The Journal of RCI

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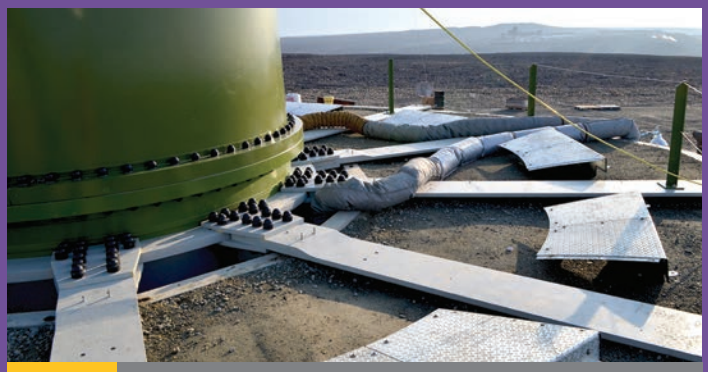

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THE JOURNAL OF RCI

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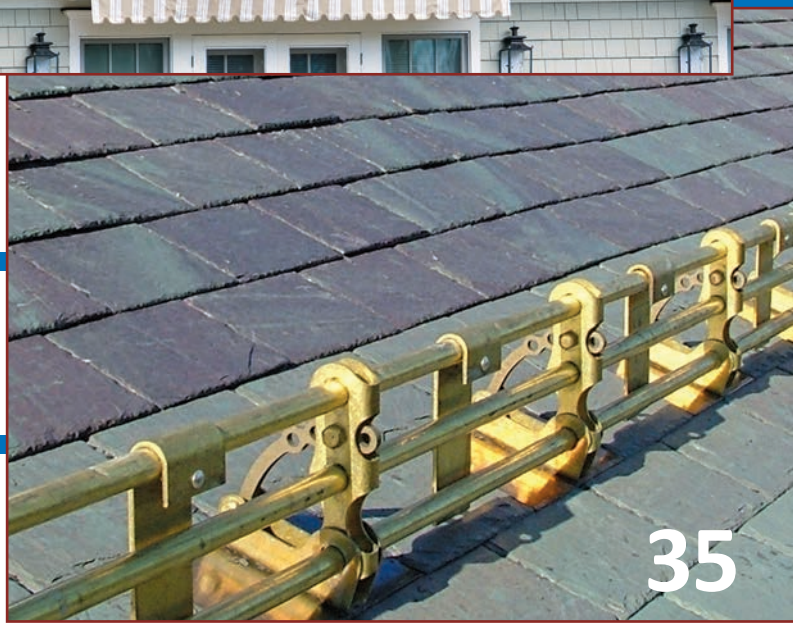
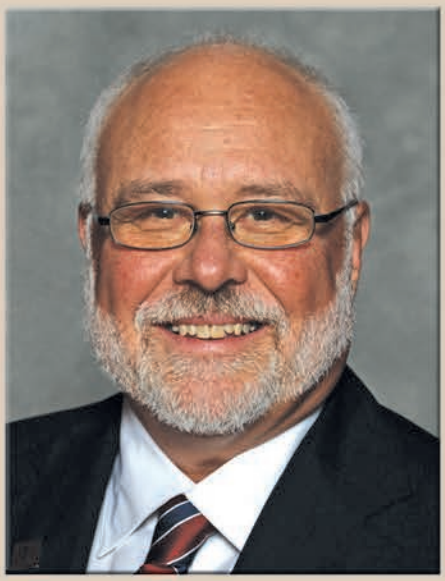


On the Cover: This brightly colored home was inspired by the movie "Up." Built in Herriman, Utah, with permission of Disney/Pixar Studios, the house was the star of the 2011 Salt Lake City Parade of Homes. Photo by Jeanetta Roberts Photography.

In This Issue: We explore steep-slope roofing issues and materials, including asphalt shingles, slate, cedar shakes and shingles, and concrete and clay tiles.



Jean-Guy Levaque, RRC, RRO
President

Our Challenges & Opportunities

The passing of another year in RCI's history presents an opportunity to reflect as president on the issues in which I believe the members should be engaged.

Our challenge to address procurement issues received my attention about 30 seconds into my presidency. Since then, procurement issues have increased. Our profession is being challenged from different sources, and we must be vigilant to address these challenges head-on. Our Advocacy Committee has been restructured to meet these challenges, and is addressing the considerable work still needed on this front. RCI is increasingly vocal in many circles, and will continue to advocate for its members.

I am an avid believer in the value of grassroots contributions. In order for RCI to be successful, its members need to be willing to step up and serve. The Leadership Workshop, held annually in Raleigh, NC, for the last 11 years provides an excellent training ground for incoming chapter executives, and we will continue to strengthen that training.

We have also formed a task force to review and rework the roles and responsibilities of region directors and are excited that our region directors have embraced this opportunity. Our goal is to encourage members to serve as region directors to advance RCI membership.

Finally, we have begun the process of developing a new registration category for members providing exterior wall observations, as we anticipate increased market demand for this service. The Registered Exterior Wall Observer (REWO) registration will allow our members another tool to differentiate themselves. I urge you to consider applying for this registration when it becomes available in 2016.

I would be remiss if I did not thank the excellent RCI staff under the leadership of CEO James Birdsong for its vision, energy, and support in the past year. Although James has given you a comprehensive look at accomplishments in 2015, I would like to mention a few that particularly excite me for the future of RCI.

We have seen an increase in education offerings over the year, with many building envelope-related programs developed and delivered by RCI, chapters, and branches. This, along with increased distance learning and local registration exam opportunities, provides flexibility for all our members. Our November Building Envelope Technology Symposium in Nashville, Tennessee, was the best-attended ever, and we are looking forward to the 2016 symposium in Houston, Texas.

We continue to enjoy a steady increase in membership and encourage all regions, chapters, and branches to provide value for the membership in their areas.

Our finances are strong, with a balanced budget achieved this year (one full year ahead of schedule). This provides the opportunity to strengthen our course offerings and to consider other options to benefit our members.

Other exciting and visionary ideas provide even more opportunities for membership support. 2016 will be another year of growth and transition for RCI, and I am looking forward to continuing to be a part of this growth.

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As we bring 2015 to a close and look forward to 2016, I want to provide a brief snapshot of our activities for the past year and share some plans for the upcoming year.

Our purpose is to represent and provide service to building envelope consultants and other professionals within that industry segment. Our main focus for services and products is directed to the areas of education, registration (certifications), publications, industry-related technical services, and advocacy. The operating budget for 2015 was $3.3 million, including the addition of approximately $100,000 to the corporate retained earnings at year's end. The net growth in membership during the past year was 5 percent, and we now have over 3,200 members.

Attendance at RCI's 2015 Annual Convention and Trade Show in San Antonio, Texas, was very near a new all-time record and resulted in a new revenue record. Likewise, the attendance at the annual Building Envelope Symposium in Nashville, Tennessee, set new attendance records.

During the past year, we added new classroom educational offerings dealing with litigation and concrete wall technology. Several of our perennial favorites were updated, and we continued to add to the list of online educational offerings.

Of significant importance in late 2014 was the agreement we reached with Castle Worldwide Services, which permits us to offer our registration program examinations in computer-based testing format at more than 1,000 Castle locations worldwide.

We began 2015 by offering the Registered Roof Observer (RRO), Registered Roof Consultant (RRC), and General Consultant Knowledge (GCK) exams at Castle testing locations. The development of the GCK exam was a noteworthy accomplishment, as once a consultant has passed this exam, it is only necessary to achieve a passing grade on the technical aspect of the various consultant designations.

The recently revised Registered Waterproofing Consultant (RWC) exam was converted to this format and became available at Castle centers in late 2015. The Registered Exterior Wall Consultant (REWC) exam will be available online in mid-2017. The conversion of this exam to the computer-based testing format was superseded by the development of the new REWC exam, which will be available online in mid-2016.

The future is always on our minds as we operate RCI on a day-to-day basis. Early in 2016, we will be unveiling our new RCI website, which should be much more user-friendly than the current version. We will also be installing new association management software (AMS). While this new AMS system is primarily a benefit to our professional staff, members logging on to their personal records through our website should experience easier access. We intend to increase our activity on social media sites beginning in early 2016, as well as make several enhancements to our publication services, adding staff to support those services. We will increase our outreach to related organizations and dramatically increase our advocacy activities.

The industry is becoming more complex, with increased regulations and technical requirements and a plethora of special interest organizations that seem to appear almost on a daily basis. It is sometimes difficult to sort out the most important issues that will be affecting building envelope consultants or to decide whether we should offer a product or service because some related organization does something similar. We anticipate we have the ability to sort through issues and focus on those that most greatly affect the professionals who are members of our organization.

I am pleased to report that RCI is well positioned to continue its growth, success, and outreach. The organization is fortunate to attract many of the best and brightest the industry has to offer. The seemingly never-ending offering of support from members who gladly contribute time, talent, and expertise by serving as subject matter experts, instructors, committee members, and board and executive committee members helps make RCI a unique and dynamic association.

RCI is also very fortunate that many of our senior staff and department heads have been part of the association for 15 or more of the 33 years since RCI was founded. Their expertise, longevity, and understanding of the needs of the industry and organization are a key part of our continued success and growth.

I want to take the opportunity to thank and acknowledge the members of RCI's Board of Directors for their invaluable leadership and the numerous volunteers and our professional staff for their roles in our continued success.

I wish you all a safe, prosperous, and happy new year.


James R. Birdsong

Membership

It Pays in Many Ways

If you are a practicing professional in the building envelope consulting field, it pays to be a member of RCI. In fact, in many ways, you can't afford not to be a member.

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  Member Discount: $150
- Convention and Trade Show
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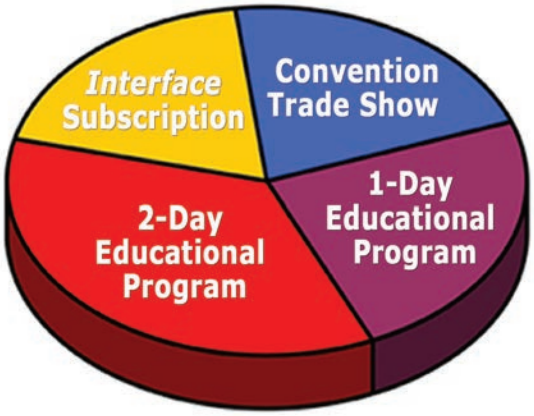

*Based on the 2016 RCI Professional Membership rate — just $475.

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NIGHTMARE ON CEDAR STREET

By Lynne Christensen

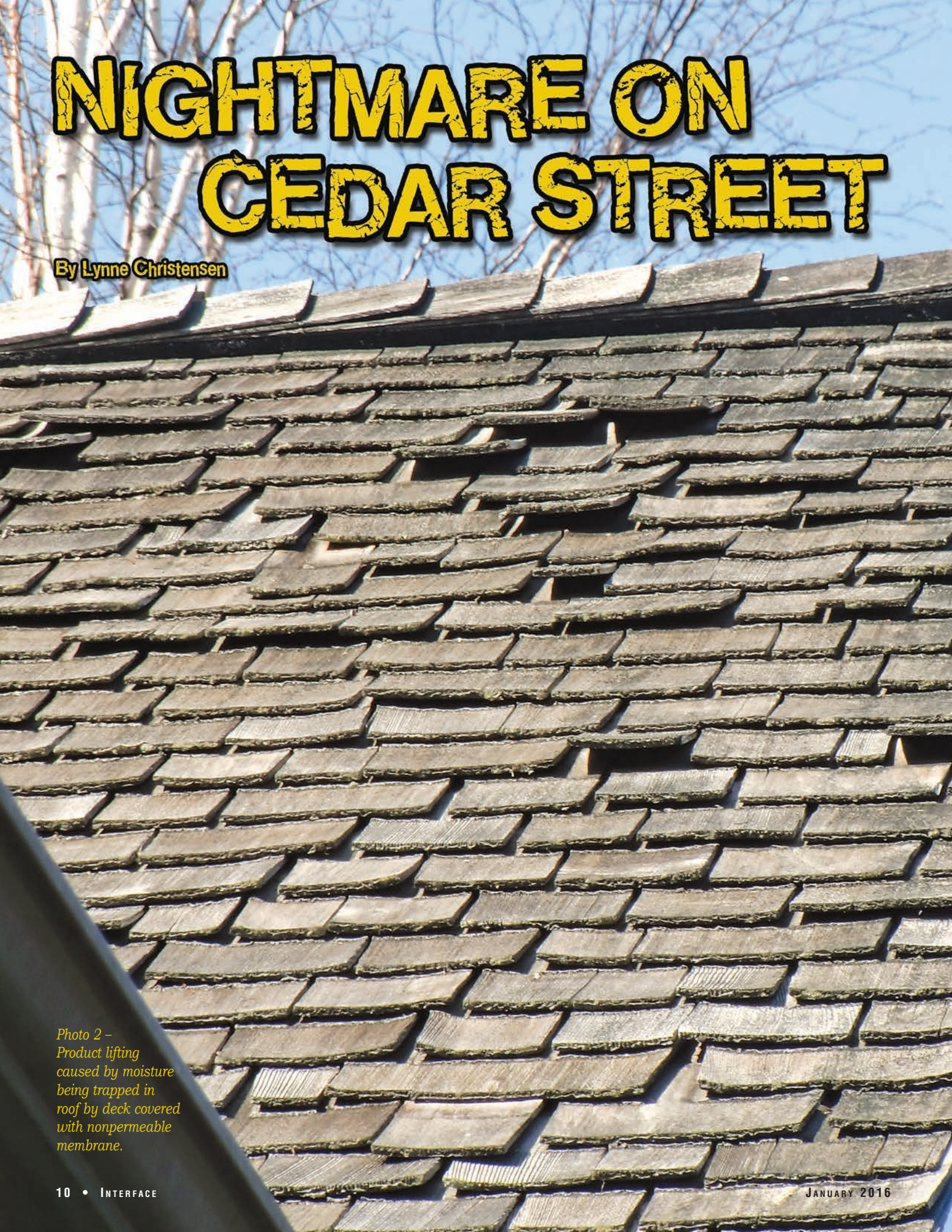


Photo 2 – Product lifting caused by moisture being trapped in roof by deck covered with nonpermeable membrane.

