RCI Journal of the Roof Consultants Institute
Interface
September 1999
Vol. XVII, No 9
$7.00

Cellular LWIC: Things You Should Know

Performance and Cost Effectiveness

Technical Tips for Observing Installation

Roof Membrane Performance

LIGHTWEIGHT INSULATING CONCRETE ROOF DECKS

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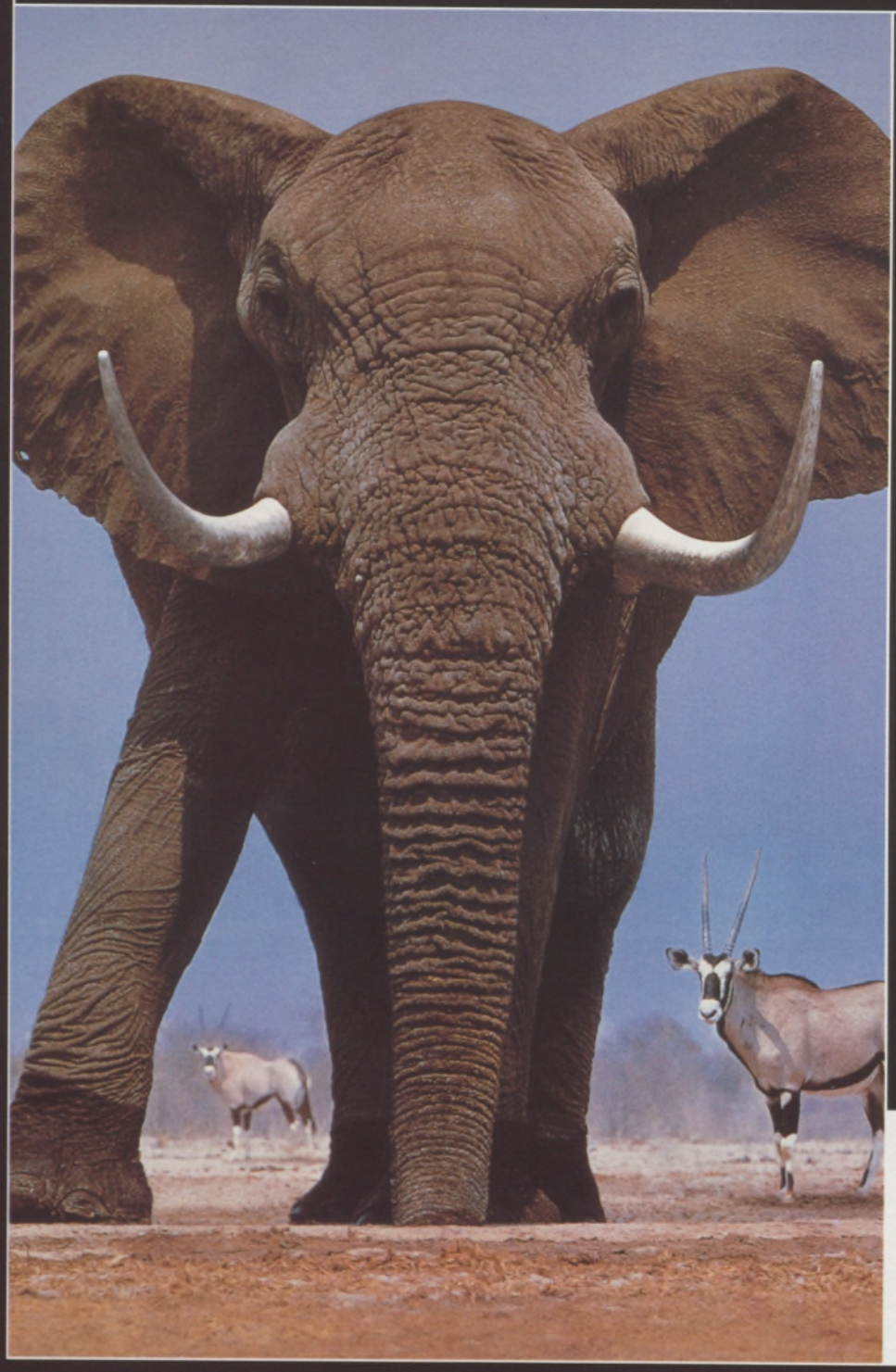

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RCI was chartered, in part, to bridge the gap between the seemingly disparate elements of the roofing profession. It is the intent of *Interface* to connect with these elements, educate and inform about roofing-related topics, establish a common ground for discussion, promote Institute programs, and branch out toward even more people. *Interface* is circulated monthly to over 3,000 people (nationwide and overseas) including RCI members, specifiers, facility managers, owners, industry contacts, and a growing number of highly placed professionals. *Interface* is frequently distributed at various trade shows, as well as educational and institutional functions. The articles contained in this publication are intended to provide information that *may* be useful to members of the Roof Consultants Institute. RCI does not necessarily endorse this information. The reader must evaluate the information in light of the unique circumstances of any particular situation and independently determine its applicability.

On the Cover: Lightweight concrete roof decks are a plausible substrate in many instances. Nevertheless, there is considerable misunderstanding about these systems. This issue is dedicated to clarification of this deck selection. The applicator on the cover finishes a roof with LWIC. Photo courtesy Siplast.

RCI

RCI Headquarters

7424 Chapel Hill Road
Raleigh, NC 27607
800-828-1902 • 919-859-0742
FAX 919-859-1328
http://www.rci-online.org

President's Message

PROFESSIONALISM

Back in July, when I was filling out the RCI member survey, I got to thinking about professionalism. (Hopefully, all of you have long completed and mailed in your survey, as it is something that will help all of us be more professional.) You see, I was writing this column in July, as our executive editor, Kris Ammerman, is a professional and insists that articles in *Interface* arrive on schedule so she can publish the journal in a timely fashion.

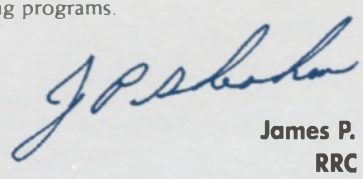
Back to the survey. I recall a question that asked what RCI should provide short-term. I wrote, rather automatically, "professionalism." The second part of that question asked what was required long-term. Again, I wrote without thinking, "professionalism." I did a lot more thinking after realizing I had filled these in without really understanding of why it came so quickly to me.

Today everyone is a professional, regardless of if they are a laborer, a designer, manufacturer, or a consultant. In its simplest form, a professional is distinguished from an amateur because he or she is paid for services rendered. The real measure of a professional is completing the task with professionalism. Everyone has come in contact with people in our industry whom we really admire. On examination, I believe you will find the admiration was based on seeing the person acting professionally. On the other hand, we have witnessed individuals just "looking" professional.

How do you get to be a professional? It isn't bequeathed to you. You don't buy it. It comes from hard work with more than a dash of integrity tossed in. I'll pass on what I believe is required. The commentary in the accompanying box was given to me many years ago by my father-in-law, Harold Judson Yerger. He was a professional. A professional salesman. He didn't have much of a formal education. He had a lot of experience but added a great deal of self study. In the 1960s, he gave me this article. The message it invokes wasn't new to the times but states truisms that date far back into history.

I've followed this philosophy in my business for a number of years and have been rewarded by seeing many young men, one of them my son, perform with professionalism.

RCI is committed to teaching. RCI is looking for new, improved methods to teach and for people who want not just to be professionals but who perform as professionals by participating in the RCI education and training programs.



James P. Sheahan,
RRC President

"Study and Experience"

You cannot learn a technical business such as ours by the lazy process of absorption. Experience is very necessary; this is not questioned, but we want to show the limitations of experience alone.

Experience is thrust on you and whether you make any endeavor or not, you will get experience. Study is left entirely to your own volition. The more you know about a proposition, the easier it is to learn more. Knowledge accelerates. It takes time to lay a foundation, after which the superstructure can be erected more speedily.

It is easy to start on a program of study, but it is hard to carry on until study becomes a habit. Unless you really determine to get down to systematic study, there is never a convenient time to start. The inclination is to delay and to find excuses until the impulse subsides.

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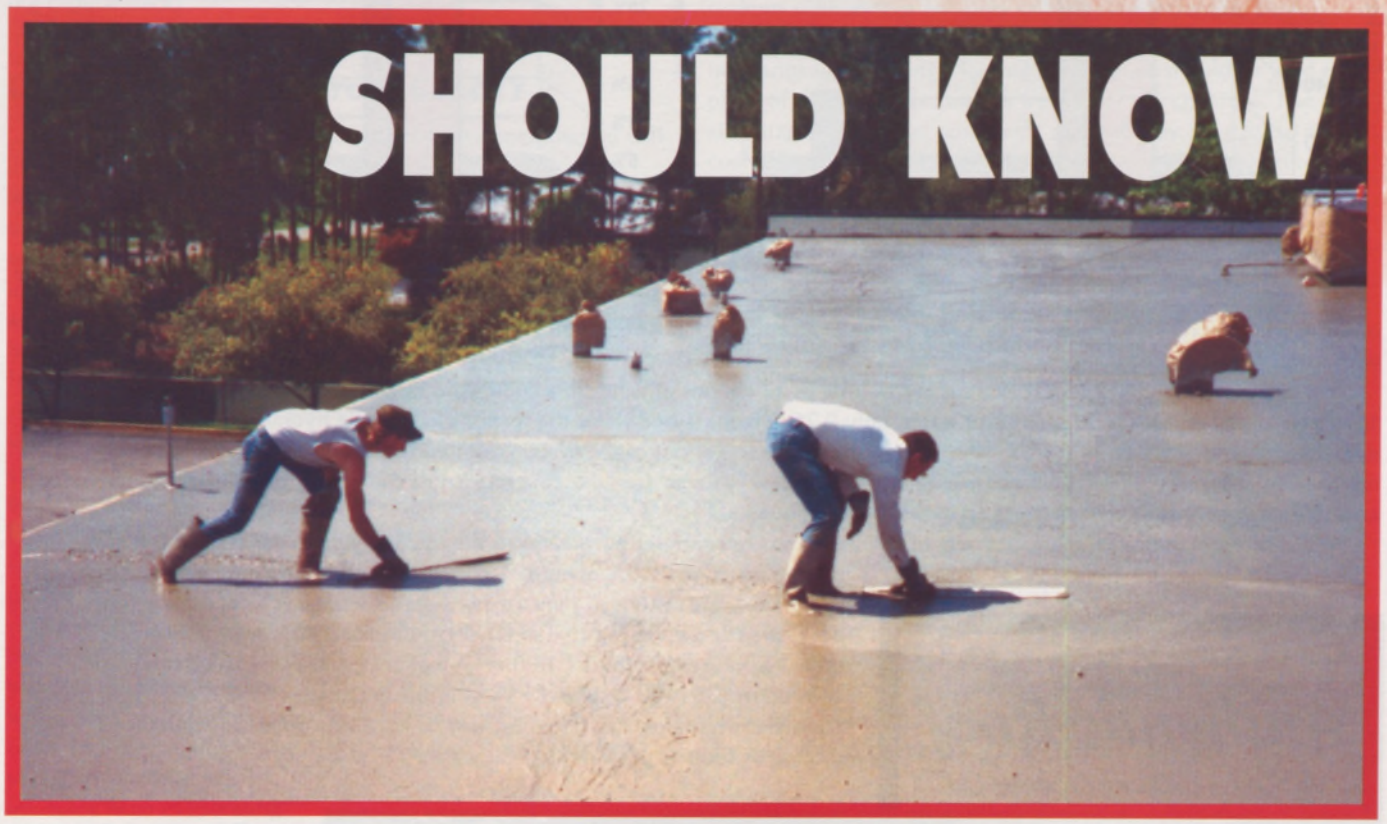
THINGS YOU SHOULD KNOW

By Mark J. Bates



Reroof application.

Cellular lightweight insulating concrete roof decks have been in use for over four decades. After all this time, it is unfortunate that many professionals in the roofing industry become confused when trying to distinguish various types of lightweight insulating concrete. It's a common misconception that cellular insulating lightweight concrete has the same restrictions as aggregate-based insulating concrete systems (vermiculite/perlite).

