labor are the major parts of the roofing cost formula. Overall, most single-ply systems are equally labor intensive; it's the membrane and flashing and their attachment that are the cost variables. The goal of product development should be a material with a proven track record and proper system design that provides cost effectiveness over the life of the roof.

My concern is that certain problems are receiving insufficient engineering analysis.

I will assume that materials meet performance requirements, although the current lack of accepted material standards may make this a dangerous assumption. My concern is the possibility that certain problems are receiving insufficient engineering analysis. These problems appear to be inherent in many of the widely used application designs. I don't have the solutions to these problems, but I would like to raise some questions and perhaps stimulate others to arrive at solutions before the single-ply industry faces some serious difficulties.

One design problem is fire resistance. Many single-ply systems currently used received their qualified fire ratings because they were covered with 1,000 pounds of ballast. Some of these materials can be reformulated at a higher cost for satisfactory fire resistance while others require a membrane overcoating to receive fire rating qualification. Of what value is the initial approval of such a system if no one, including the approving agency, can deter-

continued on following page

mine when coating erosion or deterioration destroys the system's fire retardency?

Residual or trapped moisture within the thermal insulation or the decking material is another design problem. This moisture should concern the building owner because it can significantly decrease the insulation material's thermal efficiency. Even more alarming is the compromised security of the membrane attachment this moisture can cause.

The membrane supplier should address the moisture problem during the project's design stage. This is not to suggest that the supplier perform the calculations to determine whether a vapor retarder should be used, but he should know the long-term effects of moisture on the entire system being supplied. Given a job's specific conditions, the supplier should be able to recommend the appropriate system.

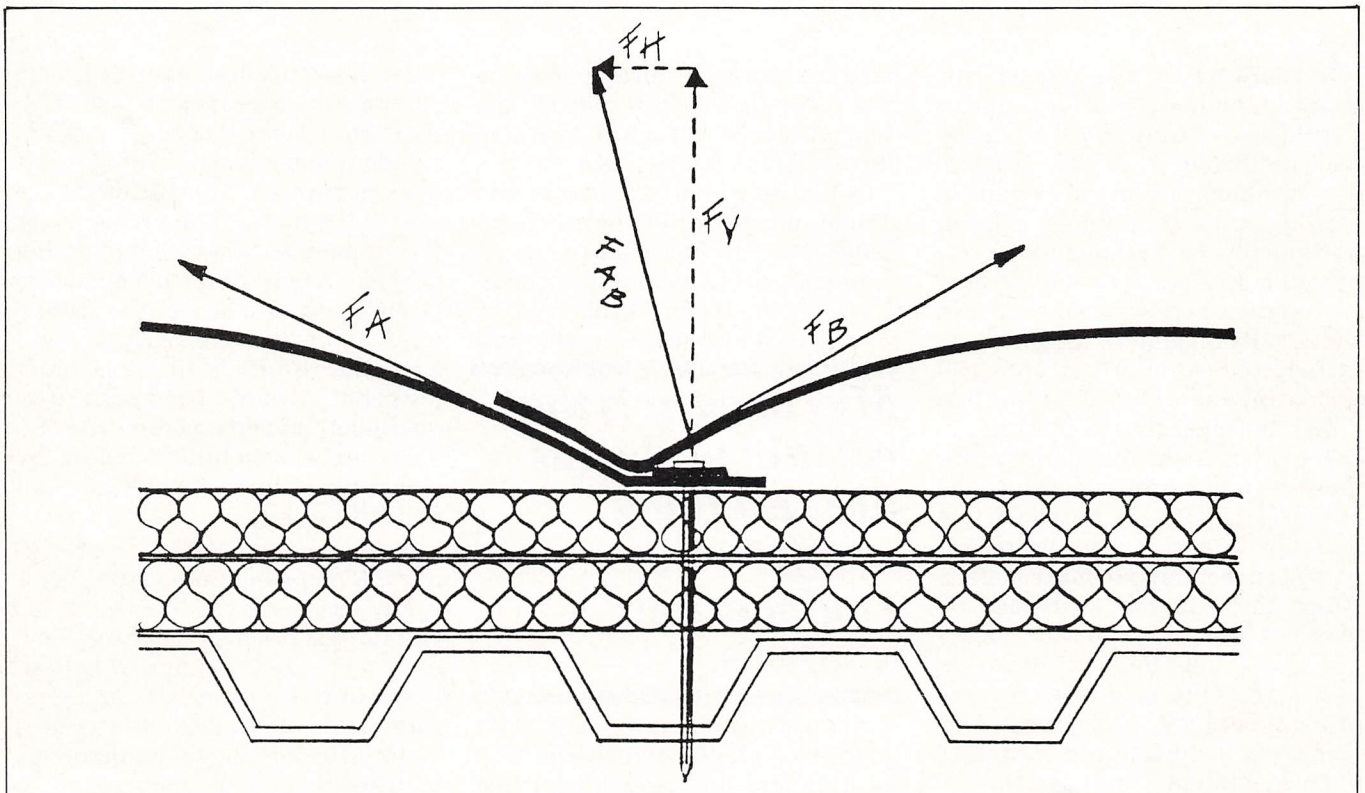
The effects of weathering and aging should also be addressed. Roofing systems are tested and receive their rating and approval under "new" conditions. How would these systems rate if the tests were repeated several years later? For example, does a roofing fastener's pull-out resistance change after five years?

Does a fastener's pull-out resistance change after five years?

As more experience is gained through actual use, the effects of fire, water and aging on roof systems will become better known and these questions will be answered. It is hoped no large-scale disasters will occur during the learning process.

The most serious and immediate concern in single-ply roofing is adequate design against wind uplift. Initially, wind uplift resistance in a single-ply system was simple: the membrane was covered with ballast. The ballasted single-plies from Europe specified 1,000 pounds per square. Built-up roofs protected by 400 to 700 pounds of gravel per square could resist anything but a tornado or hurricane. Who could

continued, page 28



F_A = tensile force in lower membrane
F_B = tensile force in covering membrane
F_{AB} = vector sum of F_A and F_B (total force at an angle)
F_V = vertical (pullout) component of force F_{AB}
F_H = horizontal (bending) component of force F_{AB}

Figure 1 The unbalanced force (F_H) must be withstood by the fastener and by the steel deck.

Tornado puts roofing systems to the test

Winds in excess of 110 mph and that unmistakable locomotive roar frightened Granite City, Ill. residents on the evening of May 1, 1983. At 10:30 p.m. their worst fears were realized—a tornado struck, damaging a shopping center, countless homes and the roofs of A.O. Smith Corp.'s automotive plant.

Bill Zinn, president of Tri Spec Systems, Inc., Clayton, Mo., lives in Granite City, near St. Louis. His firm had been working on Smith Corp.'s roofs for about eight years. In fact, Tri Spec Systems was developing a maintenance program for the 38 buildings.

"I found the place in shambles," said Zinn after investigating the devastation the next day. Chunks of the roof were strewn all over the ground, according to Zinn.

The tornado spared no roof system. Smith Corp.'s predominantly built-up roofs and the newer, single-ply systems—used to reroof four old BUR sections—were ripped apart.

However, several surprising differences between the damaged systems were noted.

Upon closer investigation, Zinn and several others discovered that the single-ply membrane remained adhered to the old, smooth-surfaced BUR; it was the built-up roof that broke away, taking the single-ply with it. The single-ply adhesive had kept everything intact.

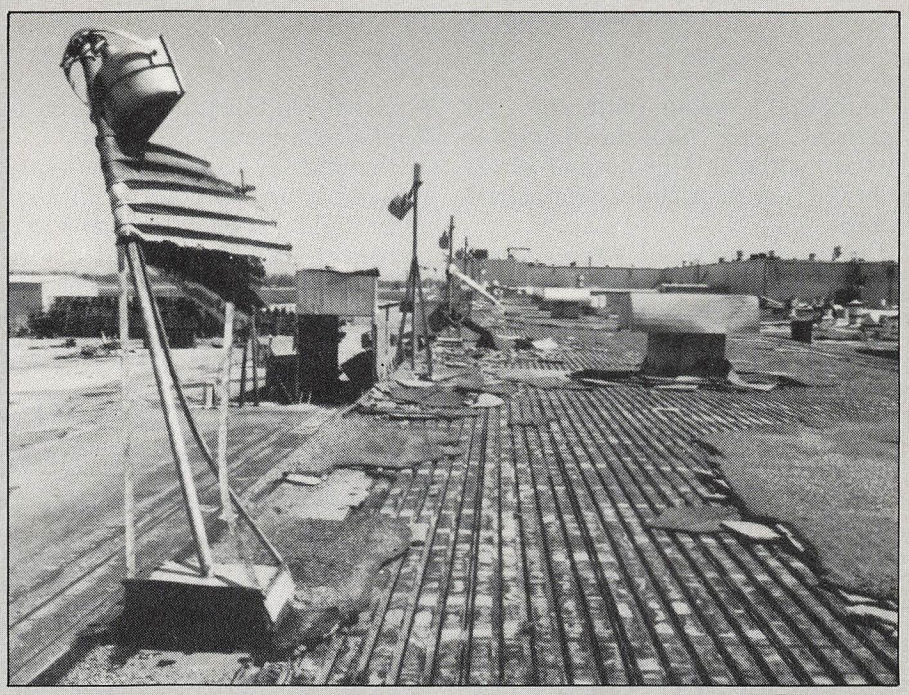
"This was good evidence that the adhesive of the modified bitumen, fully-adhered single-ply system withstood high-wind velocity conditions," Zinn said.

The edges of the mechanically-attached BUR system remained fastened, while the middle roof section, which was mopped only, broke loose.

The tornado proved to be a dramatic wind-uplift test!

Fortunately, there were no injuries. The building had been shut down since 1981. "The owners were in the process of upgrading the plant for new product lines," Zinn said.

Zinn didn't waste any time. On May 2, he assembled representatives from his own company and three others: roofing product distributors Lucas Sales and MFG Associates, Koppers Co., Inc. and Granite Sheet Metal Works, Inc.



A Granite City, Ill. tornado rips apart the Smith Corp.'s roof.

"We needed a team to analyze the situation and recommend re-installation procedures for the roofing and decking," Zinn said.

The repair proposal, set before Factory Mutual Insurance Co. and A.O. Smith, included 400,000 square feet of Koppers' Exeltherm X-Tra phenolic roof insulation, with an average thickness of 1.6 inches; Lucas' tapered-insulation system; 50,000 square feet of perlite roof insulation, varying from 1 to 2 inches thick and; Metal-Era roof etchings, also from Lucas; and a mechanically-anchored white Hypalon single-ply system supplied by MFG Associates.

The proposition was accepted. By mid-May work was underway, with Tri Spec Systems taking "the full brunt of the project," according to Zinn.

The original roofing came off. It was a hot-applied base sheet and three-ply smooth-surface BUR, with 1½ to 2 inches of perlite insulation.

"With clean-up, 100-degree plus temperatures and two more severe storms, the job took eight to nine months to complete," Zinn said.

A total of 500,000 square feet of roofing was installed. Single-ply was used on 350,000 square feet with the remainder built-up roofing and repair.

The project companies held weekly meetings to insure a speedy, efficient operation. Due to prompt attention to the problem, intensive pre-planning and follow-up meetings, the project encountered no major problems during construction, Zinn said.

The new roofs have withstood several intense wind storms, not to mention the hottest summer in history and 18 inches of snow.

Although Zinn has seen the built-up roofs on a nearby complex replaced three times since the 1983 storm, the A.O. Smith single-ply roofs held tight.

As a postscript, almost a year to the day, high winds again tormented the southern Illinois city. Fortunately, history did not repeat itself with tornado gusts up to 110 mph; only 70–80 mph winds were reported in Granite City.

What type of maintenance procedures were needed after this year's May 1 fury?

"About 20 fasteners needed to be replaced," said Zinn.

Wind

continued from page 26

doubt that a system with 50 to 250 percent more hold-down power would withstand the normal winds blowing across America's industrial buildings?

But hurricanes and strong windstorms in mountains and coastal regions have taught us a lot. Some people in the industry are questioning the suitability of loosely laid, stone-ballasted membranes on high-rise, glass-encased structures. With relatively low winds scouring stone ballast from roofs some are asking why and under what conditions they can anticipate similar problems.

Maybe we should reconsider the theory that the wind would simply displace ballast into big piles whose weight would keep the whole roof from blowing off. The ballast may also protect the membrane from fire and ultraviolet radiation. What happens to this protection if the stone is displaced or blown off?

How did the ballasted single-ply system become so popular without these problems being noted? First, there is little European wind history to document the problems. The European climate, especially its wind speeds, is far different from North America's. Unlike Europe, our major population centers are situated on windy coastal areas. Our plains and open spaces are not comparable either. The western European countries, where single-plies are used most widely, have a temperature range from freezing to moderate with long rainy periods and winds seldom exceeding 30 mph, except in the Alpine and Scandinavian countries.

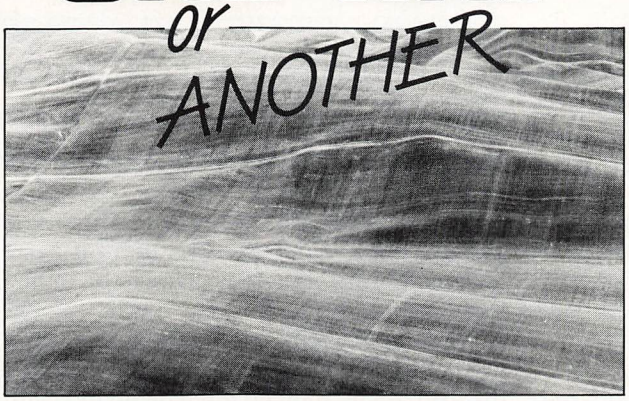
A second reason for ballasted single-ply's popularity is the misconception that 1,000 pounds of ballast is more effective than the 400 pounds of gravel laid on a built-up roof. This idea fails to take into ac-

How did the ballasted single-ply system become so popular without these problems being noted?

continued, page 30

Don't BLOW IT VENT IT

"ONE WAY" OR ANOTHER



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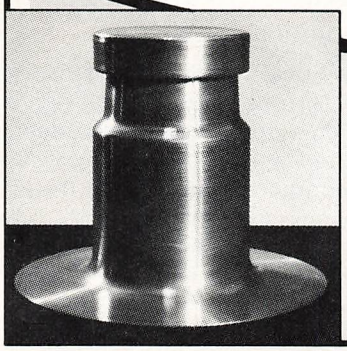

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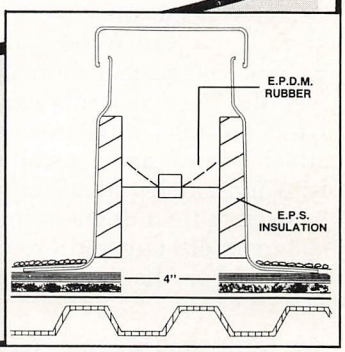

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Wind

continued from page 28

count the stiffness of a BUR membrane composed of four plies of felt and asphalt bonded to a layer of insulation and attached to a steel or concrete deck.

A loosely laid membrane with a few of the lighter stones already blown off begins to bulge and then swells up. The larger stones start to bounce around and move faster as the swelling gets larger. In a high wind even the larger stones can be bounced off the roof. The elasticity of the membrane, considered a desirable quality, is now helping to denude the roof.