INTRODUCTION

Cue the spooky music. You know, the heavy instrumental where your heart thumps in your chest and fear courses through your veins. It's clear that a terror-filled day awaits you, but this time it's not some disturbed maniac in a mask. No, the roofing industry has its own installation-gone-wrong scenes that play out one by one, day in, day out. Welcome to *Nightmare on Cedar Street.*[1]

OUR CAST

Over the course of its 100-year history, the Cedar Shake and Shingle Bureau ("CSSB") has seen its fair share of poor installation practices. The CSSB is educating as many people as possible about the perils of poor installation practices, as incorrect application methods will significantly affect the integrity of a cedar roofing system. The following is quite true: even the best-quality product does not have a chance at performing well if it isn't installed correctly.

There are a few common culprits who keep appearing in scene after scene, like a B-rated movie that goes straight to DVD. Like a bad dream, we keep seeing people we'd definitely like to remove from our thoughts and make the roofing world a better place. Asked to come up with a list of the most common installation error culprits we experience, the cast is as follows:

Erwin the Expert Contractor

This cast member is special—so special he'd warrant a designated parking space on the studio lot. Like a good ol' country song, Erwin has installed roofs the exact same way since the cows came home 30 years ago...and then went back out again. He relies on his longevity and network to keep more roofing jobs coming through his door. Problem is, he doesn't believe in continuing education ("My lifetime of experience means I don't need any training"), and Erwin hates using the computer ("Computers are for accounting clerks"), so he lacks up-to-date product knowledge. As a result, Erwin doesn't know:

- What current application specifications and techniques are recommended by the industry
- How new building codes are impacting installation requirements in his jurisdiction
- What new accessory products are on the market

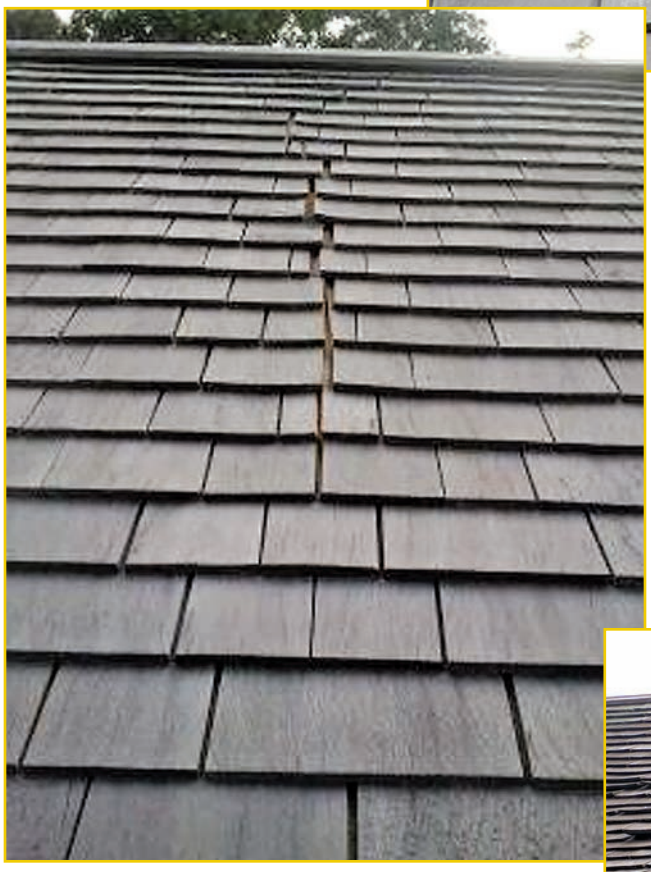
While Mother Nature hasn't altered her recipe for making more wood (trees are a renewable, recyclable resource), there are a host of new accessory products that need Erwin's attention. He should be up to speed on what his local building code says regarding synthetic underlayments, spray foam, and OSB sheathing—noting that the only solid-sheet sheathing tested with Certi-label™ cedar shake and shingle products is plywood.[2]

Erwin doesn't follow instructions and is riper than a pumpkin in December for a job site callback on an installation issue. The

Photo 1 – Rot-felted application where felt paper has started to degrade following UV exposure.

Photo 3 – Nonpermeable membrane used beneath shingles across entire roofing deck.

Photo 4 – Note how shingles have split due to moisture problems caused by installation of nonpermeable membrane across entire deck. Photo 3 and Photo 4 show two more examples of product lifting, curling, and splitting due to improper usage of nonpermeable membrane across the entire roof deck.



bottom line here is that a contractor relying solely on an uneducated customer and one's easygoing nature is not following good business practice.

We've all heard about the contractor who calls up to ask about a very odd installation practice. One of our most shocking was a contractor who had installed hand-split shakes upside down (i.e., rough side facing the deck). Sure enough, he wanted a letter from the CSSB stating that this was acceptable; of course, no such letter was ever sent! Usually this type of bizarre telephone call means that the installation is already completed and that this particular contractor is looking for a way to avoid a tear-off. Beware.

Clients hiring Erwin the Expert-type roofing contractors can be quite intent on discussing their "shake/shingle roof." Please, roof consultants, have these folks contact the CSSB; we'd be glad to send them our flyer explaining the differences between a shake and a shingle. You can also download it here: http://www.cedarbureau.org/cms-assets/documents/26244-377055.difference-between.pdf.

Photo 5 – Example of product lifting and curling due to installation of nonpermeable membrane across entire deck.

The CSSB once had a roofing contractor call up and say he'd fixed a roof system problem by shooting two full tubes of caulk up the valley. Nice try. The roof should be mechanically sound, not reliant on caulk to patch up a job that will no doubt have issues in the future. We also informed this roofing contractor that caulk is affected by ultraviolet (UV) and will break down over time. The best advice we can give to anyone contemplating installing a new Certi-label™ cedar roof is to obtain the CSSB's installation guide and follow it precisely (and allow for local building code requirements to take precedence if there is a discrepancy between the two).

Ralph the Rotfelter

Ralph is a roofing contractor who thinks he's doing everyone a favor by lowering the interlayment product between courses far beyond acceptable ranges. Ralph believes this gives the roof more protection. The problem he misses is that felt interlayment exposed to the sun's intense UV rays will degrade. Interwoven felt interlayment meeting No. 30 ASTM D226 Type II or No. 30 ASTM D4869 Type IV roofing felt does act as an additional barrier to snow and rain infiltration, but it works with the system, not as a stand-alone item. Rot felt will also wick unwanted moisture up into the roof system (See *Photo 1*). In the same nasty vein, Ralph the Rotfelter likes to interlay cedar shingles with felt; this practice is not recommended by the CSSB. Interlay shakes, yes; shingles, no.

Photo 7 – There are excessive fasteners on this application. Note the split on the top left product due to excessive fastener application. High-pressure pneumatic tools can make it tempting to add in extra fasteners, but excessive fasteners will inhibit dimensional change, causing splitting and/or distortion of the shake or shingle.

Photo 6 – Fastener issues causing roof failure.

Photo 8 – Far too many fasteners on this application.

Izzy the Iceman

Izzy's a busy guy. With six jobs on the go, he wants a way to make everything watertight so he can bounce his crew from jobsite to jobsite, thus simultaneously juggling many projects on the go. His "solution" is to cover all his roofing decks with an ice dam barrier-type membrane, making it impervious to weather while all the jobs are in progress. This may prove good for crew assignment efficiency, but it is a moisture-barrier practice that wreaks havoc on cedar roofs. Cedar shakes and shingles need to breathe, and a nonpermeable membrane will cause the shakes or shingles to overheat and trap moisture behind the cedar shakes or shingles, thus harming the roofing system's integrity. Some examples of nonpermeable membrane issues are seen in *Photos 2, 3, 4,* and *5.*

Freddie the Fastener Failure

Fastener mistakes are classic cases of horror shows that could easily be prevented. There are a host of incorrect fasteners being used in the marketplace today; following building code specification details and asking the trade association for guidance will avoid many problems down the road. The worst-case scenario is where the fastener

Photo 9 – A corroded fastener that will cause roof issues.

Photo 10 – Incorrect fastener application – nailing into air and missing the sheathing boards. The holding power of these fasteners is nil.

corrodes a few years after installation, and the wood roofing product gets blamed because the fasteners have failed. Freddie has struck again. For examples of fastener issues, refer to *Photos 6, 7, 8, 9,* and *10.*

The market is currently flooded with substandard, non-code-compliant fasteners. A quality cedar roof should last for decades, and it relies upon quality fasteners to work. Freddie the Fastener Failure invented the lie, "It's faulty wood," to avoid the true issue. One must use the correct fastener at the start to ensure the fasteners will last as long as the roofing material.

Current fastener specifications for cedar roofing are:

- Nails must be stainless steel Type 316 in locations within 15 miles of saltwater.
- For locations outside the saltwater zone, on untreated products, nails must be stainless steel, Type 304, Type 316, or hot-dipped galvanized with a coating weight of ASTM A153 Class D (1.0 oz/ft²).
- Both preservative-treated and fire-retardant-treated cedar-roofing materials, per building code, require Type 316 stainless steel nails.

Stainless steel nails offer the highest degree of corrosion resistance. Some nail manufacturers offer nails specifically for wood shake or shingle roof (and sidewall) application. Contact the nail manufacturer for further information to ensure the fasteners comply with listed requirements and are correct for your application. Do not use electro-galvanized fasteners. The CSSB prefers the use of nails as a fastener choice.

CEDAR SHAKE AND SHINGLE BUREAU

The Cedar Shake and Shingle Bureau is a nonprofit trade association founded in 1915. Celebrating its 100th anniversary in 2015, the organization works hard to promote correct installation practices. A team of knowledgeable district managers—Tony Bonura, Tony Hyatt, and Peter Parmenter—is available to provide technical and grading assistance. Together, they offer over 100 years of combined experience in the roofing, siding, and building products industries.

Uma the Undecided

Uma doesn't know what she's doing. Her customer asked for a tailored look on his roof, and she installed cartoned sidewall products because they were square on all sides. Sure, the product is tailored, but it's a sidewall material and does not meet building code for roofing installations.

Photo 11 – This photo shows an improper application. Some of the issues we see here are excessive flat-grain, off-grade material, lack of keyways, and uneven courses.

Photo 12 – Rot felting: Ice dam barrier-type product was used for interlayment. Keyway issues and off-grade product are seen here (note excessive flat grain, sapwood, and the knot in near butt end in second course from eave.)

On a related note, Uma is likely someone who'd install roofing-bundled shingles on a wall and then complain to the manufacturer that her customer wanted perfectly even keyways. Number One Grade Certigrade® roofing shingles are top-quality, gorgeous products that can be used on sidewall applications; however, if they are not trimmed on the edges when they are applied to the sidewall, they will not look the same as a true rebutted and rejointed sidewall product.

Uma believes in getting roofs done quickly for her customer. But because she isn't very educated on various product types and quality, she ends up installing non-code-compliant, unlabelled, uninspected material full of flat grain. This results in installations as seen in *Photos 11* and *12*. Again, the CSSB makes it easy to learn with this informative brochure about product quality: http://www.cedarbureau.org/green-products/supporting-documents/product-specification-sheets.asp.

Photo 13 – Buckling due to improper keyway spacing.

Photo 14 – Buckling due to improper keyway spacing.

Keith the Keywayman

The CSSB's installation guide provides correct keyway spacing guidance for both roofing and sidewall products. The International Residential Code states "wood shakes or shingles shall be installed according to this chapter and the manufacturer's installation instructions." It is indeed amazing to see examples of projects gone awry due to keyway issues (see *Photos 13* and *14*); the information is readily

Photo 15 – Courtesy Western Wood Products. Photo by John Spaulding.

available, and all the contractor needs to do is access, call, or email the CSSB. With cedar being a natural product, moisture entering and leaving the shake or shingle will cause expansion and contraction; proper keyway spacing accommodates this natural phenomenon.

CONCLUSION

Installing cedar shakes and shingles is a true craftsperson's art. Cedar shakes and shingles make beautiful roofs and sidewalls. The CSSB salutes all the roofing contractors who install cedar roofs properly and with the correct attention to detail. A quality product is only as good as the quality of installation. Quality contractors stay informed and pursue continuing education; they ensure they are aware of the latest in accessory product developments and how they relate and, in some cases, don't relate

Photo 16 – Architect: Gaylord Granger, Libby O'Brien-Smith Architects. Photo by Eduardo Calderon.

Photo 17 – Architect: Arnold Scribner & Associates. Photo by Erven Jourdan.

to cedar roof installation. Quality roofing contractors will also ask for technical assistance when needed.

The spooky cast mentioned in this article is a reminder of the dangers of installation complacency. At the CCSB, we dream of perfect installations, using correct accessory products and installation methods. We have visions of the world being filled with satisfied home and business owners, where every job is done right the first time. It's an ambitious dream. But it is possible.