The cellular concrete process combines a cement slurry (water and cement) and protein and/or synthetic foam solution in a special on-site batch plant to form millions of tiny air cells. The resulting product is poured in place on the roof deck. The foam keeps the cement particles in suspension around the cells until it hardens into the finished honeycomb, monolithic, concrete substrate that is lightweight but remarkably strong and durable.

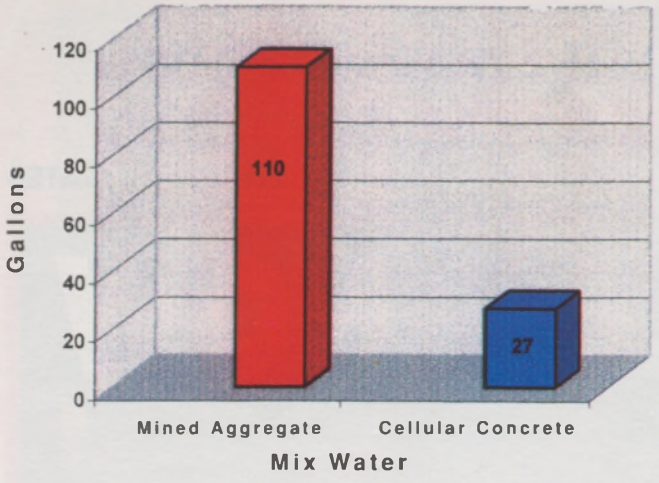
Cellular lightweight insulating concrete roof decks may be used in conjunction with expanded polystyrene insulation board to achieve slopes, add thermal efficiency, and to keep excessive loads off the supporting structure. A typical installed cellular roof deck weighs from four to six pounds per square foot.

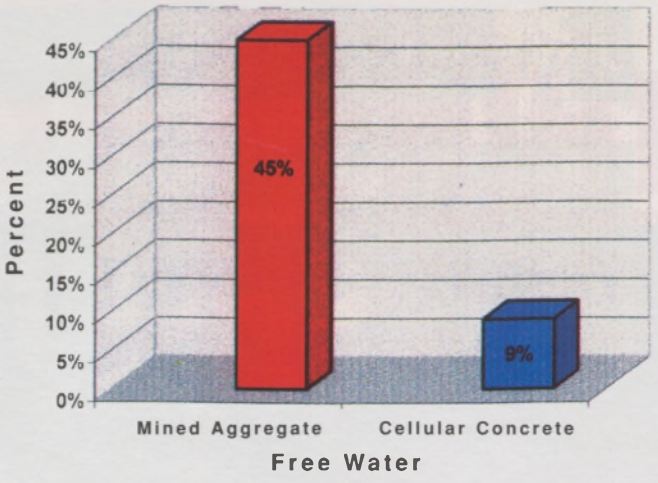
Cellular insulating concrete can be placed over galvanized metal decks, which should have a minimum gauge of 26. Cellular decks are also poured over structural precast concrete panels, poured-in-place concrete construction, and reroof applications. Cellular decks will not rot or decay; when properly installed, a cellular deck may be the last roof insulation a building owner should ever have to buy.

I am routinely asked to respond to several issues and myths within our industry. The following are questions that merit answers. You may find some of the answers surprising and quite different from articles you have read in the past. This article gives first-hand knowledge that relates to cellular concrete performance characteristics.

Why don't cellular concrete manufacturers require perforated or slotted metal decks?

Moisture retained and absorbed by mined aggregates (perlite and vermiculite) has been recognized as a hindrance to the use





of insulating concrete roof decks. This is not a problem for most cellular concrete decks. Cellular concrete mix designs are batched with lower levels of mix water.

Example: Cellular concrete mix designs use as little as 27 gallons of water in a cubic yard of concrete vs. 110 gallons for mined aggregate concrete. Of the 27 gallons of water, only 9.25 percent is free water that is not used for the hydration of the cement. For mined aggregates, 45 percent is free water. This water needs to get out of the system. Slotted or perforated metal roof decks help remove this large amount of free water from mined aggregate systems. Cellular concrete is just the opposite; cellular concrete does not have large amounts of free water that need to be removed.

In recent years, however, manufacturers of cellular foam concentrates have allowed the use of a vented metal deck if the opening is at a maximum 0.50% opening—not the typical 1.50% opening used for mined aggregates. This is not to remove mix water; the reason is that many times these decks are exposed to adverse weather conditions (rain) for prolonged periods of time—weeks, even months. In this type of environment, water is sometimes allowed to enter the system. By venting the underside of the deck, it will help remove excess rainwater. The best way to keep this from happening is to begin roofing as soon as possible, typically after 72 hours.

How long should membrane installers wait after a rain event before proceeding with the installation of roof membranes?

For true closed-cell materials, rain on the concrete deck will not absorb water from the top down. If any moisture was absorbed, it would move from the bottom up through capillary action. An open cell would be just the opposite.

The question of how long to wait after a rain cannot be answered by establishing a waiting period based on a predetermined period of time. The decision for determining when surface conditions are favorable for membrane application after a rain can easily be made by the membrane installer and made as a result of simple observation. The membrane installer may use the following guideline to base his field decisions on.

After a rain, the deck surface must be allowed to return to its natural color. With warm temperatures and proper sun and wind conditions, this will happen rapidly to the general field area of the deck. Shadowing may persist slightly longer along cracks. These observations also apply to morning dew, frost, fog, or drizzle conditions. Membrane application should not begin until discoloration along cracks no longer appears. Should shadowing along cracks persist at deck low points, a core cut should be made to determine if any standing water exists within the EPS. If water is observed in core cuts (usually only as a result of very heavy or prolonged periods of rain), it must be removed by vacuuming. The

roofing contractor should contact the roof deck contractor and/or foam concentrate manufacturer for vacuuming instructions and procedures. Standing water (found in core cuts) should always be removed. Once removed it will not affect the roof or roof deck performance. Water removal from under the deck and membrane installation may occur simultaneously. Any small amount of moisture left in the system will be used in the hydration process. This method of removal may also be used on existing cellular decks.

Does Cellular Concrete Crack?

Whether it's a mined aggregate or cellular concrete, you will experience some cracking. Cellular mix designs use large amounts of cement and, as such, are subject to the drying effects of wind and sun. In certain climatic situations, installations are subject to surface cracking. The cracking is a result of rapid drying of the top surface. These surface cracks should not have any adverse consequences on the system. Standard rigid insulation board systems allow for 1/4" openings at all butt ends of board. In most cases, cracks found in cellular decks are less than 1/4" in size. Sealing of concrete shrinkage cracks should never be considered. Although the principle of sealing roof deck shrinkage cracks with mastic is understood, the result of the practice is questionable. It has been the author's experience, even with the best efforts of a roofing contractor to seal a deck system, that water intrusion into cracks can still occur as a result of rain during the construction period.

Given the probability that water can enter into the cracks, one must consider how the water will exit the system when weather conditions improve. Water that enters a shrinkage crack will soon evaporate upon the return of improved weather conditions. However, water which finds a way into shrinkage cracks sealed with mastic will be inhibited from evaporating when weather conditions improve and will likely remain undetected and roofed over. This moisture is now trapped near the surface of the insulating fill, below the base sheet. This is the portion of the roof system most affected by the loads of daytime heating. In the presence of ample heat, the moisture is likely to transform into vapor, which can be a potential problem to the membrane system.

Can anything be done to minimize this surface cracking?

Curing is one of the last and perhaps the most neglected step applicators fail to perform. Proper curing promotes the hardening or hydration of freshly-cast concrete. Hydration is the chemical process that ultimately binds cement particles into hardened concrete. Prevention of the loss of water from cellular concrete systems is important not only to the loss of strength, but to increased permeability and plastic shrinkage (a reduction in drying shrinkage cracking). Curing compounds should be used in place of three-day continuous wetting of the concrete. The advantages of curing compounds are that they are easy to apply, cost-effective, and alleviate the need for continuous monitoring or application, as would be required for continuous wetting of the concrete.

Proper curing is of particular benefit where the system will receive a fully-adhered membrane. The attachment and subsequent wind uplift resistance of the membrane system are contingent on the surface of the concrete deck. Consult with a foam concentrate manufacturer for proper curing compounds.

Should fully-adhered single ply be installed over cellular concrete?

One of the best advantages for choosing cellular concrete is its compatibility with a variety of roof membrane applications. One just happens to be fully adhered systems. Because cellular concrete has such a low moisture content, it lends itself to this type of application. Fully-adhered systems have been successfully installed over cellular concrete decks for fifteen years. Whether the assembly is over a metal deck, precast, concrete, or reroof

Where dripping occurs and the water evaporates, a crystalline residue is left.

Aggregate-based material with inadequate bond at slurry coat.

substrate, the system performs.

There have been advancements made to fully-adhered systems when applied to cellular lightweight. The main change is the fleece-back membranes. The fleece is a more forgiving membrane that allows for small troweling imperfection, construction traffic, or slight dimples from a light rain during construction. It also allows vapors to dissipate throughout the sheet. Adhesives range from contact adhesives to water-based adhesives and urethane foam.

Fully-adhered systems over cellular concrete have performed quite well in Factory Mutual testing. Approval ratings over concrete substrate and roof-over construction are as high as FM 1-540; and over metal deck substrates, ratings are FM 1-195. As with all systems, common sense must be used when applying solvent-based adhesives and base sheet attachments to cellular decks. Don't apply them during fog, drizzle, or when there is dew on the roof deck.

Because of the wide variety of roof membranes, cellular foam concentrate manufacturers have no standard requirements for venting of above-deck roof covers. Most would refer the decisions on venting to the membrane manufacturer.

My roof deck is starting to drip and is leaving a white residue.

Fewer than 1% of all cellular roof decks drip. At start-up, some cellular decks begin to drip at a very slow rate, typically occurring below at the deck surface where the form deck sheets lap on the steel joist. In these areas where the dripping occurs and the water evaporates away, a crystalline residue remains. In places where the drip water accumulated prior to completely evaporating away, the solution acquires an oily texture but remains water-soluble.

Any Portland cement concrete system subjected to water percolation—a process known as lixiviation—will produce solutions known as lixivium. The primary soluble constituent of a lixivium from a concrete system will be calcium hydroxide. Once the water vehicle of the solution has evaporated away, the calcium hydroxide will form a crystalline residue typical of that observed on the underside of the roof deck. In time, the calcium hydroxide will combine with carbon dioxide from the atmosphere, hardening the residue into calcium carbonate. The pH of the lixivium dripping from the deck system is likely high alkaline (pH = 11.5 +). This is within the range for which the galvanized form deck is designed to perform without corrosion. A

discoloration of the galvanized coating will occur where the lixivium is present. This is as a result of a process known as galvanic action.

On the topside of the form deck, galvanic action is an important part of the bond development between the cementitious fill and the galvanized form deck. This bonding, of course, allows the roof deck to perform as a composite system. If you are experiencing dripping in a cellular deck, the source of moisture involved in the interior dripping would have been introduced from an outside source, such as rain during construction.

Not properly removing rain or other accumulated water before the membrane was installed could be part of the problem. The only option for this moisture to vent is at the underside of the roof deck once the roof membrane is installed. Generally, this underside venting process is not problematic because the operation of the HVAC system serves as transportation to dispel, by evaporation, moisture venting to the building interior. However, disruption or intermittent operation of the building's HVAC or ventilation system can cause the moisture venting rate to exceed the rate of evaporation and accordingly, droplet formation can occur. It is important to note that construction moisture is of a finite supply, provided that the roof system is free from leaks.

Therefore, the rate of venting will decrease as the system's moisture content falls and equilibrium is achieved. Another aggravating factor, particularly in Southern locations, is vapor drive. Due to the regional climate, downward vapor pressure scenarios (vapor drive from exterior to interior) may exist year-round. This condition, combined with the aforementioned interrupted operation of the building's HVAC or ventilation system, can cause droplet formation. While it is understood that the interrupted operation of the HVAC is a matter of energy cost savings, this practice may not be practical during the building's start-up period. It may be necessary to conduct a period of proper interior environmental management while moisture equilibrium is being obtained in all of the construction materials used to create the structure.

