July | August 2016

Vol. 7 | Issue 4

Roofing

THE INDUSTRY'S VOICE

Storm Stories

The Roofing Industry Protects Buildings Against Mother Nature

+ RICOWI Researches a Recent Hail Event

→ FEATURED PROJECTS

Retail

→ TECH POINT

Moisture and Concrete Roof Decks

→ BUSINESS SENSE

Building Resilience

Build something great™

Boral **Roofing**

Let your home be a statement about the **art of living.**

AMERICA'S LEADING AND LARGEST CLAY AND CONCRETE ROOF TILE MANUFACTURER

- Made in USA
- Trusted Partner Since 1962
- Ideal for Reroof or New Construction
- Superior Performance and Durability
- Extensive Range of Colors and Profiles
- Cool Roof and ENERGY STAR Rated Colors
- Boral™ Cool Roof Systems
- Industry Leading Warranties

See us in Kissimmee, Florida
SEBC 2016 Convention - Booth #927

1.800.669.TILE(8453) | www.BoralRoof.com

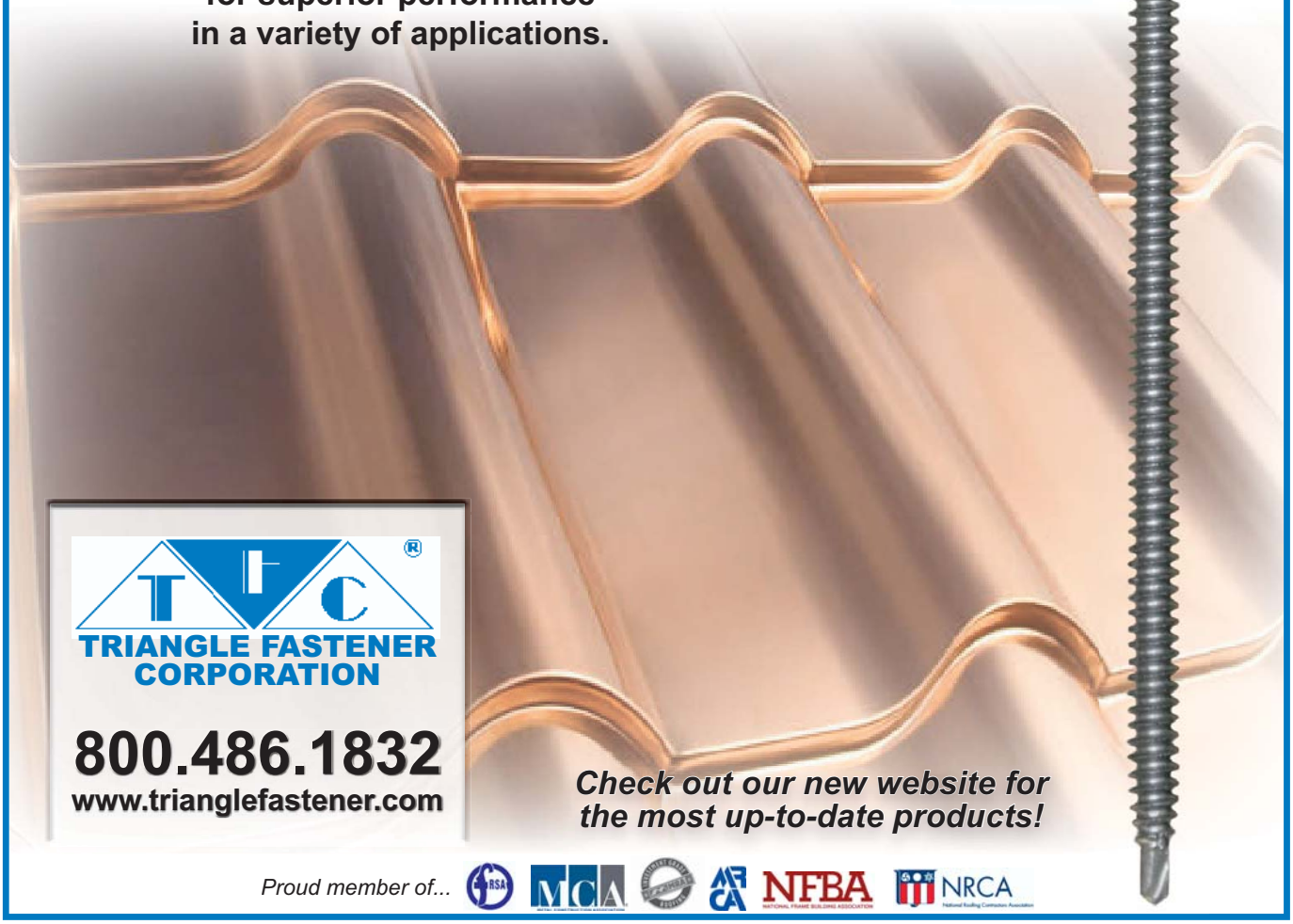
BORAL®

CONCEALOR®

PANCAKE HEAD SCREWS

THE LARGEST SELECTION IN THE INDUSTRY

Designed and engineered
for superior performance
in a variety of applications.



TRIANGLE FASTENER CORPORATION

800.486.1832

www.trianglefastener.com

Check out our new website for the most up-to-date products!

Proud member of... RSA MCA AFCA NFBA NRCA

I wouldn't trust my reputation with any other roof board

Billions of square feet of DensDeck® Roof Boards have been installed over the last 3 decades making it the only gypsum board with proven performance over the entire life span of a roof assembly.

Why trust your reputation to anything else?

DensDeck® Time-tested jobsite performance.

Build a reputation that lasts. Learn how at www.densdeck.com

METL SPAN®

INSULATED METAL PANELS

With building codes placing greater demands on wall performance, the pressure is on architects, owners, and engineers to specify wall systems that comply with evolving requirements without compromising aesthetics, business function, and budget.

Today, one manufacturer stands apart for its family of high-value, high-performance insulated metal panels (IMPs) for commercial, industrial, institutional, and cold storage wall systems. That company is Metl-Span.

Metl-Span delivers high-quality, durable, and energy-efficient solutions designed for unparalleled performance to stand the test of time.

Learn more about why many of the nation's most respected names in manufacturing rely on Metl-Span at ***metlspan.com/roofing or call 877 611 7266.***

Epilay™

ProtecTite™

ROOFING UNDERLAYMENT

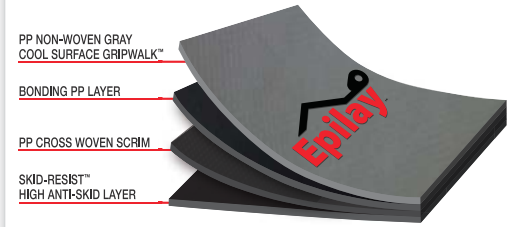
Featuring the **advanced engineering** of a mechanically-attached coated woven synthetic roofing underlayment designed for sloped roofs.

ProtecTite's™ unique design features **superior tear strength** and **light weight** that allows the contractor to easily carry rolls up & down the ladder.

Fewer laps, cuts and roll handling means you can do more jobs in less time resulting in **huge savings to the roofing contractor.**

Epilay™ Protectite™ Roofing Underlayment is a **100% synthetic composition** providing the following benefits to the roofing contractor:

EPILAY™ PROTECTITE™ 4-LAYER CONSTRUCTION



- **1 year UV protection**
- Water repellant , non-absorbent
- Strong and durable polymer construction impervious to mold growth
- Does not wrinkle , crack or become stiff in colder temperatures
- 100 % recyclable
- **W**ill not dry out or leach oil in high heat environments as saturated felts do
- Super low weight with 48" width and 250' run length means big savings in time and labor (over 30% faster to install than felt!)

Intertek
ICC-AC207 IRR#1004

CAN-CSA Approved

MIAMI-DADE COUNTY APPROVED
NOA No.: 13-1008.04

No.: FL16850

Skid-Resist™ provides less tear with a very high anti-skid bottom featuring advanced polymers.

GripWalk™ high traction top surface reduces heat and retains its non-slippery properties even with moisture on the surface.

Epilay™ ProtecTite™ specific product features:

ProtecTite™ SUPERIOR

- Specifically manufactured to replace the 15# felt
- **7 mil thickness -** a 10 square roll weighs only 23 lbs!
- **Works best for use under Asphalt shingles**
- 5 times lighter and 25 times stronger than 15# felt
- **15 year limited warranty**

ProtecTite™ ULTRA

- Specifically manufactured to replace the 30# felt
- **11 mil thickness -** a10 square roll weighs only 29 lbs!
- **Works best for use under Metal, Shake and Asphalt shingles**
- 10 times lighter and 25 times stronger than 30# felt
- **30 Year limited warranty**

ProtecTite™ PLATINUM

- Specifically manufactured to replace the 30# felt
- **17 mil thickness -** a10 square roll weighs only 37 lbs!
- **Works best for use under Metal, Shake, Asphalt , Concrete, and Slate shingles**
- 8 times lighter and 35 times stronger than 30# felt
- **40 year limited warranty**

Epilay™

For more information visit our website at www.epilay.com or Contact our Marketing Dept. at (800) 292-6728 or sales@epilay.com.

Looking for Reps Nationwide

Member of: SRUI Synthetic Roof Underlayment Institute

contents

JULY . AUGUST 2016 | VOL. 7 NO. 4

Roofing
RoofingMagazine.com

VOL. 7, NO. 4 is published bimonthly by HRT Publishing LLC, 4711 Hope Valley Road, Box 202, Durham, NC 27707. Telephone (919) 593-5318. POSTMASTER: Send address changes to *Roofing*, 4711 Hope Valley Road, Box 202, Durham, NC 27707. *Roofing* is published six times per year: January/February, March/April, May/June, July/August, September/October and November/December. The magazine is written for the building professional concerned with the design, specification and application of roofing. Issues with bonus distribution at national, regional, state and local roofing and construction conventions and trade shows occur regularly throughout the year.

contents

JULY . AUGUST 2016 | VOL. 7 NO. 4

COLUMNS

DEPARTMENTS

ONLINE

Polymer Roofing Stands Up to Wichita, Kan., Weather

The morning of April 2, 2015, started out clear and sunny for residents at the Harbor Isle community in Wichita, Kan. By evening, a powerful microburst with winds reaching up to 100 mph destroyed a bulk of the roofs in the subdivision—except polymer roofs installed by Heiland Roofing and Exteriors, Wichita.

RoofingMagazine.com/microburst-polymer-roofing

Historic Home Receives Shingle Roof System after Devastating Storm

In spring 2011, a devastating storm brought heavy winds, torrential rain, baseball-sized hail and an unforgiving tornado to Centerville, Ohio. Sitting directly in the path of destruction was one of the oldest homes in town, which suffered significant damage. Thrush & Son LLC, Brookville, Ohio, installed a new shingle roof system that has weathered storms since.

RoofingMagazine.com/storm-shingle-roofing

THIS ISSUE IS INTERACTIVE!
Download the free Layar Augmented Reality app. (The QR code will help you find the app.) Then, hover over pages 28 and 43 with a smartphone or tablet and watch a video that brings the content to life.

layar INTERACTIVE PRINT

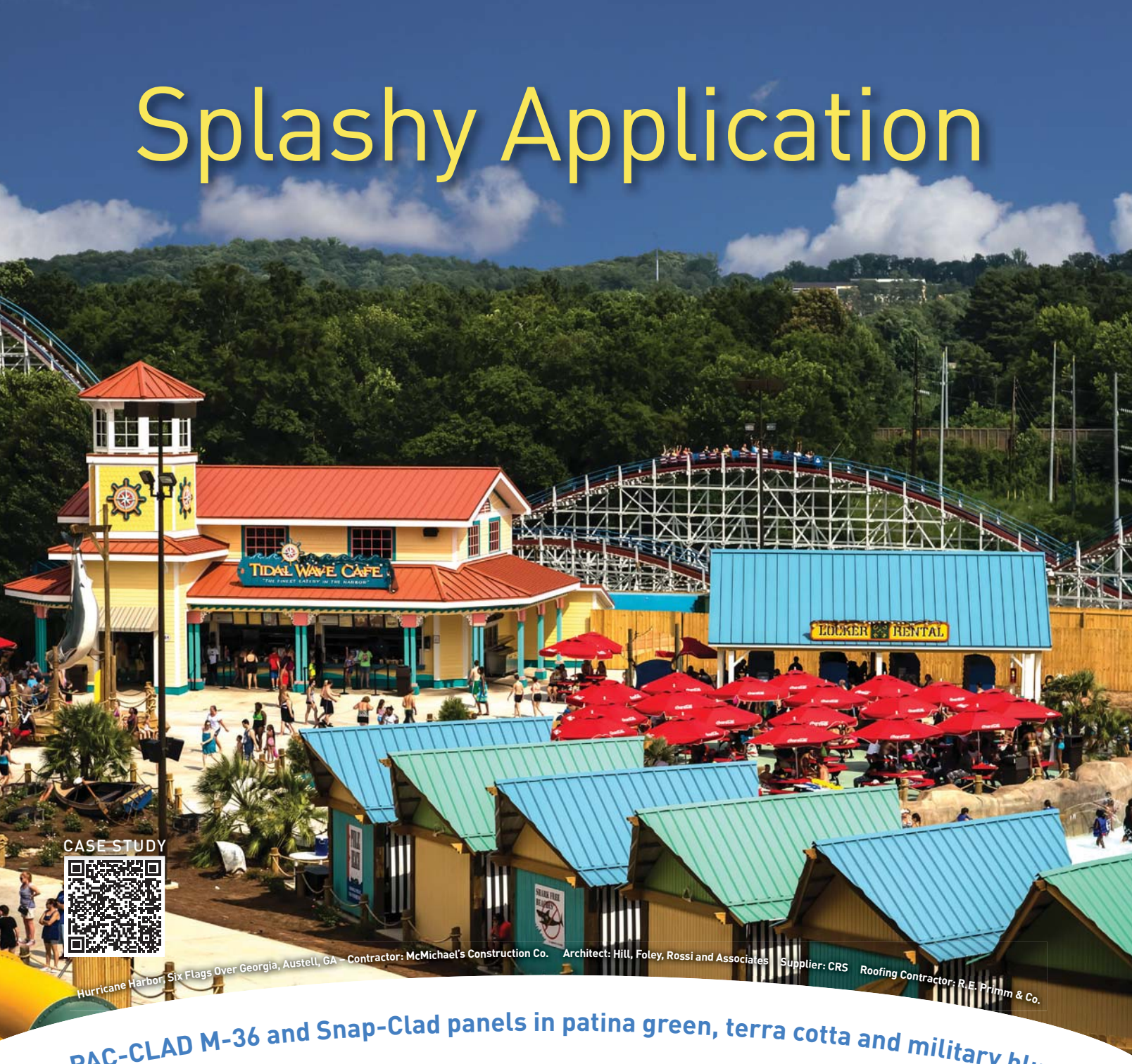
Download the free Layar App

Scan this page

Discover interactive content

ON THE COVER:
Mother Nature's power

Splashy Application



CASE STUDY

Hurricane Harbor, Six Flags Over Georgia, Austell, GA – Contractor: McMichael's Construction Co. Architect: Hill, Foley, Rossi and Associates Supplier: CRS Roofing Contractor: R.E. Primm & Co.

PAC-CLAD M-36 and Snap-Clad panels in patina green, terra cotta and military blue

"All the roofs look beautiful, and are the shining crown for the Hurricane Harbor water park at Six Flags Over Georgia."

– Rick Primm, R.E. Primm & Company

Six Flags Over Georgia's new Hurricane Harbor water park near Atlanta features 22 buildings covered with Petersen PAC-CLAD .032 aluminum standing seam and exposed fastener roofing panels.

Multiple roof colors were selected to complement the park's island theme, making for a bright and stimulating environment. Most of the PAC-CLAD 38 colors meet LEED, ENERGY STAR, and cool roof certification.

PACGREENINFO.COM
YOUR GREEN METAL RESOURCE

PAC-CLAD
PETERSEN

PAC-CLAD.COM | IL: 1 800 PAC CLAD | MD: 1 800 344 1400 | TX: 1 800 441 8661 | GA: 1 800 272 4482 | MN: 1 877 571 2025

CIRCLE NO. 6 / RoofingMagazine.com

WHERE INNOVATION AND EXPERTISE WORK FOR YOU™

ROOFING • WATERPROOFING • WALL SYSTEMS • CIVIL ENGINEERING

SOPREMA offers a comprehensive line of roofing, waterproofing, wall protection and civil engineering solutions combining superior products and systems with decades of proven performance. Our solutions include industry leading SBS-modified bitumen membranes, polymeric PMMA/PMA liquid applied membranes and synthetic single ply PVC membranes. For applications as diverse as roofing, below grade waterproofing, plaza deck and balcony waterproofing, air and vapor barriers and bridge and parking structures, SOPREMA has the solution. SOPREMA's relentless pursuit of technological advancement, sustainability and product quality has been known and respected around the world for over 100 years.

SOPREMA®

SOPREMA.US 1.800.356.3521 SOPREMA.CA 1.877.MAMMOUTH

UNSURPASSED ONSITE ROLL FORMING COMES TO YOU

Advanced design means more time forming panels, not adjusting the machine.
Backed by a company in business since 1936, dedicated to quality and service.

Discover for yourself why Zimmerman is the best.

Zimmerman Metals Inc.

1-800-247-4202 | zimmerman-metals.com

MADE IN THE USA

WRITTEN BY **CHRISTINA KOCH**

Stormy Weather

I used to love storms. I was never one to cower at the sound of thunder. I often found storms a good excuse to turn off the TV and lights, open the blinds and marvel at the sheer power of nature. If you read my January/February "Raise the Roof", page 12, or RoofingMagazine.com/water-is-constructions-worst-enemy, however, you know I have had a love-hate relationship with rain since moving in with my husband (we married in August 2015). I found myself awake on rainy nights, counting the seconds between pumps of our sump pump. If less than 20 seconds passed, I knew the basement was flooding and dreaded the morning's cleanup. (I work from home and my office is in the basement.)

In March, a waterproofing company spent two days installing its patented drainage system and a new sump pump inside our basement. We monitored the system throughout the month of April, which was rainy, to ensure there were no leaks in the system. It worked like a charm! During April, we also hired contractors to create my new home office, a guestroom and walk-in closet within the basement. So far, we have new windows, lighting and insulation; the contractors are finishing up drywall and ceiling installation as I type.

I know what it's like when you can't trust your house to weather a storm. There's nothing worse than feeling powerless, and seeing your belongings destroyed is gut-wrenching. As the nation braces against another summer of intense weather, it's comforting to know the construction industry—specifically roofing—is researching and innovating to protect people's homes and businesses from Mother Nature's wrath.

For example, in "Business Sense", Jared O. Blum, president of the Washington, D.C.-based Polyisocyanurate Insulation Manufacturers Association, writes about initiatives to improve the resiliency of our building stock and infrastructure through codes, standards and proactive design. Read his insight on page 30.

The Clinton, Ohio-based Roofing Industry Committee on Weather Issues Inc., better known as RICOWI, recently sent 30 researchers to the Dallas/Fort Worth metroplex after an April hailstorm. According to Joan Cook, RICOWI's executive director, the 10 teams of three inspected 3 million square feet of low and steep-slope roofing during the investigation. The teams' findings will result in a report to help the industry better understand what causes roofs to perform or fail in severe hail events, leading to overall improvements in roof system durability. Learn how RICOWI mobilizes and studies roofs in "Special Report", page 50.

There are many other stories within this issue about roof systems working alongside other building components to create durable, sustainable and energy-efficient buildings. Humans have a long history of innovating and evolving to meet the needs of their current situation. I have no doubt that in my lifetime our buildings will be built to withstand nearly any catastrophic event. Meanwhile, I'm happy to report we received 4 1/2 inches of rain in three hours last week and our basement remained bone dry. Thanks to innovations in basement waterproofing, I may start to enjoy storms just a bit again!

Find us on

Roofing

JULY . AUGUST 2016
VOL. 7 NO. 4

Roofing welcomes letters to the editor. Letters must be signed and include a return address/email and telephone number. *Roofing* reserves the right to edit letters for clarity and length. Send letters to Christina@RoofingMagazine.com.

If you enjoyed reading this issue, please consider submitting something for the next one. Let's talk about ideas!

Call me at (630) 308-4602; email me at Christina@RoofingMagazine.com; post a comment on our website; and/or Facebook and tweet us. This magazine—and your peers—are counting on you!

Stickitivity

/stikə ´tivitē/

noun

1. To stick with tools and products for best results
2. To have staying power
3. **Polyglass ADESO® self-adhered roof membranes**

ADESO®

SELF-ADHESIVE TECHNOLOGY

Innovative Technology Engineered to Perform

Revolutionary Self-Adhered Dual Compound APP or SBS Roof Membranes provide superior protection for low-slope installations with a long-lasting weathering surface, reinforced compound and an aggressive self-adhered bottom layer.

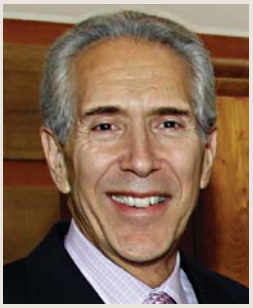
ROOFING AND WATERPROOFING SYSTEMS

POLYGLASS

MAPEI GROUP

Polyglass Intelligent Roof Systems www.polyglass.us

CONTRIBUTORS



Jared Blum is president of the Polyisocyanurate Insulation Manufacturers Association, Washington, D.C. Blum keeps an eye on the codes and standards affecting the industry and, as such, writes about initiatives that are seeking to reduce long-term costs and limit disruptions of extreme events. Read about Blum's findings in "Business Sense", page 30.

Louisa Hart is the communications director for the EPDM Roofing Association, Washington, D.C. In "Special Report", page 44, she writes that EPDM installed on the Denver International Airport after a hailstorm 15 years ago still endures.

Joan Cook is executive director of the Roofing Industry Committee on Weather Issues Inc., Clinton, Ohio. RICOWI recently mobilized 30 volunteers to research hail damage on low- and steep-slope roofs in the Dallas/Fort Worth metroplex. Read about RICOWI's work in "Special Report", page 50.