In Europe most roofs are small and are easily made airtight. In the process of blowing or bouncing the ballast around, no wind can find its way under the membrane to fill the void formed by the bulging bubble. The uplift forces are restrained by the tensile and elastic properties of the thin membrane. Unfortunately, in American roof constructions windproofing the deck, penetrations and perimeters can add to the roof's cost. This added cost is all too often the difference between the low bid and the properly engineered design bid.

The mechanically-attached membrane was developed to solve some of these problems. Such systems are being offered by most suppliers. The perceived advantage of the new system is simplicity. Without the heavy ballast a lightly structured building can be reroofed and new building designs need only accommodate snow loads. Rain water drains off the unballasted surface more easily unless the deck deflects excessively. Large sections of the mechanically-attached roof can be installed quickly. Almost any kind of strapping can be used to tie it down as long as the fasteners are covered or corrosion-proofed, or the hole the fastener punches through the membrane is sealed.

With this system there is no fractured ballast to cause hard-to-find leaks. Even the adhesives and solvents of the earlier plate- or disc-bonded systems have been eliminated by non-penetrating attachment gadgets. The mechanically-attached system is fast and easy to install—no problems. Anyone handy with tools and able to lift and unroll a bolt of roof membrane can do it, even a do-it-yourselfer. But is it that simple?

We might compare a mechanically—attached system to a sail boat.

We might compare a mechanically-attached system to a sailboat. A little bit of unbalanced force, even in a gentle wind, will propel a 5-ton sloop at a very pleasant speed. A sailor controls the unbalanced force acting on the mast and hull by changing the angle of the wind on the sails. Tensioning the lines with block and tackle and having the fixed edges of the sails firmly and continuously attached to the stiffened mast and boom keeps the sail from fluttering and the air from spilling out.

When the wind velocity picks up, the sailor has to haul the sails in tighter, and the stresses on the lines are increased. All the tackle must withstand the total force of the air pressure exerted over many square feet of sail. If the wind gets too forceful, the sails must be reefed (less area is now exposed).

Consider how strong that sail fabric must be to resist tearing. What happens if a small tear does occur? What happens if the sail pulls out of its track? What happens if the fabric has rotted with age or the screws holding the cleat to the deck have rusted? These are problems the Sunday yachtsman solves by lowering the sails to the deck, turning on the diesel auxiliary and motoring to the nearest safe harbor. When these problems occur on a roof the solutions are not that simple.

Careful roof membrane and installation detail engineering is required.

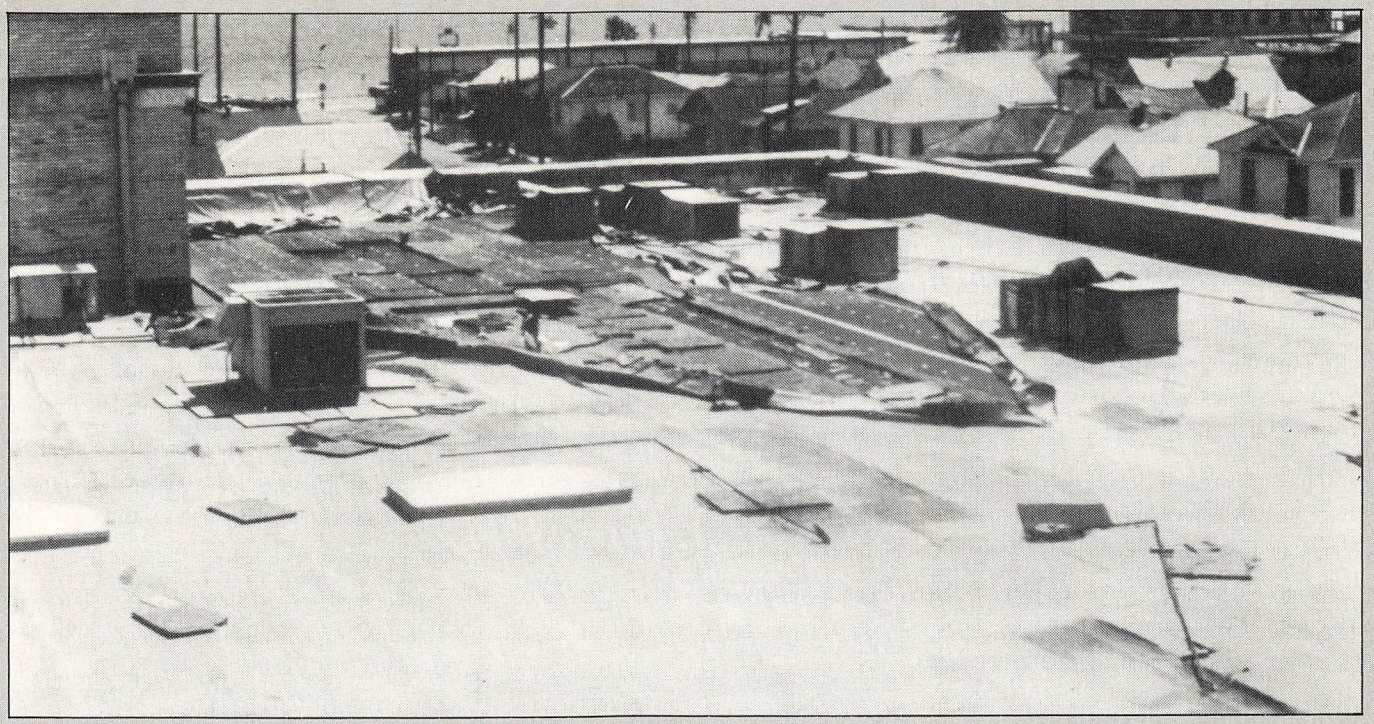
Careful roof membrane and installation detail engineering is required. The most common design is lap fastening, either with a strip of metal or staple-like point fasteners. The next sheet overlaps the fasteners and is attached to the first sheet. This produces an unbalanced force as shown in Figure 1. The billowing sheets may seem exaggerated in the illustration, but unreinforced material used in many of these systems allows the unattached portion of the membrane to inflate considerably.

The simple diagram in Figure 1 raises the following questions:

1. Should a fastener bending-strength requirement be considered?
2. Should membrane extensibility (elongation) be limited?
3. Should a minimum deck thickness be required?
4. Should the peel resistance of the sheet-to-sheet bond be examined more carefully?
5. Should the fastener strip's torsional capability be calculated?
6. Should the distance between fasteners be the same for all conditions?

If we deal with static forces, relatively simple calculations can answer these questions. But instead of looking for answers, it appears that the manufacturers' goal is to minimally pass existing test procedures.

continued, page 32



Hurricane Alicia ripped through Houston August 18, 1983 causing $1.8 billion in damage.

Alicia teaches: people who live in glass skyscrapers shouldn't roof with stones

According to O.C. Smith, Jr., executive director of the Houston Roofing and Waterproofing Contractors Association, the wind velocity of Hurricane Alicia was minimal. "In the worst of it, the winds were less than 120 mph," Smith commented. "A really good hurricane gets them up to 150. But the winds were sustained—that did the damage."

When Alicia ripped through Houston on August 18, 1983, it left behind $1.8 billion in total losses. With its penchant for glass-walled high-rises, the city was a prime target for such a vicious storm.

A Houston Glass Industries study revealed that 38 percent of the glass damage reported by its members was directly related to the roofing of adjacent buildings.

"The ballasted roof has been in existence for many years and when properly installed, has had a long track record of excellent weather protection," the report stated. "But the design of these systems...has only considered protection against ...fire, wind (uplift) and collapse."

"The major problem was aggregate from the roofs, penthouses placed up there, and anything left up there by other construction people," Smith confirmed. "The Hyatt Regency, for instance, lost one entire glass side of the building."

Shortly after the storm, the City Council asked the Construction Industry Council of Houston to develop suggestions on code revisions for buildings in preparation for the next hurricane. "We know we're going to have one," Smith said resignedly. The Construction Industry Council is composed of construction industry leaders in the city.

Don Simpson, Gulf Waterproofing Co., Inc. is the voting representative for the roofing trade. Smith attended the Council's meetings also, as do the executive directors of the other trade groups.

The Council met almost weekly in the early stages of its study. A report with its suggestions on a code revision was submitted to the Houston City Council in early March of this year.

"The ballasted roof system, which is a labor intensive method of installation, will always depend on workmanship to insure system performance," the report cited. "The present roofing standards have been established to control quality of installation but do not address behavior of gravel in high winds. From studies conducted by the National Research Council of Canada various reports on the effects of wind on roof gravel indicate that gravel scour can occur in most ballasted systems when the critical conditions are present."

According to Smith, the result of the report was a recommendation that all roofs in Houston be smooth-surface. "The City Council may pass an ordinance for right now," he said, "and later move into a code revision. That's what happened three or four years ago when we had a fire that wiped out about 800 units in an apartment complex covered with wood shakes. It takes two or three years for a code revision to get through the bureaucracy."

Although Alicia visited Houston ten months ago, Smith has vivid memories of the storm.

"I was at home, and the leading edge of the winds woke me up about 5 a.m.," he recalled. "The trailing winds lasted two or three hours, and in between there was the eye. The eye went right over us, and lasted about 45 minutes.

"It was still as a church mouse," Smith said.

Wind

continued from page 30

They prepare test mockups with fasteners a sheet-width apart and 12 inches on center and put 90 pounds of air pressure per square foot under the membrane while restraining the perimeter. If the system holds for one minute it is expected to perform on the roof.

This approach does not adequately account for individual job conditions. What happens at the perimeter on a real roof where the covering membrane has no tensile force but the lower membrane's tensile force is twice what it is in the main roof area, or at the corners where the lower membrane's tensile force is four times as strong? Will the sheet tear? Are the long fasteners used in tapered insulation systems more susceptible to bending? What happens at penetrations? Will the wind force raise the drains out of their connections or pull vent stacks out? Are skylights secure on their integral curbs?

When the dynamics of these forces are calculated it becomes even more complex. Winds are seldom steady, and the forces produced vary in intensity. This introduces a new element into our simple diagram. The pullout and bending forces pulsate and fasteners and deck designs must allow for metal fatigue. Tensile forces also pull and tug on the membrane, making tear strength in all sheet directions important.

The winds are seldom steady and the forces vary in intensity.

Remember the sailboat? Does a reinforcing fabric produce the same effect as reefing the sail by limiting the inflation of the membrane between fastening points? If it does, is a low or high elongation property the most desirable? If air can penetrate from a porous substructure (steel decks are a common example) are there uplift influences from this source that need to be calculated? Do they synchronize with the outside forces?

To complicate matters, the wind seldom blows from a fixed direction, especially in high-wind areas. A change in the direction of the wind as a storm progresses through a region will change the direction of the bending forces on the fastener. The wind might even rotate 360 degrees. If it does this often enough it could

ream out the screw threads and loosen the fastener.

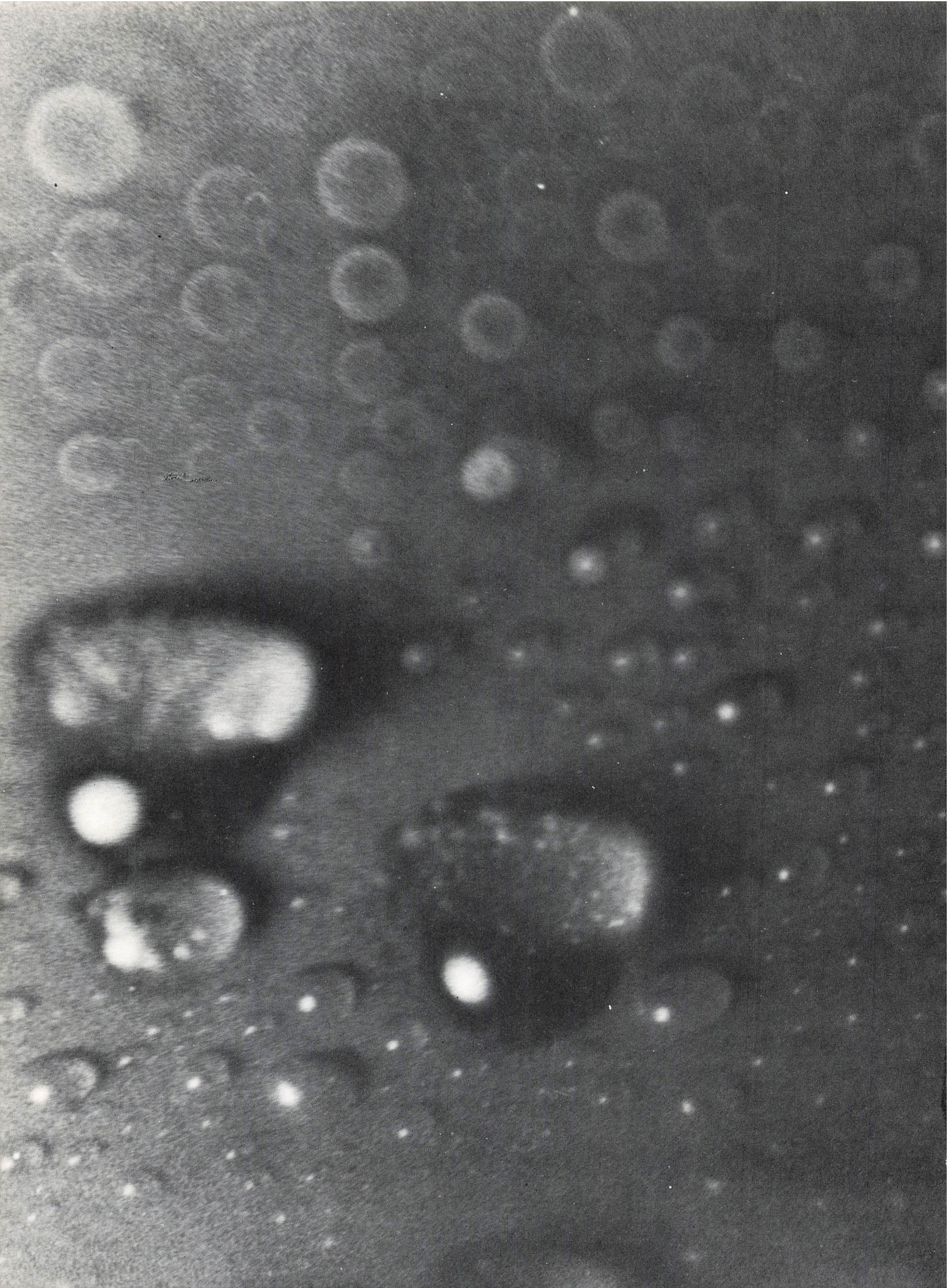
If a fastener does work loose there are even more design safety considerations. Do the adjacent fasteners have enough reserve holding power to resist the added load? Does the metal strip (if there is one) have sufficient torsional or twisting resistance? Will the assembly become progessively loosened in a domino effect? Will the unbalanced forces put greater stress on the corners, perimeters and penetrations?