Roof consultants: please contact our district managers if you have technical questions. Emphasize to your clients that they should not accept "but I've always done it this way" as a plausible defense, reason, or explanation. Point to the facts and use the CSSB's informative literature to help with your next project. Homeowners, architects, builders, and consultants all appreciate a job done right. See *Photos 15, 16,* and *17* for examples of beautiful craftsmanship.

Jobs done right provide reassurance and free up time to specify positive new jobs as opposed to chasing the guilty parties during a nightmare situation. Avoid the horror show and get the facts. Encourage education. And sleep better at night.

FOOTNOTES

1. Always consult your local building code official and building envelope specialist for regulations applicable to the specific project's jurisdiction. The information herein is not meant to supersede local building code. Also, please note: The terms "he" and "she" are used to imply all genders in each section for purposes of this article. Names used herein do not represent any particular person, and resemblance to any specific individual is not intentional and is purely coincidental.
2. The only manufacturers allowed to use the Certi-label™ name on their products' labels are CSSB members. The Certi-label™ is the purchaser's assurance that the manufacturer adheres to a third-party inspection program as well as inspections from the CSSB's Cedar Quality Auditor.

All photos in this article are courtesy of the Cedar Shake and Shingle Bureau unless otherwise noted.

Lynne Christensen

CSSB Director of Operations Lynne Christensen has over 20 years' experience in the cedar shake and shingle industry. She started working in the industry as a mailroom clerk at a private cedar mill and began her association career in 1998. This article is a result of the CSSB team's collaborative work. More information is available at www.cedarbureau.org.

Largest Roofing Contracting Firms

Engineering News-Record has released its ranking, by revenue volume, of the top 20 roofing firms in the U.S. They are, from the largest down, followed by their 2014 revenue in millions of dollars:

1. Centimark Corp., $455.5
2. Baker Roofing Co., $184.7
3. Nations Roof, $122.0
4. Kalreuth Roofing & Sheet Metal Inc., $96.8
5. Birdair Corp., $67.0
6. Latite Roofing and Sheet Metals LLC, $56.8
7. Schreiber Corp., $55.4
8. Holland Roofing, $54.4
9. The Bulldog Group Inc., $42.9
10. KPost Co., $42.7
11. Douglass Colony Group, $40.9
12. Best Contracting Services Inc., $39.2
13. King of Texas Roofing Co. LP, $39.0
14. Orndorff & Spaid Inc., $30.3
15. John J. Campbell Roofing, $29.0
16. Flynn, $27.1
17. Allsouth Subcontractors, $25.4
18. Wayne's Roofing Inc., $24.9
19. Roofing Solutions, $24.5
20. Western Construction Group, $24.5

– ENR

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Director of Sales
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Traditional laminated shingle with the classic wood-shake look.

INTRODUCTION

Asphalt shingles continue to dominate the steep-slope roofing market, and the past 20 years have seen manufacturers make significant investments in new technology and product advancements. These advancements have resulted in the introduction of new products to meet marketplace demands while continuing the advantage found with asphalt shingles—performance at an affordable price. And certainly, today's asphalt shingles aren't typically yesterday's standard strip shingle. These advancements and the products available are all good, provided we as an industry remember that an asphalt shingle must meet three basic criteria. It needs to meet the aesthetic needs of the homeowner or property owner, it needs to shed water, and it needs to perform in situ for a very long time.

AESTHETICS AND ASPHALT SHINGLES

As we continue to see homeowners play a more substantial role in the decision-making process for the type of roof that is installed, a shingle's style and color have become more and more important. In fact, in a recent third-party market research report, the #1 reason for recommending a shingle was its "color and style." Additionally, 88% of homeowners said that the shape and style of the roof were important to the decision-making process.[1] It's no wonder that homeowners are focused on the aesthetics of their roofs today; in a 2013 study with the National Association of Realtors,[2] 79% of realtors surveyed said that a new designer shingle roof contributes to a higher selling price and that a house with a new designer shingle roof would be valued higher than a house with a basic shingle. In other words, the roof is no longer just a protective covering for the home; instead, it is a testament to the homeowner's personal style and, more importantly, a strong investment.

Given the importance of aesthetics today in roofing, many leading manufacturers have invested in broadening their product portfolios. Twenty years ago, there were two dominant styles of shingles: three-tab

ASPHALT SHINGLES:

Proven Performance, Broad Array of Choices

By Helene Hardy Pierce, FRCI
and Emily Videtto

shingles and architectural laminate shingles. Most shingle companies offered each of these profiles in a variety of colors—primarily made up of different shades of a single color such as brown, gray, or black. Today, a significantly more diverse product offering is available for homeowners and contractors. Some of the most popular designs remain wood-shake-style and slate-style shingles, but many manufacturers have also created unique new shapes to match a particular architectural style. For example, diamonds and scallop-shaped shingles were designed to match Victorian and Colonial-style homes.

To get a more authentic-appearing shingle, a variety of techniques are used, including larger exposures, variability in tab width, variability in exposure within the same shingle, and multilayer constructions. As an example, manufacturers have incorporated not only variation in exposure size, but also varying tab widths to more accurately represent what a real, hand-cut wood shake roof would look like. These unique features offer a premium aesthetic coupled with the performance of an asphalt shingle.

From a color standpoint, the days of having one base color are gone; in fact, some of the most recent shingle launches have focused on a more complex color scheme that utilizes four to five color drops on both the dragon teeth and the shingle backer (the top and bottom layer of a laminated shingle, respectively) to add more pop and sophistication to the roof. Some manufacturers have even worked with recognized color consultants to ensure that colors match the most popular exterior color portfolios in the market and to make sure that the color patterns are in line with the overall trends in the exterior market.

While the drop sequence and patterning are important, so are the base granules used to design the finished color. Many manufacturers are working with granule suppliers to create new granules that align with "on-trend" exterior colors such as burgundy, navy, and mustard. Use of these new tones can create a more sophisticated color palette. They have also worked to

Artisan-crafted shapes with oversized tabs and an ultra-dimensional profile.

improve the accessory shingle products that finish the completed roof, developing ridge cap products that accentuate architectural shingle roofs by adding depth and dimension to the ridge and hip areas of the roofline.

These aesthetic improvements have offered more choices and overall better options for homeowners and property owners with steep-slope projects, and there are several do-it-yourself virtual tools that can be used to "see" different shingle styles and colors in place on an actual roof. Roof consultants should be aware, however, that the myriad of choices has also added more complexity to installation for contractors.

SHEDDING WATER (AND OTHER PARTS OF THE STEEP-SLOPE ROOFING SYSTEM)

First, "shedding water" is a broad-brush phrase meant to convey that regardless of the shingle, it must perform as a part of the steep-slope roofing system and protect the contents of the building from water intrusion. Steep-slope roofing systems not only shed water, but also protect the building from severe weather, assist with or provide ventilation for the attic space, and may contribute to insulating the conditioned space of the building.

Unlike low-slope membranes, the shingles themselves need to shed water, and they aren't designed to be installed where water is slow to move off of the roof. There is some disagreement in our industry about what the actual slope is for use of "steep-slope" products. Is it a minimum slope of 2:12, 3:12, or 4:12? Actually, it depends on the specific shingle product, but a good rule of thumb is 4:12; and if you have a slope less than that, some products should not be used and others will have additional installation requirements, such as a double layer of underlayment to ensure that the shingles and the roofing system protect the building and will perform.

UNDERLAYMENTS AND LEAK BARRIERS

As a component of the installed shingle roofing system, the underlayment can be critical to the overall performance of the roofing system, particularly with regard to how the system performs during severe weather. The use of polymer-modified-bitumen self-adhering membranes as a leak barrier under shingles at the eave, along rake edges, and anywhere the shingles are terminated has greatly reduced the frequency of leaks at these vulnerable areas of the roof. Care must be taken, however, when tearing off an existing shingle roofing system, since these membranes can be difficult to remove. Generally, manufacturers will recommend or require their removal for a couple of very good reasons. First, depending on the asphalt shingle being installed as a part of the new roofing system, a buildup of multiple plies of membrane at the edge may telegraph through and be unsightly. Second, if the existing modified sheet is not compatible with the products being installed, asphalt from either the existing sheet or a newly installed product may soften and actually flow from under the shingles or over an eave edge.

There has also been an increase in the desire to install a fully adhered modified-bitumen membrane over the entire roof deck prior to the installation of asphalt shingles as a preventative measure in the event of a catastrophic wind occurrence or to reduce the possibility that severe ice damning will cause interior leaks. For most steep-slope roof deck/attic space designs, this type of installation can work only when there is adequate ventilation of the attic space, and some would claim that there should be excessive ventilation of the attic space below the deck. Caution must be exercised or interior moisture can cause condensation within the roof/deck assembly and result in subsequent rapid degradation of the roof deck due to the impermeability of these

Classic old-world diamond-shaped dimensional shingle.

types of membranes.

Accompanying the increased use of adhered modified-bitumen sheets, there have been significant changes in underlayments being used with asphalt shingles in recent years. Traditionally, asphalt-saturated felt underlayment has been used to protect the deck under asphalt shingles; however, there are now a great number of high-performance synthetic underlayments available that provide the same benefits as traditional underlayments. Regardless of type, an underlayment is important to the performance of asphalt shingles because it provides an extra layer of protection between the shingles and the roof deck and is often critical to preventing wind-driven rain from infiltrating the system and through the roof sheathing. Key to their performance is the ability to lay flat and not cause shingles to distort over any buckles or wrinkles in the underlayment. Other items that should be considered are walkability of the underlayment and resistance to foot traffic damage.

Look of hand-cut European shingles.

VENTILATION AND STEEP-SLOPE ROOFS

A critical component for the performance of a steep-slope roof is proper attic ventilation that uses a continual flow of outside air through the attic space. This airflow removes warm air from the attic space in the summer, which reduces the load on the conditioned space and, in the winter, prevents occupant-generated moisture from condensing in the attic space, contributing to keeping the roof deck cold (which reduces the potential for ice damming to occur).

Advancements in shingles, leak barriers, and underlayments have been accompanied by a greatly enhanced degree of sophistication in roofing system ventilation and the products designed to provide that ventilation. Our industry now offers designers ventilation products and systems that address many of the unique needs that specific building designs have created, such as ridge ventilation that is resistant to infiltration of snow, hip ventilation that can accommodate exhaust necessary for homes with little or no ridge, attic intake vents for use where there is no soffit, and insulated ventilated roof sheathing.

Designers and roof consultants must ensure that the roofing system and deck design provide adequate ventilation with a balanced ventilation system in accordance with specific code requirements for net-free ventilation. Deficiencies in the ventilation system can result not only in higher energy costs and condensation in the attic space, but can contribute to significant ice damming caused by a warm deck, roof deck warping and rotting, mildew/mold growth, and buckling of the shingles.

ASPHALT SHINGLES AND PERFORMANCE

As we've stated before, the array of choices available for an asphalt shingle roof has added to the complexity of their installation. A 3-ft. x 1-ft. strip shingle with a 5-in. exposure was a common shingle to install 30 years ago, and using the same strip shingle as the starter strip and the ridge cap made any project fairly straightforward and simple. Today, before starting any project, the roofing contractor and consultant should be sure to review the installation requirements provided by the material manufacturer, even if they have been installing shingles for a long time. For example, even new color formulations may change the offsets for succeeding courses on a shingle that a contractor has installed routinely for years. Specific areas to be concerned with are underlayment requirements, starter shingles and first-course installation specifics, valleys and rake construction, offset requirements for each course (not only to prevent color patterning, but also because the offset pattern may be critical to shedding water), fastener location, and any specific requirements for high-wind areas.

Asphalt shingles must perform for a very long time, and our industry has spent much time and effort in order to have confidence in their performance. The starting point for consideration of a fiberglass-reinforced asphalt shingle's performance has traditionally been compliance to various standards, such as ASTM D3462, *Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced With Mineral Granules*; ASTM E108, *Standard Test Methods for Fire Tests of Roof Coverings*; and ASTM D7158, *Standard Test Method for Wind Resistance of Asphalt Shingles*.

ASTM D3462, the material standard specification for fiberglass asphalt shingles, will be 40 years old in 2016.[3] However, as with many materials and material standards, there are products that are ASTM-compliant that may not perform as well as others or as well as expected, and there have been products that do perform well in service that have not met all of the requirements of ASTM D3462. One issue that some manufacturers take note of is that ASTM D3462 is a "recipe" standard and a limited performance standard. It sets specific component criteria that must be met based on a history of "performance"; however, the very nature of this type of recipe approach can severely limit product innovation by excluding from use new raw materials or product designs. In fact, a review of the 1976 standard and the current version of ASTM D3462 show that Table 2, which has many

Authentic wood-shake look shingle, featuring an ultra-dimensional design.

of the recipe requirements, has not changed since this standard was first promulgated.

An additional requirement for the performance of an asphalt shingle roof system can be found in the Florida Building Code's Test Protocol HVHZ, Test Application Standard (TAS) No. 100, *Test Procedure for Wind and Wind-Driven Rain Resistance of Discontinuous Roof Systems*. This test method subjects a constructed shingle roof system, including the underlayment, to a wind-driven rain; and in order to pass the test, water cannot migrate through the roofing system and sheathing, nor can any portion of the shingle roof tear or blow upward without reseating during the test. While some may take issue with the design of this test (e.g., the wind direction), it is indicative of the water-shedding capability under specific conditions of a shingle roofing assembly, and manufacturers have used this test not only for certification in high-velocity hurricane zones as required by code, but as a check on new product designs and their ability to shed water.