Are all foam concentrates the same?

Material and procedural differences exist between foam concentrate manufacturers. For example, not all cellular concrete companies produce a closed cell material. When exposed to adverse weather conditions (rain), a closed cell product will perform quite differently. Not all foam concentrates have the ability to suspend material (cement and water). Unstable foams will result in collapsed air cells. When air cells collapse, this could affect the system's performance. A loss in insulating value and uplift value could occur, as well as water intrusion.

Some manufacturer approvals require bonding agents to be applied to both sides of the EPS insulation boards and the metal deck substrate. Other FM approvals require the metal deck to be washed down with vinegar. Others require special shaped insulation boards. Application procedure differences also exist among foam manufacturers. Some require the applicator, after placement of the insulation board, to begin the 2" topping pour within four hours. Others require the insulation board to be allowed to set overnight before installing the top 2". For this application, there is not a maximum time limit in which embedded EPS board must be covered by a topping pour of cellular concrete. EPS insulation boards should be placed in a slurry coat of fresh cellular concrete typically within thirty minutes of placement. The boards should always be placed in a staggered, "running-bond" pattern. The 2" topping should be placed on top of the insulation at such time as adequate bond has developed between the insulation and the substrate.

Expanded polystyrene board—particularly in thicknesses of two inches or more—has a tendency to float to the 2" topping surface if there is not an adequate bonding of the polystyrene board to the slurry coat. In most cases, adequate bonding develops overnight. Mined aggregates typically install the 2" topping within four hours. One of the problems with this application is that the slurry coat has not had adequate time to set.

Example: A typical crew is made up of five to seven workers. When freshly-laid insulation boards are walked on, the slurry coat bond becomes disturbed, leaving an inadequate bond. This would be like laying a concrete block in a bed of mortar and then, four hours later, lifting the block out of its slightly-set bed of mortar, then allowing the block to sit back down in the set mortar. The block is not going to perform as well as one that was left alone, allowing the mortar to properly bond to the block.

To aggravate this situation even more, some manufacturers of mined aggregate require the insulation board to have slots throughout the EPS insulation boards. The slots are provided to allow the large volume of free mix water to go downward. When this free water comes in contact with the slurry coat, the slurry coat is unintentionally washed away, leaving no bond. The board does not float but remains at the bottom of the substrate due to the weight of the mined aggregate. If the insulation board has an inadequate bond, one will experience a loss in uplift and diaphragm values.

Various manufacturers have certain specifications to accommodate their product approvals. If any questions arise, contact the manufacturer for clarification and recommendations. This article was intended to provide the reader with the insight necessary to properly understand cellular concrete systems. Ask your roof membrane manufacturers about application over cellular concrete. ■

About the Author

Mark J. Bates is vice president for Celcore Incorporated, located in Black Mountain, NC. He has 15 years experience in the cellular concrete industry and has worked in numerous aspects of the manufacturing and contracting business. Celcore is the manufacturer of a foam concentrate. Mark's company is unique in the roof deck business because it is not only a manufacturer, but has also been an on-site applicator of its own product for over 35 years.

Mark J. Bates

SYSTEMS AND ROOF MEMBRANE PERFORMANCE

BY PHILIP M. CARKNER AND
RAYMOND C. WETHERHOLT, CPRC/CPWC/RRC

INTRODUCTION

The term "concrete" is not clearly understood by many, even within the construction industry. While the term is normally associated with sidewalks, foundations, basements, and structural frames for buildings, there are actually many different concretes, each designed for a specific purpose.

Lightweight Insulating Concrete (LWIC) is a special form of concrete. It has evolved as a material intended for use as an insulation and substrate for support and attachment of roofing membranes on low slope roofs.

CONCRETE—A GENERAL DEFINITION[1,2]

Concrete is a composite material made with cement, aggregates, admixtures, and water. Aggregates generally make up approximately three-fourths of the volume of concrete. Cement (most commonly Portland cement) determines the properties of the concrete such as strength, fire resistance, and stability. Admixtures enhance or confer special properties that may include set time, freeze-thaw resistance, strength enhancement, and plasticity of the concrete. Water provides the necessary workability and is the source of critical moisture for hydration of the Portland cement. Hydration of Portland cement is the chemical reaction responsible for strength development and will be discussed further below.

LIGHTWEIGHT INSULATING CONCRETE

Low density concrete (referred to as lightweight insulating concrete in this discussion) has been defined by the American Concrete Institute (ACI)[3] as "[Concrete] made with or without aggregate additions to Portland cement, water, and air to form a hardened material which, when oven-dried, will have a unit weight of 50 pcf (800 kg/m^3) or less."

The ACI further states that the largest single use for LWIC is as a roofing base and thermal insulation for industrial and commercial buildings with low slope roofs.

LWIC is "non-structural" in the traditional sense. There are other forms of concrete, including "lightweight," that are structural in nature. An excellent discussion of the distinctions between lightweight structural and lightweight insulating concrete can be found in Baxter[4].

LIGHTWEIGHT INSULATING CONCRETE SYSTEMS

The emphasis here is on the term "system." Today's LWIC installations are combinations of components, each of which has a specific function. The substrate, lightweight insulating concrete, and molded expanded polystyrene (MEPS) work together to create an LWIC system. These components and their functions are summarized below.

The Substrate

The function of the substrate is to support the LWIC system and the waterproofing membrane. The substrate is also a structural component of the building, and as such, supports live and dead loads, contributing to seismic and wind load resistance.

The substrate may be galvanized metal deck (bottom-slotted preferred), structural concrete (poured-in-place or pre-cast), or a sound, existing built-up roof membrane.

Traditionally, the metal deck used has been high tensile-strength, galvanized, corrugated form deck. There has been an increase in the use of bottom-slotted, galvanized, 1-1/2" deep B-Deck over the past few years. This is the result of increased structural requirements and wider availability of B-Deck as compared to high-strength, galvanized centering.

Lightweight Insulating Concrete

LWIC is comprised of several components, each of which has a specific function. The components are: aggregate, cement, air entrainment, and water.

Aggregate

Aggregates in LWIC are generally nonreactive fillers used to control density and to prevent accumulated shrinkage associated with cement paste curing and drying.

The predominant aggregate is vermiculite, which is a naturally-occurring, micaceous mineral that contains water trapped between a platey aluminum, iron, and magnesium silicate structure. When heated to approximately 1800 degrees Fahrenheit, it exfoliates to an accordion-like, platey, low-density (6-9 pcf) material. In addition to its function as a means of maintaining the LWIC's low density, vermiculite retains water necessary for hydration of the Portland cement, provides the "body" necessary to build slope, and reinforces the LWIC to minimize cracking.

Perlite is a naturally-occurring, glassy (siliceous), volcanic material that contains trapped water. When heated above 1600 degrees Fahrenheit, it expands to a closed-cell, low-density material. Some sources of perlite will experience what is known as "alkali expansion reaction" with the Portland cement. Alkali expansion is a condition that occurs with some siliceous aggregates when they react with the Portland cement and create a reaction product that occupies more space than the original aggregate. Therefore, it is often recommended that expansion or control joints be used when perlite aggregate is used.

Pregenerated foam is made by mixing solutions of surfactant with compressed air. These surfactants may be hydrolyzed protein or synthetic in nature. While they are not true aggregates, they are included here because their function is to maintain low density in the LWIC. LWIC made with pregenerated foam is generally quite fluid and is limited in its ability to build slope. It also contains less water because the air bubbles do not absorb water. This characteristic may lead to insufficient hydration and strength development of the Portland cement if proper external curing conditions do not exist. LWIC made with pregenerated foam may experience drying and shrinkage cracks due to lack of moisture and reinforcing aggregate.

Cement

The function of cement in LWIC (and in all concretes) is to bind the components together and generate strength.

The cement used in LWIC is Portland cement[1,2,5]. Portland cement is a complex mixture of minerals, including silica, aluminum oxide, calcium oxide, and ferric oxide obtained from limestone, shales, clays, slates, and pyrites. Types of Portland cement used in the United States are defined in ASTM C-150. Types I, II and III are commonly used to produce LWIC. Portland cement undergoes a chemical reaction when mixed with water. This reaction creates "hydrated gels" that form a solid mass and result in hardened material.

Air Entrainment

In LWIC, air entrainment is an alkali-resistant surfactant used with aggregate concrete. The function of air entraining admixtures is to generate air cells that assist in density control and to create a homogeneous mixture that does not segregate.

Water

Water provides the moisture necessary for cement hydration. It also creates fluidity necessary for pumping and finishing of the LWIC.

Insulation

Molded Expanded Polystyrene (MEPS) used in LWIC systems is defined in ASTM C578. Type I is the preferred material. It is used in the form of boards in various thicknesses, generally from 1 to 16 inches.

The MEPS boards are perforated with various configurations of holes and/or slots in order to allow the LWIC to flow through the boards and bind the system together. The MEPS functions as the primary insulating component of the system (nominal R-value, four per inch). This lightweight material is used to build thickness and generate slope-to-drain.

LWIC—PHILOSOPHY OF DESIGN

The basis of LWIC system design is the encapsulation of MEPS insulation with lightweight insulating concrete. In all designs, there is a layer of insulating concrete applied to the substrate, commonly referred to as the slurry coat. In most cases, MEPS boards are embedded in this first layer. Thicknesses of MEPS board are stepped to create positive slope-to-drain. Finally, a topcoat of LWIC is applied to create a smooth

Lightweight Insulating Concrete

"[Concrete] made with or without aggregate additions to Portland cement, water, and air to form a hardened material which, when oven-dried, will have a unit weight of 50 pcf (800 kg/m^3) or less."

American Concrete Association

sloped monolithic surface for application of the roof membrane. The membrane is attached with a mechanically-fastened base ply and vented at the perimeter. When the substrate is non-vented (i.e., not slotted metal), topside vents are placed in the field of the membrane.

This design concept uses the inorganic, noncombustible, insulating concrete to encapsulate the polystyrene insulation board, imparting strength, stability, wind uplift resistance, and fire resistance to the composite system. (See the article by Hubert Dudley on page 17 in this issue of *Interface* for more detail regarding fire resistance, wind uplift resistance, etc.)

Portland cement develops a natural bond to galvanized metal surfaces, structural concrete, and existing bituminous roof membrane surfaces. All the components of the system are moisture resistant. Portland cement is hydraulically bound and not adversely affected by the presence of moisture.

Similarly, MEPS is minimally affected by the presence of moisture. Mechanical attachment of the membrane base sheet (see Dudley), along with vented details, allow for vapor pressure relief which prevents membrane blistering from residual construction moisture or from subsequent roof leaks. It is not recommended to adhere built-up roof membranes to the surface of LWIC systems.

Experience has shown that care must be taken by the designer and contractor when using LWIC. It is susceptible to some of the same factors that affect structural concrete. These factors include moisture contained in the mix, shrinkage cracking, and strength variability. Water in the mix can affect the roof membrane performance (cause blistering). Therefore, the use of a "vented" or "coated" base sheet or an upside-down granular surface capsheet is recommended. The upside-down capsheet is relatively economical and provides reasonable assurance that the moisture beneath will not pass into the built-up roof system above. Inorganic products are recommended.

Venting residual moisture contained in LWIC systems is required for successful roof system performance.

LWIC can be affected by freezing (the same as structural concrete), causing it to scale or dust on the surface. Moisture may also be retained in the LWIC if placed during the wetter months of the year. Checking with the manufacturer's technical department to verify unit weights, pullout tests, and compressive strengths, is appropriate.

LWIC ROOF MEMBRANE PERFORMANCE

Lightweight insulating concrete systems are the most dimensionally stable and highest compressive strength roof insulating materials available for application of roof membrane materials. LWIC has a coefficient of thermal expansion an order of magnitude lower than organic materials[3]. This means that ten times less movement is experienced by the membrane as temperatures change.