Michael Chusid, RA, FCSI, spent his youth playing outdoors during thunderstorms. He had the good fortune to survive and is now certified by the Winsted, Conn.-based Lightning Safety Alliance Corp. to present continuing-education programs about lightning protection. Consequently, Chusid writes about the basics of lightning protection in "Special Report", page 54.

David F. Cook is the principal architect for the Structural & Architectural Evaluation Group for CTLGroup, Skokie, Ill. He has more than 30 years' architectural experience in commercial and residential construction, project design, structural evaluation and project management. Cook shares his expertise in "Tech Point", page 58, writing about the troublesome combination of moisture and concrete roof decks.

Rick Duncan, Ph.D., P.E., is the technical director of the Fairfax, Va.-based Spray Polyurethane Foam Alliance, which promotes best practices in the installation of spray foam and offers a Professional Certification Program to all involved in the installation of the product. Duncan discusses the nuances of using SPF with photovoltaics in "Environmental Trends", page 68.

Matthew Hirsch is principal at Hirsch Media Services, a Berkeley, Calif.-based business communications firm with deep roots in the energy industry. Hirsch's interest in energy is demonstrated in "Residential", page 72, in which he writes about a more durable and energy-efficient home built on the site of a house destroyed by Hurricane Sandy.

Rick Cunningham is president of Baldwin Park, Calif.-based Highland Commercial Roofing. He is a member of RCI Inc. and, as such, takes special interest in waterproofing. In "On My Mind", page 76, he writes about why self-flashing skylights installed predominantly in the 1980s are beginning to leak.

Michael J. Dudek is an authorized OSHA outreach instructor with extensive experience in general industry and construction. Inspired by national news headlines, he addresses drug addiction and helps you recognize whether your employees and colleagues have dependencies to popular drugs in "Safety", page 78.

ROYAL
ADHESIVES & SEALANTS

Innovative Designer and Manufacturer of Adhesives, Sealants and Tapes for the Commercial Roofing Industry





Innovation: Advanced adhesives, sealing systems and tapes

Speed: Patented adhesive applicators for fast installation

Green: Essentially VOC free adhesives from rapidly renewable materials

Safety: Unique products that improve jobsite safety

Tel: 1-800-248-4010
www.royaladhesives.com

MIAMI-DADE COUNTY APPROVED NOA: 12-1107.06
SPRI Single Ply Roofing Industry MEMBER
National Roofing Contractors Association MEMBER
Classified UL US
FM APPROVED
SPRA Associate Member

1/16

RCI Announces Speakers for October Building Envelope Technology Symposium

Raleigh, N.C.-based RCI Inc. has assembled a panel of expert speakers to discuss methods for designing sound building exteriors. More than 300 building designers and construction professionals are expected to be in attendance at the association's annual Building Envelope Technology Symposium, which will be held Oct. 17-18 at the Westin Galleria Houston, Texas.

The program features 12 educational sessions presented by leading building envelope designers. Speakers offer their experience-based insight for specification of sound, durable exterior envelopes. Most programs focus on repair and/or sustainable design methods for strengthening and improving existing structures.

Attendees can earn up to 12 continuing-education credits from RCI and the American Institute of Architects, Washington, D.C. An evening reception after the close of the first day's meeting will allow those in attendance to network and mingle with fellow professionals.

This year's topics and speakers include:

The Performance of Weather-Resistant Barriers in Stucco Assemblies
Karim P. Allana, RRC, RWC, P.E. | Allana Buick & Bers Inc., Palo Alto, Calif.

Aluminum Windowsill Anchors and Supplemental Waterproof Flashing Design Practices
Rocco Romero, AIA | Wiss, Janney, Elstner Associates Inc., Seattle

The Ideal Third-party Warranty: A Risk-managed Approach
Lorne Ricketts, P.Eng. | RDH Building Science Inc., Vancouver

Playing Against a Stacked Deck: Restoration of a Stone Fin Façade
Matthew C. Farmer, P.E. | Wiss, Janney, Elstner Associates, Fairfax, Va.

Everyone Loves a Pool, But What's Lurking Beneath the Surface?
Rob Holmer, P.E., GE | Terracon Consulting Engineers, Sacramento, Calif.
Michael Phifer | Terracon Consulting Engineers, Sacramento

Design Principles for Tower and Steeple Restoration
Robert L. Fulmer | Fulmer Associates Building Exterior Consultants LLC, North Conway, N.H.

When the Numbers Don't Work: Engineering Judgement Tips for Historical Buildings
Rachel L. Will, P.E. | Wiss, Janney, Elstner Associates, Chicago
Edward A. Gerns, RA, LEED AP | Wiss, Janney, Elstner Associates, Chicago

Air Barrier Integration: Don't Entangle Yourself with These Common Pitfalls
Timothy A. Mills, P.E., LEED AP, CIT | TAM Consultants Inc., Williamsburg, Va.

Upgrading the Performance of Heritage Windows to Suit Modern Design Conditions
Scott Tomlinson, P.Eng. | Morrison Hershfield, Ottawa, Ontario, Canada

Design Considerations for Renewing Podium Waterproofing
Bereket Alazar, RRO, LEED AP BD+C | Morrison Hershfield, Edmonton, Alberta, Canada
Stéphane P. Hoffman, P.E. | Morrison Hershfield, Seattle

Fully Soldered Metal Roofing: More Complicated Than You Think
Nicholas T. Floyd, P.E., LEED AP | Simpson Gumpertz & Heger Inc., Waltham, Mass.

A Case History of ETFE on Today's Projects
Lee Durston | Morrison Hershfield, St. Paul, Minn.
Shawn Robinson | Morrison Hershfield, Atlanta

For more information, visit RCI-Online.org, or call (800) 828-1902.

IBHS PARTICIPATES IN WHITE HOUSE CONFERENCE ON RESILIENT BUILDING CODES

The recent White House Conference on Resilient Building Codes emphasized the critical role of building codes in helping create more resilient communities and highlighted the importance of strong construction standards, such as those in the Tampa, Fla.-based Insurance Institute for Business & Home Safety's (IBHS') FORTIFIED programs.

Several speakers at the White House event highlighted IBHS' FORTIFIED building standards and methods for new construction and retrofitting existing buildings.

In addition, IBHS made several commitments in conjunction with the White House event, including:

- To work closely with FEMA, the White House, other federal agencies, and several states to increase public awareness and use of FEMA P-804, "Wind Retrofit Guide for Residential Buildings", which mirrors technical knowledge underpinning the IBHS FORTIFIED Home-Hurricane standard.
- To work with partners in 2016 to integrate IBHS guidance for enhancing resilience of commercial properties into federal, state and private initiatives.
- To work with the National Institute of Building Sciences, Washington, and other allies to provide funding and unique engineering expertise so studies providing essential proof points about the value of loss mitigation are completed expeditiously. NIBS' Multihazard Mitigation Council's 2005 "Mitigation Saves" report found that every $1 invested in mitigation by FEMA saves society $4. The new report will be an enhanced study to identify the benefits of public and private investment in property loss mitigation.

Learn more at DisasterSafety.org.


GSSI
SEALANTS
PREMIER BUTYL SEALANT TAPES
A LASTING DEFENSE
FOR OVER 30 YEARS, MANUFACTURERS AROUND THE WORLD HAVE ENTRUSTED THEIR BUILDINGS' MOISTURE DEFENSE TO THE MOST RELIABLE BUTYL SEALANT ON THE MARKET, MB10A BUTYL TAPE.
30 YEARS
800.288.9489
GSSISEALANTS.COM

The Rosemont, Ill.-based National Roofing Contractors Association represents all segments of the roofing industry, including contractors; manufacturers; distributors; architects; consultants; engineers; building owners; and city, state and government agencies. NRCA's mission is to inform and assist the roofing industry, act as its principal advocate and help members in serving their customers. For information about NRCA and its services and offerings, visit NRCA.net.

NRCA Believes FAA Rules on Drones Will Benefit the Roofing Industry

The following statement was made by William A. Good, CAE, NRCA's CEO:

"The National Roofing Contractors Association believes the new rules issued by the Federal Aviation Administration on the commercial use of unmanned aircraft systems [UAS], commonly referred to as drones, will provide significant new opportunities for the use of such aircraft in the roofing industry.

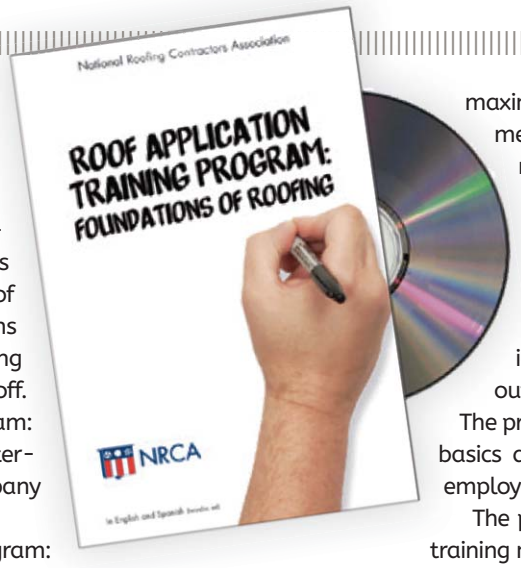
"The new rule, which goes into effect in late August, will allow people with a 'remote pilot in command' certification to operate drones for commercial and educational purposes, provided the drones weigh less than 55 pounds, do not exceed 100-mph groundspeed and don't fly more than 400-feet above ground level.

"NRCA believes the final rule is a reasonable one and is especially pleased the FAA listened to some of the concerns NRCA expressed during the rulemaking process.

"The FAA rule contains a provision for waivers to some of its rules that, for example, should allow drones to be flown at night in situations where they don't pose any danger.

"NRCA believes drone use can be of enormous benefit to the roofing industry over time. Drones can be used to evaluate existing roofs, help prepare estimates for new roofs, conduct thermal imaging and even measure reflectivity performance. And the use of drones will mean fewer people will need to be exposed to rooftop hazards to conduct routine inspections."

For more information on the rule, contact Harry Dietz, NRCA's director of enterprise risk management, at hdietz@nrca.net.



NRCA's Roof Application Training Program Package can help you train your employees in-house at your convenience regarding the basics of low- and steep-slope roofing, as well as roofing equipment and setup and tear-off procedures and techniques. The package includes Roof Application Training Program: Foundations of Roofing and Roof Application Training Program: Equipment, Setup and Tear-off. Roof Application Training Program: Foundations of Roofing includes roofing terminology, roof system components, company operations and roof safety.

Roof Application Training Program: Equipment, Setup and Tear-off offers information about safe and efficient roofing project setup and tear-off procedures and techniques; guidelines for setting up jobs for maximum efficiency; and tools and equipment used for low- and steep-slope roofing work, specifically for job setup and tear-off.

The DVD-based programs provide all the necessary tools to conduct effective training for your employees, including two-part DVD programs; instructors' guides; and student handouts and exams, among other resources. The programs help new employees learn the basics and facilitate discussion with existing employees.

The programs include English and Spanish training materials.

You can save by purchasing the package, which is $325 for members and $650 for nonmembers. Programs also can be purchased separately. For more information, visit bit.ly/29zZlnl.

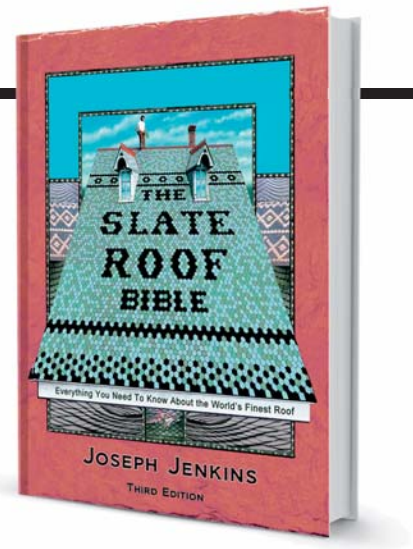
SURE. BECAUSE IT'S SURENAIL®.

Compared to standard shingles, patented SureNail® Technology provides you with 2x the bond strength, and up to double the common bond in the nail area. With SureNail® Technology, strength and durability are built into every Duration® Series shingle. The SureNail® strip, a tough-engineered woven fabric strip in the nailing area, provides an easy-to-see target nailing area for a fast, reliable, quality installation. The heritage of the Owens Corning® brand means you can be sure with SureNail® Technology. **See the strip, trust the grip.** To learn more, visit www.owenscorning.com/surenailtechnology.

SureNail®
Only on Owens Corning® shingles.

OWENS CORNING®

TECHTOOLS



Joseph Jenkins has published the third edition of *The Slate Roof Bible*. The 374-page, full-color, hardcover book includes almost 900 illustrations relating to almost every facet of slate roofs. The 21 chapters cover the history of slate, the regions in the U.S. where slate originates, and how stone roof shingles are quarried and fabricated. There are chapters dedicated to safely working on slate roofs, tools, installation, and repairing and restoring slate roofs. Additional chapters include slate roof inscriptions and designs, recycling slate roofs, international slate, flashings, chimneys, valleys, slate siding, and box gutters and snow guards. Purchase the book at Amazon.com and SlateRoofWarehouse.com.

The Asphalt Roofing Manufacturers Association has updated its technical manual *Good Application Makes a Good Roof Better – A Simplified Guide*. The 38-page manual outlines installation methods for laminated asphalt shingles and is now available as a print-on-demand book and an eBook. Updates include the latest industry best practices to instruct the roofing professional and DIY enthusiast about installation methods that help to maximize shingle life and weather protection. Readers will be able to purchase and access the eBook instantly from any e-reader device and can customize their reading experience by adjusting font sizes, zooming in on images and diagrams, and bookmarking key chapters. For more information or to purchase the guide, visit AsphaltRoofing.org.

Boral Roofing LLC has launched its "Color Guide for Lightweight Concrete Roof Tile Collections". The guide provides a "recipe book" for homeowners looking to remodel, including inspirational color harmonies for three dominant architectural styles—traditional, transitional and contemporary. The guide simplifies complex color decisions through three easy-to-use starting points: roof aesthetics, siding colors and architectural styles. For additional information, visit BoralRoof.com.

Union Corrugating's "Drip Edge and Flashing Catalog" is a comprehensive look at the products the company offers to protect asphalt roofs against water infiltration. Union Corrugating's large selection of drip edges, roll flashing, step flashing and other components are available in various colors and materials, including aluminum, steel, vinyl, copper and lead. The catalog provides information about sizes, colors and more. Ask a Union Corrugating sales representative for a copy of the catalog or download it from the company's website, UnionCorrugating.com, under the Literature section.

EVENTS

View more industry events online at RoofingMagazine.com/events. If you have an event to share, email it to Christina@RoofingMagazine.com.

JULY

18-21
INTERNATIONAL ROOF COATINGS CONFERENCE
Philadelphia
Roof Coatings Manufacturers Association
RoofCoatings.org

AUGUST

17-20
NAWIC 61ST ANNUAL MEETING & EDUCATION CONFERENCE
San Antonio
National Association of Women in Construction
NAWIC.org/nawic/Trade_Show.asp

SEPTEMBER

9-10
CONSTRUCT
Austin, Texas
Informa Exhibitions
ConstructShow.com

12-15
SOLARPOWER INTERNATIONAL
Las Vegas
Solar Energy Industries Association and Smart Electric Power Alliance
SolarPowerInternational.com

26-28
ALUMINUM ASSOCIATION ANNUAL MEETING
Washington, D.C.
Aluminum Association
Aluminum.org

26-28
NCCA FALL TECHNICAL MEETING
Indianapolis
National Coil Coating Association
CoilCoating.org

28-Oct. 1
ICAA ANNUAL CONVENTION AND TRADE SHOW
Denver
Insulation Contractors Association of America
Insulate.org/Convention

OCTOBER

5-6
GREENBUILD EXPO
Los Angeles
U.S. Green Building Council
GreenbuildExpo.com

10-12
RCMA FALL MEETING
Denver
Roofing Coatings Manufacturers Association
RoofCoatings.org

12-14
RCAT 41ST ANNUAL CONFERENCE & TRADE SHOW
Grapevine, Texas
Roofing Contractors Association of Texas
RoofingContractors-Texas.com

16-19
SMACNA 73RD ANNUAL CONVENTION
Phoenix
Sheet Metal & Air Conditioning Contractors' National Association
SMACNA.org/AnnualConvention

17-18
BUILDING ENVELOPE TECHNOLOGY SYMPOSIUM
Houston
RCI
RCI-online.org

17-19
FALL CONVENTION & EXPO
Indianapolis
The Adhesive and Sealant Council
ASCouncil.org

26-28
METALCON INTERNATIONAL
Baltimore
Metal Construction Association and PSMJ Resources
METALCON.com

31-Nov. 2
MRCA 2016 CON EXPO
Columbus, Ohio
Midwest Roofing Contractors Association
MRCA.org

TITANIUM®

SYNTHETIC ROOFING UNDERLAYMENT

TITANIUM®
LIFETIME
LIMITED
WARRANTY

Sure-Foot® patented unmatched walkability

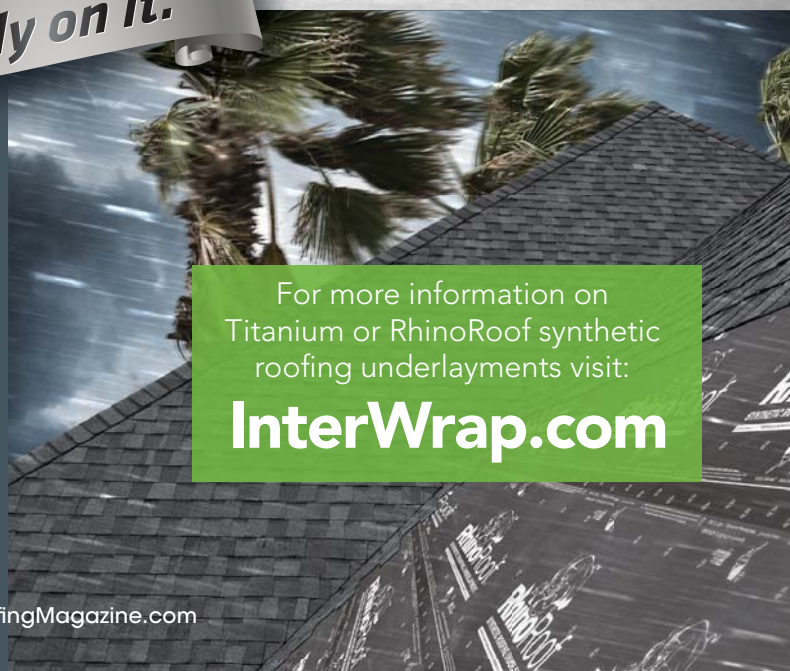
Titanium® is the difference between a synthetic roofing underlayment that "Does the job" and one that "Does it right". Choose wisely.

RMI_APR2016

Roofers rely on it.™

The Original RhinoRoof®
SYNTHETIC ROOFING UNDERLAYMENT

The industry's leading #15 felt replacement! Ask for it at your local roofing distributor or lumber yard today!



For more information on Titanium or RhinoRoof synthetic roofing underlayments visit:

InterWrap.com

MATERIALS & GADGETS

Coating Comes with List of Ingredients

Fluropon Pure is Valspar's newest addition to its Fluropon 70 percent PVDF family of coil and extrusion coatings. Formulated with material transparency in mind, Fluropon Pure does not include hexavalent chromium, lead, phthalates and PFOA, allowing the product to meet Living Building Challenge's Red List 3.0-Compliant requirement. Fluropon Pure delivers the same capabilities of Valspar's original Fluropon line, including cool roof formulations. Additionally, the coating is trusted to protect buildings against harsh outdoor elements, including humidity and corrosion, dirt, stains and chemicals.

ValsparCoilExtrusion.com | Circle No. 16

Zinc Head Screws Resist Corrosion

Triangle Fastener Corp. has launched a complete line of corrosion-resistant zinc head screws. Available on the high-performance BLAZER Drill Screws, these fasteners are preferred for use in many warranted roof systems. The ZAMAC-5 Zinc Alloy Head provides superior strength and will not red rust. The carbon steel shank is TRI-SEAL 1,000-hours salt-spray-coated, which increases the corrosion resistance by more than 20 times compared to zinc-plated screws. An EPDM washer seals and weathers. Sizes include #12 and 1/4-inch diameters in BLAZER-3 and BLAZER-5 drill points in lengths up to 4 inches.

TriangleFastener.com | Circle No. 17

SPF Locks a Roof into Place

Lapolla Industries Inc. has made available FOAM-LOK 2800-4G Spray Polyurethane Foam for roofing. The fourth-generation SPF eliminates ozone depletion potential and reduces global warming potential. The rigid, closed-cell SPF may be applied over most new or retrofit roofing substrates. FOAM-LOK locks every portion of the roof into place, creating a monolithic membrane and eliminating the need for mechanical fasteners. The product seals the envelope, which minimizes the escape of conditioned air and dramatically reduces the structure's energy consumption for heating and cooling, in turn reducing energy costs over the life of the roof. The low-maintenance material also resists wind uplift and acts as a waterproofing solution.

Lappolla.com | Circle No. 18

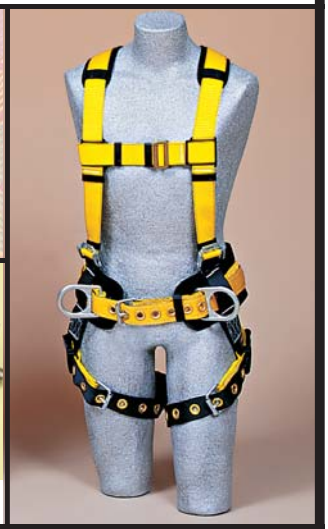
High-profile Shingles Are Durable

Malarkey Roofing Products has released its Legacy XL and Windsor XL high-profile shingles. The heavyweight shingles offer a more pronounced design on the roof while maintaining the fortified durability of their original shingle lines. The Legacy XL high-profile design utilizes durable SBS polymer modified asphalt, now known as Flexor, to promote granule adhesion and Class 4 impact resistance, as well as Scotchgard Protector from 3M for added protection against black streaks caused by algae. The Windsor XL features durable Flexor polymer-modified asphalt to promote granule adhesion and Class 4 impact resistance, as well as 3M Scotchgard Protector for protection against black streaks caused by algae.