One last consideration: let's assume that everyone has done his or her homework and the engineering department has assured the sales department that the specified design will perform as expected. Has anyone planned for physical property changes caused by aging? Will the older assembly and its joints resist wind uplift dynamic stresses as well? Are the fasteners and metal strips really going to hold if they and the deck rust from condensation on the underside of the membrane? Will the high-priced insulation installed under the membrane retain this condensation and lose efficiency or rust the fasteners? Will the thickness of the polymer over the membrane's fibers be sufficient to protect those fibers from ultraviolet damage or moisture absorption in ponded areas?

If a fastener works loose there are more design safety considerations.

None of the code agencies or insurance companies' laboratories consider these questions in their approval guides. When the building owner and roofing contractor consider all the variables—the winds of different climates and terrains and their actions on buildings of different heights and shapes—can they afford to use the same fastening pattern in all parts of the country?

Studies are being undertaken to determine how many years of exposure it takes to produce these phenomena. In anticipating these results dare we conclude that the warranty, the code approval and, if all else fails, the courts make everything OK? I can only answer: caveat emptor.



Moisture accumulation in single-ply assemblies

by Richard Baxter, Carolina Roofing Service, Inc.

There have been many recent reports on significant moisture accumulation on the undersides of rubber and plastic sheet roofing membranes. The moisture appears unrelated to water penetration through field laps or membrane flashings; at least there have been no obvious flaws or damage in the waterproofing membrane assemblies.

Moisture

continued

There are several possible explanations for this moisture: 1) vapor from the structure's interior migrates into the roof assembly, condensing on the cold membrane and dispersing by capillarity beneath the membrane; 2) moisture on the membrane's surface permeates imperfections in the sheet materials or open end or side lap junctures; 3) moisture trapped in the roofing assembly during construction vaporizes; or 4) moisture from existing wet roof insulation over which the assemblies were installed vaporizes. The moisture could also be caused by some other problem yet to be explained.

Synthetic rubber and plastic sheet membrane roofing assemblies, commonly referred to as single-plies, are different from the built-up roofing assembly in concept and composition. Expanded polystyrene (EPS), a commonly used insulating material in ballasted rubber and plastic sheet roofs, is relatively impermeable and inexpensive in "cost per R-value" when compared to traditional insulating materials. These generic differences between EPS and built-up roof insulations may contribute to perceptible moisture accumulation on the undersides of single-ply membranes.

Interior moisture

Many of the rubber and plastic sheet membranes are marketed as "breathable" membranes that allow vapor passage from the inside of the assembly through the waterproofing membrane, without allowing free water to penetrate the roof or the structure's interior. This erroneous concept has led to the elimination of vapor retarders in many single-ply assemblies where they probably would otherwise have been included—and should have been.

Installing sheet membranes over existing roof assemblies where insulation is partially or completely saturated with water has also occurred. The physical laws of vapor control and moisture migration do not change with new materials. Vapor pressure differentials exist in response to interior and exterior ambient conditions (temperature and relative humidity). This is true no matter what type of roofing assembly is installed.

Obviously, eliminating the vapor retarder or leaving an existing roof in place reduces the initial cost of the installation, making the sheet roofing assembly even more competitive with other types of systems.

The fact is, we can't fool Mother Nature. If a vapor retarder is necessary with a built-up roof, it should also be included with rubber and plastic assemblies to minimize migration of interior moisture. It condenses on the underside of the cold, impermeable membrane surface (built-up bituminous or sheet membranes) and becomes free water within the roof assembly. If a tear-off and replacement is warranted because the existing roof insulation is saturated, the existing roof should be removed before installing a sheet membrane.

Some of these leakage problems can be attributed to manufacturing flaws.

Most insulations commonly used with built-up roofs can take on and release reasonable quantities of moisture that migrate into the assembly during periods of significant vapor pressure. Many of the plastic foam insulations incorporated into single-ply assemblies are relatively non-absorptive. Migrating moisture is not as readily absorbed by this insulation, leaving visible free water between the top of the insulation surface and the bottom of the roofing membrane.

The full effect of this accumulation is not yet known, but the effects of moisture on lap adhesives is presently being studied. Preliminary reports indicate that moisture vapor may degrade some commonly used adhesive materials.

Testing conducted at the Cold Regions Research Laboratory at the U.S. Army Corps of Engineers by Wayne Tobiasson has been relatively conclusive: rubber and plastic sheet membranes do not "breathe" or allow the passage of much moisture vapor through the membrane during periods of ambient vapor pressure differential. The perm ratings of single-plies may not approach the perm ratings of the bituminous built-up roof. However, none of the membranes currently used provide enough permeability to allow the escape of all moisture that may migrate into the assembly. The liberties taken in designing single-ply systems may account for the build up of moisture commonly occurring. If engineering formulas conclude that a vapor retarder is required in one roofing assembly, it will be required in any roofing assembly (except the protected roof).

Sheet membrane defects

Calendered rubber and plastic sheets are subject to minor integrity flaws caused by non-uniform distribution of batch material as it enters the calender rolls or by trapped air in the batch mix. Some manufacturers have attempted to compensate for calendered sheet flaws by factory-laminating two calendered sheets together, hoping that the flaws in the sheets will not be coincidental in the finished product. The lamination process probably eliminates flaws in calendered membranes; the laws of probability also dictate that a percentage of flaws will remain even in laminated sheets.

Some calendered material producers do not laminate sheets in normal production. The probability of flaws in the finished membrane is much higher in these instances. There have been numerous reported

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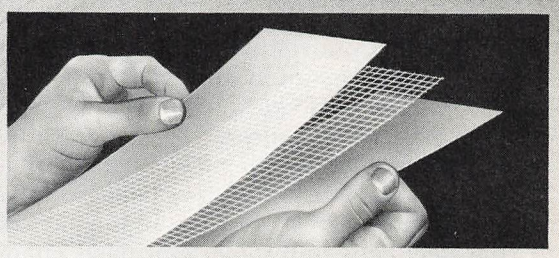

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Moisture

continued from page 36

instances of leaks through single-plies for unexplained causes. A careful check of both field and factory side and end laps, sealed penetrations and perimeters and flashings has revealed no obvious flaws in workmanship or open laps, yet the water continues to penetrate the membrane. Some of these leakage problems can probably be attributed to imperceptible manufacturing flaws which would contribute to moisture accumulation in this type of roof. Depending on the size and number of flaws, water accumulation can be significant.

Water also may enter the assembly through minor imperfections in side and end laps. Side and end lap junctures should always be suspect in the search for moisture infiltration in sheet systems. Vapor from trapped moisture and moisture condensation on the underside of the membrane would result in free water accumulation between the sheet and the top insulation surface.

Temporarily ballasting membranes with used tires in lieu of stone ballast is common. Tires worn through to the steel belts will sometimes have protruding wires, which may cause imperceptible punctures.

Moisture entry from these sources can be minimized by including positive slope in the roof deck and eliminating ponded water conditions. The sheet membranes may be even less forgiving of ponded water than some built-up roofing membranes.

Moisture trapped during construction

There is probably some water trapped in every roof assembly during installation. In a built-up roof with conventional insulation, some trapped water diffuses under high temperatures. The water is distributed through the common roof insulations, which are capable of holding some moisture without impaired thermal efficiency or structurally degrading the insulating materials. The layer of waterproofing bitumen applied to the top of insulating materials in these assemblies means that any trapped water in the insulation will stay in the insulation and not become an obvious layer of moisture on the underside of the membrane (except perhaps the area immediately over insulation joints or under conditions of significant vapor drive).

There is considerable cause for concern about the effects of moisture trapped in the roofing assembly.

The relatively impermeable plastic foam insulations used in most ballasted rubber or plastic sheet roof assemblies don't readily absorb water. As trapped moisture vaporizes it is likely to condense on the cooler, underside of the membrane and remain as a continuous film between the membrane and the top of the plastic foam insulation. The basic physical differences in single-ply components probably accentuate the moisture's visibility in the short run.

"Tie-ins" of the sheet membrane assemblies to existing bituminous built-up roofs are difficult, and in some instances next to impossible, without wasting costly material. Not making water-resistant tie-ins while installing sheet membranes should be considered as significant an error as "phasing" plies in the built-up roof. Water would enter under the sheet on a low-sloped roof during precipitation unless a seal at the juncture had been provided. Vapor from accumulated water in adjacent areas would permeate the entire assembly, creating visible moisture on the membrane's underside.

Vapor is a powerful, pervasive force. In its free form, water imposes substantial pressures on relatively impermeable materials. The pressures created by water in vapor form or under a "head" of free water are significant—any minor construction flaws will be vulnerable. It may be impossible to identify all water infiltration sources in an assembly.

Scrutinizing single-plies has revealed what appears to be a relatively high incidence of moisture accumulation, for whatever reason. The concern at this point is the effect of trapped moisture on the sheet-type roofing membranes and on the insulation.

The effects of moisture on adhesives used in the field to bond synthetic rubber sheets are of even greater concern. Moisture apparently affects the curing of these contact adhesives. At this point, no one is sure of the long-term effect of water or moisture vapor on the "cured" adhesive. Manufacturers of rubber sheet membranes have required that the material's exposed (outer) laps be protected with a caulking sealant to eliminate the adhesive's exposure to water. There is no feasible way to seal the bottom lap edge of field joints during construction. This leaves the adhesive vulnerable to the effects of moisture and/or moisture vapor from the underside. Some studies have indicated that plasticizers may be more rapidly leached from plastic sheet membranes because of moisture exposure than because of sunlight.

Even though expanded polystyrene does not readily take on water either in its free or vapor form, testing has indicated that under normal vapor pressures EPS insulation may absorb significant amounts of water. The result is that the material's thermal insulating properties are affected. EPS' moisture absorption depends on its density and integrity, with the lighter density materials much more susceptible to absorption and higher thermal loss than materials of heavier density. There have been instances

of lighter density EPS insulations reverting to styrene beads under single-ply assemblies.

It is entirely possible that this breakdown is aggravated by trapped moisture entering the interstices between styrene beads. The material literally breaks down during freeze/thaw cycles. Fasteners used to secure overlay insulation for adhered-sheet membrane systems or to secure mechanically-attached sheet membrane assemblies have disintegrated from corrosion directly attributed to moisture either in the overlay roofing assembly or in the original assembly.

Vapor permeates virtually everything and usually results in degrading materials with which it is in constant and close contact. Moisture held in contact with structural deck surfaces inevitably results in deterioration of the structural decking. The possible exception is structural concrete. Because the vast majority of roofing systems today are installed over steel or wood decks, there is considerable cause for concern about the effects of moisture trapped in the roofing assembly on the structural substrate.

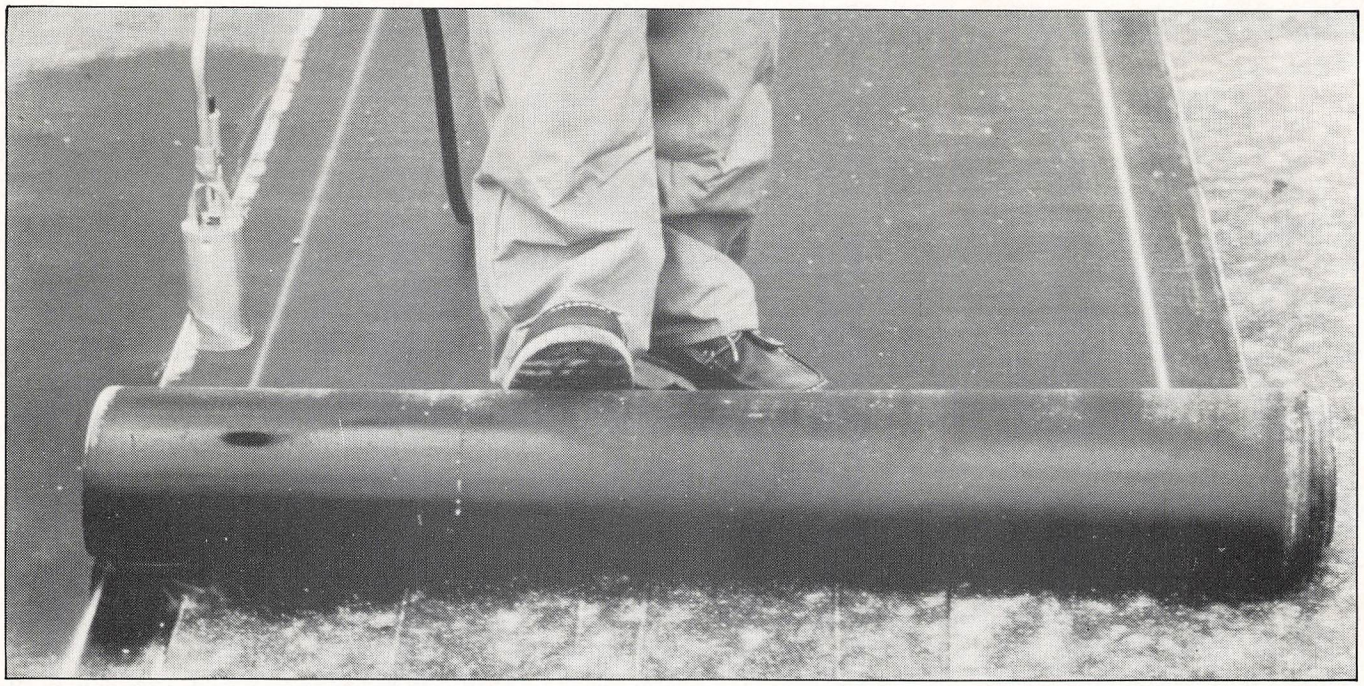
The effects of moisture contained in single-ply assemblies will be every bit as deleterious to the structural assembly as water contained in built-up roofing assemblies has been over the years.

We should take precautions in designing the roofing assembly to make sure vapor retarders are used judiciously whatever membrane is selected. Constant observation of rubber and plastic sheets during installation may permit detection of manufacturing flaws or deficient factory laps in the sheets that could contribute to moisture infiltration.

Really good methods of making single-ply tie-ins to existing roofing membrane surfaces do not exist for many materials, so extraordinary precautions must be taken during installation to prevent moisture entry into the assembly before the system is completed.

Designers must be aware that the single-ply roof assemblies are subject to the same physical laws the built-up roofing assemblies are. To insure reasonable performance from these assemblies, we must protect them from internal exposure to moisture just as the built-up roofing assemblies are protected.

Ultimately, this responsibility becomes that of all those involved in the manufacture, design and installation of these roofing systems.



Standard application of Brai modified bitumen roofing.

MB-30 tackles the diversity of modified bitumen behaviors

by Rene Dupuis, Structural Research, Inc.

MB-30 was drafted by MRCA's T&R Committee, with technical guidance and research provided by Dupuis.

Dupuis has been involved in materials research since 1974, with emphasis on built-up and single-ply roofing systems. He has participated in numerous roofing conferences throughout the U.S. as well as the International Symposium on Roofing Technology held in Brighton, England in 1981. Dupuis has written and presented many articles on roofing technology and has conducted investigations for building owners, architects, manufacturers and contractors.

The MRCA's performance criteria document, MB-30, tackled one of the major factors in assessing modified bitumen roof membrane performance: the wide diversity of tensile and elongation behaviors.

The MRCA Technical and Research (T&R) Committee has been watching roof membrane technology growth since 1977. A different tensile and elongation property became available with each new system that came into the market. Essentially, we had some modified bitumen membranes that improved the basic tensile and elongation behavior of built-up roofing (BUR) membranes. On the other hand, there were modified bitumens available that had very low tensile strength along with high elongation.