The compressive strength of lightweight insulating concrete is three to 20 times greater than that of common board insulation materials (see *Figure 1*). This characteristic supports the roof membrane during construction and subsequent roof maintenance traffic throughout the life of the building.

Encapsulating the MEPS boards in LWIC eliminates movement experienced by the roof membrane at insulation board joints. Because insulating concrete is several times as dense as common board insulation products, it provides a "mass effect" which moderates the extreme temperatures seen by the roof membrane. It also reduces the rate of temperature rise and fall, minimizing thermal shock experienced by the membrane (see *Figures 2* and *3*).

We have observed that hot asphalt built-up roofs placed over LWIC tend to "heat age" slower than roofs placed over plastic foam insulation. This may be due to the "mass effect" or the more thermally conductive nature of LWIC compared to plastic foam insulation.

Finally, lightweight insulating concrete systems allow the contractor to create positive slope-to-drain during construction. This is particularly advantageous on renovation projects where the existing conditions frequently vary from the original drawings. Asymmetrical drain locations, high density penetrations, and limited site storage space also validate use of LWIC for creating a tapered substrate.

SUMMARY

LWIC systems have been in use for over 60 years. In their modern form they provide a number of benefits in addition to their primary function as roof insulation. LWIC systems provide the designer with a versatile means of providing slope-to-drain. Their high compressive strength and dimensional stability provide support for the roof membrane system and minimize stresses imposed on the membrane from dimensional movement. Thermal stresses from temperature changes are also reduced due to the mass of the LWIC.

Finally, because LWIC is a form of concrete, it is highly resistant to damage from moisture and is reroofable in most cases. LWIC systems are an environmentally responsible choice for roof insulation.

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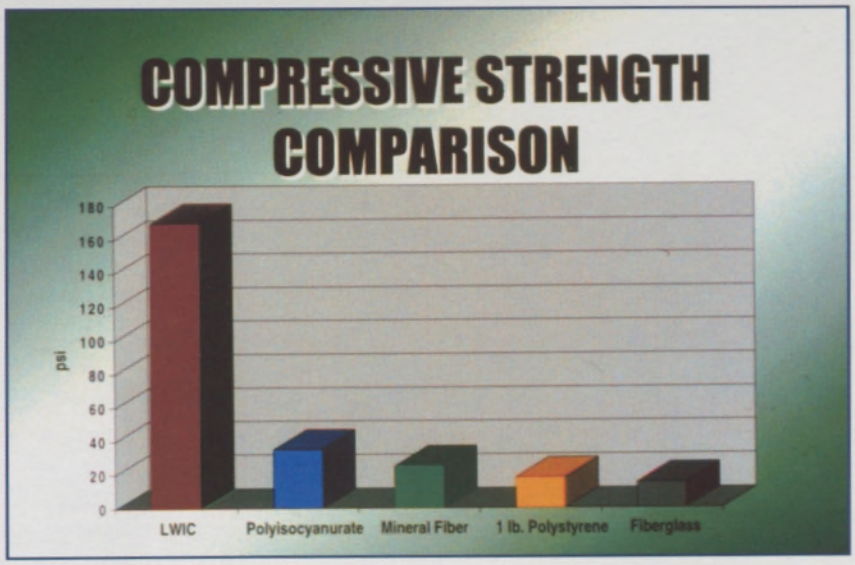


Figure 1

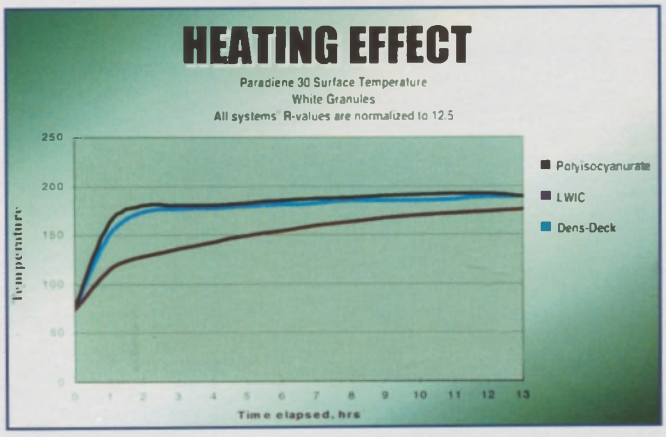


Figure 2

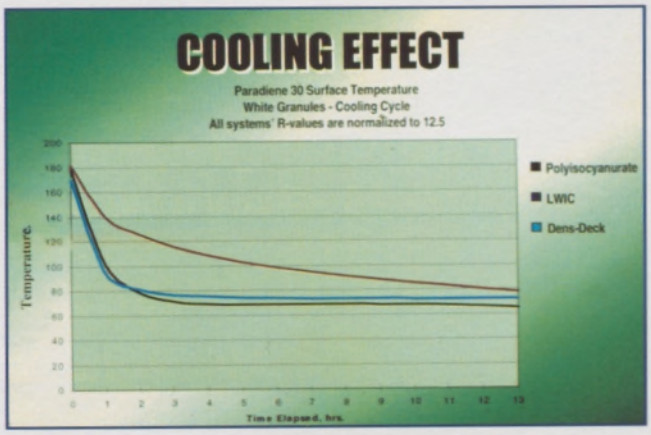


Figure 3

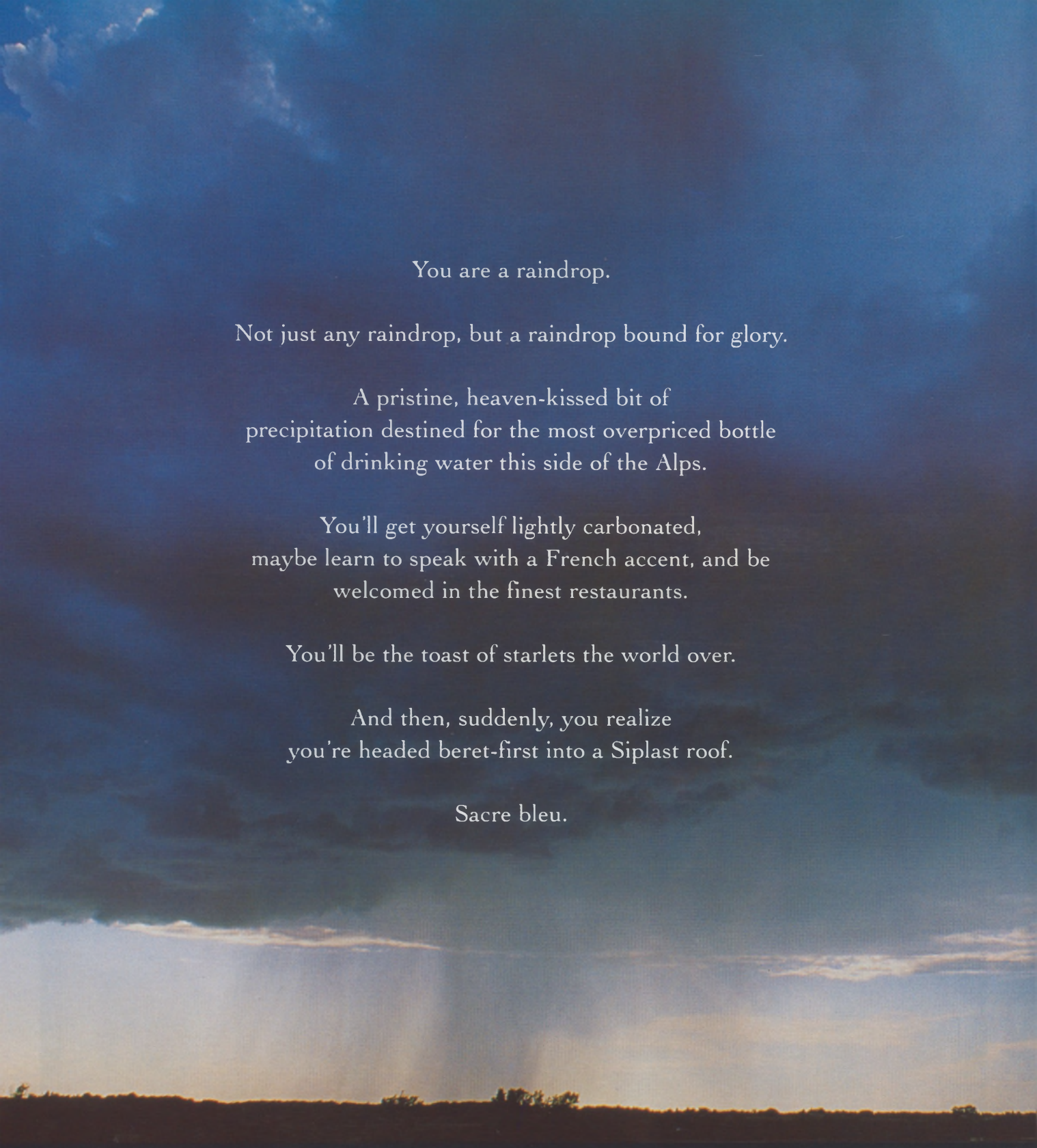
About the Authors

Philip M. Carkner

Philip M. Carkner is Research and Technical Support Manager for Siplast Roof Insulation Systems. He has been involved in construction materials research, product development, and marketing for 23 years. Carkner spent 19 years with W.R. Grace Construction Products Division prior to joining Siplast. He is a member of ACS, ACI, and ASTM. Carkner has a BA in chemistry from Potsdam College, Potsdam, NY, and a Ph.D. in inorganic chemistry from the University of New Hampshire.

Raymond Wetherholt CPRC/CPWC/RRC

Raymond C. Wetherholt, CPRC/CPWC/RRC, is the president of Wetherholt and Associates, P.S., a 15-year-old roofing and waterproofing consulting firm in Kirkland, Washington. He has worked with lightweight insulating concrete decks as well as hard rock concrete decks for over 25 years. Wetherholt is also a past president of the Institute of Roofing and Waterproofing Consultants (IRWC), which was recently absorbed by RCI. Ray may be contacted at rayw@wetherholt.com.



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RCITEMS

Keeping RCI Members on Top of Institute News

September 1999

North Carolina Forms Chapter

North Carolina has become the most recent locale to create a local chapter of RCI. The newly-elected Executive Committee of the NC Chapter met Friday, July 30, 1999. Officers are:

President—Gary R. Cattel, PE, RRC, Roof Engineering Inc., Raleigh, 919-845-1450.

Vice President—Martin L. Obando, Cedar Shingle Consultants, Elizabeth City, 252-771-5187

Secretary—Darren R. Perry, PE, Factory Mutual Engineering, Charlotte, 704-525-9000

Treasurer—Robert W. Yoder, RRO, Soprema, Inc., Mooresville, 704-662-6800

It was agreed to hold meetings on a bi-monthly basis in locations throughout the state. The meetings will be held on the second Wednesday of odd months. The first meeting will be held in Greensboro at 5:30 p.m. on November 10. Details will follow. Meetings will typically consist of a social hour, dinner, and a technical presentation.

Volunteers are needed to support the following committees:

- Education
- Programs
- Social
- Contractor Liaison
- Membership

Please contact any of the above officers to express interest or if you have any questions. See you in Greensboro!

—Gary R. Cattel, PE, RRC

GA Chapter Triples Attendance

Jim Daniels, guest speaker for the Georgia Chapter of RCI, receives a certificate of appreciation from chapter secretary Deborah Horne.

The newly-formed Georgia Chapter of RCI met for the second time this year on July 19. Attendance almost tripled from that of the group's first meeting, with a showing of 38.

The chapter has decided to have quarterly luncheon meetings, as this seems to fit most people's schedules. Jim Daniels from AEP Span gave an educational seminar on the application of standing seam metal roofing. Evaluation forms came back very positive concerning the information put forth.

Luncheons will be organized as follows: first, a business meeting for officers, committee members and general members will be held; then attendees will have lunch, after which the guest speaker will make a presentation.