MalarkeyRoofing.com | Circle No. 19

DYNAMIC FASTENER

Everything for the Metal Builder & Roofer™



DYNA-CLAMPS™

DYNA-GUARD™

FREE 132 Page Full Color Tool & Fastener Hand Guide provides prices, engineering data & details product offering.

DYNAMIC FASTENER is specifically geared to handle the needs of the Metal Building Contractor. We provide in-house custom color painting of screws and rivets with just a one or two day (days, ***NOT*** weeks) lead time. **TENS OF THOUSANDS** of power tools are stocked and sold at the lowest prices. Highest quality, top name brand fasteners are stocked and sold at the lowest prices. Same day shipment on orders received by 4:00 p.m. CST. We are a supplier to the largest metal building manufacturers.

We want to be ***YOUR*** source for screws, anchors, flashings, **DYNA-GUARD™** snow retention system, safety equipment, hand tools, power tools and accessories.

7 warehouses to serve your construction needs for tools and fasteners

(MAIN OFFICE)
Kansas City • Chicago • Houston • Las Vegas • Memphis • St. Louis • St. Paul

CALL 800-821-5448 or FAX 800-844-1199

Call for your Free Full Color 132 Pg. Hand Guide. Better yet, call us for your next tool or fastener requirement. Discover for yourself why your peers enjoy doing business with our company!

MATERIALS & GADGETS

Shingles Offered in Cool Colors

IKO's residential roofing shingles now include IKO Cambridge Cool Colors, architectural laminate shingles that are engineered to meet the California Energy Commission Building Standards Code, Title 24. IKO Cambridge Cool Colors feature a shingle coating embedded with special granules that reflect a greater amount of solar energy than standard roofing shingles. This high-reflectance technology allows less solar radiation, or heat, to enter a home through the attic and also allows absorbed radiation to be released back into the atmosphere. IKO Cambridge Cool Colors are offered in four color options: Arctic White, Desert Gold, Dual Grey and Valley Oak. All four colors are available throughout California with additional limited availability in surrounding West Coast states while Dual Grey is offered nationwide.

IKO.com | **Circle No. 21**

Roof Coating Resists Weathering

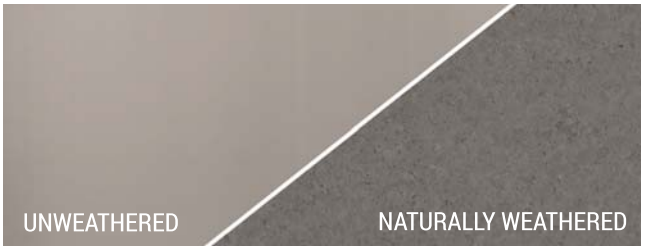
R.M. Lucas Co. has added #8400 100 percent Silicone Roof Coating to its line of products. The #8400 is a low solids, single-part roof coating that creates a barrier that is resistant to natural weathering. The coating is durable, breathable, watertight and weatherproof. The #8400 creates an offering to the professional contractor who desires the performance of a silicone coating at a lower price point than Lucas #8000 100 percent Silicone Roof Coating High Solids. #8400 is suitable for application over spray-applied polyurethane foam, EPDM, PVC, aged acrylic coatings, concrete, asphalt BUR, modified bitumen and metal.

RMLucas.com | **Circle No. 23**

Lightweight Solar Panels Can Be Used On Flat Roofs

Beamreach Solar has introduced Sprint, a lightweight photovoltaic solar panel system for flat commercial roofs. Sprint can be installed on nearly all commercial roofs that cannot currently support heavy conventional solar systems, dramatically expanding the commercial solar power market. Featuring maximum power capacities ranging from 290 to 320 watts, Sprint integrates racking into the panel for quicker installation that requires no tools and no grounding. Sprint's design also reduces the distance required between panel rows, enabling up to 30 percent more panels to be installed on a roof, increasing the solar system's overall energy output. Sprint panels have been tested to support test loads up to 5,400 Pascals and withstand wind speeds of 115 mph. Sprint also comes with a 25-year linear output warranty and 10-year product warranty.

BeamreachSolar.com | **Circle No. 22**



Tin-plated Products Are Designed for Rollforming

Roofinox provides a range of tin-plated (Terne) products that provide a substitute for lead-coated copper, zinc/tin-zinc-coated copper, Terne-coated materials, galvalume and lead. Available in coil or sheet, the tin-plated (Terne) product ensures long-term sustainability and corrosion-resistance for wall cladding, flashing, rainware, interior design and all forms of roofing applications. The tin-plated stainless-steel product has been developed and manufactured for rollforming and fabricating. It consists of a layer of 100 percent tin covering a base of 439 or 316L stainless steel. This formulation works for drainage solutions and accessory pieces. The products can be soldered, are 100 percent recyclable and are malleable.

Roofinox.com | **Circle No. 24**

Protect Your **REPUTATION** With A Roof **THAT PROTECTS.**

When you install Atlas shingles featuring Scotchgard™ Protector, you give homeowners a beautiful roof that helps protect against the black streaks caused by algae*. That's how Atlas helps protect home values — and your good reputation.

Choose Atlas.
Because Atlas Protects.

ATLAS®
PROTECTS
CONTRACTORS

StormMaster® Slate Featuring SCOTCHGARD PROTECTOR 3M
High Wind And Impact Resistant Shingles

StormMaster® Shake Featuring SCOTCHGARD PROTECTOR 3M
High Wind And Impact Resistant Shingles

Pinnacle® Pristine Featuring SCOTCHGARD PROTECTOR 3M
High Performance Architectural Shingles

#AtlasProtects **AtlasRoofing.com/Scotchgard**

* In order to qualify for the Atlas Lifetime Algae Resistance Limited Warranty against black streaks caused by blue-green algae, installation must include Atlas Pro-Cut® Hip & Ridge shingles featuring Scotchgard™ Protector or Atlas Pro-Cut® High Profile Hip & Ridge shingles featuring Scotchgard™ Protector with Atlas shingles featuring Scotchgard™ Protector.

ROOFERS' CHOICE

This issue's "Roofers' Choice" was determined by the product that received the most reader inquiries from the March/April issue's "Materials & Gadgets" section.

OMG Roofing Products' PaceCart 3

Apply Adhesives with Ergonomically Designed Cart

OMG Roofing Products has introduced the PaceCart 3, a more robust application system for applying OlyBond500 Adhesives packaged with patented Bag-in-Box technology.

The PaceCart 3 includes several features designed to improve job-site productivity and minimize pre- and post-job maintenance and storage requirements. One such feature is an ergonomically designed, easy-to-use dispensing manifold designed for applying two-part low-rise adhesives. In addition to being easier to use and maintain, the new manifold does not require greasing, so it simplifies start-up and shut-down procedures for rooftop time savings.

PaceCart 3 also features two new robust pumps that are low maintenance and designed for use with high-viscosity liquids. Other enhancements of the new PaceCart 3 include a color-coded adhesive tray to help prevent cross contamination of Part 1 and Part 2 adhesive components and a simplified electrical system with an easy-to-read voltage meter to help identify power input. Additionally, all PaceCart 3s are generator-ready and have been outfitted with a shelf designed to hold a portable generator for improved and cord-free mobility on large projects (generator not included).

As with previous PaceCarts, the PaceCart 3 includes a 30-foot hose for maximum reach and maneuverability on the roof. The system is capable of dispensing enough OlyBond500 to apply 60 squares of insulation per hour.

The new PaceCart 3 is immediately available and will replace the PaceCart 2; however, the company will continue to offer replacement parts and field support for the PaceCart 2. R

View a video about PaceCart 3.

PHOTO: OMG ROOFING PRODUCTS

LEARN MORE

Visit OMGRoofing.com.

Call (800) 633-3800.

Circle No. 26

SWENSON SHEAR
EST. 1959

SNAPTABLE PRO

From Roofer to Craftsman in 3 Easy Steps

The Snap Table PRO is an all-in-one panel preparation system for standing seam metal roofing; with the highest quality in notching, slitting, and hemming standing seam profiles from 12"-24"

*60" slitting and hemming capabilities

877-588-8748

WWW.SWENSONSHEAR.COM

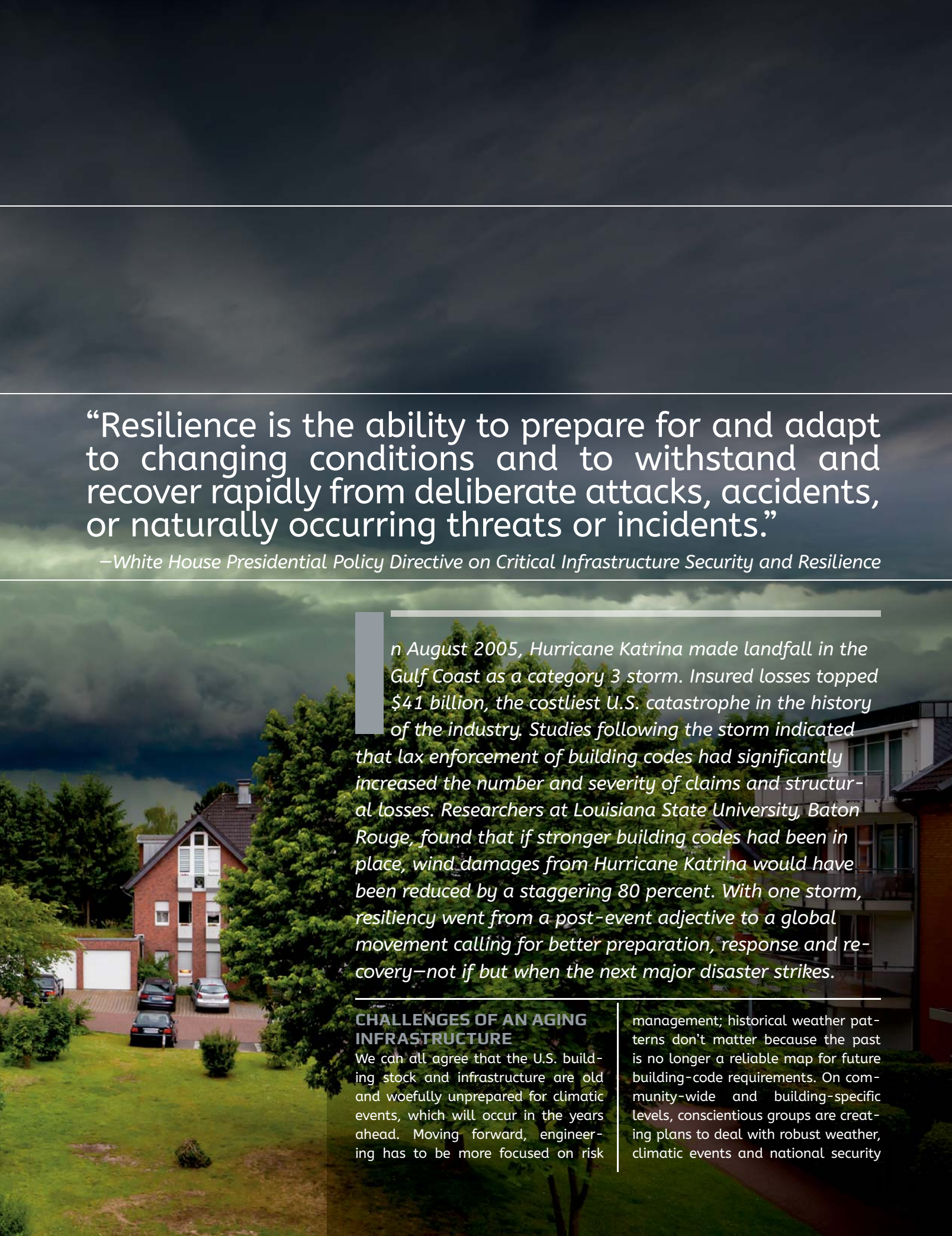
*All Photographs are projects completed with a Snap Table.

BUSINESS SENSE

WRITTEN BY **JARED BLUM**

RESILIENT BUILDINGS

The Building Industry Is Working to Reduce Long-term Costs and Limit Disruptions of Extreme Events



"Resilience is the ability to prepare for and adapt to changing conditions and to withstand and recover rapidly from deliberate attacks, accidents, or naturally occurring threats or incidents."

—White House Presidential Policy Directive on Critical Infrastructure Security and Resilience

In August 2005, Hurricane Katrina made landfall in the Gulf Coast as a category 3 storm. Insured losses topped $41 billion, the costliest U.S. catastrophe in the history of the industry. Studies following the storm indicated that lax enforcement of building codes had significantly increased the number and severity of claims and structural losses. Researchers at Louisiana State University, Baton Rouge, found that if stronger building codes had been in place, wind damages from Hurricane Katrina would have been reduced by a staggering 80 percent. With one storm, resiliency went from a post-event adjective to a global movement calling for better preparation, response and recovery—not if but when the next major disaster strikes.

CHALLENGES OF AN AGING INFRASTRUCTURE

We can all agree that the U.S. building stock and infrastructure are old and woefully unprepared for climatic events, which will occur in the years ahead. Moving forward, engineering has to be more focused on risk management; historical weather patterns don't matter because the past is no longer a reliable map for future building-code requirements. On community-wide and building-specific levels, conscientious groups are creating plans to deal with robust weather, climatic events and national security

threats through changing codes and standards to improve their capacity to withstand, absorb and recover from stress.

Improvements to infrastructure resiliency, whether they are called risk-management strategies, extreme-weather preparedness or climate-change adaptation, can help a region bounce back quickly from the next storm at considerably less cost. Two years ago, leading groups in America's design and construction industry issued an Industry Statement on Resiliency (bit.ly/28LctRH), which stated: "We recognize that natural and manmade hazards pose an increasing threat to the safety of the public and the vitality of our nation. Aging infrastructure and disasters result in unacceptable losses of life and property, straining our nation's ability to respond in a timely and efficient manner. We further recognize that contemporary planning, building materials, and design, construction and operational techniques can make our communities more resilient to these threats."

With these principles in mind, there has been a coordinated effort to revolutionize building standards to respond to higher demands.

STRENGTHENING BUILDING STANDARDS

Resiliency begins with ensuring that buildings are constructed and renovated in accordance with modern building codes and designed to evolve with change in the built and natural environment. In addition to protecting the lives of occupants, buildings that are designed for resilience can rapidly recover from a disruptive event, allowing continuity of operations that can literally save lives.

Disasters are expensive to respond to, but much of the destruction can be prevented with cost-effective mitigation features and advanced planning. A 2005 study funded by the Washington, D.C.-based Federal Emergency Management Agency and conducted by the Washington-based National Institute of Building Sciences' Multi-hazard Mitigation Council found that every dollar spent on mitigation would save $4 in losses. Improved building-code requirements during the past decade have been the single, unifying force in driving high-performing and more resilient building envelopes, especially in states that have taken the initiative to extend these requirements to existing buildings.

MITIGATION IS COST-EFFECTIVE IN THE LONG TERM

In California, there is an oft-repeated saying that "earthquakes don't kill people, buildings do." Second only to Alaska in frequency of earthquakes and with a much higher population density, California has made seismic-code upgrades a priority, even in the face of financial constraints. Last year, Los Angeles passed an ambitious bill requiring 15,000 buildings and homes to be retrofitted to meet modern codes. Without the changes, a major earthquake could seriously damage the city's economic viability: Large swaths of housing could be destroyed, commercial areas could become uninhabitable and the city would face an uphill battle to regain its economic footing. As L.A. City Councilman Gil Cedillo said, "Why are we waiting for an earthquake and then committed to spending billions of dollars, when we can spend millions of dollars before the earthquake, avoid the trauma, avoid the loss of affordable housing and do so in a preemptive manner that costs us less?"

This preemptive strategy has been adopted in response to other threats, as well. In the aftermath of Hurricane Sandy, Princeton University, Princeton, N.J., emerged as a national example of electrical resilience with its microgrid, an efficient on-campus power-generation and -delivery network that draws electricity from a gas-turbine generator and solar-panel field. When the New Jersey utility grid went down in the storm, police, firefighters, paramedics and other emergency-services workers used Princeton University as a staging ground and charging station for phones and equipment. It also served as a haven for local residents whose homes lost power. Even absent a major storm, the system provides cost efficiency, reduced environmental impact and the opportunity to use renewable energy, making the initial investment a smart one.

ROOFING STANDARDS ADAPT TO MEET DEMANDS

Many of today's sustainable roofing standards were developed in response to severe weather events. Wind-design standards across the U.S. were bolstered after Hurricane Andrew in 1992 with minimum design wind speeds rising by 30-plus mph. Coastal jurisdictions, such as Miami-Dade County, went even further with the development of wind-borne debris standards and enhanced uplift design testing. Severe heat waves and brown-outs, such as the Chicago Heat Wave of 1995, prompted that city to require cool roofs on the city's buildings.

Hurricane Sandy fostered innovation by demonstrating that when buildings are isolated from the supply of fresh water and electricity, roofs could serve an important role in keeping building occupants safe and secure. Locating power and water sources on rooftops would have maintained emergency lighting and water supplies when storm surges threatened systems located in basement utility areas. Thermally efficient roofs could have helped keep buildings more habitable until heating and cooling plants were put back into service.

In response to these changes, there are many opportunities for industry growth and adaptation. Roof designs

In addition to protecting the lives of occupants, buildings that are designed for resilience can rapidly recover from a disruptive event, allowing continuity of operations that can literally save lives.

continues on page 34

Your search for good quality stamped hanger has now come to an end!

AMG
American Master Gutters, Inc.

www.americanmastergutters.com

STAMPED FASCIA HANGER

Premium quality Stamped Fascia Hangers are now available at American Master Gutters, Inc.

From Copper, Stainless Steel, Galvanized, and Galvalume to custom powder coating in any color you need.

Inventory of 6" are now available, 5" and 8" on request. Fitting for American and European half round rain gutter.

Powder coated stamped fascia hangers

- Colonial Red
- Mansard Brown
- Medium Bronze
- Classic Green
- Hartford Green
- Matte Black
- Dark Bronze
- Charcoal
- Slate Grey
- Almond
- Bone White
- any other color
- Galvanized
- Galvalume
- Stainless steel
- Copper

A perfect fit for KWM Gutterman INC

American Master Gutters, Inc. | 4333 W. 71st Street | Indianapolis, IN 46268 | Phone: 317.328.5293 | Fax: 317.328.5609

must continue to evolve to accommodate the increasing presence of solar panels, small wind turbines and electrical equipment moved from basements, in addition to increasing snow and water loads on top of buildings. Potential energy disruptions demand greater insulation and window performance to create a habitable interior environment in the critical early hours and days after a climate event. Roofing product manufacturers will work more closely with the contractor community to ensure that roofing installation practices maximize product performance and that products are tested appropriately for in-situ behavior.

AVERTING FUTURE DISASTERS THROUGH PROACTIVE DESIGN

Rather than trying to do the minimum possible to meet requirements, building practitioners are "thinking beyond the code" to design structures built not just to withstand but to thrive in extreme circumstances. The Tampa, Fla.-based Insurance Institute for Business & Home Safety has developed an enhanced set of engineering and building standards called FORTIFIED Home, which are designed to help strengthen new and existing homes through system-specific building upgrades to reduce damage from specific natural hazards. Research on roofing materials is ongoing to find systems rigorous enough to withstand hail, UV radiation, temperature fluctuations and wind uplift. New techniques to improve roof installation quality and performance will require more training for roofing contractors and more engagement by manufacturers on the installation of their products to optimize value.

Disasters are expensive to respond to, but much of the destruction can be prevented with cost-effective mitigation features and advanced planning.

Confronted with growing exposure to disruptive events, the building industry is working cooperatively to meet the challenge of designing solutions that provide superior performance in changing circumstances to reduce long-term costs and limit disruptions. Achieving such integration requires active collaboration among building team members to improve the design process and incorporate new materials and technologies, resulting in high-performing structures that are durable, cost- and resource-efficient, and resilient so when the next disruptive event hits, our buildings and occupants will be ready. R

Lyon Metal Roofing

METAL ROOFING PANELS

* 3/4" Rib (AG Panel)
* 7 Standing Seam Panel Profiles (Can be ran onsite)
* PBR & R Panels up to 70'
* 5-V Crimp Panels
* 3" Trapezoid Mechanically Seamed Panels (Can be ran onsite in unlimited length)
* All trims,Flashings,shapes,copings, (Up to 40' lengths)
* Box Gutter & Downspouts (Up to 40' lengths)
* Pre Engineered Building Packages
* Post Frame Building Packages

SEVEN LOCATIONS TO SERVE YOU

485 Industrial Park Road
Piney Flats, TN 37686
(423) 538-5169

5600 Highway 11E
Piney Flats, TN 37686
(423) 391-7788

3515 West Andrew Johnson Highway
Greeneville, TN 37745
(423) 787-0621

323 South Center Street
Hildebran, NC 28637
(828) 322-6888

26747 US Highway 64
Jamesville, NC 27846
(252) 370-0520

505 South Florida Avenue
Greenville, SC 29611
(864) 552-1002

7822 Peppers Ferry Blvd,
Fairlawn VA 24141
(540) 633-0170

For Immediate Service Call, Text or Email anytime
Bret Lyon - 423-383-3197 - blyon@lyonroofing.com

800-892-2028

www.WeSellMetalRoofing.com

SIERRA NEVADA BREWERY
MILLS RIVER, N.C.

TEAM

Roofing Contractor: The Century Slate Roofing Co., Durham, N.C., CenturySlate.com

Architect: Matthew Galloway of Russell Gallaway Associates Inc., Chico, Calif., RGA-Chico.com

ROOF MATERIALS

Approximately 423 squares of 1/2-inch-thick, 18-inch-tall by random width Unfading Green Slates were installed by hand on the project. This was close to 750,000 pounds of slate, or 375 tons.

About 3,000 feet of custom copper gutters and downspouts, conductor heads and 100 squares of painted standing-seam panels were fabricated, and pre-built copper clad dormers and decorative copper cornices were installed.

The project also included 35 squares of copper standing-seam roofing, 25 squares of soldered copper flat-seam roofing and 115 squares of copper wall cladding. About 58,000 pounds of copper were installed on the brewery.

Everything on the building is oversized and that meant everything had to be built to support the heavy structural loads and live loads from wind and mountain snow. The large roof faces called for 10-inch custom copper gutters. When you have gutters that large in the mountains of North Carolina you have to consider the extraordinary weight of the annual snow.