The first order of business was to develop a consistent method of categorizing modified bitumen roof membrane behavior. Then other performance recommendations could be formulated.

The basic categories were: 1) low elongation/high strength membranes, 2) medium elongation/low to high strength membranes, and 3) high elongation/low to medium strength membranes.

This approach embodies all the current modified bitumen systems, whether their behavior is similar to a BUR or more like an elastomeric sheet.

Once we determine the tensile and elongation character, the recommended performance criteria take a conventional approach to roof system design, addressing roof environment, assembly, vapor retarder needs, insulation requirements, structural limitations, ease of repair and so on.

After outlining the specific concerns for a particular roof assembly, MB-30 addresses material manufacture, application and in-service performance for a modified bitumen membrane.

In some cases, the specific tensile/elongation behavior or modified bitumen membrane character calls for different low temperature (or high temperature) performance ability. The application methods or requirements are uniformly addressed for a variety of systems, and the tensile/elongation behavior in this instance does not call for special consideration.

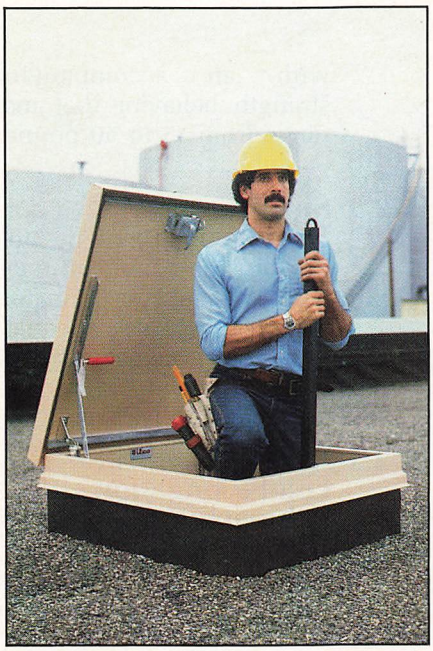
Roof membrane field performance or in-service behavior is primarily concerned with water transmission, weathering resistance and puncture strength. For fully adhered membranes, the crack-bridging ability is critical.

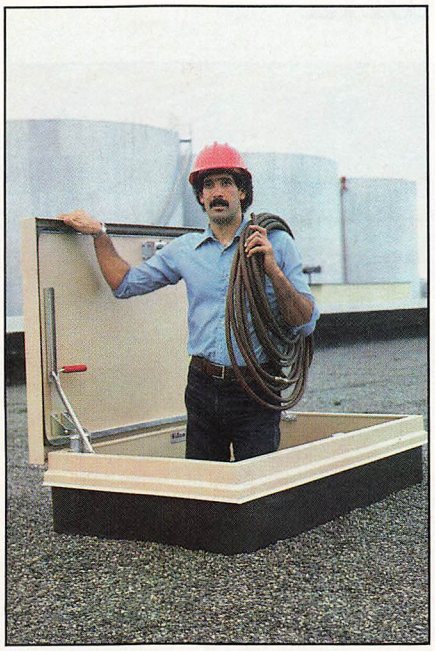
While the basic format of MB-30 is similar to that previously published by the MRCA for plastic and elastomeric systems, the most far-reaching effect of the document is its establishment of three levels of load/elongation behavior for modified bitumen systems.

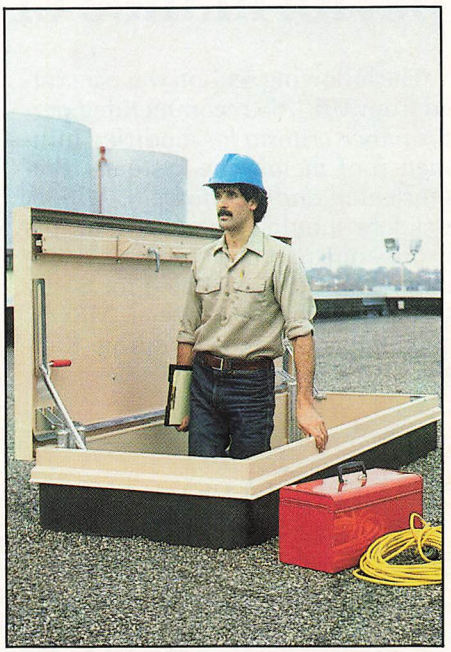
continued, page 42

Photos courtesy of U.S. Intec, Inc.

three ways to come out on top...







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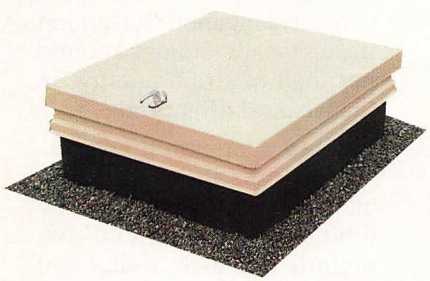

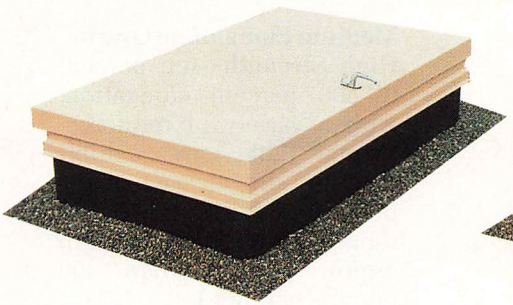

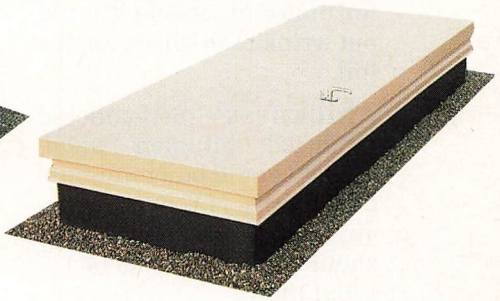

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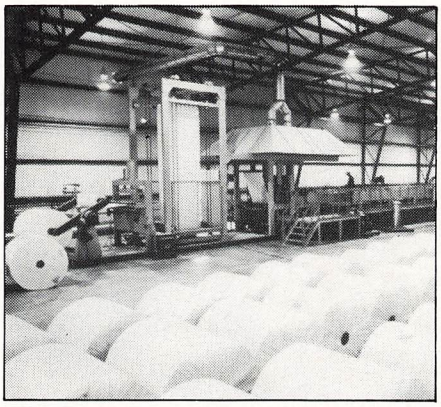
MRCA presents modified bitumen performance criteria

The following section was excerpted from *MRCA'S recommended performance criteria for modified bitumen roof membrane systems (Prefabricated and Reinforced), MB-30.* Readers should remember that this is only one part of a complete document. MB-30 is available for $1 by writing Barbara Myers at MRCA: 1000 Power & Light Building, Kansas City, Kan. 64105.



Interior of U.S. Intec plant at Port Arthur, Texas showing production line for Brai roofing.

5. MATERIALS

5.1 General Requirements

—The modified bitumen sheet membrane should contain additives that have been thoroughly blended with a compatible bitumen. Reinforcements designed to be embedded within the sheet should have sufficient cover to prevent surfacing or exposure. Surface-reinforced membranes should have a uniformly attached, smooth-surface finish without wrinkles or blistering under the surface film. Those membranes using a granule coating should have well-adhered uniformly attached granules, be free of loose material and not lose granules during application. Metal foil-surfaced membranes should have the foil uniformly attached, without wrinkles or blisters in the foil.

5.1.1 Thickness[1]—Self-adhered modified bitumen membranes should be a minimum of 45 mils (1.1 mm) thick. Torch-applied membranes should be a minimum of 120 mils (3mm).

5.1.2 Type of Membrane—Modified bitumen membranes can be used as part of a single- or multiple-ply system. If multiple plies are used, the lower ply(s) may be a base sheet, another modified bitumen sheet or conventional asphalt-saturated felts.

A modified bitumen classification system is required to help define elongation and strength behavior differences. Roofing asphalt, for example, is classified by four different softening points (as defined in ASTM D312). Modified bitumen membrane behavior can be categorized as follows:

Low Elongation/ High Strength—less than 10 percent elongation with an accompanying strength in excess of 100 pounds inches.

Medium Elongation/Low to High Strength—ten percent to 100 percent elongation, with a variety of reinforcements that may exhibit strength in excess of 15 pounds per inch and may range into the high strength region (greater than 100 pounds per inch).

High Elongation/Low to Medium Strength—elongations in excess of 100 percent with an accompanying strength behavior that may range from 15 to 50 pounds per inch.

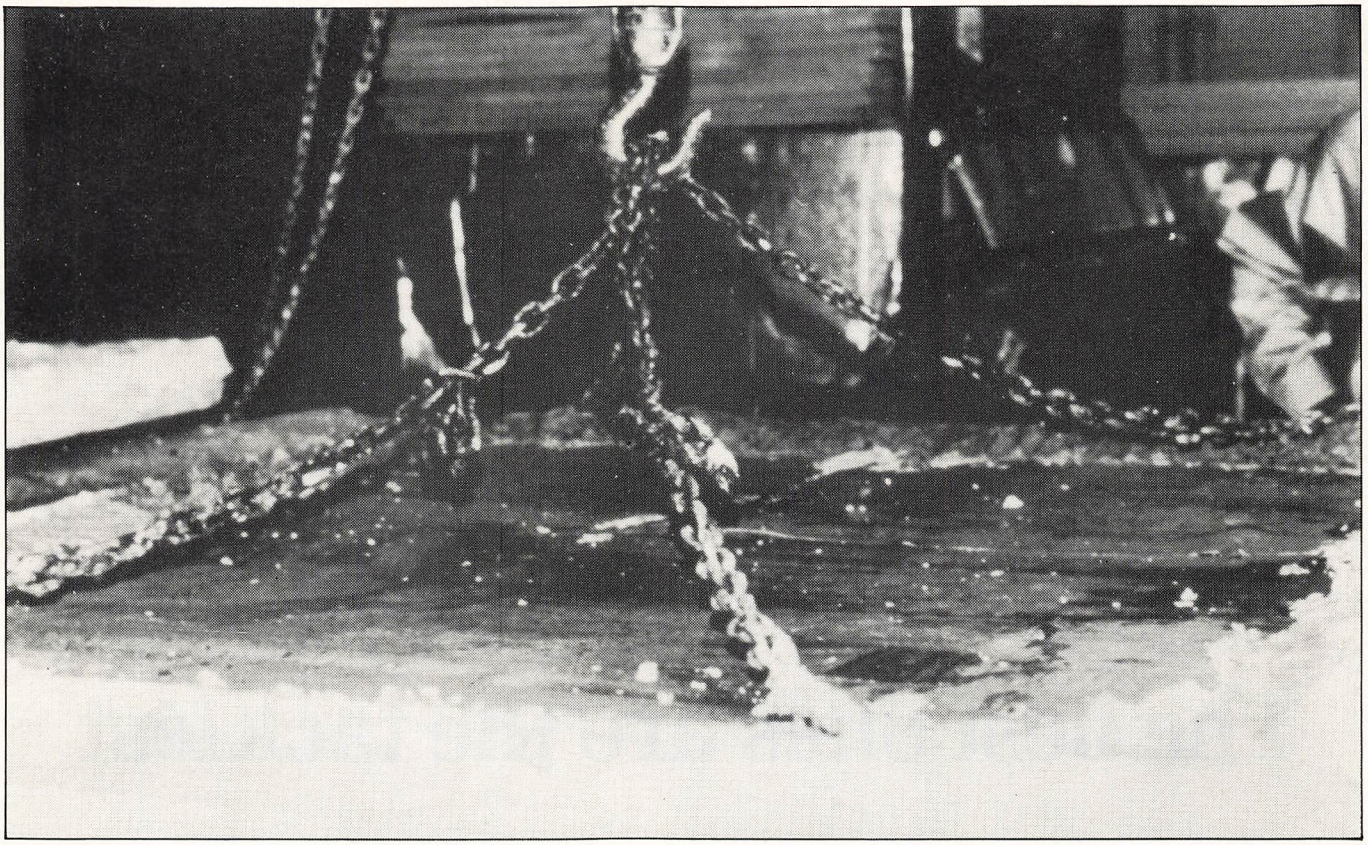
5.2 Specific Requirements—The following modified bitumen performance criteria are necessary to insure adequate field performance and to withstand the rigors and strains of application.

5.2.1 Low Temperature Load-Elongation Behavior—The load-elongation properties are an important parameter of performance. As these membranes have a high bitumen content, their range of load-elongation ability at 0 F is important. Different amounts of strain energy[2] are needed to cause material rupture at this temperature. Because load and elongation behavior are related to strain energy, it is possible (with aging) for ultimate loads to increase while elongation decreases, giving the same value of strain energy. To account for this possibility, modified bitumen membranes should meet any two of the three performance characteristics listed (elongation, tensile or strain energy).

Low Elongation/High Strength—a minimum of 2.5 percent elongation, 200 pound inches tensile and/or 20 pound per inch of strain energy, in the weakest direction.

Medium Elongation/Low to High Strength—a minimum of 10 percent elongation, exhibit a strength from 50–200 pounds per inch and/or 150 pound inches of strain energy in the weakest direction.

High Elongation/Low to Medium Strength—a minimum of 20 percent elonga-



Calorimeter testing of Brai modified bitumen roofing, to learn what combustibility the product might add to underlying material.

tion, a tensile strength range from 50–100 pounds per inch and/or have 300 pound inches of strain energy in the weakest direction.

5.2.2 Low Temperature Flexibility—Modified bitumen membranes generally lose flexibility when subjected to temperatures below freezing. To insure adequate flexibility during application, membranes should not crack at 15 F.

5.2.3 Heat Aging—Membranes should retain 85 percent of the load-elongation properties listed in Section 5.2.1 after being exposed for six weeks at 176 F in an air-circulating oven, according to ASTM D1204.

5.2.4 Temperature-Induced Load—Properly compounded modified bitumens may change their temperature-induced load behavior as they undergo weathering. New membranes should be tested for a temperature drop of 100 F over a two-hour period. Heat-aged samples (according to Section 5.2.3) should also be subjected to the same test; they should not exhibit a 25 percent increase over those temperature-induced loads demonstrated by new membranes.

5.2.5 Dimensional Stability—membranes should not change dimension by more than ± 0.5 percent in either direction when subjected to heating for 28 days at 176 F and tested according to ASTM D1204. Allow samples to recover for 24 hours at 70 F before measuring.

5.2.6 Water Resistance—Membrane samples should not absorb more than one gram of water when immersed at 122 F for five days. Also, the membranes should not experience a dimension change greater than ± 1 percent in either direction. Use 4-inch by 4-inch samples; all cut edges with exposed reinforcing should be sealed with hot asphalt beforehand. Granule-surfaced materials may require granules embedded in the membrane for this test.

5.2.7 Granule Embedment—Membranes requiring protection from direct sunlight may use granules or coatings for protection. Test methods are currently under development; a recommendation is not available at this time. However, granule or coated membranes should be checked periodically to insure that the covering has not eroded or reduced original membrane protection.

5.2.8 Metal Foil—Membranes using metal foil surface sheets should be thermally stable and not become unattached, blistered, wrinkled or fractured due to thermal cycling or expand or contract more than ± 0.1 percent during testing.