An alternative for consideration of the performance of asphalt shingles should be one that subjects the shingles to additional testing as opposed to mandating its recipe. This actually is what is found in ICC Evaluation Services' *Acceptance Criteria for Alternative Asphalt Shingles*, AC 438. These acceptance criteria were developed "to provide guidelines for the evaluation of alternative asphalt roofing shingles, since the codes do not provide test methods and performance requirements for such alternatives."[4] When compared side by side with ASTM D3462 and the performance requirements found in the International Building Code and the International Residential Code for fire and wind resistance, this criteria maintains all of the physical property testing (what some refer to as performance testing) in ASTM D3462 and replaces a significant amount of the recipe requirements with additional performance testing, including wind-driven rain, weather resistance through accelerated aging, and temperature cycling. In addition, compliance to AC 438 requires independent third-party testing and an approved third-party quality control system.

LOOKING FORWARD

Regardless of style or color choice, asphalt shingles do a great job of shedding water and performing for a very long time. With a decades-long proven track record, a lengthy repertoire of accessory items, and a broad product portfolio to meet any design needs of a particular building, it is easy to understand why asphalt shingles remain a great choice for steep-slope roofing.

Manufacturers have not rested on their laurels, as evidenced by continuous investment in research and development. Advancements in product certification and listings, such as AC 438, provide a means for innovation in raw materials and shingle construction to reach the marketplace with full certification for fire, wind, and durability performance. Looking forward, it's easy to anticipate that the industry will continue to innovate, including refining products to contribute to sustainable construction and the reduced use of limited resources. These types of technical advancements should ultimately result in the enhancement of asphalt shingles and will help to maintain their market leadership as the product of preference for many steep-slope roofs.

FOOTNOTES

1. "Designer Shingle New Shape Market Research" 2012.
2. National Association of REALTORS® survey commissioned by GAF of non-appraiser realtors in the U.S. Average increase as compared to basic, three-tab shingles. All data based on responses provided by non-appraisers that have had professional experience buying or selling a home with Timberline® shingles in the three years preceding the survey.
3. ANSI/ASTM D3462 – 76, approved January 29, 1976. American Society for Testing and Materials.
4. Acceptance Criteria for Alternative

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New Innovations for Concrete and Clay Tile Roof Assemblies

By Richard K. Olson

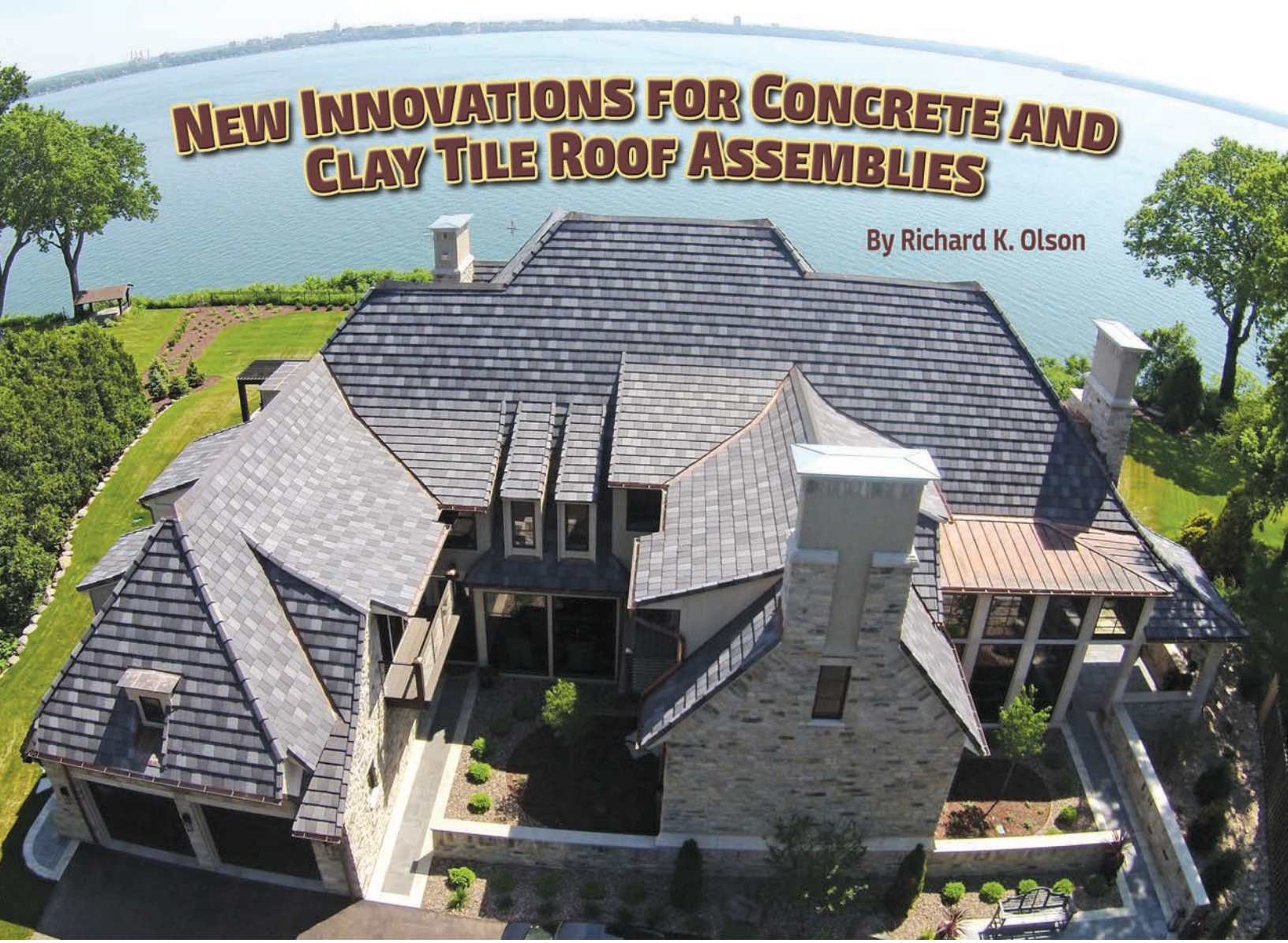

Figure 1 – Concrete flat-tile installation.

Traditional concrete and clay roofing tiles have been used for centuries in most parts of the world for steep-slope installations on both residential and commercial buildings. Over the past five years, the advancements and demands for higher overall roof assembly performance have driven new innovation in roof designs. The Tile Roofing Institute (TRI) continues to work with its members to help identify new and innovative roofing options for steep-slope applications of both clay and concrete roofing tiles. The market and design communities are seeking greater long-term performance, durability, and energy-efficient products that enhance a more green and eco-friendly technology. Tile products perform outstandingly well in several key areas to provide better roofing options to consumers. See *Figure 1*.

ENERGY EFFICIENCIES

California has led the charge for greater energy efficiencies that other states are now implementing. With the need to reduce peak energy demand and reduce heat transfer to the occupied living areas, the roofing envelope has been a high priority in the innovating model. The tile industry continues to be at the forefront of the research identifying key areas that improve buildings' overall energy performance and assisting in energy reduction in both hot and cold climates.

Solar Reflectivity

If roof claddings can help redirect the sun's energy back off the roof surface, the initial energy and heat transfer can be significantly reduced. The tile industry has developed tile-coloring applications for both concrete and clay tiles that will far exceed the Title 24 energy code requirements. Innovative energy tile products on the market provide from 0.15 to 0.70 solar reflective ratings, depending upon the color of the tiles; in most cases, they cost the same as traditional tiles. The lighter the color, the higher the reflective ratings the tile will meet.

In research performed by Dr. William Miller at the U.S. Department of Energy's Oak Ridge National Laboratory (ORNL), up to a 70% reduction in heat transfer through the roofing assembly was obtained compared to an average asphalt shingle roof. In addition, special polymer coatings have been developed that will allow traditional darker-colored tiles to perform similarly to a higher reflective rating, allowing more earth tone colors to be used in high-reflective code areas.

Concrete and clay tiles were offered in a wide array of energy-efficient colors and materials without the need for paint coatings long before energy efficiency was pushed to the forefront of technological development. Beyond tiles' natural ability

to be highly reflective and have high thermal mass, the tile manufacturers have developed improved technologies to provide even greater energy efficiency in colors that customers prefer.

Thermal Mass

As an industry, we have been able to show that the thermal mass of concrete or clay roof tiles helps reduce the heat transfer into the attic or conditioned living areas. Tile roofs are an obvious choice for design professionals looking for energy-efficient designs with attractive aesthetics. The thermal mass shifts the peak energy demands as the tiles absorb more heat than other roofing materials, thereby taking longer to heat and cool.

Above-Sheathing Ventilation

Working in collaboration with ORNL, the industry has been able to quantify the effects of the design air space that is found in a traditional concrete or clay tile application. This natural airspace, combined with the chimney effects of a steep-slope application with air intake at the eave and exhaust at the ridge, generates a thermal barrier from the air movement that will further reduce the heat transfer to the roof sheathing. Other roofing materials for steep slopes are now providing similar benefits to help increase the overall energy performance.

WIND PERFORMANCE

The high-wind regions of the country have been a focus of the tile industry since Hurricane Andrew in 1992. We continue to review and revisit our design applications in areas where the wind speeds exceed the basic code. With the new International Residential Code and International Building Code (IRC/IBC) of 2012 and 2015 in place, the recognition of roof performance to the new ASCE-7-10 standard (*Minimum Design Loads for Buildings and Other Structures*) is required in most jurisdictions.

The TRI worked with its member companies to generate new fastening tables to identify the increased uplift resistance required by the new codes. The design requirements were simplified to make it easier for design professionals and roofing installers, while also providing for greater safety by designing the roof to meet the worst-case perimeter zone requirements. These areas typically include a significant portion of current roof designs, due to multiple roof planes, dormers, hips, and valleys.

The TRI performed extensive wind tunnel testing in the United Kingdom to validate tile performance up to 125 mph in full-scale testing. The new ASCE-7-10 requirements increased the previous values in certain applications and exposures, and the TRI addressed these in its current, updated installation manuals, available at www.tileroofing.org.

INDUSTRY GUIDES

The TRI worked in collaboration with its member producers to generate industry-based installation guides. The institute recently updated both the *FRSA/TRI Florida High Wind Tile Installation Manual*, Revised 5th Edition, 2014, and its national installation guide to be inclusive of new fastening options.

The 2015 version of the *TRI Concrete and Clay Roof Tile Installation Manual* carries a formal evaluation report issued by the International Association of Plumbing and Mechanical Officials (IAPMO), UES-ER Report #2015, to show it has been reviewed and is in compliance with all of the applicable codes, including all the new 2012 and 2015 IBC/IRC.

FIRE PREVENTION

TRI's concrete and clay tile manufacturers continue to expand research and collaboration with component manufacturers that make products within the roofing assemblies to ensure Class-A fire ratings of tile roof systems. With the Wildfire Urban Interface (WUI) areas expanding in the southwest regions of the country to more urban boundaries (and in some cases, cities), the TRI has worked with the design community to help provide a greater understanding of the challenges that surround roof applications. There are now innovative ventilation products that reduce ember penetration and better flashing and valley treatments that improve the fire protection of concrete and clay tile roof systems. The TRI is working with the underlayment manufacturers to help identify better options for maintaining UL Class-A fire ratings in assemblies for steep-slope applications while maintaining the water resistance of the systems.

The next opportunities will be in the reduction of high-wind ember behavior. The TRI is working with its counterparts in other regions of the world where wildfires are a

Figure 2 – Traditional high-profile tiles.

significant threat to building performance. Recent work with the Roof Tile Association of Australia has produced some useful data on how to help further improve fire protection.

HAIL RESISTANCE

The Midwest, along tornado alley, where large hailstorms are the norm, continues to provide challenges to the building industry. The TRI continues to work in the development of more realistic hail-testing methods that will mimic more closely the effects of Mother Nature. TRI's original research and testing led to the development of the FM 4473 standard specification, *Test Standard for Impact Resistance Testing of Rigid Roofing Materials by Impacting With Freezer Ice Balls.* Our member producers have worked to reengineer their tile products to increase the overall performance for Class-4-rated tiles that will meet the Class-4 hail impact rating utilizing a 2-in. ice ball at terminal velocity. With the ability to easily replace single tiles, the cost to replace broken tiles is generally minimal, compared to repairs of other roofing systems with similar damage.

SEISMIC RESISTANCE

The West Coast region of the U.S. has experienced increased seismic activity over the last few years. The design community is looking for greater fastening or supporting research to increase the performance of roof and wall assemblies. The TRI completed industry-based seismic performance testing at the University of Southern California to demonstrate the ability of its concrete and clay tiles to outperform code requirements with traditional fastening methods.

SOLAR APPLICATIONS

As part of overall energy performance design, the industry is seeing greater adoption of solar panels in steep-slope roof applications. The solar industry has been working with tile producers to provide several innovative options for solar.

Tile Replacement

Several solar manufacturers now make panels that will interlock to individual tiles. The arrays of these panels are inserted to assume the actual tile locations and interlock at the overlap and course areas of the existing tiles. The wiring is easily installed in the air gap areas under the tiles.

Large Panels

As an industry, we are working with the various solar-mounting companies to learn how to properly install their proprietary systems for tile so that they provide proper flashing and sealing for long-term positive performance. In addition, there is the need for correct fastening of the panels to adequately support the solar systems. The lack of clear guidance via the codes is one area that will need to be addressed moving forward for greater clarity for all roofing materials.