In addition to snow guards being installed on the slate roof, custom 1/4-inch-thick copper gutter brackets fastened the gutter to the fascia. It is typical on steel-framed construction, particularly on this scale, that the framing is out of square and there is widely varying fascia and rake dimensions.

However, these items should not appear out of square or have varying dimensions. Great care had to be taken to measure and custom bend onsite all the detail flashings so everything appeared perfect. This took many skilled craftsmen, a great deal of time and the absolute drive to provide the highest quality work.

Slate Manufacturer: Evergreen Slate Co. Inc., EvergreenSlate.com

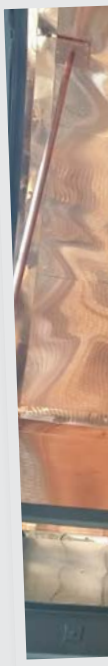
Copper Fabricator: K&M Sheet Metal LLC, KMSheetMetal.com

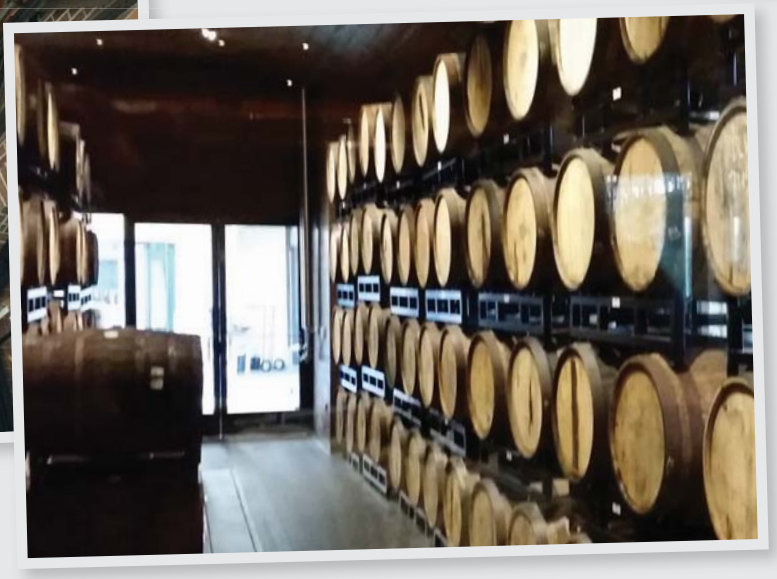
Supplier of Underlayment, Copper Sheets and Coil, Insulation and Nailbase Sheathing: ABC Supply Co. Inc., ABCSupply.com

ROOF REPORT

The new-construction project began in November 2013 and was completed in September 2015.

The team completed the slate installation so well that The Century Slate Co. was awarded the 2015 Excellence in Craftsmanship Award by Evergreen Slate for the project. R





PHOTOS: THE CENTURY SLATE ROOFING CO.

ORLANDO PREMIUM OUTLET MARKETPLACE
ORLANDO, FLA.

TEAM

Roofing Contractor: Advanced Roofing Inc., Orlando, AdvancedRoofing.com

Roof Consultant: ACRC, Oakland Park, Fla., RoofConsultant.net

ROOF MATERIALS

The 16-year-old, 140,000-square-foot, modified bitumen roof system was at the end of its service life. Temporary fixes had been made, so the roof included many patches. The roofing system was at risk of eventual failure that could potentially shut down the shopping center, halting operations during the busy holiday season.

Following an analysis of the roof system, ACRC hired Advanced Roofing to tear-off and then install a new high-efficiency single-ply roofing membrane over eight different roof sections on the occupied shopping space. The new roof added an extra R-9 value to bring the total R-value for the building to R-30.

Single-ply TPO Manufacturer: GAF, GAF.com

ROOF REPORT

Located on International Drive, this 40-store mixed-retail shopping center includes American Eagle, Calvin Klein, Guess, Levi's, Nike Clearance Store, Reebok, Skechers, Tommy Hilfiger and more.

The 140,000-square-foot reroofing project was completed between November 2015 and January 2016, the rush of the holiday retail season. Therefore, the project was incredibly challenging because all work was required to be performed so it wouldn't disturb daily operations. The project was completed on time and within budget, with zero safety issues. R

PHOTOS: ADVANCED ROOFING INC.

K&M SHEET METAL

Redefining Sheet Metal.

- Gutters
- Gutter Hangers
- Downspouts
- Elbows & Straps
- Cleanouts & Rain Chains
- Metal Roofing
- Chimney Caps
- Louvered Dormers
- Metal Cornice
- Conductor Heads
- Finials
- Tools & More

1310 E. Cornwallis Rd.
Durham, NC 27713
(888) 567-7778
info@kmSheetMetal.com
www.kmSheetMetal.com

OLIVE GARDEN RESTAURANT
ASHEVILLE, N.C.

TEAM

Installer: Crossmark Roofing Solutions LLC, Charlotte, N.C., Cross-Mark.net

Wind Calculations: Salvatore R. Granata, P.E., S.E., Opelika, Ala., SalGranata.com

Load Calculations: Penta Engineering P.A., Charlotte, PentaEngr.com

ROOF MATERIALS

The reroofing project included the removal of an existing low-slope roof system, followed by installation of wood furring and insulation. About 9,000 square feet of IMETCO AquaBlock 50 high temperature ice and water shield was applied before 9,000 square feet of IMETCO SnapLok Metal Roof System, 22-gauge, flat profile in an Epic Bronze color, was installed.

Ice and Water Shield and Metal Roofing Manufacturer: IMETCO, IMETCO.com

ROOF REPORT

The reroofing project took place between December 2015 and February 2016. R

PHOTOS: IMETCO

If you've certified it once, you've certified it 2000 times.

FM Global recently certified the R-value of its 2000th polyiso insulation sample. Each test over the past 10 years has required every participating manufacturer to meet or exceed the PIMA QualityMark℠ program requirements. To learn more about the unmatched performance of polyiso, please visit **www.polyiso.org**

POLYISO

Surround yourself with the best.

CHICAGO PREMIUM OUTLETS
AURORA, ILL.

TEAM

Roofing Contractor (a Johns Manville Summit Level Contractor): Olsson Roofing Co. Inc., Aurora, OlssonRoofing.com

General Contractor: Graycor Inc., Oakbrook Terrace, Ill., Graycor.com

Architect/Specifier: FRCH Design Worldwide, Cincinnati, FRCH.com/us

ROOF MATERIALS

The following materials were used during the new construction project:

- One layer of 2-inch JM ENRGY 3
- Polyisocyanurate insulation
- One layer of 2 1/2-inch JM ENRGY 3
- Polyisocyanurate insulation
- 250,000 square feet of 60-mil JM TPO (white, tan and light gray)
- RhinoBond Induction Welding System

Because 60-mil TPO was specified on 99 percent of the job, a RhinoBond system was Olsson Roofing's solution of choice. "We knew that RhinoBond would contribute to a successful installation of the TPO since we were dealing with below-freezing temperatures for most of the first 90 days," notes Mike Reynolds, senior project manager for Olsson Roofing. The majority of the roof surface features white TPO and the gallery roofs connecting the main buildings were tan; some canopies over walkways are gray.

Olsson Roofing used JM black EPDM for the parapet walls because the EPDM material is more flexible and easier to install in cold weather on vertical surfaces. The team appreciated the ability to mix the systems and keep the project moving forward during cold-weather installation.

Insulation, TPO, EPDM Manufacturer: Johns Manville, JM.com

RhinoBond Induction Welding System Manufacturer: OMG Roofing Products, OMGRoofing.com

ROOF REPORT

The 250,000-square-foot expansion to the Chicago Premium Outlets was completed between January and May 2015. The grand opening was held Aug. 27, 2015.

The expansion includes 30 new or expanded stores; two new restaurants; 2,200 additional parking spaces; public art; outdoor fireplaces; and a large pond that includes a pier-like pavilion with tables, chairs and umbrellas. New anchor stores include Saks Fifth Avenue Off 5th; Clarins; Robert Graham; and Wellensteyn, a Germany-based luxury coat maker.

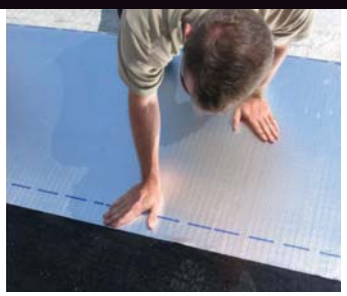
The project team faced two major challenges. Because the roofing component fell between January and May, Olsson Roofing knew the job would be difficult because of weather. The second challenge was the schedule. "The Olsson Roofing Team worked several Saturdays and overtime to get the project finished as quickly as possible," Reynolds says. "We even heated the inside of the buildings to melt the snow on the roof and shoveled areas to make room for the product on the roof." R

PHOTOS: JOHNS MANVILLE

PEEL IT. SEAL IT. DONE!

PEEL & SEAL®

SELF-STICK ROLL ROOFING



- Ideal for difficult roofing applications
- Aggressively adheres to the roof deck
- Self-seals around fasteners
- Aluminized surface limits solar gain
- Easy handling and installation
- Requires no coatings or coverings for permanent exposure to sunlight
- Virtually maintenance-free
- Variety of widths and color options
- 10-year limited warranty
- Made in the USA

Peel & Seal® is the original self-adhering waterproofing membrane designed for low slope roofing or flashing applications. This single-ply membrane applies directly to the roof deck and serves as the final roofing surface.

Ideal for hundreds of applications including whole roofs, dormers, sunrooms, metal roofs, and flashing around exterior penetrations.

55 YEARS ANNIVERSARY 1961-2016

mfm BUILDING PRODUCTS CORP.

800-882-7663 | www.mfmbp.com

Hail Strike

Denver International Airport Is Reroofed with EPDM after a Hailstorm

BY LOUISA HART

SPECIAL REPORT

The millions of passengers who pass through Denver International Airport each year no doubt have the usual list of things to review as they prepare for a flight: Checked baggage or carry-on? Buy some extra reading material or hope that the Wi-Fi on the plane is working? Grab a quick bite before takeoff or take your chances with airline snacks?

Nick Lovato, a Denver-based roofing consultant, most likely runs through a similar checklist before each flight. But there's one other important thing he does every time he walks through DIA. As he crosses the passenger bridge that connects the Jeppeson Terminal to Gate A, he always looks out at the terminal's roof and notices with some pride that it is holding up well. Fifteen years ago, after a hailstorm shredded the original roof on Denver's terminal building, his firm, CyberCon,

Centennial, Colo., was brought in as part of the design team to assess the damage, assist in developing the specifications and oversee the installation of a new roof that would stand up to Denver's sometimes unforgiving climate.

HAIL ALLEY

DIA, which opened in 1995, is located 23 miles northeast of the metropolitan Denver area, on the high mountain desert prairie of Colorado. Its location showcases its spectacular design incorporating peaked tent-like elements on its roof, meant to evoke the nearby Rocky Mountains or Native American dwellings or both. Unfortunately, this location also places the airport smack in the middle of what is known as "Hail Alley", the area east of the Rockies centered in Colorado, Nebraska and Wyoming. According to the Silver Spring, Md.-based National Weather Service, this area experiences an average of nine "hail days" a year. The reason this area gets so much hail is that the freezing point—the area of the atmosphere at 32 F or less—in the high plains is much closer to the ground. In other words, the hail doesn't have time to thaw and melt before it hits the ground.

Not only are hail storms in this area relatively frequent, they also produce the largest hail in North America. The Rocky Mountain Insurance Information Association, Greenwood Village, Colo., says the area experiences three to four hailstorms a year categorized as "catastrophic", causing at least $25 million in damage. Crops, commercial buildings, housing, automobiles and even livestock are at risk.

Statistically, more hail falls in June in Colorado than during any other month, and the storm that damaged DIA's roof followed this pattern. In June 2001, the hailstorm swept over the airport. The storm was classified as "moderate" but still caused extensive damage to the flat roofs over Jeppesen Terminal and the passenger bridge. (It's important to note that the storm did not damage the renowned tent roofs.) The airport's original roof, non-reinforced PVC single-ply membrane, was "shredded" by the storm and needed extensive repair. Lovato and his team at CyberCon assessed the damage and recommended changes in the roofing materials that would stand up to Colorado's climate. Lovato also oversaw the short-term emergency repairs to the roof and the installation of the new roof.

Under any circumstances, this would have been a challenging task. The fact that the work was being done at one of the busiest airports in the world made the challenge even more complex. The airport was the site of round-the-clock operations with ongoing public activity, meaning that noise and odor issues needed to be addressed. Hundreds of airplanes would be landing and taking off while the work was ongoing. And three months after the storm damaged the roof in Denver, terrorists attacked the World Trade Center, making security concerns paramount.

INSPECTION AND REROOFING

Lovato's inspection of the hail damage revealed the extent of the problems with the airport roof. The original PVC membrane, installed in 1991, was showing signs of degradation and premature plasticizer loss prior to being pummeled by the June 2001 storm. The storm itself created concentric cracks at the point of hail impacts and, in most cases, the cracks ran completely through the membrane. In some instances, new cracks developed in the membranes that were not initially visible following the storm. The visible cracks were repaired immediately with EPDM primer and EPDM flashing tape until more extensive repairs could begin. Lovato notes that while nature caused the damage to DIA, nature was on the roofing team's side when the repairs were being made: The reroofing project was performed during a drought, the driest in 50 years, minimizing worries about leaks into the terminal below and giving the construction teams almost endless sunny days to finish their job.

The initial examination of the roof also revealed that the existing

PHOTOS: CYBERCON

polystyrene rigid insulation, ranging in thickness from 4 to 14 inches, was salvageable, representing significant savings. Although a single-ply, ballasted roof was considered and would have been an excellent choice in other locations, it was ruled out at the airport given that the original structure was not designed for the additional weight and substantial remediation at the roof edge perimeter possibly would have been required.

Lovato chose 90-mil black EPDM membrane for the new roof. "It's the perfect roof for that facility. We wanted a roof that's going to perform. EPDM survives the best out here, given our hailstorms," he says. A single layer of 5/8-inch glass-faced gypsum board with a primed surface was installed over the existing polystyrene rigid insulation (secured with mechanical fasteners and metal plates) to provide a dense, hail-resistant substrate for the new membrane.

As would be expected, 90-mil membrane offers the highest resistance against punctures.

In some areas adjacent to the airport's clerestory windows, the membrane received much more solar radiation than other areas of the roof. When ambient temperatures exceeded 100 F, some melting of the polystyrene rigid insulation occurred. "That section of the roof was getting double reflection," Lovato points out. To reduce the impact of this reflection, the roof was covered with a high-albedo white coating, which prevented any further damage to the top layer of the polystyrene rigid insulation board and also met the aesthetic requirements of the building.

continues on page 48

Why N.B. Handy?

Our Products

Metal

- We have the most comprehensive metal offering of any manufacturer or distributor in the region including Sentrigard Metal Roofing Systems, Sentriclad Architectural Metals, and Fabral Architectural Metals


Membrane

- With over 20 years experience with Carlisle Commercial Low Slope Roof Systems, no one knows Carlisle like N.B. Handy


Machinery

- If you bend, shear, crimp, fold, notch, fasten, cut, or bead metal, we have your machine
- New and used machines available


Our Performance

- We provide what you need, when you want it, where you need it
- Our Professional Services include shop drawings, engineering, tapered design, and specifications development


NB HANDY
The Preferred Choice

Lynchburg, VA (434) 847-2498	**Richmond, VA** (804) 354-9576	**Charlotte, NC** (704) 921-1230	**Raleigh, NC** (919) 212-2090	**Greenville, SC** (864) 235-3470
Norfolk, VA (757) 857-8300	**Roanoke, VA** (540) 343-2467	**Greensboro, NC** (336) 668-0092	**Columbia, SC** (803) 791-0900	**Atlanta, GA** (678) 225-0012

Not only are hail storms in this area relatively frequent, they also produce the largest hail in North America.

LONG-TERM SOLUTION

Lovato's observations about the durability of EPDM are backed up by field experience and controlled scientific testing. In 2005, the EPDM Roofing Association, Washington, D.C., commissioned a study of the impact of hail on various roofing membranes. The study, conducted by Jim D. Koontz & Associates Inc., Hobbs, N.M., showed EPDM outperforms all other available membranes in terms of hail resistance. (View the study at bit.ly/28Q6FpF.) As would be expected, 90-mil membrane offers the highest resistance against punctures. But even thinner 45-mil membranes were affected only when impacted by a 3-inch diameter ice ball at 133.2 feet per second, more than 90 mph—extreme conditions that would rarely be experienced even in the harshest climates.

Lovato travels frequently, meaning he can informally inspect the DIA roof at regular intervals as he walks through the airport. He's confident the EPDM roof is holding up well against the Denver weather extremes, and he's optimistic about the future. With justified pride, Lovato says, "I would expect that roof to last 30-plus years." R

ROOF MATERIALS

90-mil Non-reinforced EPDM: Firestone Building Products, FirestoneBPCo.com

Gypsum Board: 5/8-inch DensDeck Prime from Georgia-Pacific, GP.com

Plates and Concrete Fasteners: Firestone Building Products

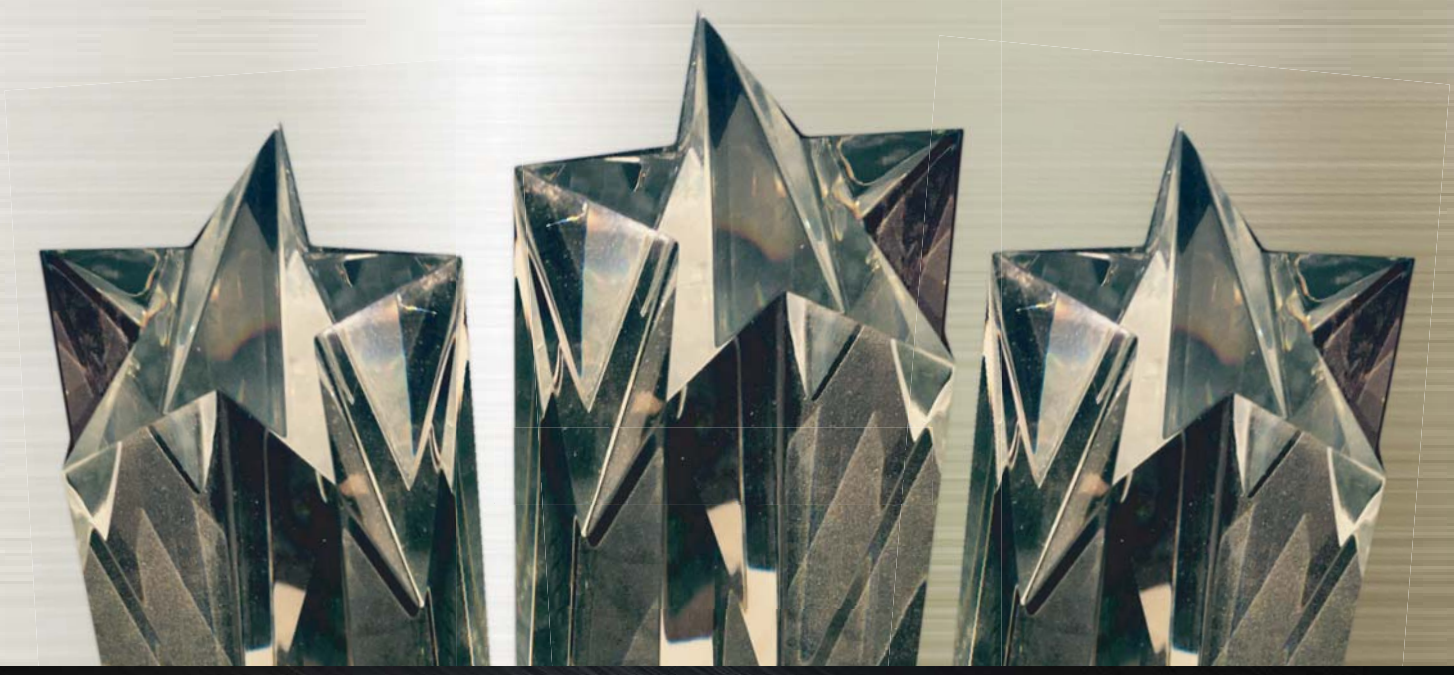
White Elastomeric Coating: AcryliTop from Firestone Building Products

Existing Polystyrene: Dow, Dow.com

MCA
METAL CONSTRUCTION ASSOCIATION

2016 TRIUMPH AWARDS

RECOGNIZING THOSE MAKING THIS INDUSTRY GREAT!



CALL FOR NOMINATIONS

WE SEE THE AMAZING WORK YOU'RE DOING...

and we want to celebrate YOU! Nominate yourself, an individual, business or organization for the inagural MCA Triumph Awards.

AWARD CATEGORIES:

Industry Champion of the Year
Young Movers and Shakers
Journalist of the Year
Corporate Citizen of the Year
Entrepreneur of the Year
Sales Person of the Year

NOMINATIONS ARE DUE BEFORE SEPTEMBER 1, 2016

E-MAIL TRIUMPHAWARDS@METALCONSTRUCTION.ORG

Click to submit your nominations.

Award Recipients will be celebrated at

METALCON

OCTOBER 26, 2016 AT 6:00 PM

Purchase your seat today at METALCON.COM at the pre-event special price.

RICOWI

Industry Organization Provides Unbiased Research on Recent Hail Damage

BY JOAN COOK

Each time weather reports and news stories warn of impending heavy rains and hail, the Hail Investigation Program (HIP) Committee of the Roofing Industry Committee on Weather Issues (RICOWI) Inc., Clinton, Ohio, begins a process to determine whether the hail damage is sufficient to meet the HIP requirements for deployment of volunteer research teams.

Mobilization criteria is met when "An event is identified as a hailstorm with hail stones greater than 1 1/2 inches in diameter causing significant damage covering an area of 5 square miles or more on one of the targeted areas." Once a storm that meets the criteria has been confirmed and meteorological data and local input have been obtained by HIP, a conference call with RICOWI's Executive Committee is held to discuss HIP's recommendation and review information. The Executive Committee decides whether to deploy.

On April 11, 2016, the hailstorm that damaged the Dallas/Fort Worth metroplex met the requirements for mobilization.