As a newly-formed chapter, applications for Georgia membership will be sent out to attendees of this meeting as well as to the existing RCI membership from Georgia. The officers anticipate tremendous involvement after the strong showing and interest brought forth at the July meeting. The next meeting will be October 15 at the Colonnade Restaurant in Atlanta. Richard Roe will dicuss the most current roof insulation issues. Call 800-443-90147 to make reservations.

—Deborah Horne

Inside

EXECUTIVE NOTES

Membership —How Does Our Garden Grow?

Francis A. Acquaviva

This morning our Membership/ Registration Manager, Micki Kamszik, gave me our latest membership figures. Each month we look at the dynamics of membership. We look at the number of new members, the number who have not paid their fees by the end of the 90-day grace period, and the number who have decided, for whatever reasons, not to renew their memberships. Fortunately, there are very few of the last category.

We also look at growth of membership over the past year, comparing the month this year with the same month last year. Doing this tells us not only where we are in terms of growth and our goals, but also where our growth (or lack thereof) is occurring, and how timely members are on returning their invoices.

For members, this would ordinarily be pretty boring stuff, but a couple of things have shown up this year that I think might interest you. Also, I think you deserve to know how your organization is doing.

This past fiscal year, one of our goals was to add over 300 new members. You can see from the first line of *Table 1* that as of July 1999, we have added 322, with one month to go on our fiscal year. Just over 25 of these members were the result of our joining forces recently with the Institute of Roofing and Waterproofing Consultants (IRWC), but with August figures yet to come in, we will certainly reach our goal. Congratulations to our volunteers and staff, and welcome to these new members.

Table 1
RCI Membership Growth
July 1998 to July 1999

Active Members, 7/31/98	1113
New Members, 7/98 - 7/99	322
Possible Active Members, 7/99	1,435
Attrition 7/98 - 7/99	80
Attrition 7/98 - 7/99	7.2%
Actual Members, 7/99	1,355
Net increase, 7/98 - 7/99	242
Net increase, 7/98 - 7/99	21.7%

Another of our goals was at least 15% growth overall. Over three hundred new members is wonderful, but if, at the same time, we lose three hundred old members, we've done nothing, and several of us need to be looking for new lines of work. A very important part of the business of association management is member retention—getting those who are already members to renew.

No professional society has 100% renewal. Members fail to renew because they change careers, they retire, they forget, they go to meet their makers, and, as difficult as it is to believe, some just don't want to.

Typically, attrition in a professional society will run 8 to 12 percent per year. At RCI, our attrition historically has been less than that, and you can see from *Table 1* that in the past year it's been 7.2%. Thus, our net growth since July 1998 has been 242 members, or over 21%. That's a pretty remarkable increase, even for an organization with a small membership base like RCI and deserves a round of applause for the Institute and its leadership.

Speaking of applause, let's look at where those members are. *Table 2* describes membership by region a year ago and again this July, with percentage increases. We can see that the largest proportional increase was in Region 7, and that significantly greater than average increases were seen also in Regions 2 and 8. Kudos to the directors and members who have worked for their regions, and to the new chapters developing in Western Canada, Georgia, and North Carolina.

Finally, let's look at growth by membership category. *Table 3* indicates that over the past year, we have added 103 Professional and Professional Affiliate members and a similar number (110) of Industry and Industry Affiliate members. The percentage increase of the latter two groups is higher because the starting base was smaller. QAO memberships are up more than average, as are Facility Manager members, but the numbers are smaller.

Current Legislation Could Affect Small Business Estate Taxes

Two bills before the legislature could affect many small, privately-held businesses when it comes time to pay estate taxes following the death of the owner. These are H.R. 86 and H.R. 8. In the Senate, they are S. 38 and S. 56. H.R. 86 and S. 56 would repeal federal estate and gift taxes on generation-skipping transfers. H.R. 8 and S. 38 would phase out the federal estate and gift taxes by 5 percent each year for the next 11 years.

There are currently ten to twelve million privately-held businesses in the U.S. They account for 50% of the Gross National Product, 50% of all jobs, and 65% of U.S. wages paid.

The failure rate for family businesses, however, is steep. The typical life expectancy of a business which makes it past the first five years is 24 years—the average working life of the founder. Less than 33% of family businesses survive into the second generation, and less than 10% survive into the third generation.

Transfer taxes can cause a tremendous financial strain on small businesses. In the majority of cases, estate and gift tax rates paid by recipients of business property are between 55% and 60% of the fair market value of the business. With a $1.3 million exemption, it is easy for a small business owner with a residence, life insurance, profit sharing or IRA and some savings, to go over the $1.3 million IRS exemption.

If you wish to provide input on either of these bills, contact their sponsors or your representatives. Sponsors of H.R. 86 and S. 56 are Rep. Chris Cox (R-CA), and Sen. Jon Kyl (R-AZ). Sponsors of H.R. 8 and S. 38 are Rep. Jennifer Dunn (R-WA) and Sen. Ben Nighthorse Campbell (R-CO).

—Extracted from SMACNA Release

NOTE: A provision to demolish the "Death Tax" was included in the $792 billion tax cut legislation passed by the House of Representatives on Aug. 5. It was being considered on the Senate floor as we went to press.

Membership *(continued)*

In general, then, this is what our membership looks like. This is the platform from which we will report to you each year from now on. I'm pleased with our growth; I expect it will continue; and if we can do anything that will increase the value of your membership for you, you know where to find me. I'm fran@rci-online.org.

Table 2
RCI Membership by Region
July 1998 to July 1999

Region	July 1998	July 1999	Change #	Change %
1	226	273	47	20.8
2	247	323	76	30.8
3	177	207	30	17.0
4	122	149	27	22.1
5	33	32	(1)	(3.0)
6	162	177	15	9.3
7	30	46	16	53.3
8	116	148	32	27.6
Total	1113	1355	242	21.7

Table 3
RCI Membership by Category
July 1998 to July 1999

Category	July 1998	July 1999	Change #	Change %
Professional	526	622	96	18.3
Professional Affiliate	79	86	7	8.9
Industry	273	351	78	28.6
Industry Affiliate	48	80	32	66.7
Quality Assurance Observer	99	126	27	26.7
Facility Manager	26	34	8	30.8
Other	62	56	(6)	(9.7)
Total	1113	1355	242	21.7

How to Protect Against BAD INFO

By Reed Booker

If information is the currency of the Knowledge Age, then faulty information can damage an enterprise as surely as fire or flood. And while fires and floods are impervious to human complaints, people who commit costly errors are increasingly held accountable for damages.

While the Industrial Age saw development of insurance products to protect against human injury and property damage, such commercial general liability (CGL) protection was not intended to cover losses arising from professional errors or omissions. The new insurance specialty covering professional liability is the fastest growing element of the insurance industry.

In a quiz of your awareness of the difference between CGL and professional liability insurance, decide which form would cover the losses described in the following scenarios:

- A company pays $10 million to restore data and software due to an accidental upload of a computer virus by a consultant.
- A billing system expected to process ten accounts per minute turns out to perform only half that number.
- Confidential information is disclosed to a third party, causing inventory to depreciate in value.
- A consultant's installation of a program on a client company's mainframe computer opens the company up to a copyright infringement action.
- A person is defamed by a remark logged into a company's web site, and sues the site's host company.
- A consultant is sued for damages arising from faulty advice dispensed in a seminar.

The answers, of course, are Professional Liability: 6; CGL: 0. This exercise is purely theoretical and does not reflect actual cases, nor is it intended to project the chances of successful legal action. The intent is merely to illustrate the differences between two kinds of business insurance. Following are detailed explanatory notes for each scenario.

THE $10 MILLION VIRUS

That's easy. It was a mistake by the consultant for which he or she can be found liable. But the CGL won't provide protection because the damage was to data, which is intangible property, rather than to tangible things like the computers themselves. That's why so many companies that employ consultants are asking to see proof of professional liability insurance before a contract is let. Many individual consultants who do not have coverage would be unable to pay for the costs of a major mistake, and so hiring them exposes companies to significant risk.

THE SLUGGISH SYSTEM

Failure to deliver an adequate system is not covered by the CGL because there is no bodily injury or property damage, notes Jean M. Younger, assistant vice president of Westport Insurance Corp., a specialist in electronic errors and omissions liability coverage. Whether or not a successful action occurs will probably depend on how clearly the system's required specifications were expressed in the consultant contract.

A LEAK OF CONFIDENTIAL INFORMATION

Even though it affects property (in this example, the value of inventory), disclosure of confidential information is not covered by a CGL. In this case, the company would have recourse against the consultant who disclosed the data; but without professional liability coverage, the client could just as well send a turnip to the blood bank.

MAINFRAME COPYRIGHT INFRINGEMENT

It's really immaterial what kind of computer is employed to exploit a copyright, but protection is available only through professional liability coverage. The company has recourse against the consultant for the cost to defend the copyright claim, as well as damages alleged by the copyright owner. Costs to defend a copyright claim average in the hundreds of thousands of dollars. That's a good reason to check any consultant's policy to make sure it covers claims for copyright infringement. Not all professional liability policies do.

THE WEB SLUR

This represents a whole new kind of potential liability. The good news about the Internet is that its content is immediately available to millions of people all over the world. That's also the bad news. A web site operator or Internet service provider would fall under a CGL policy's exclusions of those in the businesses of advertising, broadcasting, publishing, or telecasting. An emerging legal code is grappling with problems of defamation and copyright infringement through unauthorized downloading or uploading of copyrighted material. Any consultant or company engaged in web site development or presentation is open to potential damages, protection from which may be found in professional liability policies.

THE FLAWED EXPERT

Seminar presenters have long protected themselves against liabilities arising from, say, an attendee tripping over a mike cord or being injured by faulty equipment. Those kinds of exposures are usually covered by CGL policies that protect against bodily injury or property damage. But advice dispensed by a speaker is considered a professional service, and any claims for damages would be a matter for professional liability coverage.

In addition to these few examples, there are as many compelling reasons for professional liability insurance as there are potential mistakes to be made. As one of the fastest growing forms of business insurance, it has rewarded its buyers with rates that have been moderated by industry-specific exposures. Prior to industry-specific plans, lower-risk professionals were lumped in with higher-risk professions with resulting high premiums.

A typical feature of professional liability protection is legal defense when required. Insurance lawyers who are experienced in defending against liability claims go into action immediately when needed at no cost to the policy holder.

In an ever more litigious society, professional liability insurance has joined commercial general liability plans to form the basis of protection for almost every business or professional service.

Reed Booker is with MIMS International Ltd., an insurance broker that has partnered with RCI to provide professional liability insurance to its members. For more information, call 1-800-899-1399, or e-mail your request to mims@mimsintl.com. Be sure to mention your membership in RCI.

John Stadum

by Kris Ammerman

Want a real challenge? Be a roof consultant in vast, out-of-the-way places like the Alaskan Aleutian Islands. Just ask John Stadum. "Roof consulting here requires lots of traveling, challenging weather issues, and allows for many fine experiences," says Stadum. Though he was born on a farm in West Central Minnesota and grew up and attended college in Seattle, WA, John has been in "beautiful, expansive Alaska" for almost 25 years now. And he likes it just fine.

Having begun his construction career as a carpenter in Seattle, Stadum recalls watching the King Dome being built as he helped to renovate buildings in Pioneer Square. He worked for TRA, a large A/E firm in Seattle, for three years as a mechanical draftsman and designer before taking the big leap to Alaska in 1975.

After working for five years in general construction in Alaska, Stadum joined USKH, an A/E firm in Anchorage, in 1979. There he was initially an architectural and structural draftsman, evolving into a design and construction project manager and acquiring CADD skills along the way. John earned RIEI certification and has devoted the last nine years with USKH to roof consulting. Stadum is now a shareholder in the company.

In 1995, John joined RCI. "The organization is a fine resource for objective information and networking. I share *Interface* articles with contractors, clients, and others." Being in "out-of-the-way" Alaska, the need to stay up-to-date on new products and product issues, bidding methods, and so on, is crucial. "RCI is a great resource for those purposes."

"For my business to be on the cutting edge, close association with roofing contractors is crucial," John notes. "Their perspective and experiences are invaluable," he adds.