ENVIRONMENTALLY FRIENDLY

Several concrete and clay tile producers have developed added features to their tiles to enhance environmental performance over time. From patented coatings for color, durability, and enhanced reflectivity, to additives that help reduce smog and increase insulation properties, the tile industry is staying on the leading edge of innovation. Concrete and clay tiles are made from natural materials by Mother Earth and, as such, are environmentally friendly from cradle to grave. With one of the longest lifespans of any roofing material, tile roofs help reduce the need for reroofing and the disposal issues associated with traditional roofing products (*Figure 2*).

COLD-WEATHER APPLICATIONS

The TRI continues to research the effects of cold-weather applications in areas of high solar incidence (the sun shines with sub-zero temperatures). In these areas, the use of greater ventilation options will increase the overall long-term performance of the roof assembly and reduce ice damming that can lead to roof damage and leaks. The proper design of snow retention is also a benefit for roofs. In almost all regions outside of the U.S., the retention of snow on the roof provides additional thermal insulation to help reduce heat loss in the roofing assembly. Proper attention to snow retention products has provided significant innovation in installation techniques for long-term performance.

The TRI and its members continue to work with their counterparts in the rest of the world to identify new and innovative practices that will help improve roof performance in all climatic and design conditions. Collaborative work with other organizations and industries has opened the door to even greater knowledge for the next generation of roofing products.

Richard K. Olson

Richard K. Olson is president and technical director for the Tile Roofing Institute (TRI). The association represents industry professionals involved in the manufacturing and installation of concrete and clay tile roofs in the U.S. and Canada, and works with national, state, and local building officials to develop installation techniques, codes, and standards for better roofing systems.

Rooftop Quality Assurance

Rooftop Quality Assurance is a two-day course for professionals interested in performing observation to assure that roof installation is consistent with construction documents. The program covers the diverse and challenging aspects of roofing as encountered in the field and is ideal for roofing material manufacturers, general contractors, quality assurance observers, and field inspectors. Course participants will receive objective and detailed information regarding the duties of the roof quality observer. It helps prepare individuals to provide an independent measure of quality and to assist with project communications and coordination. Although not a preparatory course for the Registered Roof Observer (RRO)® exam, this course provides useful information for the individual who is preparing for RRO registration.

The course is organized into twelve main topics:

- Introduction to rooftop quality assurance – an historical perspective
- The role of the roof observer
- Daily reports
- Contract documents and contract administration
- OSHA for consultants, manufacturers, and building owners
- Contract issues for the observer
- Ethics for the observer
- Tapered roof insulation
- Low-slope roofing – structures, decks, vapor retarders, and insulation
- Low-slope roofing insulation – flat and tapered
- Low-slope roofing – built-up, modified-bitumen, single-ply, and sprayed polyurethane foam
- Steep-slope roofing – asphalt shingles
- Steep-slope roofing – concrete and clay tile

Course participants will learn the role of the observer as defined by RCI, Inc. and by ASTM D7186. Successful students will be able to do the following:

- Understand the role and authority of the rooftop observer
- Write appropriate daily reports
- Use contract documents and contract administration principles as part of the observer's duties
- Apply roofing technology to the observer function

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SLATE ROOF EVALUATIONS AND DESIGN CONSIDERATIONS

By Christopher Musorofiti, RRC

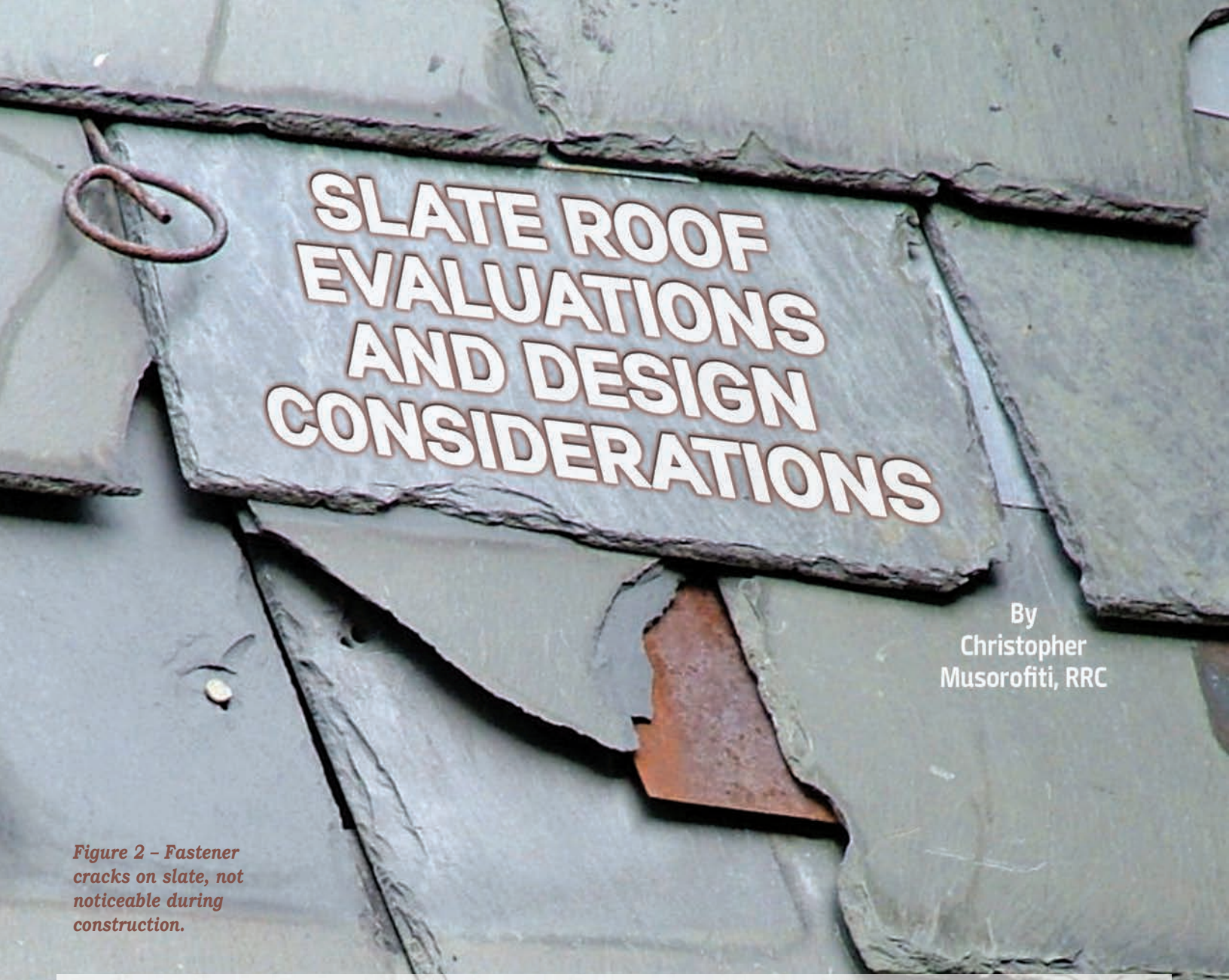

Figure 2 – Fastener cracks on slate, not noticeable during construction.

HISTORY OF SLATE IN THE UNITED STATES

Slate has been used in the United States since the 1600s, with much of the early slate being imported from Wales in the British Isles. In 1734, the first recognized slate quarry was opened on the Pennsylvania/Maryland border. From this point onward, numerous quarries could be found in the northeastern states and through the central/mid U.S. (Oklahoma, Colorado, Utah, Nevada). Slate production in the U.S. peaked in 1902 with approximately 1.4 million squares of slate reportedly produced that year. The National Slate Association was formed in 1922[1] to increase product marketing, standardize slate sizes and manufacturing practices, eliminate product waste, and clarify the industry's descriptive terminology.

Slate production and use slowed dramatically in the 1930s (due to the Depression) and the 1940s (due to World War II). Another cause of the decline was the introduction of alternative roofing shingles, such as asphalt and composite (typically, asbestos- or cement-based) shingles. These products were introduced to lower production and labor costs associated with roofing operations. However, one of the ironic aspects of the alternative roofing products was that many of them incorporated crushed slate applied to their surfaces to mimic the appearance and color of natural slate.

In the 1950s, many of these alternate roofing products started to fail. Failure of these products, environmental health concerns associated with the asbestos added to some roofing products, and rising costs associated with petroleum-based products resulted in a slate revival that began in the 1970s. Unfortunately, slate roofing was a lost art, since the skilled slaters of the 1930s were not available to train new labor, resulting in many incorrectly installed slate roofs. The problems included improper fastening of the shingles, incorrect overlapping of slate coursings, and poor slate and metal flashing transitioning.

Typically, the tradesmen of this period were accustomed to driving nails into the alternative materials to "fasten" the products to the roof deck. However, slate shingles are intended to be "hung" by the shank of the roofing nail, which allows for some movement (*Figure 1*). When slate is fastened too tightly, the underside of the slate may crack and even punch out the back of the slate shingle. This is often not noticed during construction and eventually results in broken slate (*Figure 2*). Similarly, when the fastener is not properly recessed into the prepunched fastener hole of the

slate, it can protrude into the underside of the upper course of slate and will fracture/crack as a result of applied loading (snow or trafficking of the roof).

Improper overlapping and head laps of the shingles (*Figure 3*) also posed a problem, as these conditions can allow water infiltration into the nail holes or openings between the shingle coursing, potentially deteriorating the roof decking and allowing moisture infiltration to the interior.

What Is Slate?

Slate is a natural material that is excavated from the ground. It is dense, durable, and considered "virtually nonabsorbent." However, with the varying grades of slate and physical/chemical composition, some slates do have the ability to absorb moisture within the structure, which can result in deterioration of the roof deck components over time. As with most natural products, the differences in physical and chemical compositions can vary the slate's texture, color, and weathering characteristics.

Where Does Slate Come From?

Slate is a natural product created millions of years ago during mountain formations. Slate in its previous form was typically aqueous sediment (clay) or volcanic ash that was subject to high pressure and tremendous heat. As a result of these combined effects, the sediments were compressed, allowing the molecular structure to form a cleavage plane that is 90 degrees with respect to the sediment plane. This allows the slate to be "split" into thin planes such as shingles.

How Is Slate Made?

Slate is harvested in large sections from the earth. After the excavation of these large portions of slate, each section is split into smaller pieces along cleavage planes to achieve nominal dimensions. The splitting is repeated until the required nominal thickness of the slate shingle is obtained. This nominal thickness can range from a typical shingle thickness of ¼ inch to approximately 2 inches or greater. Once the desired thickness is obtained, the units are trimmed to meet the sizes required for specific projects. For slate shingle uses, nail holes are typically prepunched by the slate manufacturer, allowing for the nail heads to fit flush within the shingles' surfaces.

EVALUATION PHASE OF IN-PLACE ROOF SYSTEMS

Available Plans and History

Many of the slate roof projects we encounter and are asked to evaluate are on historically significant structures. It is important to review available plans and the history of the building prior to initiating work. Determining if the building is a local

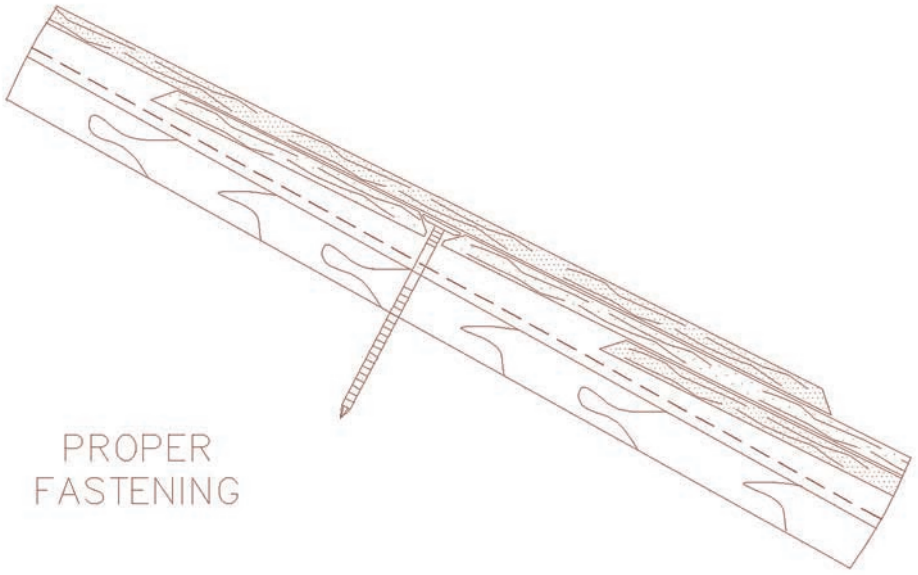

Figure 1 – Fastener sits flush with the top surface of the shingle, within the punched hole.