RESEARCH TEAMS AND BUILDINGS

Volunteer recruitment is an ongoing process throughout the year. RICOWI members are encouraged to volunteer as a deployment team member by completing forms online or at HIP committee meetings held twice a year in conjunction with RICOWI seminars and meetings.

Once a deployment is called, an email is sent to RICOWI members to alert the volunteers and encourage new volunteers. RICOWI sponsoring organizations also promote the investigation to their memberships. Volunteers are a mixture of new and returning personnel.

On May 2, 2016, 30 industry professionals traveled from across the U.S. to assemble in Texas. These volunteers were alerted to bring their trucks, ladders and safety equipment. To provide an impartial review, 10 teams of three volunteers were balanced with roofing material representatives, roofing consultants or engineers, meteorologists, contractors and researchers. Team members volunteered to be their team's photographer, data collector or team leader.

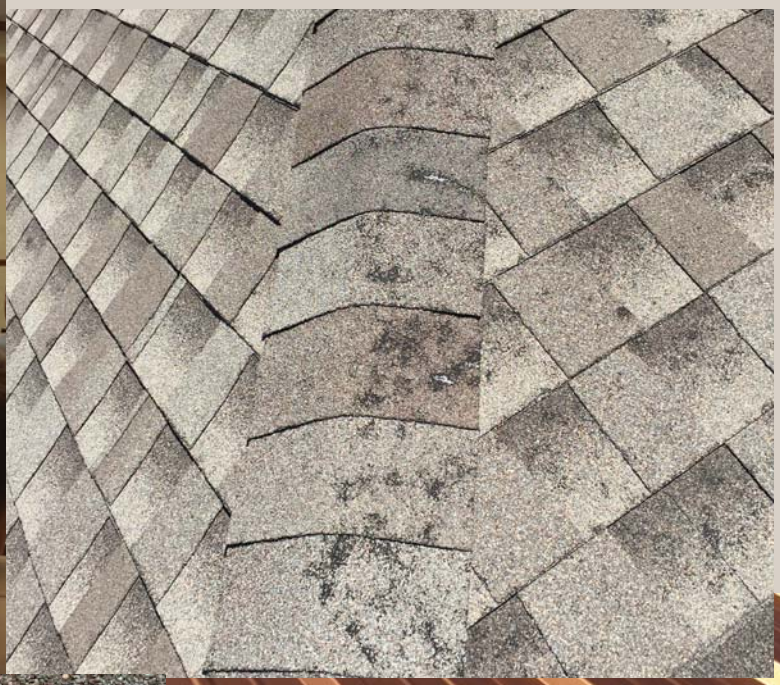
When the deployment was called, press releases were sent to various media in the Dallas/Fort Worth area to alert local companies and homeowners of the research investigation. RICOWI staff began making calls immediately to the local area's government officials to seek approval for the investigation teams to conduct research. Staff also made calls throughout the research week to help identify additional buildings.

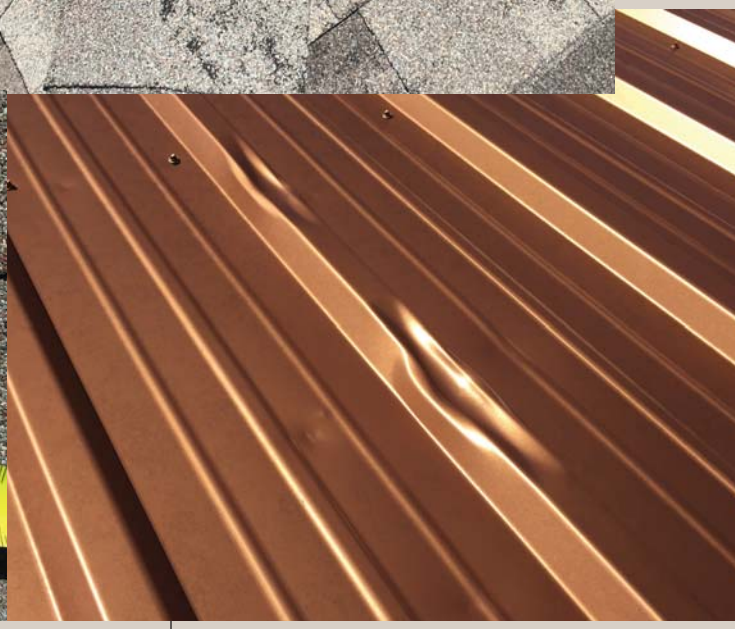
Several methods are used to help determine which areas and roofs are chosen. A list of building permits were provided to RICOWI by local building officials to assist with roof choice. In addition, one of RICOWI's members from the area did preliminary research and provided addresses for the teams. These site owners were contacted through phone and email to notify them of the research project.

Teams were assigned low- or steep-slope research and were assigned addresses accordingly. Team members carried copies of the press release and additional information to help

The Dallas/Fort Worth investigation was purely to gather research information through photo documentation, measurement and obseruation of the hail damage.

SPECIAL REPORT





introduce the investigation to business owners and homeowners.

Ultimately, the objective of the research project in Dallas/Fort Worth included the following:

- Investigate the field performance of roofing assemblies after this major hail event.
- Factually describe roof assembly performance and modes of damage.
- Formally report the results for substantiated hail events.

DAY-TO-DAY DUTIES

Before the daily assignments began, the volunteers reviewed the various research requirements, met their team members and learned their responsibilities. The teams were briefed on safety, how to take proper photos and how to capture important data.

As each day began, a briefing was held providing assignments for the day. This included addresses for investigation based on whether the team was focused on low- or steep-slope research. The teams were encouraged to stop at other homes and facilities that were undergoing roof repairs in addition to their assigned inspections.

The days were hot and long for the teams. Volunteers began each day at 8 a.m. and many did not return until 5 or 6 p.m., depending on the number of roofs they were assigned. The temperature during the day was around 80 F and humid; the temperatures on the roofs were much worse.

Because of the widespread damage from this storm, the teams were given addresses in a specific area that, according to hail maps, had significant damage. The teams observed and recorded the effects of varying sizes of hail on different types of roofs. In some cases, the teams would be able to speak to the owner of the home or manager of the building. In no case would the team speculate on the need to replace or repair the roof nor did the team suggest someone to call to repair the roofs. This investigation was purely to gather research information through photo documentation, measurement and observation of the hail damage.

The teams came in at the end of each day, looking a bit tired, but full of stories of the damage they saw, the people they met and the challenges they, as teams, faced. Each day,

PHOTOS: ROOFING INDUSTRY COMMITTEE ON WEATHER ISSUES INC.

the investigative teams completed the web-based data reports for each surveyed building and turned in their photos.

The web-based program was developed by RICOWI's Hail and Wind Program Coordinator David Roodvoets. The Google-based program was built to use the same research questions previously used in earlier research, therefore, expediting analysis. Each team completed one form per building. If the team did not have access to the web during their investigations, they completed a paper form and later entered the data into the web form. The addition of this online program allows RICOWI's report of the research teams' findings to be completed and distributed in a shorter period.

FINDINGS

Investigation findings were generally the same as in the previous two RICOWI HIP reports from Norman, Okla., in 2004 and Dallas in 2011. However, the Dallas/Fort Worth study was particularly interesting because a large area in and around Wylie, Texas, had hail as large as 4 inches in diameter. In general, roofing materials are not designed to resist this extremely large hail and the teams' research substantiated that.

In other areas, large quantities of smaller, very dense hail was blown with high winds onto the steep sides of windward-facing slopes, resulting in more damage than would be expected just based on hail size.

"I have participated in all three RICOWI HIP studies. While all three studies yielded good data, this storm was unique for the truly catastrophic hail damage that occurred in the city of Wylie, which was a small portion of the storm path," notes Richard F. Herzog, P.E., RRC, branch manager/principal engineer/meteorologist for Haag Engineering Co., Burnsville, Minn.

At the end of the week, the teams investigated 177 properties. The information from the research conducted will be compiled into a formal report by team members and RICOWI staff that will be available at no cost on RICOWI's website, RICOWI.com.

Formal reports from RICOWI's previous hail storm investigations in Norman and Dallas are posted on the website currently. These reports are used by professionals from the roofing industry, code officials and the insurance industry. Because the reports provide unbiased, detailed information about the hail resistance of low- and steep-slope roofing systems from credible investigative teams and document roofing systems that fail or survive major hailstorm events, they provide educational materials for roofing professionals to design hail-resistant roofing systems. All data can be used to improve building codes, roof system design, and educate the industry and public.

In addition, RICOWI has partnered with the Tampa, Fla.-based Insurance Institute for Business & Home Safety to develop a "Best Practice" manual that will be used as a reference document to provide a better understanding of roofing best practices for various roofing products. This reference manual will include all roofing categories with information about product identification, performance installation requirements, maintenance and damage identification, and identification of various types of roof damage.

RICOWI's reports are meant to create a greater industry understanding of what causes roofs to perform or fail in severe hail events, leading to overall improvements in roof system durability; the reduction of waste from reroofing activities; and a reduction in insurance losses, which will lead to lower overall costs for the public. R

JOIN RICOWI

As a roofing industry think tank comprised of a diverse group of roofing industry professionals, RICOWI is working to help address improvement in roofing systems through unbiased research and education. Active committees are working on issues related to codes, moisture control/green, underlayment, wind and hail.

RICOWI invites interested groups and individuals to participate in its discussions and attend its two annual meetings and seminars. The next seminar and meeting will be held in Colorado on Oct. 4-5, 2016. A tour of the National Center for Atmospheric Research will be included. Additional information about membership and meetings is available at RICOWI.com, or contact the RICOWI office at (330) 671-4569.

WIND RESEARCH

RICOWI has a similar research program for extreme wind events. The Wind Investigation Program has published several reports about hurricane investigations. These reports are available at no cost on RICOWI's website, RICOWI.com.

BEYOND LIMITS

ne

CONSTRUCT

SPONSORED BY: CSI

EDUCATION:
SEPTEMBER 7-9, 2016

EXHIBIT HALL:
SEPTEMBER 8-9, 2016

AUSTIN CONVENTION CENTER
AUSTIN, TX

REGISTER TODAY!
SPECIAL OFFER FOR ROOFING READERS:

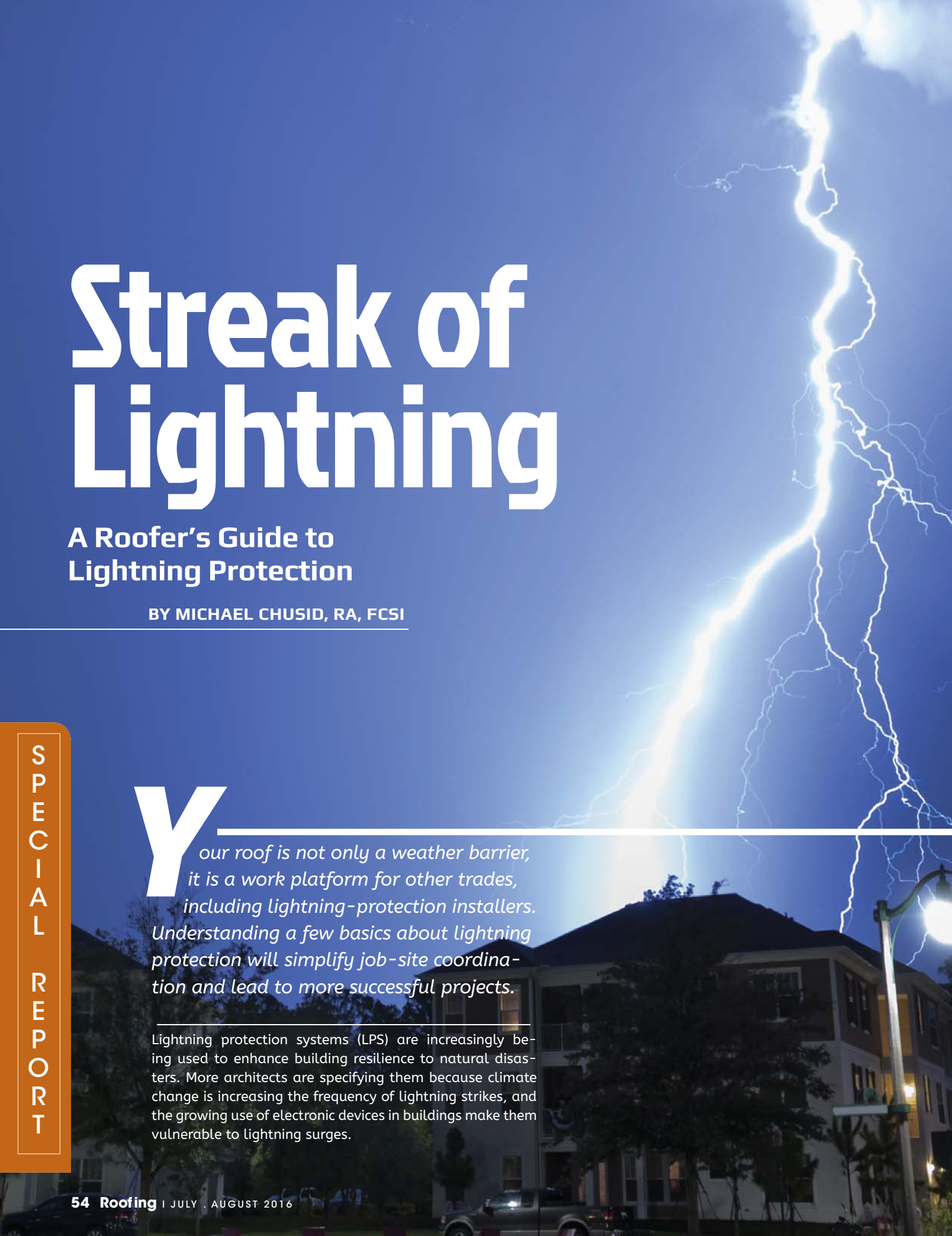
FREE EXPO PASS WHEN YOU REGISTER ONLINE
WITH THIS CODE: **ADCON1615**

EDUCATION RATES INCREASE ON AUG. 2ND SO DON'T DELAY

WWW.CONSTRUCTSHOW.COM

REGISTER @ CONSTRUCTSHOW.COM

*OFFER VALID FOR NEW REGISTRATIONS ONLY. NO REFUNDS WILL BE ISSUED. OFFER IS NON-TRANSFERRABLE



Streak of Lightning

A Roofer's Guide to Lightning Protection

BY MICHAEL CHUSID, RA, FCSI

SPECIAL REPORT

Your roof is not only a weather barrier, it is a work platform for other trades, including lightning-protection installers. Understanding a few basics about lightning protection will simplify job-site coordination and lead to more successful projects.

Lightning protection systems (LPS) are increasingly being used to enhance building resilience to natural disasters. More architects are specifying them because climate change is increasing the frequency of lightning strikes, and the growing use of electronic devices in buildings make them vulnerable to lightning surges.

Lightning protection installers are among the first trades on a job site and one of the last to leave; grounding may have to be installed simultaneously with foundations and final connections cannot be made until all building systems are in place.

The Maryville, Mo.-based Lightning Protection Institute (LPI) has certification programs for journeymen and master installers. An advanced Master Installer/Designer certificate is also available; it is crucial because project architects typically delegate design authority to the lightning protection contractor. The installer/designer must then meet stringent standards issued by the Quincy, Mass.-based National Fire Protection Association; Northbrook, Ill.-based UL LLC; and LPI.

COMPONENTS

Most of an LPS is below roof level. The most obvious above-roof components are air terminals, formerly called lightning rods. They must be located at the highest points on a roof. Depending on the building's size and configuration, additional air terminals are required around the roof perimeter at intervals not exceeding 20 feet, within the field of the roof, on rooftop equipment and

Most of a lightning protection system is below roof level. The most obvious above-roof components are air terminals, formerly called lightning rods.

as dictated by the standards. Air terminals can be as slender as 3/8-inch diameter and as short as 10-inches tall; larger ones can be used for decorative purposes or to meet special requirements. While most air terminals now have blunt tips, pointed ones are still encountered and can be a hazard to the unwary.

Air terminals are interconnected by conductors—typically multi-strand cables that can safely carry up to 3 million volts of lightning to ground. Conductors must also be used to bond rooftop equipment and metal components to ground. In most buildings, through-roof penetrations are required so the down conductors can be run inside the structure; the penetrations can be sealed with typical flashing details. If conductors are exposed to view, they should be located in the least conspicuous locations and follow the building's architectural lines.

Every wire entering the building must have a surge-protective device on it, and these are sometimes mounted above the roof. A variety of mounting devices, connectors, fasteners and adhesives are also required. All LPS components should be listed by UL specifically for lightning protection.

LPS components are typically copper or aluminum. To prevent galvanic action with roofing and flashings, copper components should be used with copper roofing and aluminum components with steel or aluminum roofing.

CONSTRUCTION

Before getting on the job, the roofer,

A lightning strike on a hotel on Marco Island, Fla., shattered concrete roof tiles and created a hazard to people and facilities 10 stories below. A fire could have resulted if the building had a wood frame instead of a non-combustible structure.

PHOTOS: EAST COAST LIGHTNING EQUIPMENT INC.

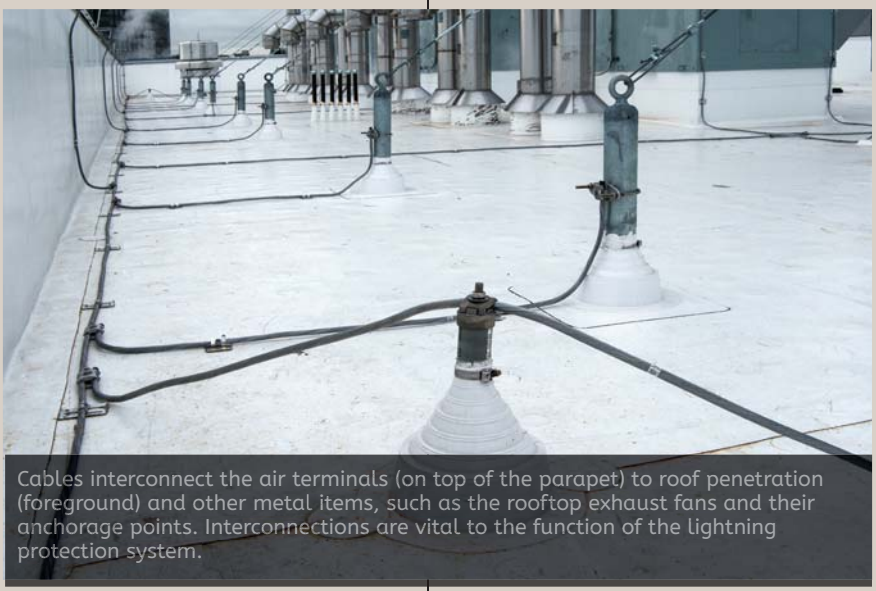
LIGHTNING SAFETY EDUCATION

The Lightning Safety Alliance Corp., Winsted, Conn., offers educational programs to roofing organizations, architects and other groups. Visit its website, LightningSafetyAlliance.com.

The National Fire Protection Association has criteria to determine which buildings are most at risk because of lightning. A program to aid in calculations is available at ECLE.biz/riskcalculator.

Like roofing, the most significant factor in estimating the cost of a lighting protection system is roof area. Cost-estimating guidelines are available at www.ECLE.biz/CostStudy.

Lightning protection installers are highly trained craftsmen. Like roofers, they work exposed to the weather and often at dangerous heights. Metal castings are installed on a rooftop prominence as a base for an air terminal. Fasteners for conductors are usually installed with construction-grade adhesives. Air terminals are a welcome sight to anyone that understands the hazards of lightning.



Cables interconnect the air terminals (on top of the parapet) to roof penetration (foreground) and other metal items, such as the rooftop exhaust fans and their anchorage points. Interconnections are vital to the function of the lightning protection system.

LPS installer, and general contractor should agree on project schedule and roof access, as well as review proposed locations of lightning protection components. Penetrations, especially, should be located and marked prior to roofing so they can be found afterward.

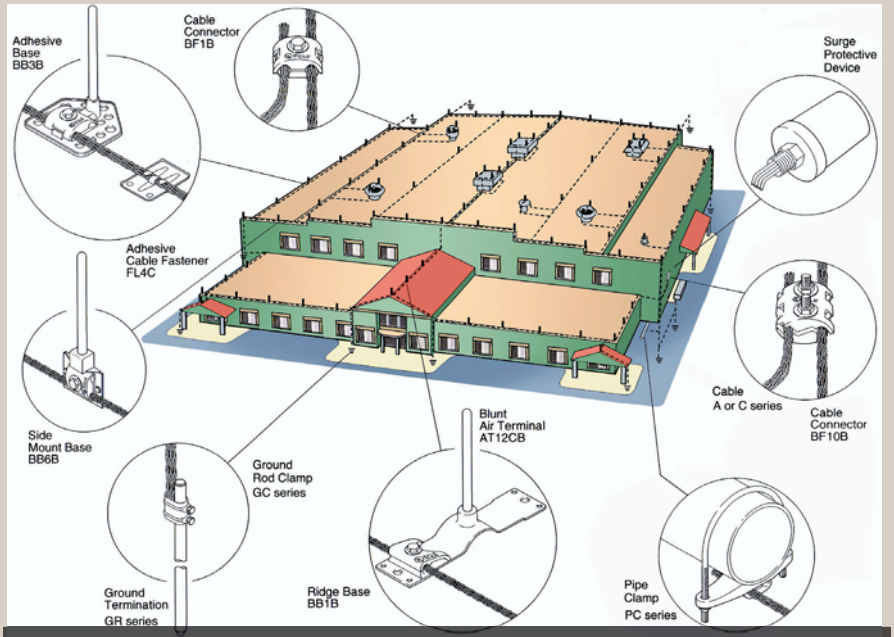
The roofing manufacturer should be consulted for its recommendations. Adhesives, for example, must be compatible with the roofing, and some manufacturers require an extra layer of membrane under attachment points.

For added assurance, the building owner should have UL or LPI Inspection Service inspect the job and certify the LPS was properly installed.