[1] *The MRCA does not have enough data to conclusively recommend a minimum thickness acceptable for each type of roof system assembly. Field experience indicates satisfactory performance with some membranes less than 45 mils thick; however, MRCA conservatively recommends a 45 mils thick minimum.*

[2] *Strain energy is defined as the product of load times elongation or force times distance; the units are pound-inch and represent work done.*

The best ones are the tackiest

by Stephen A. Westley

A good adhesive seams to be the key to EPDM's success

Adhesion is the most significant and critical factor in the durability of the single-ply EPDM roof. The seam area is the most likely to fail in service. Understanding seam adhesion is an important first step in developing and applying effective adhesives.

The first factor affecting adhesion is the substrate's nature, in this case Ethylene Propylene Diene Monomer, more commonly called EPDM. EPDM is a low-polarity elastomer that is a vulcanized chemical relative to polyethylene.

EPDM weathers very well because it is so inert. Unfortunately, its inertness prevents traditional bonding agents from wetting or spreading on the surface or bonding to the membrane. Unless the adhesive is formulated to EPDM, it will never provide high levels of adhesion, and will never equal or surpass the strength of its adherend, the sign of a true adhesive.

Roof conditions at installation also affect the bonding quality. The wrong roof temperature, too little pressure on the seam, or application haste can prevent the adhesive from working effectively. Other factors such as rain, snow, dew point on the rubber, wind and dust can also sabotage an adhesive.

Incorrect preparation of the EPDM surface before bonding can be a problem, too. There is a direct and absolute correlation between surface quality and adhesion. Almost all of the EPDM membranes on the market have been treated with talc, clay, mica or combinations of these release agents. They assist processing during manufacture and prevent sticking in shipping and storage. Membranes that do not have heavy inorganic treatments invariably have some type of mold release that accomplishes the same purpose. This surface contaminant *must* be removed before the adhesive is applied because release agents work even better on the adhesive than on the EPDM. While all specifications call for cleaning the seam area, in practice there is undoubtedly a wide variation in cleaning effectiveness.

Those membranes that are sold *free* of release agents certainly provide higher levels of adhesion than even membranes that are washed because of remaining mica and talc on the washed surface. This statement cannot be an absolute rule, unfortunately, because the surface of membranes free of release agents may contain compounding materials used in processing that migrate and function as disbonding agents. High oil loadings are a frequently seen example of this problem.

The only factor affecting bond quality that is not directly tied to the surface phenomenon of EPDM is the cure rate. This is one area the adhesive technologist can control. Cure rate should not be confused with the initial "grab" of the adhesive when the two surfaces are combined. The cure rate proceeds as a function of time and temperature. This cure process will determine the cohesive integrity or "guts" of the adhesive. The adhesive must cure fast enough for the bond to withstand the initial, primarily thermal disbonding forces.

Both short-term and long-term forces cause seam failures. For the short term, the roof must contend with shear and peel forces. When a single-ply roof is put down, there are immediate stresses placed on the bonded seam area. In the case of the fully-adhered roof, these stresses are dissipated over a large area so that the seam area will not receive all the stress of thermal expansion and contraction. Ballasted roofs, however, transmit shear forces directly to the seam.

Peel, caused by the elastic memory of the rubber, is also part of any disbonding action. Peel forces make the seam peel back with heat and at their worst, can open a seam. Even when conditions are less severe, fishmouths can occur.

Since thermal forces will always be at work, adhesives must be able to accommodate both shear and peel forces to withstand initial or short-term disbonding.

Over the long term, a roof must withstand weathering. These forces are countered by the chemical resistance of the adhesive, which must withstand oxidation, ozonization, hydrolysis, and chemical attack from any ponded water. To do this, the adhesive must be able to work through the seasonal cycle of freezing and thawing. The seam must also be able to resist the constant thermal cycling of the black EPDM membrane.

EPDM roofing systems are generally installed with a 10-year warranty. Obviously, the adhesive must be as durable as the EPDM for the entire system to last this long. The challenge is to get a reasonable trade-off between adhesive activity and the predicted durability of such a system. The adhesive must be practical for on-site application or no one will use it no matter how durable it is.

There are five adhesive types available that are practical for on-site application: contact adhesives, hot-melt adhesives, 100 percent solids liquid-type, water-based adhesives and pressure-sensitive adhesives.

Without question, the rubber-based contact adhesive in solvent carrier is the most widely used in single-ply roofing. Its application requires coating both surfaces of the seam, allowing the solvent to flash off and combining the two tacky surfaces.

While it is a practical and reliable system, the resulting adhesion values are low and there is very little margin of safety in case the seams have not been thoroughly cleaned. Also, areas of improper wetting may not be apparent until the seam fails in service.

Hot-melt adhesives are useful for product assembly in a factory but less useful on a roof. They are single-pack, applied by heat to one surface and may have good adhesion to EPDM. However, they require special equipment to dispense and the application margin of safety can be critical.

One hundred percent solids liquid-type adhesives are generally urethane. They have excellent weathering qualities and can be applied to one surface. On the minus side, these systems have low initial tack or grab and few offer good adhesion. When in a single-pack, moisture is needed for cure, while in a two-pack the system cures rapidly. The cost is high for urethanes, however, and there is little history to recommend them.

The challenge is to get a reasonable trade-off between adhesive activity and durability.

Water-based adhesives are poor candidates for outdoor application. The adhesive will freeze and generally coagulate after thawing. The bond, which is moisture sensitive, is slow to dry and may trap water, giving rise to blisters in the seam. In the adhesive's favor, the cost is low and it presents no flammability hazard. Once again, there is no history of its use to give us a clue to its performance.

Pressure sensitive adhesives could be excellent candidates for an all-purpose system if and when they are improved. Used as a mastic or thick film, they have quick grab, there are no solvents to dry, they can be used in single-pack and are generally versatile and foolproof to apply. However, the disadvantages are formidable. Pressure sensitives have low cohesive strength and poor heat resistance. As with contact adhesives, repositioning is a problem. There is little history of their use for roofing except in the form of semi-cured or uncured butyl tapes.

Because of the wide use of neoprene-phenolic contact adhesives, Lord Corp., Hughson Chemicals Div., has been working to improve its bonding propensity to commercial EPDM membranes. The company's laboratory is seeking a better adhesive that will provide a wider margin of adhesion safety, extended durability and trouble-free performance.

Because of the inordinate difficulty in bonding EPDM at ambient temperatures under varying field conditions, Lord believes a two-coat system is needed. The first coat is a primer to wet, spread and adhere to the cured EPDM. This is followed by a contact adhesive to adhere to the primer and join the seams.

However, because seams, primed or not, cannot be joined through a brush heap of mica, talc or debris a three-step application is needed. The first step is a solvent wash applied before the primer and contact adhesive are brushed on. All three steps must allow time for the solvents to evaporate, which due to vapor pressure and heat from the black EPDM, will be very rapid.

Experimental results prove that the three stage application system is the most performance effective. But is it the most cost effective? Rough

continued on following page

Adhesion

continued

calculations have been run using $1 per square foot for EPDM and labor at $20 per hour per man for a three-man crew. Including the adhesive, primer, and solvents plus labor for a 250-square-foot seam, an installed cost of $1.20 per square foot was calculated for the two stages and $1.33 per square foot for the three-stage system.

If the seams are 10 percent of the total job, and we value the EPDM roof to the customer at $3 per square foot installed, then the cost add-on is now $.013 per square foot. The insurance needed to assure seam performance would cost .43 percent of the total cost or .043 percent per year for a 10-year warranty. This is hardly considered excessive when compared with the cost of on-site repairs. While there is resistance to additional steps in any process, it must be weighed against the cost and bother of a roof failure.

Lord ran tests on bonded EPDM to discover the most effective way to join seams. The results of the tests are offered in the accompanying tables.

The first table shows bonding data from a comparison of six commercial EPDM sheets. All peel samples were washed with hexane, bonded with the adhesive or a primer/adhesive system and permitted to age for a period of seven days prior to testing. Peel tests were done using ASTM D413-A (peeling at a 180-degree angle and pulled at 2 inches per minute.)

Shear specimens were bonded in a similar manner, but the specimens were first adhered to grit-blasted steel coupons the same size as the samples.

Test results are recorded in pounds per linear inch (pli) for peel and pounds per square inch (psi) for shear. Peel and shear were performed at temperatures of 25 C and 70 C.

The upper set of values in Figure 1 shows the primer/adhesive combination. The lower set in parentheses is the contact adhesive used alone.

While shear forces may be more common in actual practice, Lord believes the peel data more accurately documents adhesion performance. Stress applied in shear is spread over the entire bond area, while peel measures the force concentrated at the interface.

Certain conclusions may be drawn from the test data. First, there is an across-the-board improvement of adhesion values using the primer-adhesive combination. Generally, values are doubled or better for peel.

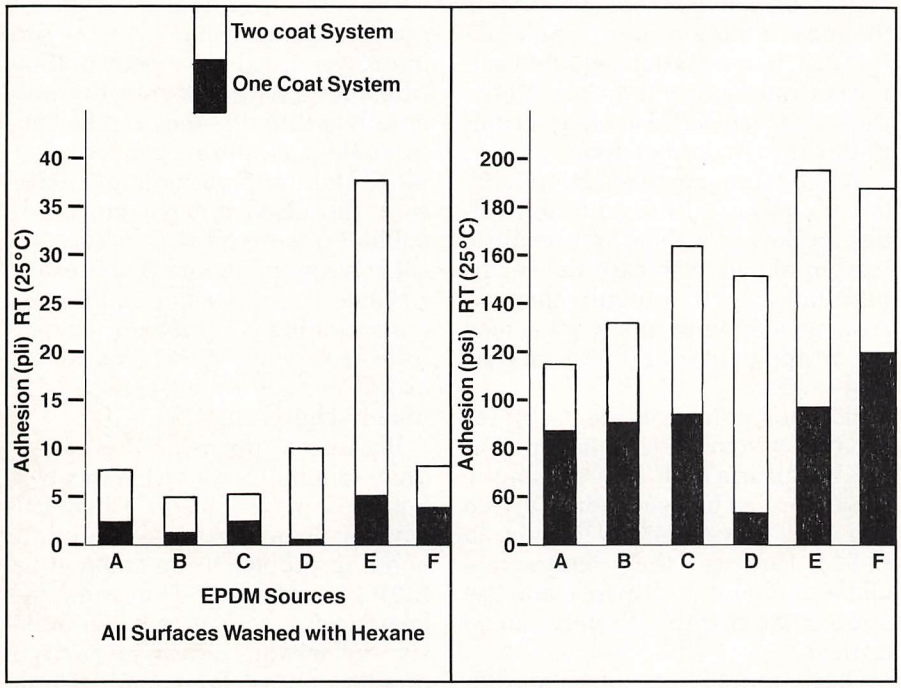


Table 1
Peel Adhesion

Table 2
Shear Adhesion

EPDM SOURCES	A	B	C	D	E	F
T Peel Adhesion, RT (25°C), P l i	6.6 (2.1)	4.3 (1.9)	5.6 (2.2)	9.1 (1.0)	*38.2 (5.0)	6.4 (3.0)
T Peel Adhesion, 70°C, P l i	4.8 (3.5)	3.3 (3.0)	3.0 (3.1)	5.0 (1.8)	6.7 (1.9)	3.3 (3.0)
Shear Adhesion, RT (25°C), Psi	112 (85)	125 (90)	162 (92)	150 (58)	*190 (98)	184 (120)
Shear Adhesion, 70°C, Psi	63 (34)	46 (32)	48 (22)	41 (17)	60.4 (38.2)	44 (21)
Accelerated Aging, 70°C, 100% RH, 2 Weeks, P l i	8.3 (1.2)	3.1 (0.6)	4.8 (2.3)	10.2 (1.4)	*40.1 (5.5)	8.0 (2.8)
Accelerated Aging, RT, H_2O Immersion, 2 Weeks, P l i	6.6 (1.1)	3.2 (0.5)	4.8 (2.7)	8.3 (1.1)	*36.4 (3.8)	6.3 (1.8)

NOTES:
1. All samples washed with hexane
2. Values without brackets use primer and contact adhesive, bracketed values using contact adhesive alone
3. Peel testing in accordance with ASTM D413, Method A (180°)
4. Shear testing in accordance with ASTM D1002-78 (lap shear)
5. Adhesion at 70°C measured after 15′ period at 70°C and pulled at 70°C
6. * indicates failure of the substrate

Figure 1
Adhesion Study: EPDM Roofing Membrane

Though the ratios are lower for shear, there is still consistent improvement in performance with the primer-adhesive combination.

A second observation is a drop in values when samples are tested at 70 C. This is more evident in shear than peel. This test predicts the actual heat resistance of the bonded assembly on the roof.

Also, according to the data, the primer-adhesive combination performs better than adhesive alone when the samples are aged.

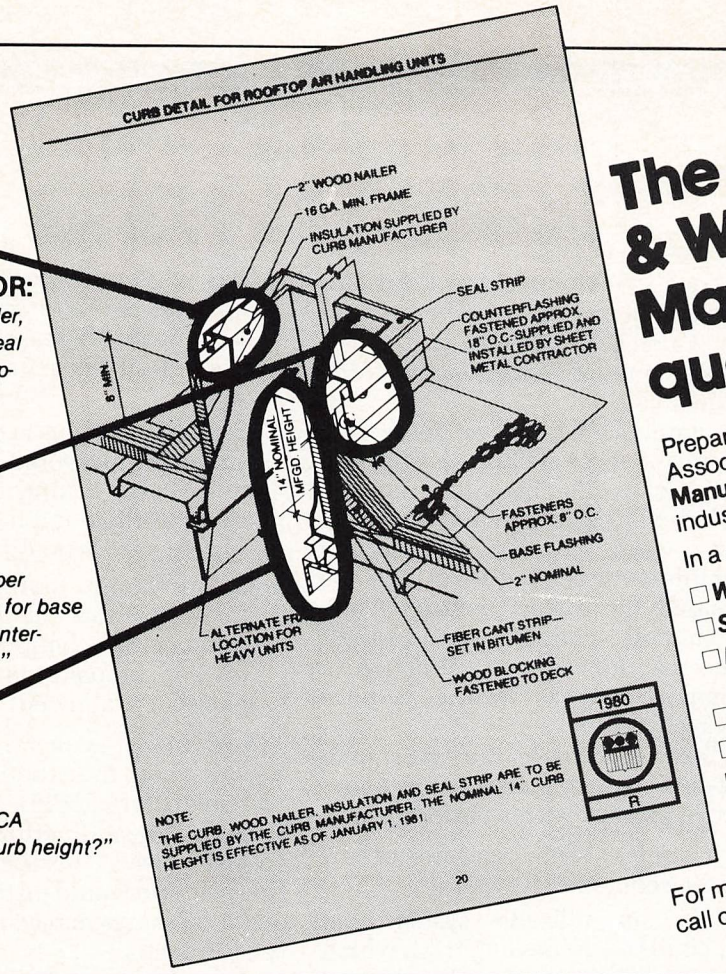
Looking at an individual sample's performance can also be informative. In this study, Sample E, which appeared under magnification to be the cleanest of the washed samples, out-performed the others by a wide margin. The primer/adhesive bond actually outlasted the substrate, which failed when adhesion exceeded 38 pli for peel and 190 psi for shear. When contact adhesive was used alone on this sample, the perfomance more closely matched the others.