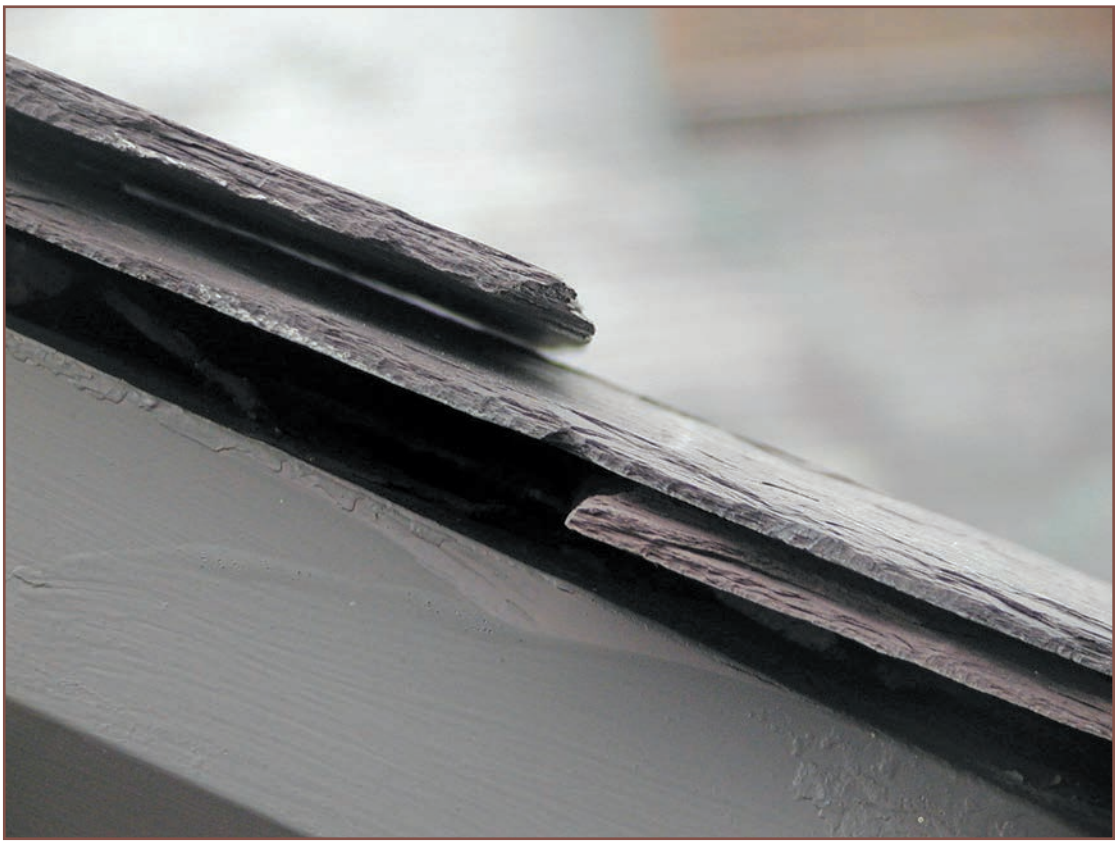

Figure 3 – Improper head laps.

Figure 4 – Staining under roof deck and on floor.

or nationally registered structure is critical to the design and construction efforts, as this will affect the overall recommendations if replacement is required. It is possible to determine the building's historical value by asking the client, researching photos/plaques within the building, or visiting the various websites that list local and nationally registered buildings.

Interior Leak Survey

Performing an interior leak survey is important in determining potential defects in the existing roof system. A leak survey can pinpoint detailing issues that could pose a problem during the design and construction phases and can expose areas where repeated moisture intrusion may have resulted in deteriorated structural components. In addition to locating active leaks, staining on the underside of the roof deck should be noted (*Figure 4*). Staining can indicate the absence of dampproofing under the slate and the possibility that the shingles have absorbed moisture that has wicked into the deck components. Evidence of moisture intrusion typically includes:

- Staining under the roof deck or on the floor
- Efflorescent staining on the underside of a concrete deck
- Rust staining of structural steel purlins used to support lightweight concrete or angle-iron decking
- Staining on sheathing boards
- Deteriorated roof rafters

Proper determination of these potential costly repairs can prevent surprises and embarrassment during the construction phase.

History of Slate Roof Renovations

An important phase of any slate roof evaluation is to research and confirm the history of the building. This is accomplished by determining the existing building configurations, construction, and design intent. Aesthetics of historically significant buildings are typically very important and will require replacement with similar detailing and historical fabric. When possible, document the original slate configuration (standard, textured, or graduated) to allow for the proper replacement materials.

Sampling

In the evaluation of slate buildings, varying colors and slate thicknesses are often observed. When the evaluation/design is progressing, it is important to obtain a minimum of three full slate shingles (the designer and the owner should agree these shingles best represent the original slate color of the building). These samples should be divided amongst the designer, the owner, and the product supplier so that a future match of the same color and texture can be specified and quarried for installation at the site. Where fading or multicolor slates are present, all parties should agree what the intended color scheme should be when selecting the color sample from the existing roof.

Other samples required from the roof include the fasteners, sheet metal types and thicknesses (both sheet metal and slate configurations to match the original configurations), and any hazardous materials that may be encountered. Hazardous materials can typically be found in the underlayments, slater's cement, sealants, painted finishes, etc. The need for laboratory testing of slate is discussed under "Testing Requirements of Slate Replacements."

Defects Typically Encountered

As with any roof evaluation, it is important to document the type and quantity of defects, which will assist in determining the potential problems and required renovations. Typical defects that indicate past, present, or future moisture intrusion into a building include:

- Cracked slate, either vertically or horizontally (*Figure 5*)
- Broken corners that exceed a 1-in by 1-in-square dimension
- Sheet metal repair materials under the slate shingles
- Insufficient slate overlaps
- Holes, results of iron deposits, or incorrectly installed shingle units
- Delamination of slate (typically a result of mineral impurities that react with water and form gypsum within the cleavage planes)
- Backed out or protruding fasteners
- Sealant repairs over defective slate

QUESTIONS TO ASK

"Were previous repairs performed on the original roof?"

This is often the case when some of the slate is colored, textured, or sized differently than the original slate shingles; sealant or slater's cement has been applied; and bib

or hook metal has been installed to secure slate. However, an evaluator should use care when documenting sheet metal under slate shingles to confirm that they were not part of the original installation contractor's roof bracket system, which is not considered a defect condition.

If repairs were performed, *"Does over 20% of the slate roof need to be repaired?"*

If so, preservation briefs[2] and guidelines strongly recommend that the entire roof system be replaced. This recommendation is based on the fact that a roofing contractor will likely traffic the majority of the roof system to replace individual shingles. When the roof is trafficked, there is a strong possibility that additional cracked shingles will occur and not be observed or replaced. Also, if the building is experiencing defects and most of the slate is from the same installation period, it is likely that the roof system may have reached its useful service life. Removing a large section of the slate could result in improper tie-ins to render the area watertight.

Figure 5 – Cracked slate.

Figure 6 – Snow guard installation.

If replacement is being considered, *"What potential problems could affect the roof system installation budget?"*

Gutters, masonry walls and chimneys, dormer windows, finial caps and spires, and wood trim components should all be considered when trying to determine what could affect the finished product of the roof system. Whenever possible (if the budget allows), attempt to limit the amount of future foot traffic and scaffolding that may be required on the new roof system.

SLATE DESIGN

Prior to embarking on the design for repairs or replacement to slate roofing and associated work, the following technical resources should be reviewed:

- Joseph Jenkins, *The Slate Roof Bible: Understanding, Installing, and Restoring the World's Finest Roof*, Jenkins Publishing, 2003
- National Roofing Contractors Association
- National Slate Association, *Slate Roofs Design and Installation Manual*, 2010
- Preservation briefs, National Park Service, U.S. Department of the Interior.
- Brian Sterns, Alan Sterns, and John Meyer, *The Slate Book: How to Design, Specify, Install and Repair a Slate Roof*, Vermont Slate and Copper Services, 1998
- Vermont Structural Slate, *Slate Roofs*

Testing requirements of slate replacements

Slate comes in three types of grades:

- S1 – Service life of over 75 years
- S2 – Service life of 40 to 75 years
- S3 – Service life of 20 to 40 years

This grading is based on ASTM Standard C406, *Standard Specification for Roofing Slate*, which classifies the service life based on the modulus of rupture, the absorption rate, and the depth of softening for the slate components. Only S1-graded slate is recommended for roofing applications. ASTM C406 testing should be performed and submitted to the designer within a four-year period of quarrying to confirm that the slate being processed meets the required grading for roofing projects.

It is typically not recognized in the industry that ASTM testing is required on slate shingles that are over 30 years old, as variations in the material can be present. Also, if the slate is sampled from an existing slate covering, the shingles could have been taken from a repair area and would not be a true indication of the original roof slate shingle composition.

PRIOR TO THE DESIGN

During the evaluation and schematic design phases, potential construction issues (particularly modifications to historical details to make watertight connections) should be presented to clients for their consideration. Installing new components can modify the aesthetics of the building's profile (i.e., roof-to-wall or eave locations). Structural issues, such as deteriorated decking or framing, should be communicated to the client, since replacement may be necessary to reach the desired service life of the replacement slate system. In order to achieve the anticipated extended service life of slate replacement systems, metal flashing configurations and thickness are important.

Also, it is very important to notify clients of potential lead times associated with obtaining slate. Slate is not typically stockpiled, and may require quarrying to generate sufficient slate for a specific project. This lead time is particularly critical when bidding a project for a specific construction duration (such as summer recess in a school building), as a delay in the project award could result in the slate not being delivered in time to complete the work.

DESIGN CONSIDERATIONS

Make sure to match the existing building configuration as much as possible, but provide long-term detailing to reduce the potential of moisture intrusion. During the design, reviewing the structural capacity of the structure for slate loading to confirm the building can handle the load requirements is important. The designer should not assume that the structure is sufficient based solely on the fact that the previous covering was slate. Discuss potential cost implications with the client for slate configurations (i.e., standard width vs. random width), because a random-size slate shingle will cost more in labor than the standard-width configuration. The sizing of gutters and downspouts is very important in order to comply with

Figure 7 – The final product.

building codes for storm drainage. Snow guard types and placements (*Figure 6*) are critical to address snow slide to other roof areas and site features such as walkways, parking areas, and access locations.

CAUTION THE CLIENT

Since slate is a natural product, variations in the colors that are selected should be anticipated. The final colors may not completely match the sample that was selected. Clients should be made aware of the potential of "shedding" or falling slate from the roof following the replacement. This phenomenon typically occurs upon completion of the project and up to a two-year period. It is not uncommon for approximately 2% of the slate shingles to shed during this period. This phenomenon can be caused by cracked slate that may not have been noticed prior to the contractor's demobilization and slate that has become loose over time as a result of vibrations (swinging doors, mechanical equipment, wind loads, etc.). These slate shingles will need to be replaced. The owner should consider keeping an "attic stock" of the replacement slate so that this shedding slate and any other future repairs as a result of wind damage can be replaced with the same slate color and texture. A good warrantee/guarantee should include the contractor's assistance over this two-year period to repair all shedding slate at no cost.

FOOTNOTES

1. The National Slate Association became inactive shortly after its formation in 1922, but was revitalized in January 2002 by producers, contractors, architects, building owners, and other interested parties.
2. "The Repair, Replacement, and Maintenance of Historic Slate Roofs," Preservation Brief 29 by the National Park Service, U.S. Dept. of the Interior.

Editor's Note: This article was originally published in the Proceedings of the 2007 RCI Symposium on Building Envelope Technology.

Christopher Musorofiti, RRC

Christopher Musorofiti, RRC, is an associate for the Building Envelope Technology Group at Gale Associates, Inc. He has 22 years of experience investigating existing facilities (roofs, walls, windows, waterproofing), designing exterior envelope systems to meet current building codes and industry standards, preparing contract documents, and performing construction period services. Musorofiti graduated from Worcester Polytechnic Institute with a B.S. in civil engineering.

2015 RCI Building Envelope Symposium Is Huge Success

By Amy Peevey
Chairwoman, Symposium on Building Envelope Technology

With a record attendance of 338, an excellent lineup of speakers, and a wide variety of building envelope-related topics, the 2015 RCI Building Envelope Symposium was a huge success! It is an honor to be the chairwoman of such an important and widely attended RCI event. It was exciting to see many return attendees, as well as first-timers from our engineering and architectural community. Attendees traveled from as far away as South Korea to join our international neighbors from Canada and many from the United States.

The feedback received from attendees throughout the event was extremely positive from every aspect, including the cutting-edge presentations and quality speakers, the opulence of the Gaylord Opryland Resort and Convention Center, and the numerous networking opportunities. As shared by exhibiting sponsor David Carroll, representative of York Manufacturing, "The symposium just keeps getting better and better. This event has quality presentations and some of the industry's best speakers; overall, very impressive and a big draw."

A special thank-you is extended to the symposium committee members, exhibiting sponsors, the RCI Board of Directors, and the RCI staff for their support and for making this event such a positive and engaging learning and networking experience. If you haven't already done so, I encourage each attendee to fill out the surveys emailed to you at the end of the symposium. With your feedback and continued high volume of submitted abstracts, we will make next year's symposium another success. I look forward to seeing you October 17-18, 2016, in Houston, Texas!

RCI President Jean-Guy Levaque gives a welcoming talk at the reception.

The hall was packed as Hannah Thevapalan (at the podium) and Carly Connor gave their talk on restoration of a historical terra cotta façade.

31st International Convention & Trade Show

Expand Your Educational Connections With Supplemental Convention Programs on Friday, March 11.

Auxiliary Seminar: The Future of the High-Velocity Hurricane Zone... Built on a Foundation of Performance

The purpose of this presentation is to provide roof consultants and designers with a historical perspective regarding the formation and development of the post-Hurricane Andrew building code, the Florida Building Code, and the High-Velocity Hurricane Zone (HVHZ). While the building code continues to address familiar and specific concerns related to wind performance, component attachment, drainage, and durability, the code must remain flexible and ultimately evolve to meet the demands presented by innovative materials, components, and systems with necessary prescriptive and performance standards. The path ahead for the HVHZ, as well as issues of theory, design, and application, will be explored.