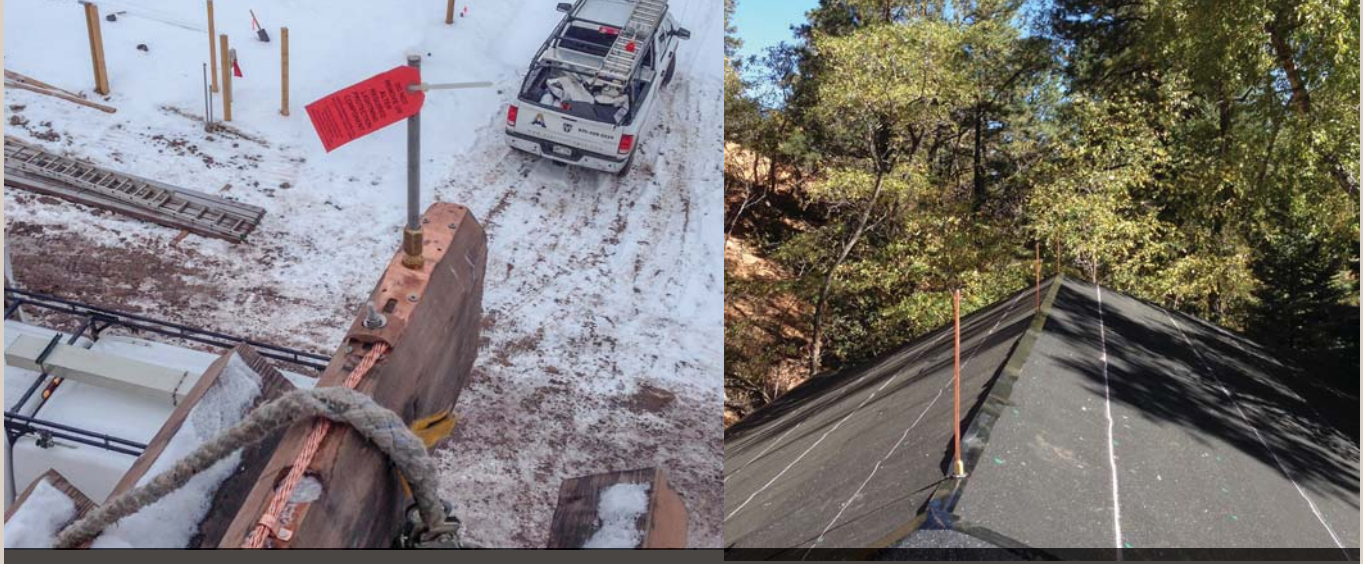
MAINTENANCE AND REROOFING

LPS components are durable and can last the life of a structure. Yet the electrical continuity from sky to ground can be broken if any of the components are disconnected or damaged. This might happen, for example, during maintenance work on rooftop equipment. Problems also arise if new equipment or services are installed on a roof without bonding or surge-protective devices. If you are called back to a job site, your foreman must be trained to recognize and protect the LPS, as well as notify the general contractor or building owner promptly if something appears askew.

Additional coordination is required during roof maintenance and reroofing. If the LPS installer is your subcontractor,



Lightning protection systems should be designed and installed by individuals certified by the Lightning Protection Institute, Maryville, Mo. Components should be listed by UL, Northbrook, Ill., for lightning protection.



A copper conductor on the ridge beam connects to a UL-listed through-roof penetration device (left). The red tag notifies subsequent trades to protect the penetration device. Air terminals attach to top of penetration devices and conductors are hidden beneath the roof (right). When conductors are exposed to view, they should be aligned with the architectural features of the building.

use a firm with LPI-certified installers and insist on an inspection certificate at the end of the project. Removal of lightning protection devices must be done only by a lightning protection professional so components still meeting UL requirements can be reused and remaining components are not damaged. The owner should be notified before the lightning protection system is deactivated so he or she can safeguard operations, especially at hospitals, communications and data processing centers, as well as other critical facilities that cannot tolerate going down because of lightning.

SAFETY FIRST

Lightning may be a disaster, but don't let it become a tragedy. A lightning protection system will protect a building and its contents but it will not protect you if you are on the roof when lightning approaches. Get off the roof and into an enclosed building or an automobile at the first indication of thunder or lightning, even if it is miles away. Then stay off the roof for at least a half hour after the storm has passed. As the Silver Spring, Md.-based National Weather Service cautions, "When Thunder Roars, Go Indoors." R

TECH POINT

WRITTEN BY **DAVID F. COOK**

Moisture and Concrete Roof Decks

Better Understand Why this Combination Is Troublesome

The primary function of a well-built and well-designed roofing system is to prevent water from moving through into the building below it. Yet, as the Rosemont, Ill.-based National Roofing Contractors Association has observed, an increasing number of "good roofs" installed on concrete decks have failed in recent years. Blistering, de-bonding and substrate buckling have occurred with no reports of water leakage. Upon investigation, the roofing materials and substrates are found to be wet and deteriorated.

Why is this? One potential cause is trapped moisture; there are numerous potential sources of trapped moisture in a structure. Let's examine the moisture source embedded within the concrete roof deck.

WHY DOES THIS MOISTURE BECOME TRAPPED?

It often starts with the schedule. In construction, time is money, and faster completion means lower cost to the general contractor and owner. Many construction schedules include the installation of the roof on the critical path because the interior building components and finishes cannot be completed until the roof has been installed. Therefore, to keep the project on schedule, roofers are pressured to install the roof soon after the roof deck has been poured. Adding to the pressure are contracts written so the general contractor receives a milestone payment once the roof has been installed and the building has been topped out.

Historically, roofers wait a minimum of 28 days after the roof deck is poured before starting to install a new roof. This is the concrete industry's standard time for curing the concrete before testing and evaluating the concrete's compressive strength. Twenty-eight days has no relation to the dryness of a concrete slab. Regardless, after 28 days the roofer may come under pressure from the general contractor to install the roof membrane. The concrete slab's surface may pass the historic "hot asphalt" or the ASTM D4263 Standard "plastic sheet" test, but the apparently dry surface can be deceptive. Curing is not the same as drying, and significant amounts of water remain within a 28-day-old concrete deck. Depending on the ambient conditions, slab thickness and mixture proportions, the interior of the slab will likely have a relative humidity (RH) well over 90 percent at 28 days.

FROM WHERE DOES THE WATER COME?

Upon placing the concrete slab, the batch water goes to several uses. Portland cement reacts with water through the hydration process, creating the glue that holds concrete together. The remaining water held in capillary pores can be lost through evaporation, but evaporation is a slow, diffusion-based process. The diffusion rate of concrete is governed by the size and volume of capillary pores which, in turn, are controlled by the water/cement (w/cm) ratio. The total volume of water that will be lost is controlled by the degree of hydration, which is primarily related to curing and w/cm.

A 4-inch-thick concrete slab releases about 1 quart of water for each square foot of surface area. If a roof membrane is installed before this water escapes

the slab, it can become trapped and collect beneath the roof system. The water does not damage the concrete, but it can migrate into the roofing system—and that's when problems begin to occur. For instance, moisture that moves into the roofing system can:

- Reduce thermal performance of the insulation.
- Cause the insulation, cover board, adhesive or fasteners to lose strength, making the roofing system susceptible to uplift or damage from wind, hail or even foot traffic.
- Lead to dimensional changes in the substrate, causing buckling and eventually damaging the roof membrane.
- Allow mold growth.

A number of factors compound the problem. In buildings where a metal deck is installed, moisture cannot exit the slab through its bottom surface. Instead, the moisture is forced to exit the slab by moving upward. Eliminating one drying surface almost doubles the length of drying time of a concrete slab. The small slots cut in ventilated metal decking have little effect on reducing this drying time.

Ambient conditions also affect the drying rate of a concrete slab since it readily absorbs and retains moisture. Additional moisture may enter an unprotected roof slab from snow cover, rain or dew. Even overcast days will slow the rate of drying.

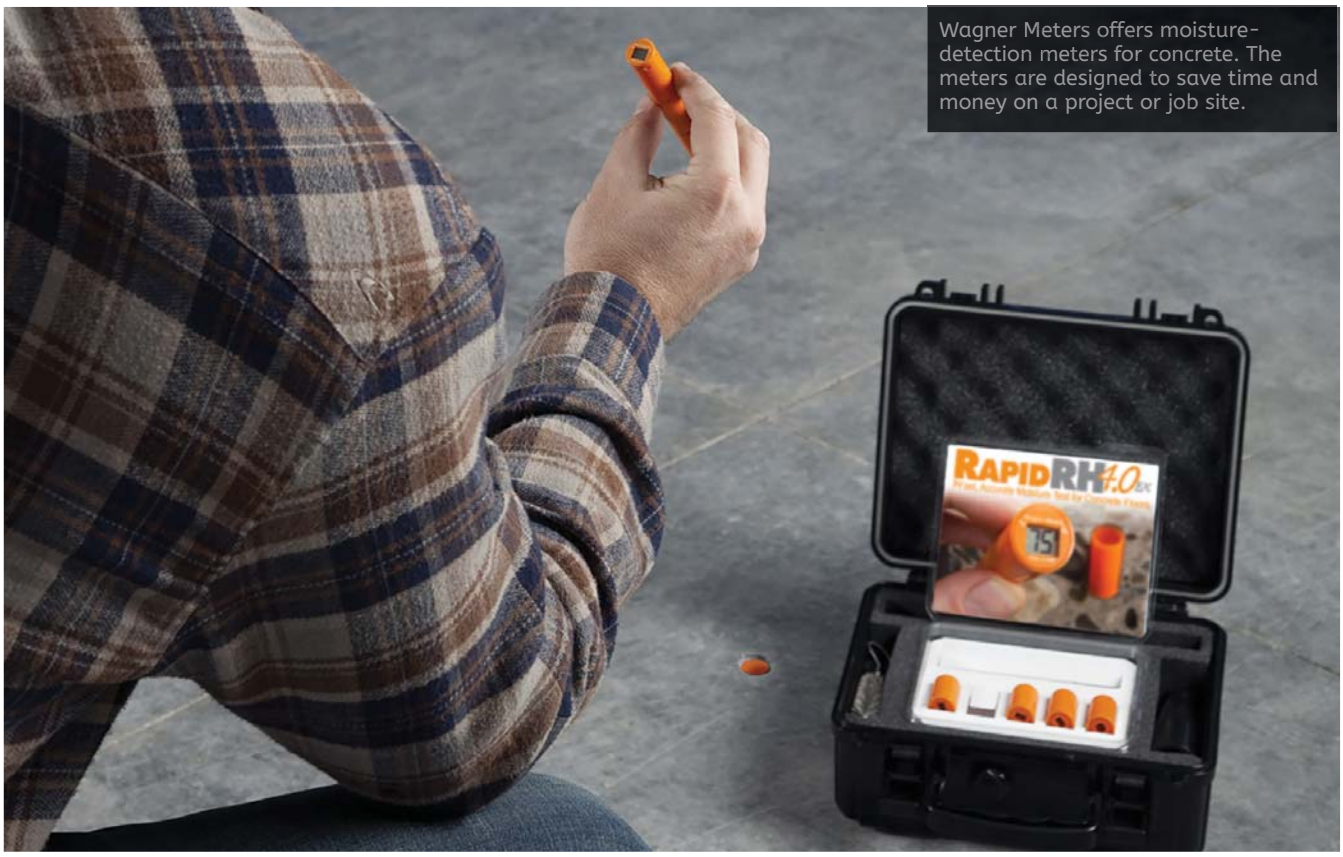
A MODERN-DAY PROBLEM

Before the introduction of today's low-VOC roofing materials, historic roof systems didn't experience as many of these moisture issues. Typically, they were installed onto concrete decks on a continuous layer of hot asphalt adhesive that bonded the insulation to the deck. This low-permeable adhesive acted as a vapor retarder and limited the rate of moisture migrating from the concrete into the roofing assembly. As a result, historic roof systems were somewhat isolated from moisture coming from the concrete slab.

Many of today's single-ply roof membranes are not installed with a vapor retarder. Moisture is able to migrate from the concrete slab into the roof materials. Modern insulation boards are often faced with moisture-sensitive paper facers and adhered to substrates with moisture-sensitive adhesives. These moisture-sensitive paper facers and adhesives are causing many of the problems.

Rene Dupuis of Middleton, Wis.-based Structural Research Inc. recently presented a paper to the Chicago Roofing Contractors Association on the subject. Some of his findings include the following:

- Due to air-quality requirements, government regulations curtailed the use of solvent-based adhesives because they are high in VOCs. Consequently, manufacturers changed to water-based adhesives because they are lower in VOCs, have low odor, are easy to apply and provide more coverage.
- There can be several drawbacks to water-based bonding adhesives. One is that they may be moisture sensitive. Moisture and alkaline salts migrating into roof systems from



Wagner Meters offers moisture-detection meters for concrete. The meters are designed to save time and money on a project or job site.

PHOTOS: WAGNER METERS

Portable moisture meters can detect relative humidity in concrete.

concrete decks can trigger a negative reaction with some water-based adhesives. This reaction can cause the adhesives to revert to a liquid, or it may alter or delay the curing of some foam-based adhesives. Some adhesive manufacturers have recognized these problems and have begun reformulating their adhesives to address these drawbacks.

- Negative reactions also occur when moisture-sensitive paper facers come into contact with moisture. This reaction typically results in decay, mold growth and loss of cohesive strength. Moisture in the roof system may also cause gypsum and wood-fiber-based cover boards to lose cohesive strength.

Dupuis noted moisture from any source can compromise adhered roof systems with wind uplift when attached to paper insulation or gypsum board. He also said facer research clearly shows paper facers suffer loss of strength as moisture content increases.

CONCRETE MIXTURES

Another part of the problem is the change in concrete mixes. For instance, concrete mixes made with fly ash or slag are more durable and may contain admixtures that reduce the water content. In addition, these concrete mixes can be less permeable which, in turn, slows the release of moisture from the concrete.

The increased use of lightweight structural concrete, with its pre-wetted aggregates, adds additional moisture to the mix. Increased moisture in the mix exacerbates the problem of trapped moisture beneath the roof membrane. Although lightweight concrete mix has its benefits, it also doubles the drying time of concrete compared to normal-weight structural concrete.

Concrete is typically classified as normal-weight structural concrete, lightweight structural concrete or lightweight insulating concrete. Normal-weight structural concrete is most common. It has a density of about 150 pounds per cubic foot (pcf). Lightweight structural concrete is similar to normal-weight structural concrete in terms of load-bearing capacity. It has a density ranging from 85 to 120 pcf. Lightweight insulating concrete, used as an insulating, slope-to-drain deck topping, has a density ranging from 20 to 40 pcf.

Normal-weight structural concrete and lightweight structural concrete are produced by mixing large and small aggregates, Portland cement, water and, in some cases, fly ash or chemical additives. Aggregates are inert granular materials, such as sand, gravel, or crushed stone and account for 60 to 75 percent of the total volume of concrete.

Unlike aggregates, most chemical admixtures are supplied in ready-to-use liquid form. They are classed according to function, of which there are four distinct classes. Chemical admixtures are added to the mix immediately before or during mixing and serve a number of purposes:

- Add entrained air to the concrete (microscopic air bubbles that primarily prevent freeze-thaw damage).
- Accelerate or retard the setting or strength gain.
- Reduce the necessary water content (dispersants).
- Slow corrosion of embedded reinforcing steel.

The main difference in the composition of normal-weight structural concrete and lightweight structural concrete is the type of coarse aggregate used. Normal-weight structural concrete contains aggregates, such as natural stone or crushed gravel. These aggregates are dense and ordinarily absorb no more than 2 percent moisture by weight.

Lightweight structural concrete, on the other hand, uses porous aggregates, such as expanded shale. Shale will absorb about 5 to 25 percent moisture by weight. Since it absorbs so much moisture, most lightweight mixes require the use of saturated aggregate to prevent the aggregate from absorbing all of the mix water and reducing the mix water available for hydration. Because the aggregate is saturated, lightweight structural concrete contains much more water than normal-weight structural concrete

After placement, there is little to no difference in appearance between

continues on page 62

METALCON

A FUTURE BUILT BY HAND

WE'VE GOT YOU COVERED

WWW.METALCON.COM

normal and lightweight structural concretes. It typically requires a trained petrographer or engineer using a microscope or a scale to make a positive identification between the two materials.

CONCRETE MOISTURE PROBLEMS

As noted, lightweight structural concrete contains substantially more moisture in the mix than normal-weight structural concrete. NRCA reports the following problems associated with the moisture present in lightweight structural concrete roof decks:

- Vapor from the concrete roof deck condenses in or beneath a roof system.
- Deteriorates moisture-sensitive roofing materials causing reduced cohesive strength.
- Affects adhesive curing and drying rates and causes loss of bond strength because of adhesive "rewetting".
- Corrodes metal components, including fasteners.
- Lowers effective R-value of most insulation products.
- Supports microbial growth on organic-based materials, such as wood fiberboard, perlite board and some insulation facer sheets.

ADDRESSING THE PROBLEM

The moisture issues we are seeing in the roofing industry are similar to what occurs in the flooring industry. That is, flooring often suffers detrimental effects from moisture vapor diffusing out of concrete slabs.

To combat the problem, the flooring industry developed test methods to measure the internal RH of concrete. Initially, the popular calcium chloride test was shown to give false readings. Because of its unreliability, the preferred method is now in-situ RH testing. Using data from in-situ RH testing, many flooring manufacturers specify acceptable RH limits for the concrete at the time of flooring installation as a condition of their warranty.

Although the roofing industry has recently paid more serious attention to moisture issues in concrete roof decks, its typical methods for determining the suitability for installing a roof system have proven to be inadequate. Consider the following methods:

TWENTY-EIGHT-DAY METHOD

A common guideline for determining when to apply roofing materials is to wait a minimum of 28 days after pouring the concrete roof deck. The roofing industry accepts this 28-day period as the minimum length of time needed for the concrete to be cured before it is tested for design compression strength.

Unfortunately, many in the industry mistakenly equate this 28-day period with the time required for the concrete to be considered "dry". This is false. There is no known correlation between this 28-day curing period and the concrete's dryness. Of course, as stated

continues on page 64

ACCELLA Roofing Solutions.

Always Working For You.

- Spray Polyurethane Foam
- Acrylic and Silicone Coatings
- System warranties backed by ACCELLA

Become an Approved Applicator:

888-284-7488

www.cfsolutions.us.com

POLY-SIL™ An Accella Brand

premiSEAL™ An Accella Brand

premiCOTE™ An Accella Brand

ACCELLA ROOFING SOLUTIONS

Formerly Coating and Foam Solutions

earlier in this article, pressure on the industry to meet construction schedules helps promote this thinking.

Although most concrete decks may look and feel dry after 28 days, there is substantial evidence they are not sufficiently dry enough beneath the surface to accept a roof membrane.

HOT-ASPHALT METHOD

A second method involves dripping or mopping hot bitumen onto the concrete deck surface. If the concrete is too wet, the hot bitumen causes water on the concrete surface to bubble, turn to steam and splatter. If the hot bitumen does not splatter, the concrete deck is believed to be sufficiently dry to accept a roof membrane.

Although the hot bitumen may indicate the presence of surface moisture, this method does not provide a way to know if a 1/2 inch or more below the surface the concrete is actually wet. NRCA no longer accepts this method as reliable.

PLASTIC-SHEET METHOD

A third method is standardized as ASTM D4263, "Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method". This protocol calls for taping a small piece of transparent plastic or glass pane to the concrete deck surface for 24 hours. If, after 24 hours, there is condensation on the bottom of the plastic or glass, then the roof deck is considered too wet for the application of a roof membrane.

NRCA no longer considers this method reliable either. This method can result in false readings. One reason for inaccurate results is that it's difficult to achieve an airtight seal at the test panel's edges. Secondly, unless the temperatures on the top and bottom sides of the concrete deck are nearly the same, the resulting lack of a vapor pressure difference can give a false "dry" indication.

To illustrate, if the test is performed on a warm day, then no condensation may appear because the plastic will be warmer than the concrete slab. Even if the test is performed in the shade instead of the sun, similar results may occur.

IN-SITU PROBE METHOD

Still another way for measuring the concrete deck's level of moisture content is to use the method the flooring industry has found to be reliable: ASTM F2170, "Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes." This method calls for small holes to be drilled in the concrete slab, then small moisture probes are inserted and sealed in the drilled openings for a minimum of 72 hours. Each probe reads the concrete's internal temperature and RH.

Although NRCA considers this method to have some merit, it also realizes ASTM F2170 must overcome the following challenges before becoming a viable test method:

- First, the roofing industry, unlike the flooring industry, has not yet "established any benchmarks or acceptable levels" for moisture in concrete. Therefore, no one can say with any assurance at what RH reading a roof membrane can be reliably installed.

- Second, no practical method has been established to get a reliable number even if an acceptable benchmark is established. The moisture probes used in the flooring industry are designed to work in an interior environment under a fixed temperature and fixed moisture level. That's not the case when the probes are used on a concrete roof deck. They are exposed to changes in temperature and RH, as well as changes in weather. For instance, what happens if current technology moisture probes are installed in a roof slab and it rains? The test results would be skewed.

In addition, there currently is not an acceptable RH value for concrete roof decks. To attain the 75 percent value accepted by the flooring industry, normal-weight structural concrete would take close to 90 days to dry under ideal, controlled laboratory conditions (no rewetting). Meanwhile, lightweight structural concrete would take about six months to reach the same 75 percent value.

SOLUTIONS

The roofing industry is looking at various ways to remedy or minimize the problems surrounding concrete roof deck moisture. Aside from ASTM F2170 and the promise that it may one day help determine a concrete slab's acceptable level of dryness, let's look at some other ways of solving these problems.

One of the most obvious solutions is to avoid using lightweight structural concrete. It holds significantly more water than normal-weight structural concrete and requires at least twice as long to sufficiently dry out.

Another thing to avoid is using a metal deck. Doing so will not allow the concrete slab to dry to the bottom.

Another approach is to change the mix by including additives and admixtures that change the water/cement ratio. This mix would contain less water and dry out faster, yet provide a good, high-strength concrete.

There's also work being done on using different coatings to coat the roof deck. These coatings are designed to seal the moisture in and prevent it from causing problems with the moisture-sensitive materials. While this may sound promising, the cost of many of these coatings are relatively expensive compared to the overall roof system, so, at the present time, this is not a good solution.