Sample D, which was not treated with a release agent, also looked very clean under magnification and could even be used in the field without a wash. However, testing on a sample using contact adhesive alone yielded the lowest values of any membrane. The data seem to indicate that adhesion is a function of compounding as well as surface cleanliness.

Taken as a whole, the experimental data suggest specific ways to improve EPDM systems performance.

1. Use clean seam areas free of surface contamination.
2. Use an adhesive system that bonds all grades of EPDM, which has wide tolerance in handling and use and will provide adhesion levels adequate to secure the seams for a minimum period of 10 years.
3. Establish minimum standards of adhesion measured by conventional peel testing or peel and shear testing, and be certain the system used is qualified.
4. Set up rigorous training sessions for supervisors and inspectors to make certain that proper materials and preparation procedures have been followed.

And finally, a general observation to which both the experimental data and the history of EPDM point: promote quality and performance over cost and speed. This is an important first step and would justify all subsequent measures to reach final quality assurance.



CONTRACTOR:
"Is the wood nailer, insulation and seal strip typically supplied by the curb manufacturer?"

SPECIFIER:
"What is the proper fastener spacing for base flashing and counterflashing at curb?"

ARCHITECT:
"What is the NRCA recommended curb height?"

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- ☐ **Appendix**

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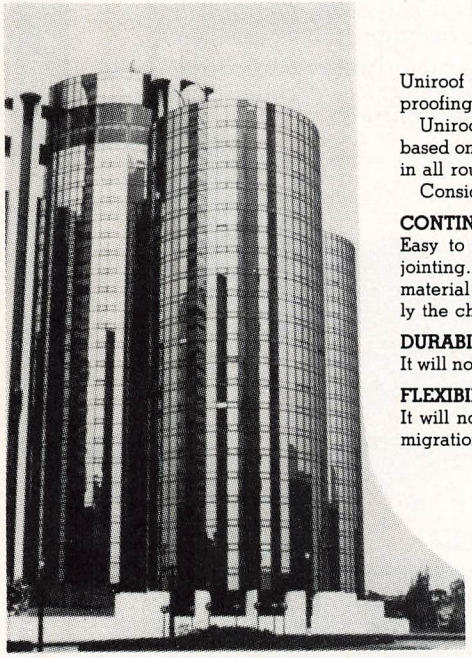

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Member Supplement

Phone day goal— 90 percent retention

Gaylord Blue, Billy Fort, and Stanley Gerson spent April 26 in Chicago calling members who had not paid their dues. The objectives of this phone-day were to remind members to pay, resolve any questions or problems they had, record and research reasons for resignation, and reinforce NRCA's powerful partnership.

Of the 258 calls, 45 percent were made to inappropriate company representatives, but diligence did pay off. A total of 41 percent of the calls resulted in promises to pay; 106 letters and reminder invoices were sent.

Bennett Hutchison III, who was scheduled to participate but couldn't make it to Chicago, volunteered to make 85 calls to unpaid members from his office. "We anticipate the phone day will yield over 90 percent member retention for this year," Carl Good, Member Services manager said.

"Member-to-member contact is not only a superior method of retaining members, but also the only way to get true, accurate comments and criticism."

Thanks to Blue, Fort, Gerson, and Hutchison for helping NRCA surpass its phone day goals.

Firestone selects Nightingale

John T. Nightingale, president of Nightingale Roofing, Inc., Hollis, N.H. has been appointed to the Advisory Council of the Firestone Industrial Products Co. He was the only New Englander to attend the recent meeting of the Council in Hot Springs, Ark.

The Firestone Advisory Council is limited to 16 leading roofing contractors throughout the U.S. Council members evaluate Firestone roofing products, systems and services. They also identify and assess trends within the commerical roofing industry and help measure the effectiveness of Firestone's advertising and promotional programs.

Nightingale is also a member of the Advisory Board of Owens-Corning Fiberglas Corp., another national leader in the manufacture of roofing materials.

Thorpe to serve on CAM board

Leonard "Bus" Thorpe, president of The Ben T. Young Co., Detroit, was elected to the Board of Directors of the Construction Association of Michigan (CAM).

He will serve a three-year term.

Thorpe is a past president of the Construction Specifications Institute, Detroit Chapter and is a voting member of the National Roofing Contractors Association.

Stephenson potentate of Moolah Temple Shrine

Congratulations to George E. Stephenson, president of Stephenson Roofing & Sheet Metal Co., St. Louis, Mo., who has been elected as the new potentate of the Moolah Temple Shrine. George Stephenson is an active former president of NRCA (1976).

New Members

The following have been approved for NRCA membership between April 8 and April 30.

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- Adair Contracting Co.
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- B. Allendorfer & Associates
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  Lincolnwood, Ill. 60645
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- Asphalt Built Up Roofing Co., Inc.
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  James D. Walker
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  Ferndale, Mich. 48220
  Larry Brisky
- Kirkendoll Roofing
  811 S. Chestnut
  Cameron, Mo. 64429
  Kitch Kirkendoll
- Phil. R. Klapp, Inc.
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  Mayfield, Ky. 42066
  Phil. R. Klapp
- Mainely Metal, Inc.
  P.O. Box M
  Moose Hill Road
  Livermore Falls, Me. 04254
  Don Cotter
- Marion & Green Roofing & Sheet Metal Co.
  479 D. Buchanan Drive
  LaVergne, Tenn. 37086
  Bridgette George
- Merit Contracting, Inc.
  4615 Highway 63 North
  Rochester, Minn. 55904
  Richard E. Stanley
- Mid-State Roofing Co., Inc.
  P.O. Box 1627
  Dayton, Texas 77535
  Gordon Mitchell
- New Britain Roofing Co.
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  New Britain, Conn. 06051
  Thomas Leith
- J.T. Penyak Roofing Co., Inc.
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  South Plainfield, N.J. 07080
  Joseph T. Penyak
- Pro-Tek Systems, Inc.
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  David P. Slager, Sr.
- SK Quality Roofing, Inc.
  1604 S.W. 7th St.
  Delray Beach, Fla. 33444
  Kirk Keuter
- SWR, Inc. (Snow White Roofers)
  3209 Ridgelake Drive
  Metairie, La. 70002
  Richard Schmidt
- Vascow's Roofing & Sheet Metal, Inc.
  1915 Ryder Drive
  Baton Rouge, La. 70808
  William M. Vascow
- The Mike Volk Co., Inc.
  P.O. Box 1607
  2880 Park Ave. West
  Mansfield, Ohio 44901
  Herald Volk
- Western Waterproofing Co.
  9960 Freeland
  Detroit, Mich. 48227
  Bob Mazur
- Winpigler Roofing, Inc.
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  Leroy F. Winpigler
- Roofing Supply, Inc.
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- Strober Bros.
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  Brooklyn, N.Y. 11232
  Howard Roach

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  Brookfield, Wis. 53005
  William Moltzan
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Now available from NRCA is a worker training program — **Kettles, Tankers and Bitumen Heating.** This four-part audiovisual program covers everything workers need to know for correct bitumen heating and operation and maintenance of heating equipment.

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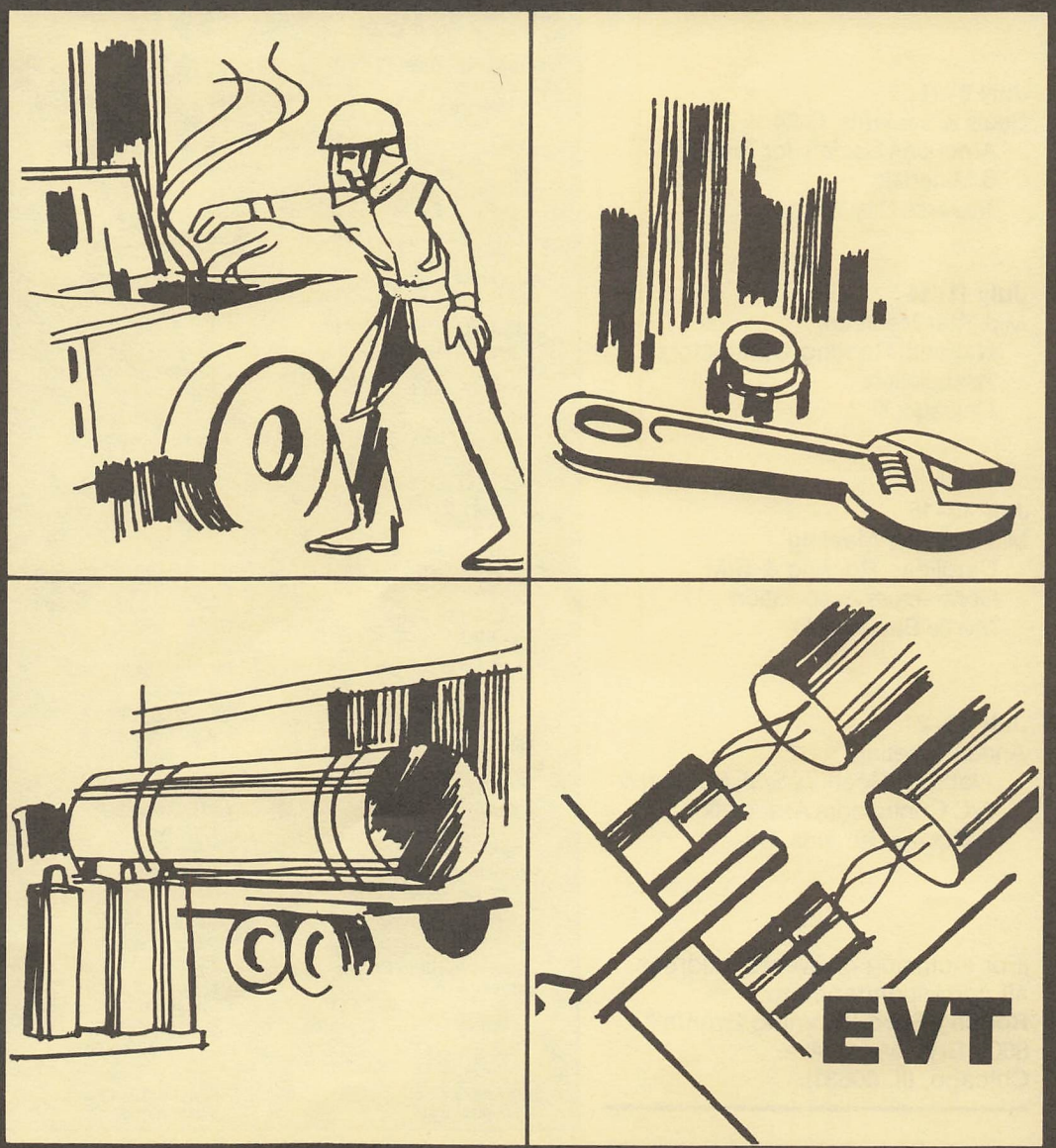
In addition, a comprehensive workbook contains a complete outline of the program with quizzes and tests to gauge worker knowledge.

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

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

Kettles, Tankers, and Bitumen Heating



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Annual Convention
Construction Specifications Institute
Dallas, Texas

June 25–27
ASTM D-8: Roofing, Waterproofing & Bituminous Materials
American Society for Testing and Materials
Denver, Colo.

June 26–28
ASTM E-5: Fire Standards
American Society for Testing and Materials
Denver, Colo.

July 8–11
Seals & Sealants, C-24
American Society for Testing & Materials
Traverse City, Mich.

July 11–14
Mid-Year Meetings
National Roofing Contractors Association
Chicago, Ill.

July 12–15
Mid-Summer Meeting
Carolinas Roofing & S/M Contractors Association
Myrtle Beach, S.C.

July 19–21
Annual Meeting
Alabama Roofing, S/M, Heating & A/C Contractors Association
Calloway Gardens, Ga.

(For inclusion of events, address all correspondence to:
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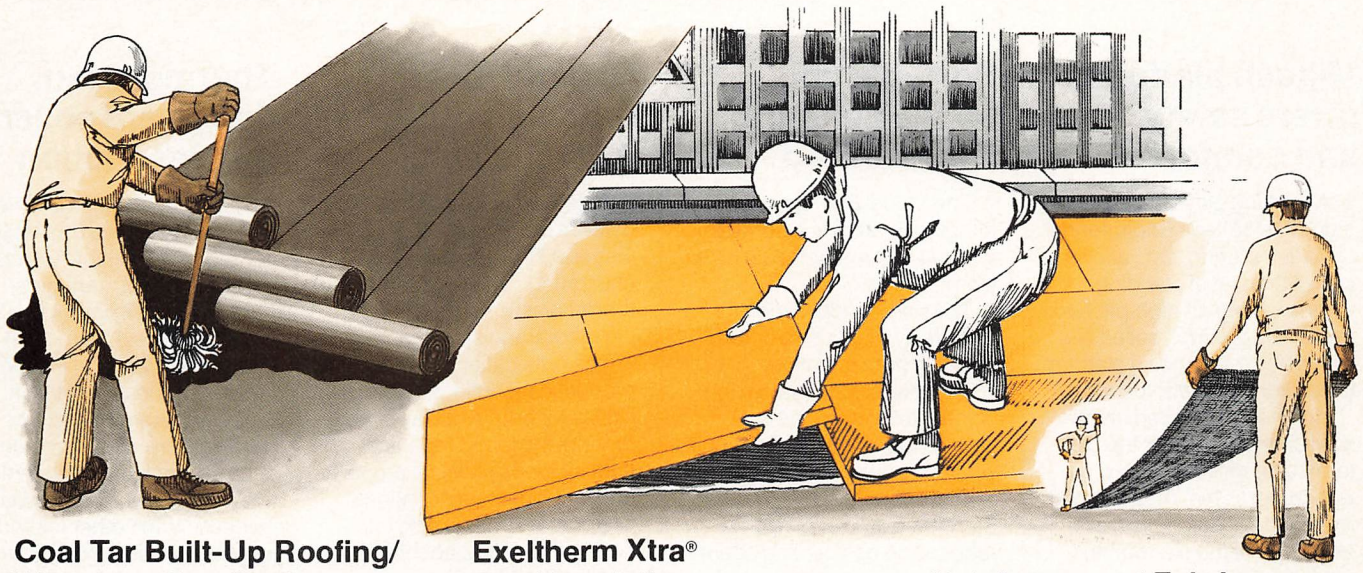

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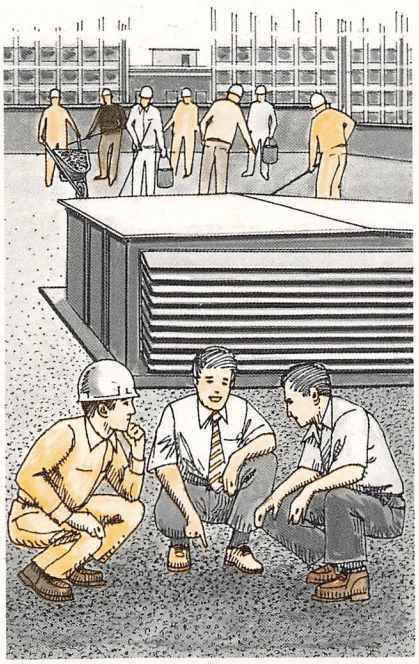

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Check #743 on Reader Service Card

New Products, Ideas, & Publications

Miltech platform offers safety and comfort

A working platform, designed by Miltech Engineering & Manufacturing, Inc., allows better-than-level standing when working on high-pitched roofs. The product, called Nu Steep Jac™, features a platform tilted slightly toward the roof.