Having done architectural work and then moved into the roofing arena, John has a high regard for the "massive" skills and knowledge architects are expected to employ. "Our engineers and architects drive each other nuts at times, but projects get done, and we usually appreciate one another." As a specialist in roofing, John feels he can pay closer attention to details, products, and installation, since his focus is narrower.

John does a lot of traveling in the course of his work. "Alaskan Native culture is awesome, as is the scenery, the wildlife, World War II history, and countless other sites and subjects," he notes. When he's at home, John enjoys playing in a YMCA basketball league, building things (like a horse barn and a get-away cabin), and "goofing off with the kids"—Anders, an energetic nine-year-old, and Julia, 11, a budding artist. Other favorite things are weekend escapes with wife Mary, a rural economic development consultant and horse lover. "I also appreciate volleyball, a bit of cribbage, and warm, sandy beaches with lots of time to spend and nothing specific to do....Creating a balance between work and family is difficult," John adds.

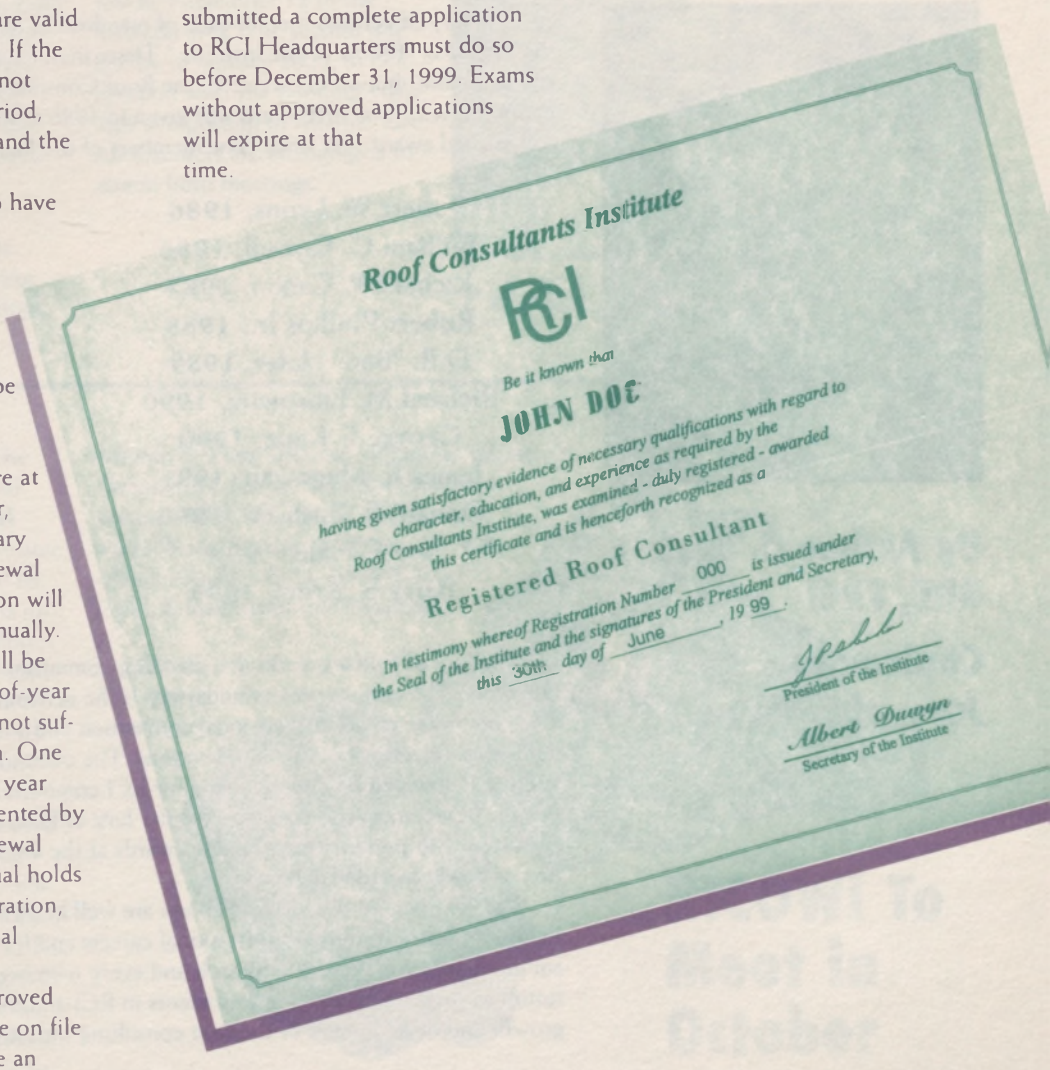
It appears that John is working hard to balance work, horses, and family. He recently combined a trip to Seattle to visit family and friends while attending a meeting of RCI's Region 7. RCI salutes John Stadum and dedicated men like him.

New Registration Policies

Micki Kamszik, Registration Manager

At its meeting July 6, the RCI Board of Directors approved the following policies, which will be added to those governing the Institute's Registration program. The new policies are effective immediately.

- RCI and RRO applications are valid for two years after approval. If the corresponding credential is not attained within this time period, the application will expire, and the candidate must reapply. For instance, all individuals who have applications on file at RCI Headquarters which were approved before March 1998 have until March 31, 2000 to test on those applications. Reapplication will be necessary after this date.
- In the future, all RRC and RRO registrations will expire at the end of the calendar year, rather than on the anniversary date of registration. All renewal fees and CEU documentation will be due by December 31 annually. Invoices for fee renewals will be prorated to reflect the end-of-year date. Fee payment alone is not sufficient to renew registration. One CEU (ten credit hours) per year must be earned and documented by Headquarters to satisfy renewal requirements. If an individual holds an RRC and an RRO registration, one CEU will satisfy renewal requirements for both.
- Policy requires that an approved RRO or RRC application be on file at RCI Headquarters before an exam may be taken. In the past, a small number of individuals under extenuating circumstances were permitted to sit for specific exams without prior application approval. Any such individuals who have not submitted a complete application to RCI Headquarters must do so before December 31, 1999. Exams without approved applications will expire at that time.


Roof Consultants Institute

RCI

Be it known that

JOHN DOE

having given satisfactory evidence of necessary qualifications with regard to character, education, and experience as required by the Roof Consultants Institute, was examined - duly registered - awarded this certificate and is henceforth recognized as a

Registered Roof Consultant

In testimony whereof Registration Number 000 is issued under the Seal of the Institute and the signatures of the President and Secretary, this 30th day of June, 19 99.

President of the Institute

Albert Dunyn

Secretary of the Institute

Committees

JURY OF FELLOWS

By Arthur O. Sark, RRC, FRCI

Chairman, Jury of Fellows

The Jury of Fellows is composed of members of RCI who have been honored with the degree of "Fellow of the Institute." These individuals were selected for their outstanding contribution of service to the Roof Consultants Institute and receive the designation, "FRCI." The first award was given in 1986 at the annual convention and has been a cherished award ever since. The members of the Jury are as follows:

Robert W. Lyons, 1986
William C. Correll, 1986
Richard P. Canon, 1987
Robert Phillips Jr., 1988
D.B. "Ben" Hales, 1989
Richard M. Horowitz, 1990
George F. Kanz, 1990
James E. Magowan, 1991
Donald E. Bush Sr., 1992
Joe F. Hale, 1992
Barry S. Krum, 1993
Robert Martin, 1993
Lyle Hogan, 1994
Sam Huff, 1994
John L. Willers, 1995
Arthur O. Sark, 1996
Dave Siple, 1996
Phil Dregger, 1997
Robb Smith, 1998
Michael Blanchette, 1999
William Cypher, 1999

The Jury of Fellows works as a standing committee and reports to the Board of Directors. The current project underway is the revision of the awards program manual. The committee meets at the annual convention and will have a minimum of one teleconference meeting between conventions. The committee operates under the Bylaws and the Policy and Procedure Guide for RCI committees. The President and/or the Board of Directors assign projects for the Jury of Fellows. The Fellows are currently entrusted with presentation of many awards at the annual convention, including selection of newly-awarded Fellows.

The members of the Jury of Fellows are well known and influential throughout the roofing industry from their professional careers and for their service to the Institute. I am proud to have worked with each and every member of the Jury and can personally testify to their pride of accomplishments in RCI and their commitment to the continued growth and development of the roof consulting industry and the promotion of RCI.

Region 2 Members Visit RCI HQ

Raleigh, NC July 16

On July 16, over forty members of Region 2 met in Raleigh, NC for an informative educational program. The event was kicked off on the evening of July 15 with a cookout sponsored by Gary Cattel of Roof Engineering, Inc. The poolside "pig pickin'" was well attended and included food, fun, and fellowship for all. We extend thanks to Gary for his hospitality.

On July 16, Lyle Hogan began the technical portion of the meeting with an informative discussion on how not to build a roof. Lyle had some great photographs showing the pitfalls of improper design, application, and material selection. As usual, Lyle's presentation was very informative. Joe Hale of HDH Associates PC was next with a session on disaster response and readiness. As usual, we appreciate Joe's expertise and wisdom.

The business portion of the meeting covered numerous issues and happenings within RCI explained by Executive Director Fran Acquaviva, including the merger between RCI and IRWC. The day ended with a tour of RCI Headquarters, just across the road from the hotel in which the meeting was held. It was great to be able to put faces with the voices from staff that we have dealt with so many times in the past.

The next two Region 2 meetings have been scheduled. The first one will be November 12 in the Orlando area. The second one will be in January 2000, in conjunction with the building envelope symposium in Atlanta, GA. All members are encouraged to attend both meetings.

C. Allan Kidd, RRC, EIT

RICOWI To Meet in October

As previously noted in *Interface*, The Roofing Industry Committee on Wind Issues Inc. (RICOWI) has changed its name to The Roofing Industry Committee on Weather Issues Inc. and expanded its mandate. Although wind issues are its primary focus, RICOWI's Board of Directors recently approved broadening the organization's scope to include other weather-related issues facing the roofing industry such as hail, energy efficiency, and durability effects.

RICOWI's next seminar—on the proper design, installation and testing procedures for specific roofing materials—will be held at Underwriters Laboratories Inc., Northbrook, IL on October 22, 1999. The seminar will be of interest to roofing professionals, architects, engineers, contractors, facility managers, and those in the insurance fields. RICOWI's general membership meeting will also be held at UL on October 23. For additional information, contact RICOWI's Executive Director, Patty Wood-Shields, McDonough, GA office: 770-914-7235; fax: 770-914-7102; E-mail: pawsroofl@aol.com.

Mike Muses on Motorbikes, Airline Meals, & Membership Classifications

By Mike Blanchette, RRC, RRO, FRCI

Immediate Past President, RCI

Editor's Note: Some organizations have pet names for their officers who "max out" after their terms, yet keep on hanging in there, contributing to the cause. The Jaycees calls those who are too old to belong to the "Junior" Chamber of Commerce "exhausted roosters" (a name which had to be revised when the organization began to take female members. I recall "old biddy" being proposed and rejected...) Perhaps RCI needs a new category for folks like Mike. Got any suggestions? KA

It's been a while since you have all heard from me, so I thought that I would let you know I'm still around. The question that I'm most frequently asked by RCI members is, "How do you like retirement?" My reply to this is, "Not really much of a retirement yet." Just ask my staff and my wife.

I still get to attend teleconferences. I also attended a board meeting in Raleigh at the end of June, the usual region meetings, and today I finished a one-day course on wind design. The wind design seminar was held by SPRI in Columbia, MD, and we had several RCI members in attendance. To say the least, it was a joy sharing the teaching podium with Dave Roodvoets and getting another class under my belt.

I am also busy with some Jury of Fellows correspondence in addition to cajoling some advertising bucks in *Interface* out of our professional members. I attended the WSRCA convention in Las Vegas, and NRCA's mid-year committee meetings in Chicago.