Still another approach is to use moisture-vapor-transmission calculations. Moisture migrates through roofing system

components over time. The construction industry has been investigating moisture vapor flow for many years. Sophisticated computer programs have been developed to predict moisture vapor flow and are used by building envelope consultants. These programs have inherent limitations. They are typically one-dimensional analytic tools that focus on vapor diffusion and do not account for bulk air or water leakage. Therefore, if the roof membrane and air barrier malfunction, the results will be inaccurate. Another limitation is that hygrothermal analysis program results require knowing the maximum amount of moisture that roofing materials can safely tolerate and these levels have not been established by manufacturers.

WHO TAKES RESPONSIBILITY?

Manufacturers' installation requirements often try to place the responsibility on roofing contractors when it comes to ensuring a structural concrete deck's suitability for installing roofing materials, project contract and specification.

Although the roofing industry has recently paid more serious attention to moisture issues in concrete roof decks, its typical methods for determining the suitability for installing a roof system have proven to be inadequate.

NRCA, however, says it is not the contractor's responsibility and given current technology, it is beyond his or her controllability to assess properly. Pointing to all the variables involved in this decision, such as concrete mix design, placement, curing and drying, NRCA claims roofing contractors do not have this information or simply lack the knowledge to make an informed decision.

Normally, a roofing contractor can make a visual or tactile assessment of whether the concrete's uppermost surface is dry, but he or she cannot accurately assess what level of moisture content lies within the concrete and its likely release.

WHAT NRCA RECOMMENDS

According to NRCA, the decision to cover a newly placed concrete deck with a new roof system should be made by the building's structural engineer, general contractor, concrete supplier and

concrete placement contractor. The reason is that each of them should have considerably more knowledge than the roofing contractor about the particular concrete's curing and moisture-release rates. If additional assistance would be helpful, NRCA recommends consulting the building's roof system designer and roof system manufacturer.

NRCA contends its position on this issue is similar to the flooring industry. That is, floor-covering manufacturers of resilient tile and textile floor coverings and coatings typically require quantitative moisture testing be performed before floor covering installation on concrete. They use ASTM F2170 for this purpose.

In new construction, NRCA recommends designers should not specify—and construction managers and general contractors should not use—lightweight structural concrete for roof decks or as toppings for roof decks. It is NRCA's opinion that the risks of moisture-related problems associated with lightweight structural concrete roof decks outweigh the benefits.

Should lightweight structural concrete be used, NRCA recommends designers clearly state the concrete's drying parameters and ASTM F2170 should be used for this purpose. Until such time that pass-fail criteria be established for determining concrete's internal humidity, NRCA suggests a maximum of 75 percent RH value be used. And, whenever organic-based materials are used for roof system components, such as wood fiberboard, perlite board and some insulation facer sheets, then lower RH values may be required.

PROCEED WITH CAUTION

For the near term, it appears that the roofing industry will continue to face costly and troublesome problems with moisture and concrete decks. Until the roofing industry finds and adopts an acceptable moisture test method or finds a system that can accommodate the release of moisture from the underlying structure, the project designer, general contractor, concrete contractor and their suppliers—not the roofing contractor—should make the decision of when a concrete deck may be roofed. With concrete specifications and the project environment at their fingertips, including the heated interior and additional high-moisture interior components and other factors that could drive moisture out of the concrete, these other professionals are more knowledgeable of the potential water/moisture migration and potential vapor pressures than roofing contractors.

Once the design and management group believe the roof deck is sufficiently dry for it to be safe to install the roof assembly, then, and only then, should they authorize the roofing contractor to proceed with installation of the roof. R

WRITTEN BY **RICK DUNCAN, PH.D., P.E.**

Spray Polyurethane Foam and Photovoltaic Roofing Systems

When Working with These Systems, You Must Consider Design, Safety, Maintenance and More

Spray polyurethane foam and photovoltaic systems are increasingly utilized together as a joint solution for energy savings. With the continued push toward sustainability and growing movements, like net-zero-energy construction, SPF and PV systems are a logical combined solution for the generation of renewable energy, the conservation of heating and cooling energy, and the elimination of the structure's dependence on fossil-fuel-consuming electricity sources.

Regardless of whether net-zero energy is the end goal, SPF and PV combined in roofing can be quite effective for many structures. Here are some considerations when looking to join these two powerful systems on the roof of a building.

ROOFTOP PV INSTALLATION TYPES FOR USE WITH SPF

Rooftop PV systems can vary significantly in size. Large-footprint buildings can employ PV systems rated from 50

PHOTOS: SPRAY POLYURETHANE FOAM ALLIANCE

Self-flashing of PV supports using SPF roofing systems.

kilowatts to 1,000 kW or larger while residential rooftop PV systems are commonly 3 kW to 5 kW.

Rooftop PV systems may be installed on racks or adhered directly to the roof surface. When looking to combine PV with SPF, it is generally not advised to adhere or place the PV panels directly onto the roof surface. Solar heat and water can accumulate between the PV and roof coating which could negatively impact coating performance. Moreover, panels applied directly to a low-slope roof will not be properly aligned with the sun to achieve optimal performance.

Non-penetrating rack systems may be placed directly on a rooftop and held in place with ballast. Racks may also be installed with penetrating supports that require flashings. Each type provides advantages and disadvantages. For example, ballasted racks may block water flow and affect drainage while penetrations require leak- and maintenance-prone flashings. SPF is unique in that it easily self-flashes around penetrating supports.

PV EXPLANATION

PV cells are the basic unit used to convert light to electricity. Many PV cells are bundled together to make a PV panel, or module. PV panels are grouped electrically to create a PV string. Depending on the system size, two or more strings are combined to create a PV array.

The dominant type of PV panel used with SPF roofing is cSi, or crystalline silicon. cSi is a typically rigid panel with a glass and metal frame and may be applied, unlike other dominant PV panel types, via rack installation methods.

A PV system includes many components in addition to the panels. Components include racks, rails, rooftop attachment devices, grounding systems, wiring and wiring harnesses, combiner boxes, inverter(s) and connection to the main electrical panel. Components may also include control modules and storage batteries for off-grid PV system installations.

ELECTRICAL SAFETY

Photovoltaic panels must be handled and maintained with caution. Electricity is produced when a single panel is exposed to light; however, because a panel is not part of a circuit, that electricity will not flow until the circuit is complete. A worker may complete the circuit by connecting the two wires from the backside of a PV panel.

When maintaining a PV system, it may become necessary at some point to disconnect or remove an individual panel from a string or an array. The whole system must be shutdown properly as a precautionary measure to prevent shocks from occurring to workers and arcing between electrical connections. This "shutdown" procedure must be followed with precision as part of a lock-out/tag-out program. This procedure is provided by the inverter manufacturer. Under no circumstances should SPF contractors ever disconnect or decommission a PV panel or system unless they are trained and qualified to do so.

Under no circumstances should SPF contractors ever disconnect or decommission a PV panel or system unless they are trained and qualified to do so.

HEAT BUILDUP

Photovoltaic panels convert approximately 15 to 20 percent of light to electricity, leaving the remaining unconverted energy to be released as heat. Additionally, PV panels are more effective when their temperature drops. It is for these reasons that the majority of rooftop PV systems are installed to encourage airflow under panels, which reduces the temperature of the panels, improves conversion efficiency and releases heat effectively. Photovoltaic panels installed 4 to 5 inches above the roof will not change the temperature of the roof and, instead, provide shade to the surface of that roof. This additional shade may extend the life of SPF roof coatings.

LOAD

PV panels add weight to a rooftop and this must be factored into the design and installation. Existing structures should be analyzed by a structural engineer to determine if the additional weight of the PV system is acceptable.

Rack-mounted arrays with penetrating attachments are fairly lightweight at 2 to 3 pounds per square

SPF roofing systems self-flash around PV rack system supports, various types of skylights and roof-mounted HVAC equipment.

foot, and ballasted arrays add 4 to 6 pounds per square foot. However, with the latter, more ballast is utilized at the perimeters and corners of a PV array. Thus, localized loading from ballast may reach as high as 12 to 17 pounds per square foot, which must be considered. Most SPF roofing systems have a compressive strength of 40 to 60 psi.

Additionally, roofs are required by codes to provide "live-load" capacity, a measurement that includes people, snow and other weight-bearing temporary scenarios that may occur. The weight of a PV system is typically below the live-load capacity, however in the absence of a structural analysis, the live-load capacity will be reduced by the addition of the PV system.

A final consideration is whether a PV installation will create new locations for drifting snow, which may add considerable weight to a roof.

When determining key considerations for wind load and fire safety, best practices require deferral to the PV supplier.

EQUIVALENT SERVICE LIFE

Ideally, a roof system and the PV system should have the same expected service life. Removal (decommissioning) and reinstallation (recommissioning) of a PV system is costly, and the cost should be weighed relative to the residual service life of the existing roof and cost of roof replacement at the time of PV installation. Ballasted, rack-mounted PV systems are difficult, if not impossible, to reroof (or recoat) under and around. Elevated racks with adequate space beneath may be able to be left in place when reroofing.

For example, a PV system that covers 10 percent of the rooftop will be easier

to relocate during reroofing than a PV system that covers 75 percent of the rooftop. Building owners should be advised of future reroofing and maintenance costs with roof-mounted PV systems.

Drainage on rooftops is important for safety of the structure and longevity of the roof. PV arrays often have many points of contact with a roof, and these are possible locations that will block or slow drainage. PV racking should be positioned to minimize ponding water and/or include methods, such as notched pads, to allow drainage under points of contact, especially for ballasted systems.

Roof systems used as platforms for PV systems must be tough and durable, and generally speaking, SPF has greater compressive strength as density increases. Higher-density SPF systems may be preferred, especially when ballasted support systems are used.

An SPF system will be stressed during the installation of the PV system and coatings and granules will help protect the roof during this time, as well as during scheduled maintenance. Because a roof surface below PV panels will likely not dry as fast as non-covered portions, coatings that stand up better to standing water and biological growth should be selected.

Ideally, a roof system and the PV system should have the same expected service life.

PV SYSTEM ACCESS

All roof-mounted PV systems should be inspected and maintained at least twice a year. Wiring, attachment points and flashings should be inspected, and cleaning of the top surface of the PV panels may be required.

To maintain and service the roof and PV system, workers must be able to access both. PV systems should not block access to drains, penetrations, flashings, mechanical units or other rooftop equipment. Similarly, PV systems should be installed so maintenance workers can access wiring, inspect panel-to-racking connections and properly clean top surfaces without stepping on PV panels.

Installation of PV systems on SPF roofing will inevitably create additional foot traffic. It is important to protect heavily trafficked areas with additional coating and granules or walk pads. The cost to do so is low and will protect the service life of the roof.

Although there are many additional considerations to the application of PV systems in combination with SPF roofs, the energy generation and conservation provided by the combined solution is well worth the extra effort.

RESIDENTIAL

WRITTEN BY **MATTHEW HIRSCH**

Ready to Rumble with Nature

A Coastal Home Is Built to Withstand the Severe Weather that Destroyed Its Predecessor

Dave Caldwell doesn't have to travel into the future to see how a sustainable beach house—a complete rebuild of a home destroyed by Hurricane Sandy—in Westerly, R.I., will survive the next major storm. Half an hour northeast along the coastline, on the ocean side of Narragansett Bay, stands a testament to resiliency, another new home that Caldwell built in October 2012, just two weeks before Sandy swept in.

Featuring the same asphalt laminate shingle and integrated solar shingle roofing system, the Narragansett Bay home weathered the worst storm to hit the Ocean State in more than half a century, emerging unscathed while 1,000 other coastal Rhode Island properties incurred a combined $35 million in damage. The home's survival demonstrated the power of construction techniques used to protect against the forces of nature—techniques that Caldwell repeated in the re-creation

PHOTOS: CERTAINTEED CORP.

> **"Durability is a key component of sustainable green building."**
>
> —Dave Caldwell, owner, Caldwell & Johnson

of the Westerly home.

For Caldwell, the second-generation owner of North Kingstown, R.I.-based Caldwell & Johnson, a design-build firm founded in 1968, the construction industry's response to Hurricane Sandy only validates an approach to sustainable building that emphasizes long-term value over one-time costs. He says the owners of the Westerly home, a retired couple from South Carolina, were not afraid to put a little money into making the building stout and durable after their previous home was destroyed by the storm. "The goal," he says, "was to sit and watch the next category 5 hurricane blow through."

HURRICANE DESTRUCTION AND ITS AFTERMATH

It's a good thing nobody was at the Westerly home in late October 2012 when 15-foot waves carrying softball-sized stones and tons of sand crashed onto Misquamicut State Beach. The structure there at the time was a bedrock of family tradition, an annual summer destination for the owners and their children and grandchildren. But without insulation to even keep out cold air in winter, it was no match for flooding and gale-force winds. Caldwell describes the storm's impact in neat and peaceful terms. "After the tidal surge, not much of the house was left," he says. "Where the living room used to be, there was a 4-foot pile of sand."

Commissioned to rebuild using the maximum footprint allowed by regulatory agencies, Caldwell designed a flood-resistant foundation using concrete footings and pilings reinforced with rebar and breakaway walls at ground level so the rest of the house will not be compromised by the next big storm. The whole house received airtight insulation, efficient heating and cooling systems, and a third-party-verified air quality measurement that combined to achieve a silver rating by the National Green Building Standard, which is maintained by the National Association of Home Builders, Washington, D.C.

Caldwell gets a lot of customer requests to add rooftop solar panels. Many times he says no because of shading impacts or suboptimal roof orientation that can limit energy production. When site conditions allow for solar, Caldwell usually brings in a subcontractor for the installation. For high-end projects with an aesthetic that requires preserving the architectural integrity of the roofline, Caldwell has his own construction crew, led by foreman Dwayne Smith, install solar shingles that integrate with traditional shingles to form a seamless roof system. Smith went through a manufacturer's training program to

become a certified roof shingle and solar shingle installer, making Caldwell & Johnson eligible for warranty protection from the supplier and demonstrating to customers that the firm is serious about the product.

Traditional solar panels would not have been suitable for the Westerly beach home, because durability was a principal concern for the client, a retired physicist.

"Durability is a key component of sustainable green building," Caldwell explains. "Oceanfront homes in our region are exposed to some pretty harsh elements throughout the year, including high winds, ice, salt and more. Fortunately, the individual components of the integrated solar system are up to task, and the fastening system allows the entire array to be secured directly to the roof deck as an integral unit."

Caldwell was able to easily dispel the concern by referring to the Narragansett Bay project that survived Hurricane Sandy, where his team had installed solar shingles for the first time. "That home came through the storm with no problem at all. The solar energy system turned on and hasn't had a problem since," he says.

If the conditions in Rhode Island don't provide enough assurance that solar shingles can withstand the worst that Mother Nature has to offer, Caldwell can also point to an installation he's put on his own ski house in the White Mountains of New Hampshire, about 4,000 feet above sea level. "If you wanted to test this stuff, that's getting on the outer edge of the bell curve," he says. "I wouldn't put traditional solar panels there. It would be too dangerous. But in pretty harsh conditions, the solar shingles work great."

ROOF MATERIALS

Solar Shingles: Apollo II Solar System from CertainTeed Corp., bit.ly/28WB1tr

Asphalt Roofing Shingles: Landmark Designer Series, color Pewterwood, from CertainTeed, bit.ly/28Ss8yx

FORTIFIED HOME CONSTRUCTION

Since Hurricane Sandy, building officials in Rhode Island have been working to improve industry standards so the housing stock can become more resilient against high winds and water damage. Caldwell is helping to lead the transition by delivering New England's first participant in the Tampa, Fla.-based Insurance Institute for Business & Home Safety's FORTIFIED Home program: a waterfront project in Matunuck, about midway between Westerly and Narragansett. The Westerly beach project preceded the introduction of the FORTIFIED Home program, but Caldwell says it meets all the requirements. The owners can obtain FORTIFIED Home designation any time after project completion. Doing so might qualify them for a home insurance cost reduction.

Caldwell says roof installation on a FORTIFIED Home calls for a little extra attention to detail.

Caldwell says roof installation on a FORTIFIED Home calls for a little extra attention to detail. He uses extra-long ring shank nails to attach the roof deck, then tapes all the seams and applies a reinforced, synthetic underlayment that keeps out water and ice as an alternative to felt paper. Even if roof shingles blow off, water still isn't getting into the home.

Nothing about the Westerly beach project increased complexity of design or supply-chain management, including the use of solar shingles. Caldwell says solar was actually a last-minute addition, one he could handle on pretty short notice because it did not alter the roofing system design. He sourced the solar shingles and accompanying underlayment from Coventry, R.I.-based Coventry Lumber, the same supplier that handled the other building materials for the project. The only word of caution, Caldwell says, is that solar shingles can be slippery, so be careful when installing them in bad weather or wait until conditions clear up.

ENERGY PRODUCTION FROM SOLAR SHINGLES

Although the solar shingles on the Westerly beach house were designed to blend into the roofline and match the color of the surrounding roof shingles, the homeowners will have no trouble spotting an impact on their home energy costs. Robert Sherwood, a senior project manager at the energy consulting firm CLEAResult, based in East Greenwich, R.I., says the solar shingles helped reduce the project's Home Energy Rating System (HERS) score from 60 to 36, resulting in substantial energy savings each year.

The HERS index is a tool created by the non-profit Residential Energy Services Network (RESNET), Oceanside, Calif., to report on energy efficiency in new and existing houses. New homes can attain a score of 0 to 100 with lower scores for more efficient buildings. Sherwood says a score of 75 corresponds loosely with the threshold for meeting the new energy code in Rhode Island, and a home would have to score in the low 60s or lower to achieve ENERGY STAR certification.

According to Sherwood's analysis, the solar shingles are expected to produce 21.4 million Btus (6,276 kilowatt-hours) per year. This level of output would reduce energy costs by $920 a year, and if the homeowners consume energy at the anticipated rate, the savings from solar would offset 59 percent of the utility bill. Anyone who installs a solar electric system can claim a 30 percent federal income tax credit. After monetizing the credit and collecting the expected annual energy savings, the solar shingles would pay for themselves in four years and continue generating energy at no cost for at least 20 years.

In the wake of Hurricane Sandy, sustainable home builders in Rhode Island are demonstrating that durability and efficiency go hand in hand. R

WRITTEN BY **RICK CUNNINGHAM**

The 40-year-old Problem

Self-flashing Skylights on Commercial Warehouses Are Beginning to Leak

Today, many commercial roofers are dealing with a large-scale problem—reinstalling and replacing leaky self-flashing skylights on commercial warehouses. I have seen firsthand how improper installation of self-flashing skylights has become a headache for commercial property owners.

Around the late 1970s and early 1980s, intermodal freight became a huge part of global distribution. To handle the increase in freight projects, warehouse construction exploded. The Port of Oakland, for instance, invested heavily in intermodal container transfer capabilities in the '80s. In fact, the aggressive growth of intermodal freight distribution continued into the early 2000s.

The cheapest and easiest way for skylights to be installed on these warehouses was to use self-flashing skylights. The metal curb or L bracket attached to the bottom of the skylight was, in theory, supposed to be set on top of the built-up roofing material and then stripped in, sandwiching the flange between the roofing layers. The result would be roofing material, then skylight, then more roofing material over the flashing on the skylight.

Unfortunately, many of the skylights installed on commercial warehouse properties in the western Sunbelt states were installed improperly because they were installed first and foremost as fall protection for the open floor in the roof during construction by the builder and not by the roofer. Our teams have seen thousands of these original self-flashing skylight installations where self-flashing flanges are set directly on the plywood roof deck, below all the roofing materials.

Most of the original roofers didn't budget in the time and money it took to pull the skylight assembly apart from the roof deck and re-install it the proper way. Nor did they wash the oils off the new metal from the galvanizing process or use asphalt primer to prep the steel flanges of the assembly and ensure the roofing asphalt would stick properly. Over the years, as the metal of the skylight flanges expanded and contracted and the built-up roof did the same, but at a different rate, the roofing system eventually separated from the skylight, leaving a self-flashing skylight that's now turned into what we jokingly refer to as a "self-leaking skylight". This is part of the reason why everyone thinks skylights always leak.

The best way we've found to install leak-free skylights on a commercial warehouse roof, especially when replacing the self-flashing skylights on an existing building, is to use a curb-mounted skylight. A curb-mounted skylight fits like a shoebox lid over a new curb the roofing contractor fabricates as part of the installation. This curbed design eliminates the metal flange and offers waterproofing redundancy in critical areas of the installation, so water can't get into the building at the skylight opening. Because the new skylight is installed on a curb, it's also much easier to address any future issues with the skylight or to replace it down the road if necessary. This especially comes in handy when owners lease to new tenants. New building occupancy regulations mean skylights may be required by municipalities to be changed out for smoke vents to comply with fire codes.