Michael L. Goolsby, RRC, CDT, LEED AP BD+C, CBO – Miami-Dade County Department of Regulatory and Economic Resources, Miami, FL | Michael Goolsby has been involved in the construction industry for over 30 years in a variety of positions, including roofing contractor, roofing inspector, and general contractor. Goolsby's current role is division director of the Miami-Dade County Board and Code Administration. He is active in the Florida Chapter of RCI and has been a featured speaker at conventions, conferences, and trade associations.

Eduardo Fernandez, CBO, CGC, PX, BN – Miami-Dade County Department of Regulatory and Economic Resources, Miami, FL | Eduardo Fernandez has been involved in the construction industry for over 30 years. He gained experience with architectural and engineering firms, performed design work, prepared construction documents for permitting, provided construction management, and performed building and structural field inspections. He has been employed by Miami Dade County for over 24 years as a building plans examiner, inspector and inspector supervisor, code compliance specialist, training and certification officer, and staff for the Miami Dade County Board of Rules and Appeals.

Auxiliary Seminar: Litigation Support Services for Building Envelope Experts

This seminar is specifically designed for building envelope experts who provide litigation support services. Using real case histories, the seminar will provide an overview of the construction litigation process and various construction claim types. Presenters will discuss all stages of litigation, the role of an expert in various stages, how an expert can make or break a case, and the important attributes of a building envelope expert. The presenters will also cover typical challenges facing building envelope experts, ranging from document management to attribution of damages to various parties. They will also cover the "dos" and "don'ts" of testifying in various venues.

Kamran Farahmandpour, FRCI, RRC, RWC, REWC, RBEC, PE, FNAFE, CCS, CCCA – Building Technology Consultants, PC, Arlington Heights, IL | Kami Farahmandpour is a licensed professional engineer in several states, a registered building envelope consultant, a Fellow of RCI, and a Fellow of the National Academy of Forensic Engineers. During his 30 years of experience, he has been active in many building envelope organizations and has been retained as an expert on many cases by both plaintiffs and defendants.

Josh M. Leavitt, Esq. – Much Shelist, PC, Chicago, IL | Josh Leavitt cochairs the Construction Law Group at Much Shelist, a Chicago-based firm named to the *Midsized Hot List* by the *National Law Journal*. He is entering his 30th year of practice, is a Fellow of the American College of Construction Lawyers with numerous honors, and lectures and publishes frequently on construction and design law topics. Leavitt's legal experience includes design, construction, restoration, repair, and replacement matters, with substantial experience with roofing, façade, and curtain wall systems. He received his B.A. in economics from Yale and his J.D. from New York University School of Law.

Auxiliary Seminars are available at additional cost to attendees. Register Today. rci-online.org/international-convention.html

Foundation Board Members and Staff Visit RCIF-Funded Project at Virginia Tech

By Wanda Edwards
RCI Senior Director of Technical Services

Figure 1 – Dr. Grant (crouching) explains the equipment to André Desjarlais (second from right) and David Hawn (center). Standing on the far right are David Liebal and Rick Gardner.

On a foggy October Monday, RCI Foundation Board members Joe Hale, David Hawn, and André Desjarlais joined RCI staff members Rick Gardner, Rebecca Cunningham, and Wanda Edwards at Virginia Tech in Blacksburg, Virginia, to see a recently installed research project about reflective roofing directed by Dr. Elizabeth Grant (*Figure 1*). Dr. Grant is an assistant professor and associate director of the Virginia Tech Center for High Performance Environments.

The project, "The Influence of Roof Color on Ambient Air and Roof and Adjacent Wall Surface Temperature," is being conducted at Virginia Tech's Center for High Performance Environments and is being funded, in part, by the RCI Foundation. The purpose of the research project is to study surface and ambient temperatures above reflective and dark membranes. The study will also record ambient temperatures at various heights above the roof surface as well as at adjacent opaque walls and glazed openings. Hourly measurements of irradiance, ambient temperature, wind speed, relative humidity, and rainfall will be recorded and analyzed to determine the effects that weather and roof surfaces have on ambient temperatures. Data will be gathered through the summer of 2016.

The research is in response to documented evidence of urban heat island effect that shows that urban temperatures are warmer than surrounding rural areas, which spurred the use of reflective roof surfaces. With more and more reflective roofs being installed, questions arise about ambient temperatures over reflective roof surfaces and how these temperatures compare to ambient temperatures over dark membranes. Additionally, questions arise about how adjacent opaque and glazed openings are affected by reflective surfaces (*Figures 2* and *3*). There is great debate in the industry as to whether reflective surfaces reflect heat onto other surfaces and whether reflected heat moving through walls and glazed openings can increase cooling loads in buildings.

The research installation consists of one weather station (*Figure 4*), eleven tripod masts (*Figure 5*), 15 data loggers (*Figure 6*), and 102 temperature sensors measuring rooftop, air, conduit, window, and wall temperatures above and adjacent to both reflective and dark EPDM and TPO membranes.

At the conclusion of the research, the data will be analyzed to determine patterns in the temperature profiles, and conclusions will be drawn about the effects of roof color

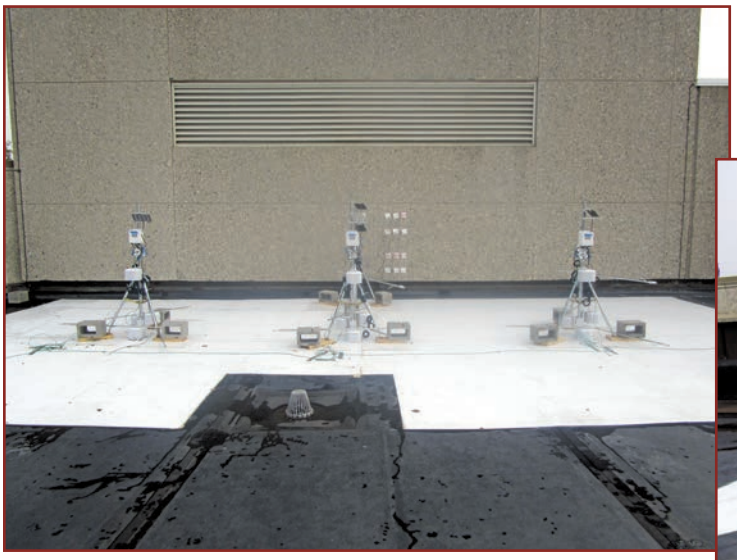

Figure 2 – Units collecting data on the reflective surface and opaque wall.

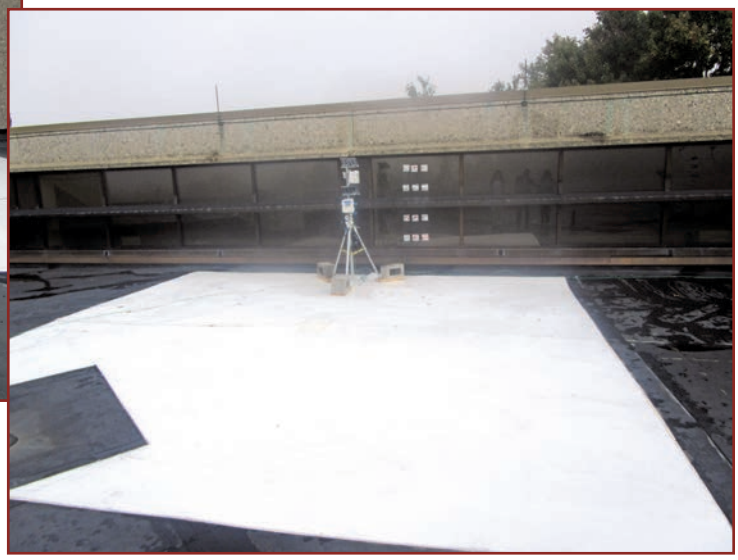

Figure 3 – Data collector on reflective roof and glazed openings.

Figure 4 – Weather station.

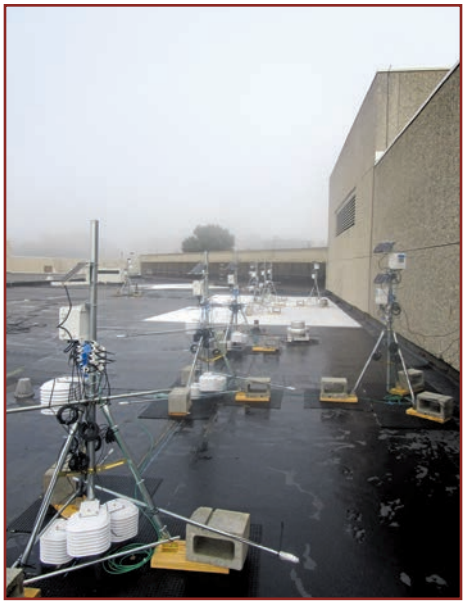

Figure 5 – Tripod masts.

Figure 6 – Data collected for dark membrane and opaque wall.

and weather parameters on ambient air temperatures at various heights and temperatures at roof and wall surfaces. Future research will include hygrothermal analysis and energy modeling to analyze and compare potential heat flow through roofs and façades for these different roof treatments.

In addition to Dr. Grant, five students have worked on various elements of this research project, gaining critical skills and learning about issues important to the building industry. The lead graduate assistant on the project, Kenneth Black, developed his interest in and enthusiasm for experimental work in the building sciences through his attendance at the RCI International Convention and Trade Show in 2012 and 2013. His attendance at the conventions was made possible thanks to the RCI Convention College Scholarship program funded by the RCI Foundation.

Contractors Having Trouble Filling Jobs; Architectural Firms Increase Revenue, While Engineering Firms' Revenue Declines

By Ken Simonson

EMPLOYMENT

Nearly four out of five contractors (79%) are having trouble filling hourly craft professional positions, while 52% report difficulty filling salaried positions, based on 1,358 responses to a survey and analysis the Associated General Contractors (AGC) released in September. Among 10 types of salaried professions, the scarcest were project managers and supervisors (55% reported difficulty), followed by estimating professionals (43%) and engineers (34%). Fifty-six percent of the respondents who employ roofers said they were having difficulty filling those positions.

Nonfarm payroll employment increased by 2,814,000 (2.0%) from October 2014 to October 2015, while unemployment dropped to a 7½-year low of 5.0%, the Bureau of Labor Statistics (BLS) reported. The number of unemployed jobseekers who last worked in construction edged down to 6.2%—the lowest October rate since 2007.

MATERIALS PRICING

"Prices for construction materials have been falling around 2 to 5% (year-to-year) every month in 2015," said Deni Koenhemsi, an economist with Consultant IHS and the Procurement Executives Group.

Nevertheless, "demand is soaring for the metal-framed glass panels or curtain wall used to sheath skyscrapers," the *Wall Street Journal* reported. "Glass manufacturers and fabricators can't keep up. ...In the meantime, builders are reporting curtain-wall prices, which have risen more than 30% in the last 18 months, are setting records... Scott Kinter, a senior vice president with AvalonBay Communities Inc., one of the largest U.S. apartment builders, said...he expects a significant curtain-wall shortage...into early 2016. Prices are up between 35% and 45% from 2013, he said."

A/E FIRM REVENUE

Total revenue of architectural and related services firms increased 5.7% (not seasonally adjusted) from the second quarter of 2014 to the second quarter of 2015 and 9.9% year-to-date for the first two quarters combined, the U.S. Census Bureau reported. Total revenue of engineering services firms declined 3.9% between the two quarters and 0.9% year-to-date.

PERMITS

Building permits increased 13% from January to September 2014, and 4.7% year-to-year, with single-family permits rising 9.4% and 6.7%, respectively. Multifamily permits were up 19% for the first nine months, but down 1.3% year-to-year. Multifamily permits year-to-date far exceeded starts, suggesting more projects were set to start soon.

STRONG CONSTRUCTION SPENDING PUSHES GDP

The Bureau of Economic Analysis (BEA) reported in late November that real gross domestic product—the value of the goods and services produced by the nation's economy less the value of the goods and services used up in production, adjusted for price changes—increased at an annual rate of 2.1% in the third quarter of 2015. In the second quarter, real GDP increased 3.9%.

Ken Simonson

This series on the economy and its impact on the construction industry is published quarterly in Interface. *The column is prepared by Kenneth D. Simonson, chief economist for the Associated General Contractors of America (AGC). Simonson was the 2012-13 president of the National Association for Business Economics. He may be reached at simonsonk@agc.org.*

You wouldn't do it with an engagement ring.

Don't accept a look-alike.

The manufacturers of cubic zirconias have a goal: to produce stones that are as close as possible to real diamonds. A CZ can look pretty good on the surface. But at some point, she'll find out it isn't a diamond. Then you have a problem.

There's nothing wrong with "equals," as long as they truly are equal. But to avoid getting less than you bargained for, it's important to know where the differences lie. Comparing fluid-applied systems using superficial criteria will not tell you whether you have a look-alike or a product that offers equal performance.

At Siplast, we never set out to be "equal." Our goals are higher. Siplast fluid-applied roofing and waterproofing systems are formulated using advanced PMMA technology to provide application and performance advantages over other liquid products. And we manufacture the materials ourselves, in North America.

We like healthy competition. It makes everyone better. **But if the performance-based criteria aren't equal, an alternate can lose its sparkle.**

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RCABC Names Wallner CEO


Bryan L. Wallner

The Roofing Contractors Association of British Columbia (RCABC) has appointed Bryan L. Wallner as its new CEO, succeeding Ivan van Spronsen (who was in the position of executive vice president). Wallner previously worked as the senior vice president for Canada and the U.S. Northwest for SP+ Corporation. Prior to that, he was president and COO of Imperial Parking Corporation in Vancouver.