Notched, U-shaped aluminum channels permit the platform to be moved upward as work progresses. An L-shaped kickplate is located on the outside edge of the platform for safety.

More information on the product may be obtained from Miltech.

Check #174 on Reader Service Card

Portable unit spots moisture with infrared

The Model 320 Thermal Imaging System is a portable infrared unit marketed by ICSD Corp.

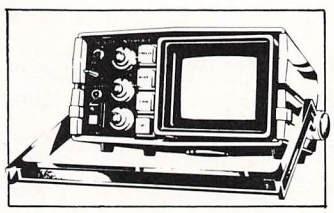
The unit identifies moisture in roofs by measuring differences in heat retention.

The Model 320 System includes an infrared thermal viewer and video interface unit, which is color compatible.

The thermal viewer features thermo-electric cooling and requires no gas cooling agents for operation.

A brochure describing the system and its uses in detail is available from ICSD.

Check #175 on Reader Service Card



General Tire's brochure outlines ACR systems

A new 20-page illustrated Sweet's brochure describes General Tire's GenFlex ACR elastomeric and GenSeal ACR thermoplastic single-ply roofing membrane systems.

The publication provides product descriptions and capabilities for both ACR (all-climate roofing) systems. Technical data includes physical property and installation descriptions.

General Tire has also introduced a new disc anchor system for GenFlex. The system employs eight-inch diameter, high-alloy aluminum discs. Fewer fasteners are required with this system and the discs do not have to be covered with a membrane once installed, according to the manufacturer.

The Sweet's brochure and information on the disc anchoring system are available from GTR Building Products Co., an operating unit of the General Tire & Rubber Co.

Check #176 on Reader Service Card

Thermo-Scan document covers roof inspection

A sample statement of work for comprehensive roof inspections is now available to building owners and managers. Thermo-Scan Engineering, Inc. developed the document in cooperation with the Roofing Industry Educational Institute.

The statement of work covers a comprehensive roof inspection, including nondestructive moisture surveys, visual inspection and other related inspection leading to roof system correction recommendations. By surveying the document, inspection firms will be able to submit quotations based on equivalent work.

The moisture survey section of the statement permits the use of thermal imaging, nuclear backscatter or electric dielectric detection methods.

More information is available from Thermo-Scan.

Check #177 on Reader Service Card

Extended panel added to Lucas Tapered Systems

The Lucas Sales Company, Inc. has added the Lucas Extended Panel System and Lucas "No-Fill" Cricket System to its Lucas Tapered System line.

The Lucas Extended Panel System (1/8" incline) can span up to 16 feet without the need of fill insulation. Fill insulation in two-inch increments is used every 16 feet thereafter.

The Lucas "No-Fill" Cricket System eliminates the need for fill insulation for crickets up to 16 feet wide.

All Lucas systems come bundled and wrapped in polyethelene on pallets. Each panel is clearly identified and has indicator arrows to show direction of slope.

The systems may be used with BUR, Elasto/Plastic and modified bitumen systems.

Check #178 on Reader Service Card

Owens-Corning booklet describes new OCFoam™

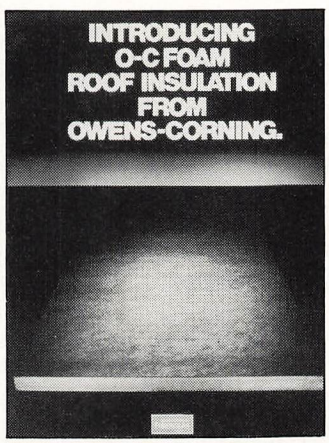
A six-page brochure describes the new OCFoam™ roof insulation introduced by Owens-Corning Fiberglas.

The insulation is a polyisocyanurate foam reinforced with glass fiber facings. It is designed for use on low-pitched decks; flat decks, either nailable or non-nailable; or metal decks and may be used as a base for built-up membranes.

Insulation boards measure 3 feet by 4 feet. Thicknesses of1.4 inches and 3.2 inches and C-values of .05 to .12 are available.

Copies of the brochure describing this new insulation may be obtained from Owens-Corning.

Check #179 on Reader Service Card



Forplast offers hot-air, single-ply seam welders

Two hot-air welders designed especially for overlap welding single-ply materials are being marketed by Forplast U. S. A., Inc.

One is an automatic, self-propelled model with a 40mm nozzle, adjustable speed settings and temperature control.

The other welder is the hand-held Roofing Quick Gun. It can be used with both a 40mm and a 20mm nozzle and is available in a complete kit with metal case and accessories.

More information on these two products as well as other hot-air welding tools is available from Forplast.

Check #180 on Reader Service Card

Labor Rates available from R.S. Means Co.

The 11th annual edition of *Labor Rates for the Construction Industry* is available from R. S. Means Co., Inc.

The manual contains detailed wage rates for over 300 U. S. and Canadian cities with 46 construction trades listed by local union numbers.

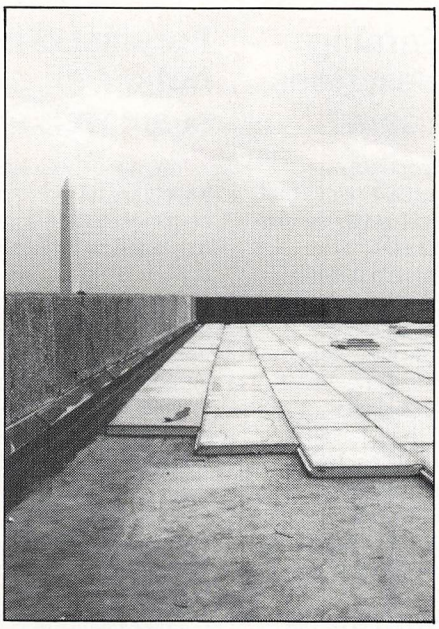
Base hourly wage rates and fringe benefits package costs are also included. Publication users may compare a city's average wage rates with national averages by employing factors included in the manual. Wage rates for July 1, 1982 and 1983 are also given.

Copies of the publication are available from R. S. Means.

Check #181 on Reader Service Card

On the Roof

Roofers, architects cooperate on a better roof



Reroofing on the AIA building, Washington, D.C. nears completion.

John C. Van Wagoner, president of Prospect Enterprises can think of "nothing...more disastrous" than putting a new roof on the American Institute of Architects' (AIA) building and having something go wrong.

His company recently installed an insulated roof membrane assembly on the Institute's Washington, D.C. headquarters.

This roof is also important to AIA. The organization knows that its every move is scrutinized. Gary Lewis, program director, Professional Systems Division, AIA Service Corp., is especially concerned that none of the problems that caused the failure of the original membrane occur in the new one.

The old roof was plagued with "blisters all over the place," according to Lewis, including an enormous blister full of water over the board room. It was a leak "just sitting there waiting to happen," Lewis says.

It's not certain how AIA's roof was allowed to deteriorate. What is known is that considerable damage was caused by window washers dragging their cables across the gravel and kicking the flashing when they hauled up their equipment. Also, a couple of drains shown on the original drawings were never installed, and water ponded on nearly all the roofs.

In choosing the new roofing several factors were considered. It would have to withstand the stress of roof traffic and a winter installation. It would have to be installed over the existing roof to save time and money. And finally, a 10-year manufacturer's warranty covering both materials and workmanship would have to be included.

A protected EPDM membrane roof was chosen to cover the existing roof. An EPDM membrane with concrete pavers as ballast was chosen for the penthouse, where the old roof had to be removed.

For the protected membrane, the loose gravel was vacuumed off the old roof. One inch of expanded polystyrene insulation was laid to provide a smooth surface for the 45-mil EPDM membrane.

Interlocking LG boards, recently developed by Dow Chemical, were placed on top of the membrane. The rectangular insulating slabs consist of a 2 inch layer of extruded polystyrene protected on top by a 3/8-inch layer of latex modified concrete. The LG boards were selected for ballast because of their weight, 4.5 pounds per square foot (versus a minimum of 10 pounds per square foot for gravel). The boards are tongue-and-groove on their long sides and are locked in place by metal banding around the roof's perimeter.

The rubber membrane sandwiched between two slabs of insulation would be protected almost completely from environmental and physical abuse such as thermal shock, ultraviolet degradation and roof traffic.

An EPDM membrane was picked because of its thermal performance range, resistance to moisture, durability and detailing suitability.

Contractors and architects were cooperating inside the building as well as on top of it. Some NRCA officers, including Van Wagoner, visited the AIA *Masterspec* writers to discuss various NRCA programs to help the roofing industry at about the same time as the installation.

The *Masterspec* writers invited the contractors to take a look at AIA's roofing specs and give their comments. In return, NRCA invited Lewis to join the advisory committee for its *Roofing Materials Reference* and *Guide*, which is currently being expanded to include insulations.

Consultation on *Masterspec* and the *Guide* has generated mutual respect between the two groups. After several meetings, Lewis recalls: "We found out that we were all after one thing: a better roof."

The future may not be all rosy, cautions Lewis, "I'm sure there will be instances when we're going to revert to adversary roles very quickly when something goes wrong. But at least if you start out talking to each other, your chances of getting to that adversary role are probably a lot less."

"Sarnafil single-ply roofing doesn't ask you to take anything on faith... its performance has been proved in twenty years of actual service."

When you have to put a new roof on an existing building, you really should think about what you are getting into.

"Remember what you are buying is the total roof, not just the roofing material, not just the roofing installation, and certainly not just the warranty; but a total roof that should last without problems for years and years."

First of all, remember what you are buying is the total roof, not just the roofing material, not just the roofing installation, and certainly not just the warranty; but a total roof that should last without problems for years and years.

In order to get such a roof, you need a high quality membrane, high integrity seams, proper design, and a highly capable and conscientious installation contractor.

The only sure way to know if a membrane will last for twenty or twenty-five years is to look at its history of service on other buildings. With single-ply products this is pretty hard to do, since most haven't been around for that long.

"Look at its history of service... Sarnafil samples taken from 20-year-old roofs are as serviceable today as when they were installed."

Sarnafil has however, and samples taken from twenty-year-old roofs are as serviceable today as when they were installed.

Sarnafil doesn't shrink. And, unlike other PVC products, it retains its plasticizer and original pliability. Samples taken from twenty-year-old roofs and subjected to accelerated aging tests show many years of additional life expectancy.

Seams and joints are equally important. If you have to depend on sealants, they too must have some record of service life.

And you should consider the many variables that affect the integrity of field joints such as talc on the sealed surfaces, moisture, temperature, and the shelf life of the sealants.

"Sarnafil roofs don't use joint sealants. They are hot-air welded... creating a joint that is stronger than the membrane itself."

Sarnafil roofs don't use joint sealants. They are hot-air welded by a process that fuses both surfaces together, creating a joint that is actually stronger than the membrane itself.

But even with a high quality membrane and high integrity seams, you still aren't out of the woods. Design factors, such as building dynamics; wind uplift; vapor transmission, which varies from climate zone to climate zone; load bearing; and the treatment of penetrations, are important considerations on which you should have qualified technical assistance.

"Sarnafil inspects the old roof and works closely with you in the planning and engineering of your new roof."

At Sarnafil, we work closely with you in the planning and engineering of your roof, inspect the old roof, make sure that the surface is properly prepared, train, certify, and thoroughly support our Sarnafil qualified contractor during the installation. And inspect and approve the finished roof before issuing a warranty on both materials and labor.

"You get the best membrane, the best technical support, the best installation... and a warranty you'll probably never have to exercise."

When you buy a Sarnafil roof, you get more than the world's best roofing membrane... you get absolute leakproof seam integrity, the best technical support, the best installation, lower lifetime cost... and the best warranty of all... one that you'll probably never have to exercise.

If you'd like more information on Sarnafil roofs, write Sarnafil (U.S.) Inc.
Canton Commerce Center
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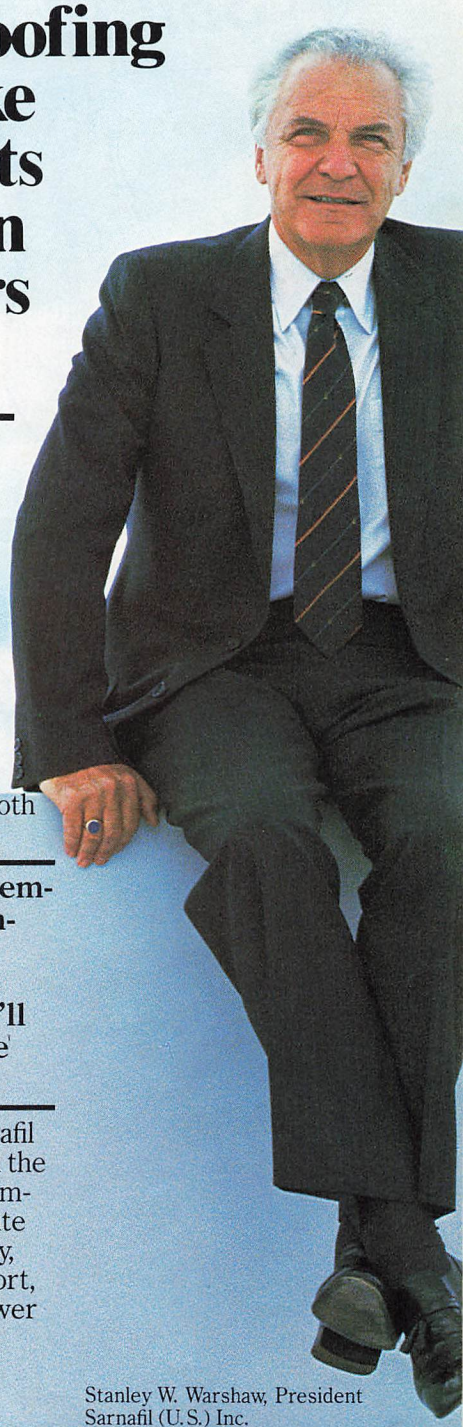

Stanley W. Warshaw, President
Sarnafil (U.S.) Inc.

Sarnafil®

"Living up to the promise of single-ply roofing"

Check #754 on Reader Service Card

SAFE & SOUND

Sound advice on roofing safety by the members of the National Roofing Contractors Association (NRCA).

Safety makes an indelible mark on the minds of employees at Aeroil Products Co., Inc., in South Hackensack, N.J. Eight stamps, each with a different safety slogan, are rotated monthly on invoices and other company correspondence, according to Charles Schaefer, Jr. The safety habit is easy to acquire when its reinforced every day.