If you're dealing with one or more self-flashing skylight leaks, there are a few things to keep in mind:

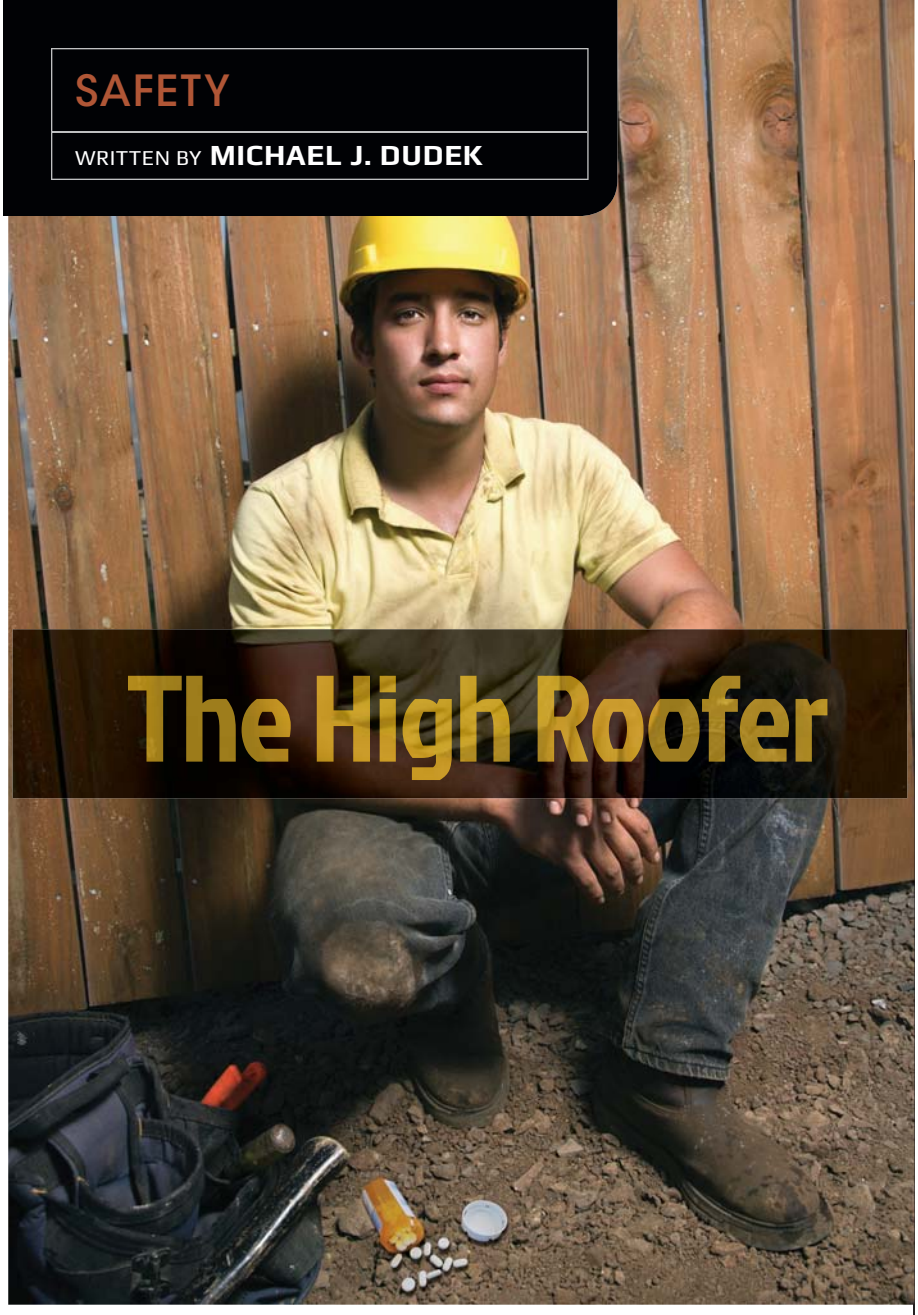
- Check if there is condensation on the inside of the skylight; a lot of skylights have a trough where condensation runoff will leak into the building.
- Be sure to check the juncture where the skylight and the roof meet (the skylight base flashing), which can sometimes include up to 5 inches of mastic at the base flashing.
- If the skylight has a frameless acrylic

cap without a metal frame around the outside, check the acrylic dome for stress cracks. It is possible to replace some acrylic domes on some skylights but often the cost of an acrylic dome is roughly the same as the cost of a new skylight, and if you're already considering installing a new roof with a 15- to 20-year warranty, it doesn't make much sense to leave the "self-leaking skylight" frame in place. Replacing the skylights during the reroofing project is much more cost-effective than returning to replace skylights later. In addition, skylight technology is far better now than it was 15 or 20 years ago (think about today's impact-resistant polycarbonate and better UV and fall protection).

Don't let self-flashing skylights give you and your roofing business a bad name.

Above all else, don't let self-flashing skylights give you and your roofing business a bad name. Instead, address the issue with your commercial clients and educate them about the best choices for their skylights and how they can stay current with the International Building Code and municipal codes. You'll be helping them protect one of their biggest assets by ensuring their skylights stay leak-free. R

WRITTEN BY **MICHAEL J. DUDEK**



The High Roofer

Drug abuse in the workplace is a great threat to the health and safety of American workers, and roofers are no exception. Roofers have the fifth-highest work-related death rate in construction—about twice the average for all construction (about 50 roofers are killed on the job each year, most by falls). According to the National Survey on Drug Use and Health, the construction industry, including the roofing trade, has the second highest level of alcohol abuse and sixth highest level of drug abuse. (The survey is sponsored by the Substance Abuse and Mental Health Services Administration, an agency in the U.S. Department of Health and Human Services, Washington, D.C.)

Signs and symptoms of drug abuse in the workplace are absenteeism, staff turnover, lower productivity, poor work quality and overall poor morale. These can lead to increased accidents and near misses, theft of equipment and materials, and equipment breakdowns.

In addition, behavioral issues commonly are associated with substance abuse. For example, addicted workers may exhibit a change in attitude or work performance, erratic performance, hangover symptoms and secretive behavior. Other signs include isolation, forgetfulness, indecision, erratic judgment, impulsive and temperamental behavior, changes in personal appearance and hygiene, jitters, hand tremors, hyper-excitability, carelessness, sleeping on the job, trouble with police, aggression and constant illnesses.

If your employees are using, some common sites for drug abuse while at work are lunchrooms and lounge areas, parking lots and cars, remote areas of a worksite, equipment and storage rooms, and restrooms.

Read on to learn about today's common drugs and identify whether your employees have addictions to these drugs:

MARIJUANA

Marijuana, also known as weed, reefer, pot, etc., comes from the hemp plant (cannabis sativa). About 10 percent of roofing workers claim to use marijuana. In 1974, marijuana had an approximate 1 percent content of THC (the chemical responsible for marijuana's high). Depending on the grower, today's marijuana's THC content can be between 15 and 22 percent.

Marijuana is highly carcinogenic. One joint is equivalent to 25 cigarettes. It can be smoked, eaten or vaped. Marijuana affects the user's mental function. Feelings include a sense of well-being, irritability, insomnia, anxiety, depression, apathy, diminished concentration, delayed decision-making, impaired short-term memory, erratic cognitive functions and distortions in time estimation.

Signs and symptoms of marijuana use include impaired tracking, distinctive odor on clothing, decrease in visual functioning and other ophthalmic problems, reddened eyes, slowed speech, chronic fatigue and a lack of motivation. Acute/overdose effects are aggressive urges, anxiety, confusion, fearfulness, hallucinations and heavy sedation.

Withdrawal comes with a loss of appetite, restlessness, chronic fatigue and a lack of motivation.

METHAMPHETAMINE

Amphetamine, methamphetamine, uppers, speed, crank and ice are similar in makeup and effect. The second-most widely used drug (after marijuana), meth can come in different colors: white, brown, pink. It can be taken orally as

tablets or capsules. Its liquid form can be injected or mixed with other fluids and drank. It can also be snorted as a powder. In its rock form, it can be smoked.

Within minutes after being smoked or injected, users experience an intense "rush", which is said to be very pleasurable. Although the rush only lasts a few minutes, the effects can last for up to 12 hours and keep users awake and moving for several days at a time. Meth users build up a tolerance, which forces them to have a strong desire for more.

Visible signs and symptoms of meth use are hyper-excitability, dilated pupils, profuse sweating, confusion, panic, talkativeness and an inability to concentrate. Regular use produces strong psychological dependence and increased drug tolerance. High doses may cause toxic psychosis, resembling schizophrenia. Intoxication may induce heart attack or stroke. Chronic users experience increased impulsive or risk-taking behaviors.

Withdrawal causes severe depression. The effects of meth are so potent that there is a 95 percent relapse rate.

COCAINE

Cocaine was once called the "Rich Man's Drug" because of its short-lived effects. Regular use can upset chemical balance in the brain. It also causes the heart to beat faster and harder. Deaths caused by overdose can occur when taken with depressants.

Signs and symptoms of cocaine use in the workplace include financial problems; frequent absences from work; increased physical activity followed by fatigue, isolation and withdrawal. Cocaine users usually show increasing secretive behaviors and unusual defensiveness. Other symptoms include wide mood swings, nose problems, difficulty in

LEARN MORE

National Survey on Drug Use and Health: 1.usa.gov/295XSRI

ELCOSH Electronic Library of Occupational Safety and Health: bit.ly/293IARN

Partnership for Drug-free Kids: Drugfree.org

concentration and dilated pupils.

Cocaine addicts exhibit the strongest mental dependency of all drugs, and the treatment success rates are lower than all other addictive drugs.

OPIOIDS

One of the worst drug problems in the U.S. today is the opiate/opioid epidemic. Natural opiates are derived from resin of the poppy plant. However, synthetic opioids are increasingly replacing natural opiates.

Addiction to opioid medications has impacted every level of society. Many people blame the addiction prevalence on health-care providers who are quick to write a prescription for help with chronic pain. An estimated 210 million prescriptions for opiates were dispensed in 2010 alone. According to DrugAbuse.com, examples of opiates include heroin, morphine, oxycodone (trade names are OxyContin and Percocet), hydrocodone (trade names are Vicodin and Lortab), codeine and fentanyl. Frighteningly, prescription opiate abusers are far more likely to eventually develop a heroin addiction than a non-opiate abuser because heroin will offer a similar high at a cheaper price.

Any long-term use puts a person at risk of addiction, even if the substance is used as prescribed. Many people who use opiates will develop a tolerance to them—a phenomenon that can trigger the cycle of addiction. When this occurs, people routinely take more of the substance to elicit the desired response. This ever-increasing dosing places one at great risk for overdose.

Physical signs that someone may be abusing an opiate include noticeable elation/euphoria, marked sedation/drowsiness, confusion, constricted pupils, slowed breathing, and intermittent nodding off or loss of consciousness. Other signs of opiate abuse include shifting or dramatically changing moods, extra pill bottles turning up in the trash, social withdrawal/isolation, and sudden financial problems.

Withdrawal symptoms from opiates can be extremely severe. The symptoms mimic the flu and include headache, nausea and vomiting, diarrhea, sweating, fatigue, anxiety and inability to sleep. These symptoms can be so severe that the addict will do anything to feel better.

DON'T MIX ROOFING AND DRUGS

Because falls from roof edges account for half or three-fourths of roofers' deaths, it's not difficult to understand why drug use on the job would be concerning. For roofers in residential construction, falls from roof edges accounted for 70 percent of work-related fall deaths and 90 percent of roof fall deaths. These statistics coupled with the statistics on drug abuse in the construction industry suggest that drug abuse possibly may be a contributor to falls. R

ADINDEX

COMPANY	PHONE	WEB ADDRESS	PAGE	CIRCLE
Accella Polyurethane Systems	(770) 528-9556	AccellaPolyurethane.com	63	43
Acme Cone	(866) 516-4079	AcmeCone.com	48	36
Advanced Architectural Sheet Metal	(877) 756-4890	AdvArchSM.com	67	47
American Master Gutters	(317) 328-5293	AmericanMasterGutters.com	33	28
Atlas Roofing Corp.	(800) 388-6134	AtlasRoofing.com	27	25
Aztec Washer	(858) 513-4350	AztecWasher.com	80	54
Boral Roofing	(800) 669-TILES	BoralRoof.com	2	1
Classic Gutter Systems LLC	(269) 665-2700	ClassicGutters.com	80	55
Construct	(866) 920-0208	ConstructShow.com	53	39
Dynamic Fastener	(800) 821-5448	DynamicFastener.com	25	20
EPDM Coatings	(610) 298-1989	EPDMCoatings.com	65	45
Epilay	(800) 292-6728	Epilay.com	6	5
GAF	(973) 628-3000	GAF.com	84	58
Georgia-Pacific	(800) 225-6119	BuildGP.com	4	3
GSSI	(800) 288-9489	GSSISealants.com	17	11
Interwrap	(800) 567-9727	Interwrap.com	23	15
Johns Manville	(800) 922-5922	JM.com	46/62	34/42
K & M Sheet Metal	(919) 544-8887	KMSheetMetal.com	39	31
KM Coatings	(602) 253-1168	KMCoatingsMfg.com	21	13
Leland	(800) 263-3393	LelandIndustries.com	57	40
LM Curbs	(800) 284-1412	LMCurbs.com	48	37
Lyon Roofing	(423) 538-5169	LyonMetalRoofing.com	35	30
Marathon Drains	(716) 332-7673	MarathonDrains.com	66	46
Metal Construction Association	(857) 255-3343	MetalConstruction.org/index.php/metalcon/triumph_awards	49	38
Metal Plus LLC	(860) 379-1327	MetalPlusLLC.com	71	49
METALCON	(857) 255-3343	METALCON.com	61	41
Metl-Span	(972) 221-6656	MetlSpan.com	5	4
MFM Building Products	(740) 622-2645	MFMBP.com	43	33
Morin Corp.	(800) 640-9501	MorinCorp.com	64	44
Nationwide Protective Coatings	(800) 423-7264	NationwideCoatings.com	77	51
NB Handy	(434) 847-2498	NBHandy.com	47	35
Owens Corning	(800) GET-PINK	OwensCorning.com/roofing/browse-shingles/surenail-technology/	19	12
Petersen Aluminum	(888) 942-2636	PAC-CLAD.com	9	6
PIMA	(202) 591-2473	Polyiso.org	41	32
Polyglass	(954) 233-1239	Polyglass.us	13	9
Progressive Materials	(812) 944-7803	PMSilicone.com	77	50
RK Hydrovac	(800) 762-8361	RKHydrovac.com	83	57
Roof Hugger	(800) 771-1711	RoofHugger.com	79	52
Royal Adhesives	(517) 841-7108	RoyalAdhesives.com	15	10
S-5!	(888) 825-3432	S-5.com	79	53
Snojax	(717) 458-7880	Snoblox.com	81	56
Soprema	(330) 331-3062	Soprema.us	10	7
Standing Seam Roof Anchor	(863) 703-4522	FallPD.com	22	14
Swenson Shear	(877) 588-8748	SwensonShear.com	29	27
Triad Corrugated Metal	(866) 625-9727	TriadMetalRoof.com	70	48
Triangle Fastener	(800) 486-1832	TriangleFastener.com	3	2
WUKO	(844) WUKOINC	WUKOinc.com	34	29
Zimmerman Metals	(303) 294-0180	ZimmermanMetals.com	11	8

2016 National Roofing Week is a Success

NRCA Members Celebrate National Roofing Week

As part of National Roofing Week, Rosemont, Ill.-based National Roofing Contractors Association members celebrated their industry pride in unique ways. The following images were shared via NRCA's Facebook page:

Deer Park Roofing Inc., Cincinnati, celebrated National Roofing Week by taking employees and families to a Cincinnati Reds baseball game, of course.

Baker Roofing, Raleigh, N.C., celebrated National Roofing Week with a treat for its employees.

RJK Construction Co., Willoughby, Ohio, showed its commitment to safety during National Roofing Week.

RoofCARE, Albuquerque, N.M., showed off its good work as part of National Roofing Week.

Isabella Jube, daughter of Raphael Jube, an employee of Ideal Building Solutions, Norcross, Ga., won NRCA's Children's Art Contest in the Grades 3-5 category. The third-annual National Roofing Week contest, received 53 entries; more than 3,000 online votes chose the winners.

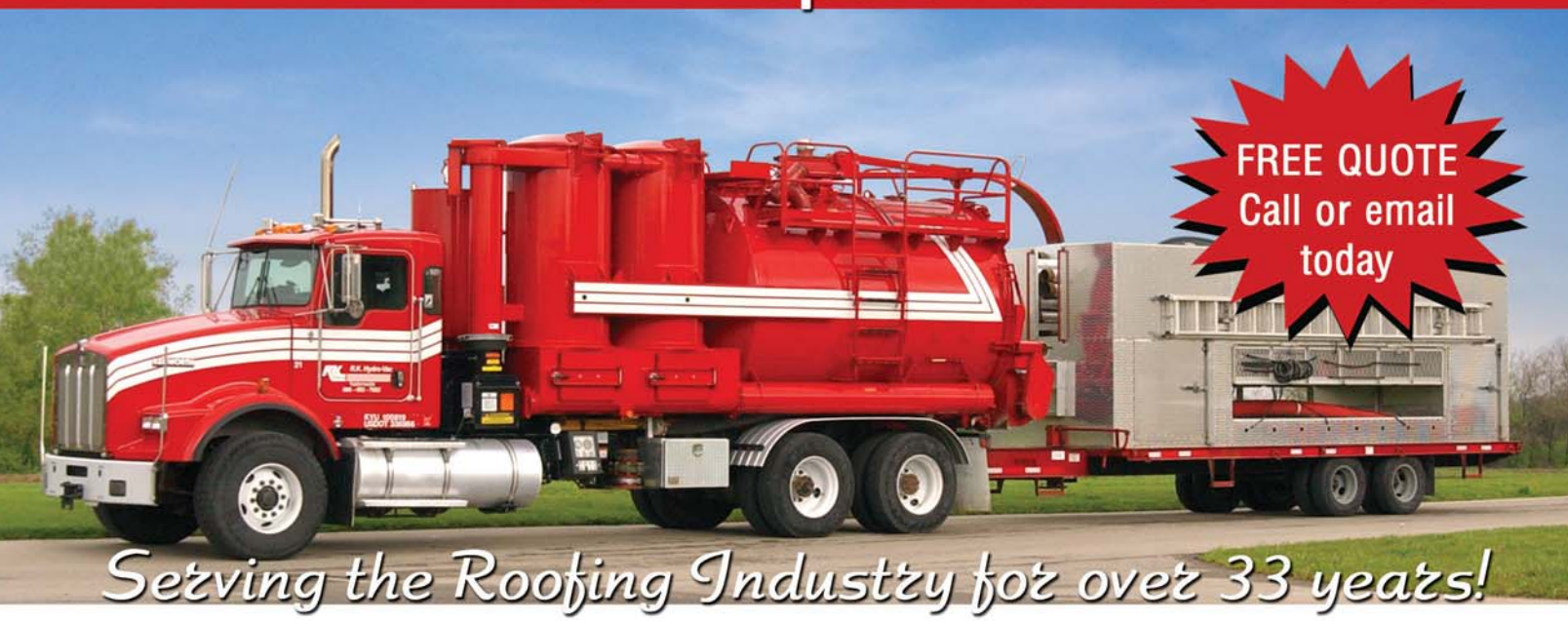
SENATOR SPONSORS CONGRESSIONAL RECOGNITION OF NATIONAL ROOFING WEEK

The Rosemont, Ill.-based National Roofing Contractors Association held National Roofing Week June 5-11 to increase recognition of the significance of roofs to every home and business in the U.S., promote the good deeds of the roofing industry and emphasize the value of professional roofing contractors.

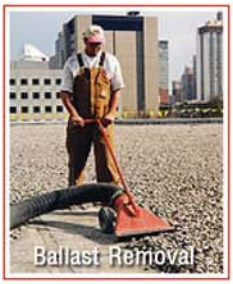
Sen. Mark Kirk (R-Ill.) sponsored congressional recognition of National Roofing Week in the *Congressional Record*. The recognition explains a roof's importance as a component of a home or business and recognizes National Roofing Week and its purpose.

To view the recognition in its entirety, visit bit.ly/29ohgLF.

Setting the Standard in Roof Preparation Services



Serving the Roofing Industry for over 33 years!



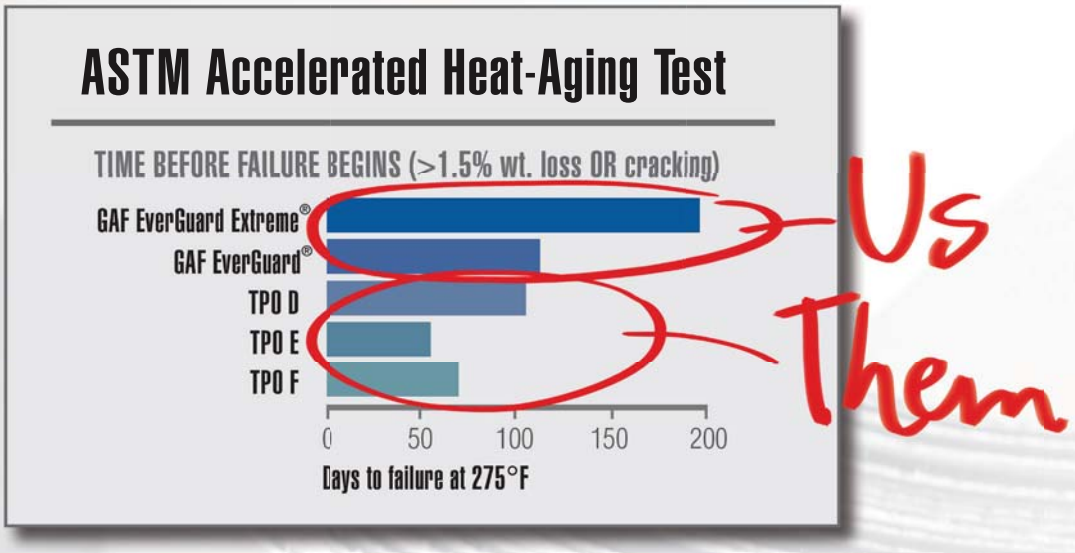
Dedicated to the Roofing Industry with a full line of Roof Vacuuming Services:

- Ballast Removal
- One Pass Dry Vacuum
- Wet Vacuum
- Pneumatic Ballasting

We provide the most reliable roof preparation in the business. RK's experience, technology, and timeliness permit us to handle numerous projects at a time and we are available 364 days a year. RK is setting the standard in roof vacuuming services.

RK Hydro-Vac, Inc.

1-888-493-7682
www.rkhydrovac.com



Top TPO Revealed. Bar None.

An exhaustive study by SRI, one of the roofing industry's most respected testing laboratories, has named GAF EverGuard Extreme® TPO as the industry's top-performing TPO. EverGuard Extreme® TPO outperformed all of the other 60 mil leading brands in both ASTM accelerated aging and weight-loss testing—the tests most closely associated with long-term membrane performance.

If you'd like to find out how each TPO brand fared, visit *TPOresults.com* for the complete test report.

GAF EverGuard® TPO SINGLE-PLY ROOFING SYSTEMS

About Structural Research Inc. (SRI): SRI is recognized as one of the oldest and most experienced commercial building envelope consulting firms in the country. The company specializes in architectural design, structural engineering, building inspection, management, and failure investigation of roofs and exterior walls. SRI's state-of-the-art materials testing and research laboratory provides objective and unbiased product testing services to manufacturers, contractors, industry associations, building owners, and other consultants. SRI is not affiliated with any manufacturers, suppliers, or contractors.