As you can see, the frequent flier miles are still coming in. I am on yet another airplane as I put this to the laptop and was just wondering:

- Is American Airlines just a front for a chicken farm? Jeez, chicken for every meal, every day!
- If the plastic bag on the oxygen masks won't inflate, what the hell is it there for? Extra air sickness bag?
- Why does it seem that so many air travelers just got out of a congeniality class taught by Saddam Hussein? Do they really think that gate agents and flight attendants make flight delays happen on purpose?
- Am I the only person whose roofing projects don't develop problems until they're out of town? My cell phone bills apparently aren't high enough...
- Why do I have such a narrow-minded spouse, who seems to think it is more important to keep our daughter's college tuition current than to let me buy a new motorcycle?
- When will this great, up-beat economy end? Please, God, just another ten or 15 years, please.
- Speaking of God, I would ask that He please grant our subcommittee the serenity and wisdom to come up with some good new membership classifications and definitions. Then, make the Board listen to us.
- Finally, pass the word: airlines usually board by row number. If they call boarding for rows 20 through 30, get out of my way and wait your turn. There isn't any room in the overhead anyway.

John Cook

John Cook Named Senior Associate

John R. Cook, a Professional member of RCI, has been named a Senior Associate with George Butler Associates Inc. (GBA), an engineering and architectural firm. Cook joined GBA in 1996 as an Associate responsible for directing the activities of the firm's Lisle, IL office, which specializes in providing roof consulting and risk management services to clients. Prior to joining GBA, Cook spent 12 years with the Thomas Howell Group in Downers Grove, IL, where he served as Manager of Engineering Services. Earlier he was a Project Manager for Doyen & Assoc., consulting engineers in Chicago. Cook holds a BS in civil engineering from the University of Illinois in Champaign and an MBA from Roosevelt University in Chicago. A registered professional engineer, he is a member of the National Society of Professional Engineers, the Illinois Society of Professional Engineers, the NRCA, MRCA, RCI, RIEI, and the Chicago Surety Claims Association.

Spady Promoted at CTL

Jeffrey L. Spady, RRC, has been named Director of Roof Engineering Services with CTL Engineering, Inc. Jeff will oversee all roofing/waterproofing engineering services for all offices of CTL Engineering. Spady will continue to be based in the company's Durham, NC office.

Robert Parden Expires

Robert Parden Jr., RRO, died July 15 of an apparent heart attack. Parden was 44 years of age and was a senior technician with Thompson Engineering Testing Inc. of Mobile, AL. He has been a member of RCI since July 1998, and an RRO since January. Parden previously worked as a quality assurance roof inspector with CTS Inc., Mobile.

new members for JULY 1999

Name	Company	Region	Category
Alfred Alesi, CPRC/RRC	Roofing Solutions, Inc.	1	P
Robert Alford, CPRC/RRC	Amtech Roofing Consultants	4	P
Terry L. Aten, CPRC/RRC	Roof Spec, Inc.	3	P
Mark Bechtold	IRC Building Sciences Inc.	8	QAO
Carveth W. Bennett Sr., FIRWC	Bennett & Assoc. Sev. Corp.	2	P
Richard Boon	RIEI	5	P
William Boskwick	WB Consulting Inc.	8	P
Paul Boyce	Paul Boyce & Associates	2	P
Robert Boyd	Roofing Consultants of Virginia	2	P
Marcus Callahan	Soprema, Inc.	2	IA
Carl G. Cash	Simpson Gumpertz & Heger, Inc.	1	P
Michael L. Cogburn	Arnold & Associates, Inc.	4	P
Richard L. Cook	Austin, Dillon, Cook Eng. Inc.	2	QAO
Dennis Crawford	IRC Building Sciences Inc.	8	QAO
Michael L. Crawford	University of Virginia	2	QAO
Donald Dorner, CPRC/RRC	A/R/C/Associates	2	P
Tom Doyle	IRC Building Sci. Group Inc.	8	QAO
Herbert B. Fishman	H. B. Fishman & Co.	1	P
William F. Fulcher	New Hanover County Schools	2	FM
R. Tad Furrow, PE	UNC, Greensboro	2	P
Sandra Gray, CPRC/RRC	The Moriarty Corp.	1	P
Luc Guilbeault	IRC Batten Sears Group Inc.	8	QAO
Bland F. Harper, CPWC		4	P
Daniel R. Held	Roof Spec. of New York Inc.	1	P
John Herdina	Southern Reserve Roofing Co.	2	I
Matthew Hitlin, CPRC/FIRWC/RRC	Matt Hitlin Roof Cons. Ltd.	2	P
William L. Hutchings	U of I, Chicago	3	P
Dave Jolliffe	IRC Group Inc.	8	QAO
Brian R. Leslie	Specialty Steel Ind. of NA	1	I
Robert Lichy, CPRC/RRC	R.C. Lichy & Assoc.	1	P
Max Mazraeh	A/R/C Associates, Inc.	2	P
Mike McCormick	E. J. McCormick Assoc. Inc.	2	P
Tesfmariam Merid, RRO	D-7 Consultants	6	P
David Moore	IRC Building Sciences Inc.	8	QAO
Daniel Moriarty, CPRC/FIRWC/RRC	The Moriarty Corp.	1	P
Stephen Mulvihill, CPRC/RRC	ARCON Associates Inc.	3	P
Zachary D. Munton	Associated Roof Management	6	S
Lawrence T. Musil, Jr.	Interbay Roof Insp. Cons.	7	P
Raymond Norton, CPRC/RRC	Norton Servs. and Cons. Corp.	3	P
Stephen Patterson, CPRC/RRC	Roof Technical Services	4	P
Kelly Robinson	Geoscience Group Inc.	2	QAO
Kenneth Schneider	Schneider & Associates Inc.	2	P
John S. Seeback	Seeback Roofing & S. M. Ltd.	8	I
Ron Seguin	IRC Batten Sears Group Inc.	8	QAO
Dan Seifert	Shive-Hattery, Inc.	3	PA
Doug Sloan	IRC Batten Sears Group Inc.	8	QAO
Gary E. Stearman	Mid-West Roofing Consultants	4	P
Ryan Kelly Sullivan	Southern Reserve Roofing Co.	2	IA
Kenneth Sutton	Sutton Consulting Services	6	P
Chander Thusu	IRC Building Sciences Inc.	8	QAO
Darrel K. Unrue, CPRC/RRC	Roofing Technical Services	7	P
Paul Whitley	Nelson Hall & Associates Inc.	2	QAO
Joseph J. Williams, CPRC/RRC	A/R/C Associates	2	P
William Wright, CPRC/RRC	Roofing Consultants, Inc.	3	P

RCI CALENDAR OF EVENTS

SEPTEMBER 1999

23-25 Fundamentals of Roofing Course
Indianapolis, IN
28 Region 6 Meeting/BURSI
Oakland, CA
30 Basics of Roofing Course
Chicago, IL

OCTOBER 1999

1-3 Board Midyear Meeting
Vancouver, BC
3-5 International Facility Management. Association*
Los Angeles, CA
7-9 Advanced Roof Consulting Course
10 RRC Exam
Dallas, TX
15 Georgia Chapter Meeting
Atlanta, GA
15 Rooftop Quality Assurance Course
16 RRO Exam
Kansas City, MO
28 Region 4 Meeting
Dallas, TX
29 Region 3 Meeting
Kansas City, MO
29 Region 1 Meeting
Parsippany, NJ
29-30 Building Envelope Symposium
Parsippany, NJ

NOVEMBER 1999

4-6 Advanced Roof Consulting Course
7 RRC Exam
Richmond, VA
12 Region 2 Meeting
Orlando, FL
16 Exec. Committee Teleconference
18-20 Fundamentals of Roofing Course
Phoenix, AZ

DECEMBER 1999

2 Basics of Roofing Course
Raleigh, NC
3 Region 1 Meeting
Western PA/Ohio
10 Rooftop Quality Assurance Course
11 RRO Exam
Tampa, FL
21 Board of Directors Teleconference

JANUARY 2000

26 Region 2 Meeting
Atlanta, GA
26-27 Building Envelope Symposia
Atlanta, GA

All events (except those with an asterisk) are presented by RCI. ALL RCI PLANNED EVENTS ARE SUBJECT TO CHANGE OR CANCELLATION. Call RCI for current dates, locations, and fees. Telephone 1-800-828-1902 or (919) 859-0742.

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*RCI will exhibit at trade show.

Write for RCI. Get Published!

Upcoming issues:

Testing & Analysis	October 1999
Wood Decks and Wood Shakes	November 1999
Steep Roofing	January 2000
Bituminous Roof Systems	February 2000
Spray-in-Place & Liquid-Applied Roofing; Caulking and Sealants	March 2000
Roof Management Software/Computers	April 2000

For information, phone:
Executive Editor Kris Ammerman, 919-859-0742 or
Senior Editor Lyle Hogan, 336-856-1923

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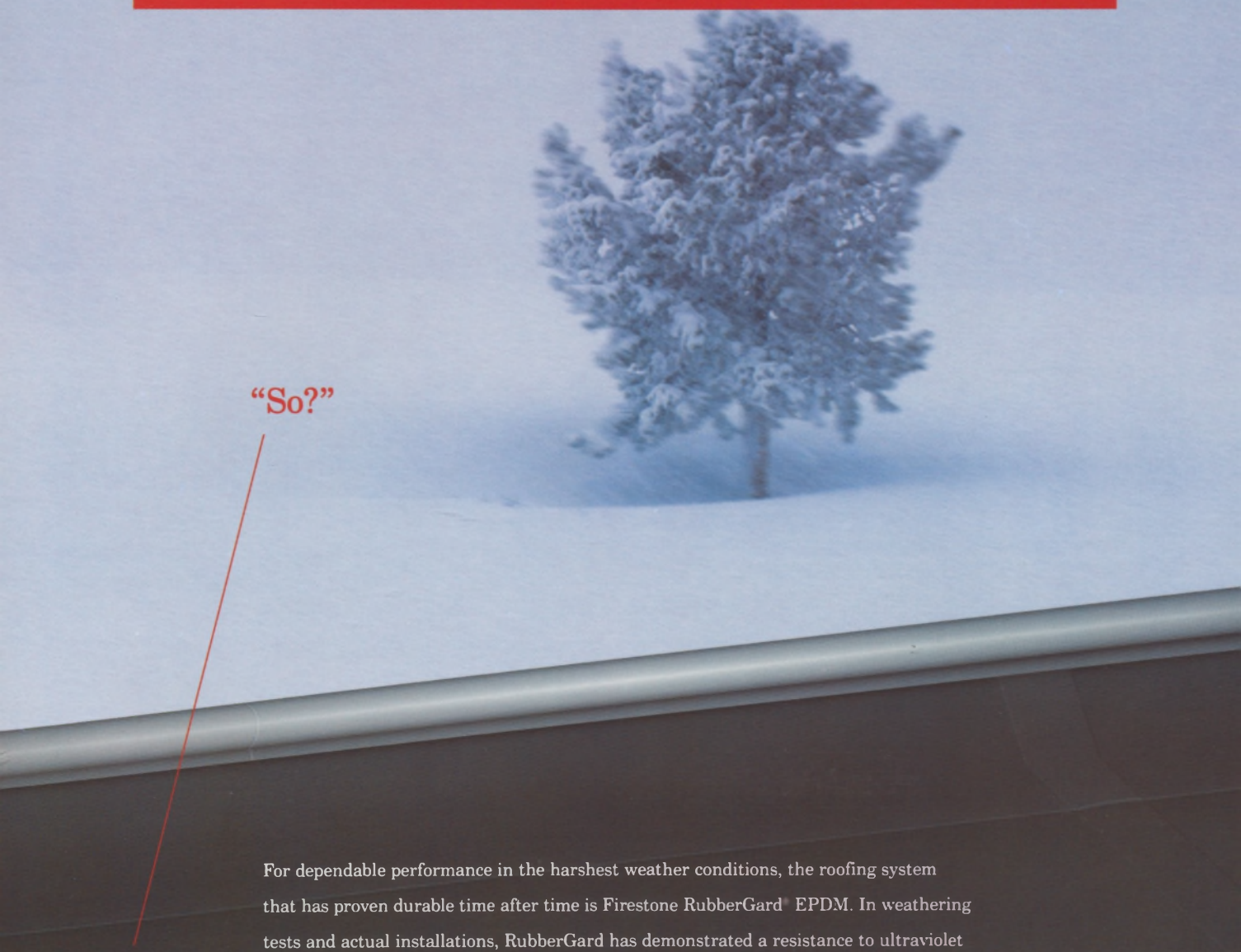

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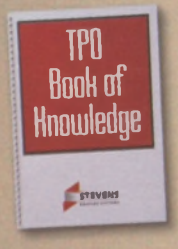

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Figures are for the North American Reinforced TPO market from January 1993 to December 1998.