Western Waterproofing Changes Name

Western Waterproofing Company and its 30-plus branch offices and member companies nationwide (including Brisk Waterproofing, Peoria Roofing, Western Facades, and Harry S. Peterson Co.) are now known as Western Specialty Contractors. This year, Western Waterproofing Company celebrated its 100th anniversary.

BTC Employees Earn CDT Credentials

Building Technology Consultants, PC (BTC) announced that two additional team members have passed the Construction Specification Institute's (CSI) exam for their Construction Documents Technology (CDT) certification. They are Associate Architectural Consultant Jaclyn May and Engineering Technician Almir Maksumic.

LeBlanc Re-elected as CRCA President


Michel LeBlanc

Michel LeBlanc of L.K. Industries was re-elected to a second term as president of the Canadian Roofing Contractors Association (CRCA). He will hold the position until May of 2016. Other officers for 2015-16 are Colin Rasmussen, Mike Lloyd, Jason Baptist, Darren McCallum, Rob Kucher, Marc Leblanc, Paula Scotia, Terry Casey, and Dave Miller.

Malarkey Expands Southern Sales Force

Malarkey Roofing Products has promoted individuals in its Southern Region. Ed Cochran is now Colorado district manager, while Marshall Kovacs is Texas district manager. The region also welcomes New Mexico and El Paso representative Charles Breunig, North and West Texas commercial rep Tim Keith, Houston rep Stephen Kliafas, Eastern Missouri and Southern Illinois rep Thomas Fisher, and Colorado rep Cooper Robbins.

Cochran has worked in the roofing industry for over 40 years, representing Malarkey in the Colorado region for 18 years. Kovacs has been in the construction industry for 38 years, including 17 with Malarkey. Breunig comes to Malarkey with ten years of experience at Velux America, where he was awarded the Western Regional Builder Salesman of the year in 2005. Keith has seven years of construction industry experience in both the commercial and residential arenas and is a member of the North Texas Chapter of RCI, North Texas Roofing Contractors Association, and the Panhandle Roofing Contractors Association. Kliafas brings over 18 years of construction industry sales experience, including seven years in the roofing industry. Fisher also brings 18 years of experience in the construction industry. Robbins comes to Malarkey with experience in property management and a background in economics.

Soprema Offers Scholarships

Soprema has announced a new scholarship program to assist students pursuing a degree in architecture, engineering, construction management, or a similar field at an accredited four-year college or university. Up to seven scholarships will be awarded.

CRCA Honors Trevor Stevens

The Canadian Roofing Contractors Association (CRCA) recognized Trevor Stevens, past CRCA president and former owner of the Quebec-based Norman & Collie roofing firm, with its Honorary Member Award. Stevens launched his roofing career in 1976 as an estimator of his father-in-law's business.

DEATHS

Sig Hall III

Sig Hall III, former general manager of Western Pacific Roofing Corp.'s Palm Spring, CA, location, died September 2, 2015, at the age of 68. He served on several NRCA committees and served as president of the Spray Polyurethane Foam Alliance, receiving SPFA's 2014 Workhorse Award. He was a Vietnam War veteran and avid golfer. He is survived by his wife, children, and grandchildren.

To submit an industry news item to *Interface,* e-mail it to kammerman@rci-online.org or mail it to RCI, *Interface* Journal, 1500 Sunday Drive, Suite 204, Raleigh, NC 27607. Note: News must fit journal requirements in order to be published.

ADVERTISERS' INDEX

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GAF Materials Corporation	(800) 555-1852	gaf.com	Cover 4
Leading Edge Safety	(888) 990-2990	leadingedgesafety.net	33
RCI Foundations	(800) 828-1902	rcifoundation.org	39
Seaman Corp.	(800) 927-8578	seamancorp.com	19
Sika Corporation – Roofing	(800) 576-2358	usa.sarnafil.sika.com	7
Siplast	(800) 922-8800	siplast.com	41
Situra	(888) 474-8872	situra.com	Cover 2

PIMA Releases Warning on Effect of Roof Traffic and Moisture on Roof Insulations

The Polyisocyanurate Insulation Manufacturers Association (PIMA) has released a research report suggesting that low-slope roofs using single-ply roof coverings may not be suitable for the use of mineral fiber (also known as mineral wool or rock wool) board insulation when subject to roof traffic and/or moisture accumulation.

The report, titled "The Effect of Roof Traffic and Moisture on Roof Insulations," was developed as a follow-up to previous research studies from Europe that evaluated the performance of mineral fiber subjected to a combination of simulated roof traffic and increased roof moisture content. The study suggests that moisture vapor may significantly reduce the compressive strength of mineral fiber insulation, leading to a significant increase in overall roofing failures.

The research report concludes that:

- After exposure to 95% humidity for 48 hours, single-ply roofing assemblies installed over two different types of rigid mineral fiber board insulation lost over 85% of their initial compressive strength when tested for only five cycles of a walkability test, recently developed in Europe to evaluate the effects of roof traffic on roofing systems.
- Based on this observed loss of compressive strength, all of the roofing assemblies tested were rated as "Not Suitable" for roof traffic using a classification protocol developed in conjunction with the walkability test.
- The reduction in walkability observed in this testing was slightly mitigated by increasing the thickness of the single-ply roof covering, but the benefit appeared to be minimal.

The full report is available at http://c.ymcdn.com/sites/www.polyiso.org/resource/resmgr/Technical_Bulletins/The_Effect_of_Roof_Traffic_a.pdf.

calendar of events

JANUARY

14-15	Exterior Concrete Wall Systems *Delivered by RCI Ontario Chapter* Info: rci-onchapterinc.ca	Toronto, ON
18-19	16th Annual Hawaii Winter Workshop *Delivered by RCI SoCal Chapter* Info: socalrci.org	Maui, HI
19-21	NAHB International Builders' Show Info: buildersshow.com	Las Vegas, NV
21-22	Chicago RCA Trade Show & Seminars Info: crca.org	Oak Brook, IL

FEBRUARY

17-19	International Roofing Expo Info: theroofingexpo.com	Orlando, FL

MARCH

10-15	RCI 31st International Convention & Trade Show	Orlando, FL
10	RCI Board of Directors Meeting	Orlando, FL
11	REWC Exam *(REWC applications due 12/11/15)*	Orlando, FL
12	Region Meetings	Orlando, FL
14	RCI Annual Meeting of the Members	Orlando, FL
15	RCI Board of Directors Meeting	Orlando, FL

APRIL

8	Vegetative Roofs for the Design Pro *Delivered by RCI Ontario Chapter* Info: rci-onchapterinc.ca	Toronto, ON
21-22	Waterproofing *Delivered by RCI Chicago Area Chapter* Info: cac-rci.org	Chicago, IL
26-27	Rooftop Quality Assurance	New Orleans, LA
28-29	Metal Roofing	New Orleans, LA

MAY

5-6	Exterior Walls Technology & Science *Delivered by RCI Puget Sound Chapter* Info: rcipugetsound.org	Seattle, WA
12-13	Stucco & Ext. Finish Cladding Sys. *Delivered by RCI Northern Gulf Coast Chapter* Info: rci-northerngulfcoast.org	Pensacola, FL
19-21	AIA National Convention Info: convention.aia.org	Philadelphia, PA
27	*REWC applications due for 8/27/16 exam*	

JUNE

12-14	Western States Roofing Contractors Conv. Info: wsrca.com	Las Vegas, NV
15	Region V meeting	Las Vegas, NV

JULY

TBD	Executive Committee summer meeting	TBD
29	Region II meeting	Atlanta, GA

Red print: RCI Education or Registration Opportunity
Blue print: RCI Leadership Event
Green print: RCI Region or Chapter Meeting
Black print: Industry Event

Calendar subject to change without prior notice.
Visit **www.rci-online.org** for schedule updates.

Scan this QR Code to sign up directly for events at rci-online.org

Publish in *Interface*

Interface journal is seeking submissions for the following issues. Optimum article size is 2,000 to 3,000 words, containing five to ten graphics. Articles may serve commercial interests but should not promote specific products. Articles on subjects that do not fit any given theme may be submitted at any time.

ISSUE	SUBJECT	SUBMISSION DEADLINE
April 2016	Historical restoration	January 15, 2016
May/June 2016	Convention review	February 15, 2016
July 2016	Indust. orgs. & associations	April 15, 2016
August 2016	Building failures	May 15, 2016
September 2016	Miscellaneous	June 15, 2016
October 2016	Wind	July 15, 2016

Submit articles or questions to Executive Editor Kristen Ammerman at 800-828-1902 or kammerman@rci-online.org.

31st International Convention & Trade Show

Making Connections

Make A Connection With These Exhibiting Companies

2001 Company
3M
Advanced Roofing, Inc.
American Hydrotech, Inc.
Andek Cocoon
APOC, A Division of Gardner-Gibson
ATAS International, Inc.
Atlas Roofing Corp.
Babcock-Davis
Barrett Company
BASF Corp.
Burke Industries
C.I.M. Industries, Inc.
Carlisle Construction Materials
CertainTeed Corp.
Chem Link, Inc.
Cosella-Dörken Products, Inc.
Covestro, LLC
DaVinci Roofscapes
DERBIGUM Americas, Inc.
D-Mark, Inc.
Dow Building Solutions
Durapax, LLC
Duro-Last Roofing, Inc.
Eagle Roofing Products
Elastizell Canada, Inc.
Evan Fall Protection
FBC Chemical Corporation
Fibertite Roofing Systems
Firestone Building Products
Flex Membrane International
Florida Roof Deck Association, Inc.
FRSA
Gaco Western, LLC
GAF Materials Corp.
Georgia-Pacific Gypsum, LLC
Guy Roofing
Hanover Architectural Products
Hartsfield & Nash Agency, Inc.
Henry Company
Huber Engineered Woods
Hunter Panels
Hyload, Inc.
IB Roof Systems, Inc.
IR Analyzers / Vector Mapping
ITW Polymers Sealants North America
Johns Manville
JR Jones Roofing
Karnak Corp.
Kemper System America, Inc.
Kirberg Roofing
Leading Edge Safety, LLC
Loadmaster Systems, Inc.
Malarkey Roofing Products
MAPA Products
McElroy Metal, Inc.
Menzies Metal Products
Metal-Era, Inc.
MIRO Industries, Inc.
Momentive Performance Materials, Inc.
National Coatings Corporation
National Gypsum Company
National Roof Deck Contractors Assoc.
National Roofing Contractors Association
National Roofing Partners
NEOGARD
Norman-Spencer Insurance
North American Roofing Services, Inc.
O'Hagin
OMG Roofing Products
Owens Corning
Peach State Roofing, Inc.
Pecora Corporation
Petersen Aluminum Corp.
Plasteco, Inc.
Polyguard Products, Inc.
Progressive Materials, LLC
PROSOCO, Inc.
Revere Copper Products, Inc.
Roof Integrated Solar Energy, Inc.
Roof Monitor
RoofLogic
Rooftop Anchor, Inc.
Roxul, Inc.
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Sika Corporation
Siplast
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STS Coatings
T Clear Corp.
Thaler Metal Industries, Ltd.
Tramex, Ltd.
Tremco, Inc.
Tropical Roofing Products
TRUFAST, LLC
TuffWrap Installations, Inc.
Uniflex Fluid Applied Roof Systems
US Ply, Inc.
USG Roofing Solutions
Versico, Inc.
Volatile Free, Inc.
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Western Colloid SC, Inc.
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Condensate and sweat are related somehow, right?

Those plumbing vent pipes sure come in handy when you need them to drain A/C condensate on an already-flooded flat roof or to secure a satellite dish. No worries if the pipe flashing is compromised in the process. (Hopefully the sweatpants were spares.)

These innovations were observed atop an apartment building in Miami, Florida, where several more vent pipe flashings had been compromised by satellite dish attachments.

Contributed by
Stephen R. Towne, RRC
Bracken Engineering Inc.
Tampa, FL

Readers running across situations that would catch the attention of other building envelope consultants are asked to submit representative photographs and a maximum 150-word summary to Kristen Ammerman, Director of Publications, "Would You Look at That!" column, RCI, 1500 Sunday Drive, Suite 204, Raleigh, NC 27607; or via e-mail to kammerman@rci-online.org.

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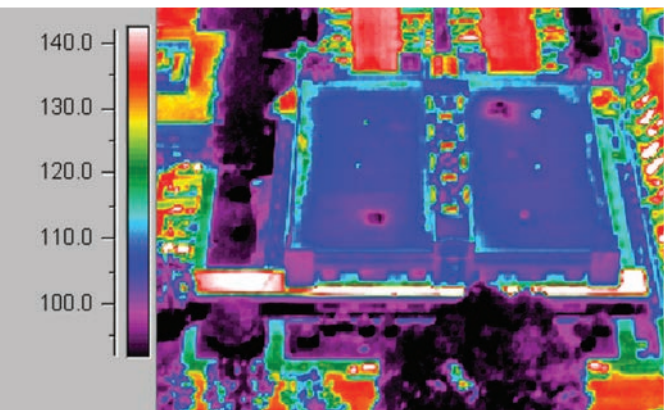

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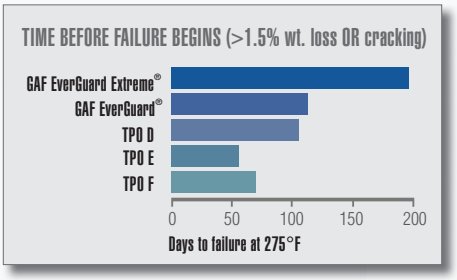

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