HOT STUFF
CAN BE DANGEROUS!
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SAVE YOUR HIDE
WEAR PROTECTIVE CLOTHING

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USE PERIMETER WARNINGS

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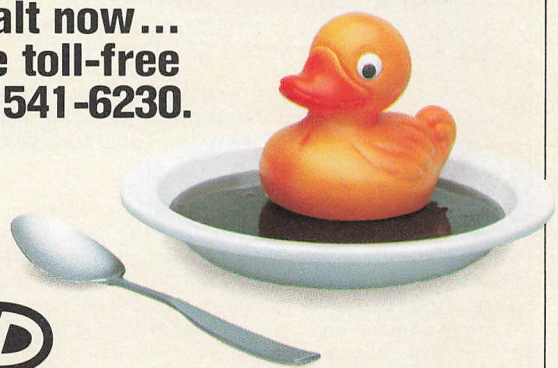

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Classified Ads

Place a classified ad in *Roofing Spec* for 50 cents per word. There is a minimum charge of $20. Boxed or display advertisements are available in the classified section for $40 per inch (one inch minimum). Ads using blind boxes available at no additional charge to NRCA members; non-members add $10 to total order. Send ad copy and payment to: Advertising Manager, *Roofing Spec,* 8600 Bryn Mawr Ave., Chicago, Ill., 60631.

SALES REPRESENTATIVES/DISTRIBUTORS

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ROOFING SALESMAN

Southern California Roofing Co., located in Los Angeles County, established in 1926, is in need of a roofing salesman thoroughly experienced and successful in commercial, industrial and public works reroofing sales. Only energetic, self-starters who are interested in a profitable and successful future through hard work should apply. Please send resume to: Harold R. Provin, C.E.O., Southern California Roofing Co., 9623 Imperial Highway, P.O. Box 158, Downey, Calif. 90241, 213/803-5583.

NORTHERN INDIANA ROOFING CONTRACTOR

Profitable business; over 25 years of experience with excellent reputation in industrial/residential markets; projected 1984 sales: $350,000; excellent growth potential. Contact: Business Resource Network 219/234-4045.

ROOF CORE

Roof Core Sampler "C.R.R.E.L." type 1-7/8-in. core, hardened steel jaws, compact weight less than 6 pounds. $135 plus $8 shipping and handling. For details contact Autrey Steel & Machine, P.O. Box 40304, Tucson, Ariz. 85717. Phone 602/623-3444.

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Successful roofing contractor wants to communicate only with the best in the business. Candidates must have a very successful experience in industrial and commerical reroofing sales. Opportunities available on West Coast that are unique and lucrative. Send work history and objectives to Speranza Management Consultants Co., 12 Johns Canyon Road, Rolling Hills, Calif. 90274.

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Wish to hire individual as branch manager for large Arizona contractor. Must have roofing and strong business or marketing experience. Applicant must be willing to relocate to sunny Tucson, Ariz. Good salary, incentive comp plan, auto and company benefits. Send resume or call Universal Roofers, P.O. Box 20627, Phoenix, Ariz. 85036.

COMMERCIAL/INDUSTRIAL SALESPERSON WANTED

Wish to hire experienced commercial/industrial reroofing salesman. Applicants must be willing to relocate to sunny Arizona. Good salary, auto and company benefits furnished. Send resumes or call Universal Roofers, P.O. Box 20627, Phoenix, Ariz. 85036.

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Roofing superintendent for architectural and roofing consulting firm. Minimum 10 years field and technical experience. Ex-rep or retired contractor considered. C.B. Goldsmith & Associates, 13303 US Highway 19 S., Clearwater, Fla. 33546, 813/536-0456.

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Growing fifty-year-old firm need experienced estimator for new construction and reroofing. Should have five years experience and be able to sell owners, architects and contractors. Excellent starting salary and benefits for full time position. Send resume to Empire Roofing and Insulation Company, P.O. Box 480, Tulsa, Okla. 74101, an equal opportunity employer.

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We have an opening for a top level executive to take full responsibility for the day-to-day management of our roofing production, sheet metal production and warehousing operations.

Responsibilities include:

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- Supervision of two (2) warehouse superintendents
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Job requirements: ■ Ten (10) years experience in the commercial roofing contracting business

- willingness to accept major responsibility and handle day-to-day management ■ college degree preferable but not required
- ability to motivate subordinates and coordinate with other managers within the company ■ ability to set and meet goals and budgets

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Please contact: **Michael D. Beldon**
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San Antonio, Texas 78213 512/341-3106

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Reputable roofing manufacturer interested in competent dealer-installer for a superior, reinforced, thermo-plastic, UL/FM-approved single-ply roofing system. Send company history, etc. to Dan Hayes, Technical Services Director **Bond Cote Systems,** 38 Third St., Pulaski, Va. 24301.

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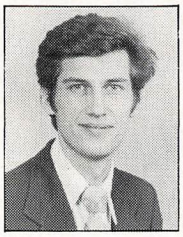

TECH TALK

by Bob LaCosse, CAE, director of Technical Services
and Jeff Lowinski, manager of Technical Services

Single-ply manual

The NRCA Single-Ply Committee met in May to complete the first rough draft of the revised *NRCA Roofing & Waterproofing Manual.* The *Manual* will integrate single-ply roofing information into the existing built-up roofing sections. The Committee intends to meet its mid-June target for a completed *Manual* rewrite. Next steps? More rough drafts, then to the NRCA Technical Operations Committee (TOC) for final review.

EPS roof insulation

TOC also met in May to review the 140-page final draft report, *EPS for Use in the Built-Up and Single-Ply Roofing Systems,* prepared by Rene Dupuis, Structural Research, Inc. The Society of Plastics Industry's Block Molders Group, the Midwest Roofing Contractors Association (MRCA) and NRCA sponsored the two-year study.

International single-layer committee

NRCA Research Associate Bill Cullen and Bob LaCosse will participate in the International Joint Committee on Single-Layer Roofing in Paris, France, May 28–31. Representatives from the United States, the International Union of Testing and Research Laboratories for Materials and Structures (RILEM) and the International Council of Building Research (CIB) will be present. The 1983 meeting drew attendance from 30 countries. Participants will review the state-of-the-art of single-layer roofing, try to establish single-ply criteria and possibly end up with international standards for single-ply products.

FM–29

A joint meeting between NRCA, MRCA and Factory Mutual (FM) representatives is proposed for mid-summer on the revision of FM Data Sheet 1–29, Single-Ply Membrane Roof Systems. "We're not happy with it," LaCosse says. Lowinski explains: "Some single-ply systems that should be mentioned (in the document) weren't. Also, there is too much detail in certain sections and not enough detail in other sections."

ASTM

The Association for Testing and Materials (ASTM) is continuing its work on developing single-ply standards, according to Lowinski. "None have yet to make full standard status," he says.

LaCosse and Lowinski will travel to Denver in June to work on specifications for EPDM, Modified Bitumen and PVC at the ASTM D-8 Roofing, Waterproofing & Bituminous Materials meeting.

Rubber manufacturers

The Rubber Manufacturers Association (RMA) has completed its work on developing EPDM and Neoprene material standards. The results will be presented to the American National Standards Institute. For more information, contact RMA at 1400 K. St., N.W., Washington, D.C. 20005; 202/682-4800.

UL relations

The TOC met with Underwriters Laboratories (UL) representatives, including UL President Jack Bono, on April 30 to update joint projects since their January session. Topics include:

1. UL product listing and classifications information:
   a. change format of *UL Building Materials* and *UL Fire Resistance* directories
   b. possible separate roofing products, materials and systems directory
2. NRCA access to current UL listing information
3. Proposed NRCA electronic network
4. Use of UL-labeled products
5. Adjunct testing:
   a. durability and performance
   b. comparability of UL requirements and ASTM standards
6. Possible cooperative lab tests
7. Possible establishment of joint NRCA/UL liaison or advisory committee

Look for a progress report in the July Tech Talk.

1985 symposium

The Second International Symposium on Roofing Technology will be held September 18–20, 1985 at the National Bureau of Standards (NBS), Gaithersburg, Md. The NRCA International Symposium Committee met in May to review 80 abstracts of submitted papers to determine which topics will be presented at the conference. Each presentation will be 20 minutes, a 10-minute synopsis and a 10-minute question-and-answer period.

Papers not selected for presentation will possibly be printed in a hardbound book for distribution at the symposium. The event is jointly sponsored by NRCA, NBS, and RILEM. Two hundred people have registered to date; 800–1,000 are expected.

Coal tar bitumen overruns

Bob First, First Roofing Co., Lima, Ohio; Koppers Co., Inc. representatives; LaCosse and Cullen conducted coal tar bitumen field tests at Koppers' Verona, Penn. research facility in May. The joint NRCA and Koppers project studied the relationship between heating and application temperatures, application viscosity and the amount of coal tar bitumen interply mopping used in the construction of built-up roofing membranes. The field tests are a follow-up to the recent tests conducted at Chicago Testing Laboratories, Northbrook, Ill. Complete test results and a report will be available in late summer or early fall.

A wrap-up of the May TOC and Executive Committee meeting action will be presented in the July Tech Talk.

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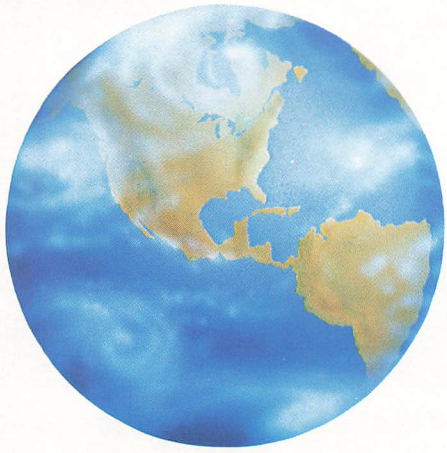

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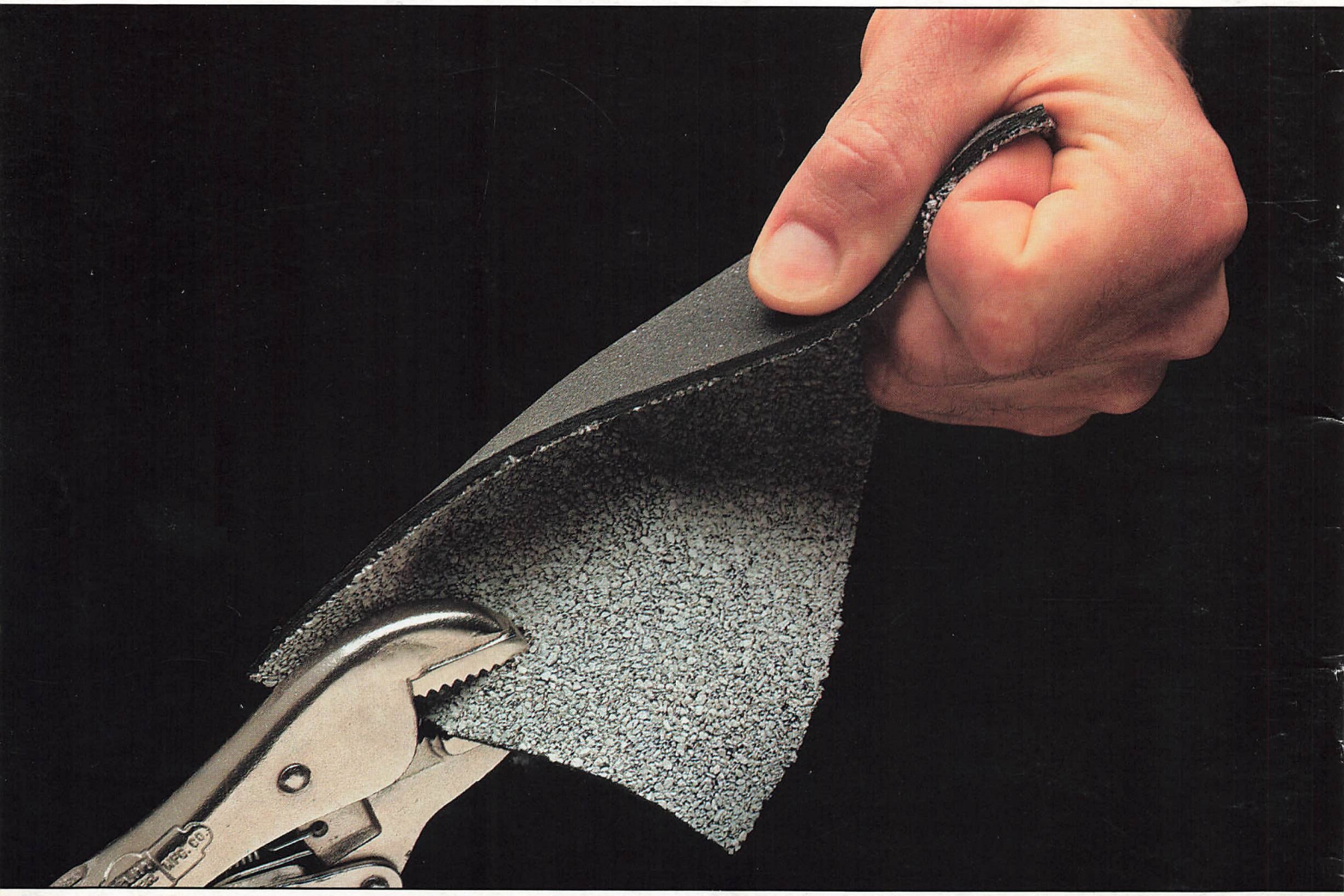

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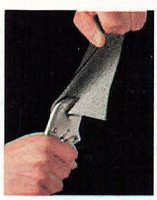
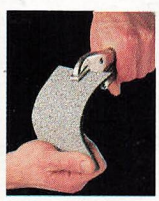


Twisting for Ambient Flex: No Failure.



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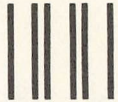

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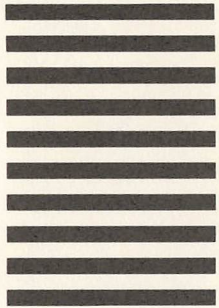

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☐ 727	American Associated Companies	15
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☐ 729	Associated Foam Manufacturers	15
☐ 730	Bilco	41
☐ 731	Boato Tecsystem	15
☐ 732	Bond Cote Systems	59
☐ 733	DuPont-Reemay	10, 11
☐ 734	Dupont-Reemay Hot	37
☐ 735	Duro Last	32
☐ 736	Evans Products Co.	55
☐ 737	Evergreen Slate Co., Inc.	32
☐ 738	Firestone Industrial Products	7
☐ 739	GAF Corporation	2–3
☐ 740	Globe Industries	24
☐ 741	Jimco Products	29
☐ 742	Kendall Company	19
☐ 743	Koppers Co., Inc.	49
☐ 744	Liquid Asphalt Systems-Crane	18
☐ 745	Liquid Asphalt Systems-Rockbuster	47
☐ 746	Liquid Asphalt Systems-Tanker	39
☐ 747	Manning Paper	22

Advertisers		Page
☐ 748	Miltech Engineering & Mfg.	14
☐ 749	MM Systems	54
☐ 750	Morgen Manufacturing Co.	13
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☐ 752	Polycoat Systems, Inc.	47
☐ 753	Red Bell	13
☐ 754	Sarnafil Inc.	53
☐ 755	Siplast	4
☐ 756	J.P. Stevens	20
☐ 757	Tamko	60
☐ 758	Tramex Electronics	57
☐ 759	Tropical Industrial Coatings	56
☐ 760	U.S. Intec	12
☐ 761	Uniroof Ltd.	48
☐ 762	NRCA/Kettles	MS III
New Products, Ideas & Publications		
☐ 174	Miltech Engineering & Mfg.	50
☐ 175	ICSD Corp.	50
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