LIGHTWEIGHT INSULATING CONCRETE SYSTEMS: PERFORMANCE-PROVEN AND COST-EFFECTIVE

By Hubert T. Dudley

Nailing the base sheet to a lightweight insulating concrete deck.

Long Performance History

At the start of the year 2000, lightweight insulating concrete (LWIC) systems will have been in continuous use as a roofing membrane substrate for over 60 years in the United States. During this time, well over 3 billion square feet of LWIC roofing substrate have been applied over all kinds of structural decks in all types of climatic conditions and geographic regions of the country. The products continue to be specified and used by people with experience and those newly introduced to the product concept. This is because the systems have performance-proven field applications and cost-effective solutions for many building rooftop conditions.

Lightweight insulating concrete systems are composed of either aggregate or cellular concrete. The basic composition of concrete material has not changed substantially with time. However, the composite system has been improved to deal with changing market needs. Most of the system modifications were made in the 1970s. During this time, slotted metal decking became available, a special form of expanded polystyrene insulation was invented, a specialty fastener to attach the roofing base sheet was developed, and a special re-roofing system was introduced. The last of these changes will have over 20 years of proven market performance at the start of the new millennium.

Slotted metal decking allows the natural flow of water (downward by gravity and solar driving forces toward the building interior). This phenomenon speeds the rate of drying of the insulating concrete. A special "holed" form of expanded polystyrene insulation increased the insulating capacity of the systems, reduced the thickness of insulating concrete placed,

created the ability to use stair-stepped board to provide slope, and reduced the weight of the systems.

A special fastener was developed which allowed the economical use of a nailed base sheet. The nailed base sheet, in conjunction with vented edge details, eliminated high vapor pressure and roofing blisters. The fastener also allowed the systems to achieve high wind uplift approvals for membrane systems. The last modification was the introduction of a stronger insulating concrete that could be placed at a minimum of 1-inch. This reduced thickness (with the resultant weight reduction), and stair-stepped EPS application for slope, allowed a commercially viable re-roofing system. All of these changes have improved the acceptance and performance of lightweight insulating concrete systems.

Attributes Creating Continued Market Use

Product attributes have driven the continued use of these systems within the marketplace. LWIC systems are a cost-effective means of creating positive slope; are low-cost, fire-rated systems; and maintain a long history of high wind uplift performance.

All sloped insulation systems are designed as if the structural deck is tabletop flat. The important issue is not that slope can be easily designed but rather the ability to create positive slope over the real-world conditions encountered with structural substrates. The difference between a LWIC system and other systems is the ability to move from the design stage to actual rooftop conditions and still deliver the positive slope-to-drain as designed at a quoted cost. Originally, changing the thickness of insulating concrete created slope. Increasing or decreasing the LWIC thickness also easily accommodated the height variation in the structural deck. Today, slope is primarily created by placing stair-stepped thicknesses of EPS board imbedded in concrete slurry. Varying the topcoat thickness of LWIC creates the final positive slope.

Many buildings require an hourly fire rating as part of building code mandated designs. Typically, the code may require a one- to three-hour fire-rated roof system for protection of life from interior fires. LWIC systems can achieve a real cost savings of $1.00 to $1.50 per square of roof area for 1-1/2 hour or higher fire-rated steel deck construction when compared with rigid insulation systems. The cost savings occurs by eliminating the need for covering the entire deck underside with sprayed fireproofing.

Long before high wind uplift approvals for membranes were required by regulatory agencies, LWIC systems were known in coastal areas as having a performance history of resistance to high wind loads. The concrete slurry coat bonds the system to the structural substrate, helping to provide high wind load resistance. In the case of steel decks, filling the flutes with the concrete slurry eliminates air movement in the flutes. This reduces the likelihood of system delamination at this critical interface and creates a monolithic layer, eliminating the inside air pressure from being transferred upward to the membrane. Because of these factors, some LWIC systems (even with a nailed base sheet), achieve a Factory Mutual (FM) rating of Class 1-165 over steel decks. A fully-adhered roofing system over structural concrete has even achieved a Class 1-855 FM rating.

Improving Roofing Membrane Performance

Lightweight insulating concrete creates several benefits that extend the life of roofing membranes. One benefit is tied to the thermal properties of the concrete. LWIC has a higher specific heat than any rigid insulation material. This heat-absorptive capacity is created by the concrete mass. It reduces the rate at which the membrane temperature increases and reduces the maximum temperature the membrane experiences. These two factors reduce the daily stress undergone by the membrane. LWIC systems extend the time required to achieve maximum membrane temperature by one to three hours. LWIC systems also reduce the maximum daily membrane temperature by 15 to 25 degrees F compared to rigid insulation of the same

R-value. These less stressful conditions serve to increase membrane life.

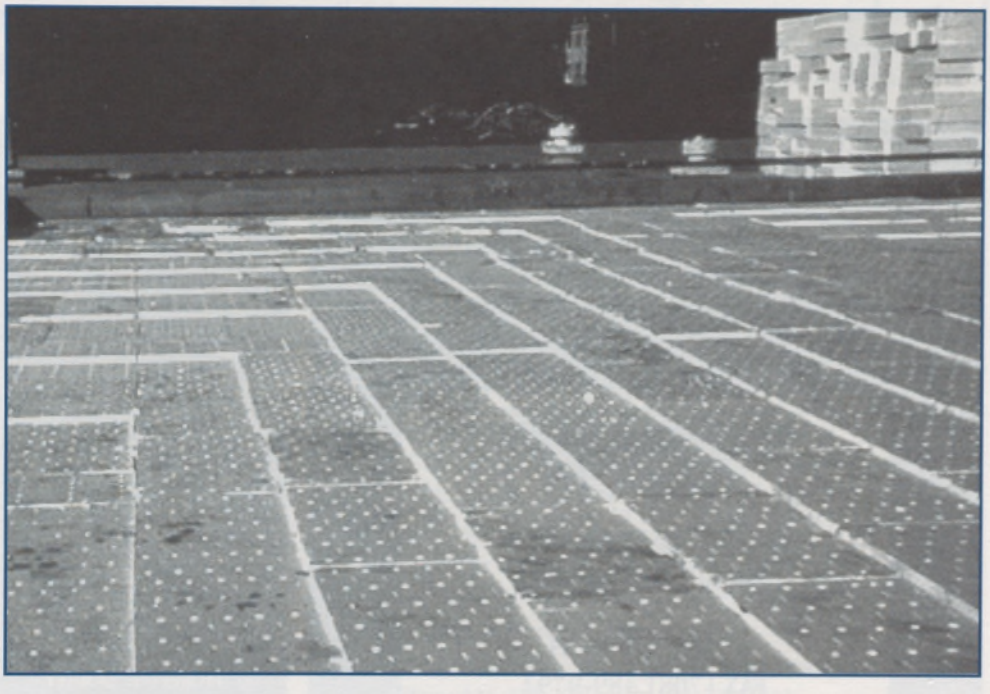
Another benefit is tied to the lower coefficient of thermal expansion. LWIC has a coefficient of thermal expansion of 10-12 x 10-6 compared to typical rigid insulation that has a coefficient of 12-18 x 10-5. This difference is a full magnitude lower for a LWIC system and creates less membrane stress for the roofing membrane installed over a LWIC roof deck.

Lastly, the roofing membrane attached to an LWIC system with mechanical fasteners also benefits from reduced stress in comparison to a rigid insulation system. A membrane fully adhered across a joint experiences stress concentrations that can create micro ruptures of the membrane and result in roof leaks. A nailed base sheet distributes the stress between fasteners by several inches versus thousandths of an inch over a joint. Applying the same load to the membrane easily demonstrates that the LWIC system will cause lower membrane stress.

Roofer-Friendly Insulation System

Roofing industry leaders continue to point to a major lack of skilled labor entering the roofing business. The younger generation does not look to the roofing industry as being attractive as a life-long vocation. Those products or application procedures that reduce the quantity of labor necessary to complete a roofing installation should be welcomed by the roofing industry in the future. Today an LWIC system provides the opportunity to the roofing applicator to reduce labor cost. Part of the labor cost reduction is associated with reduced crew size required to place rigid board insulation panels quickly enough to allow roofing to be placed the same day. An LWIC system placed by an outside contractor eliminates the need for a roofer to hire additional labor to place insulation. An LWIC system also allows increased production from the roofing crew.

Therefore, the contractor benefits by using an LWIC system by reducing the number of laborers he keeps on payroll to place the insulation, and he benefits from the fixed cost of insulation installed by another contractor. The roofer can reduce his overhead cost and increase the daily roofing area with reduced crew size. Although his gross income might be less, his profit picture will often improve from the fixed insulation cost and lower installation cost.



Stair-stepped EPS to create slope-to-drain.

Re-Useable, Cost-Effective Insulation

Most LWIC systems that are re-roofed these days are left in place and are repaired only where necessary. Many LWIC systems that were placed in the 1960s are being salvaged by adding a new membrane without adding the cost of new insulation when re-roofing occurs. To the building owner, this is a significant cost savings in materials. It is also a significant savings in refuse disposal cost and damage to the environment. Applying a typical rigid board insulation would cost between $ 1.20- $2.50 per square foot installed plus a $ 0.50 - $ 1.00 per square foot disposal cost. Disposal costs will only escalate with time as landfills are closed and the distance traveled to dispose of material increases. LWIC systems already reduce both of these costs since they may be re-roofable without replacement.

As previously mentioned, fire rated constructions can benefit from reduced cost by eliminating the fireproofing cost associated with a rigid board installation. Additionally, sloped applications typically provide a lower initial cost for LWIC versus rigid board insulation systems. Fastening requirements for rigid insulation on certain membranes generate these higher costs. LWIC systems have one attachment cost for all installations. In many cases, LWIC systems not only will be the lowest long-term cost for the owner but may also be the lowest initial cost.

Looking Toward the Future

LWIC systems are proven performers in the market, with a track record of over 60 years of continuous use. The system features that contribute to their long use make them an increasingly attractive roofing substrate in today's marketplace. The reduction in available labor and the continuing increase in rigid board replacement and disposal costs would indicate that LWIC will continue to be a competitive force in the market for many years to come. ■

About the Organization

The National Roof Deck Contractors Association (NRDCA) is a trade association of contractors who apply lightweight insulating concrete systems. The NRDCA is dedicated to improving the quality of application by member contractors and promoting the benefits of LWIC systems.

NATIONAL ROOF DECK CONTRACTORS ASSOCIATION

NRDCA

12635 S. Springfield Ave.
Aslip, Illinois 60803

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(708) 489-9185
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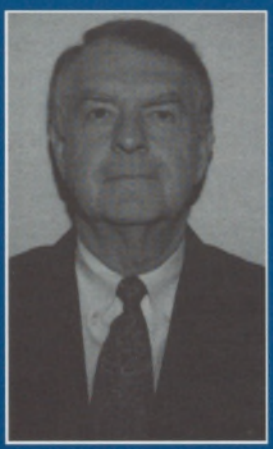
About the Author



Hubert T. Dudley

Hubert T. Dudley, President of Constructive Consulting, has 35 years experience in heading research projects, creating products, and marketing them for use in the construction industry. Twenty years of that time have been spent developing and managing the Zonolite Roof Deck and the Siplast Roof Insulation lightweight insulating concrete systems business for W.R. Grace & Co. and Siplast, Inc. Constructive Consulting is dedicated to assisting companies in creating markets for products in the construction industry.

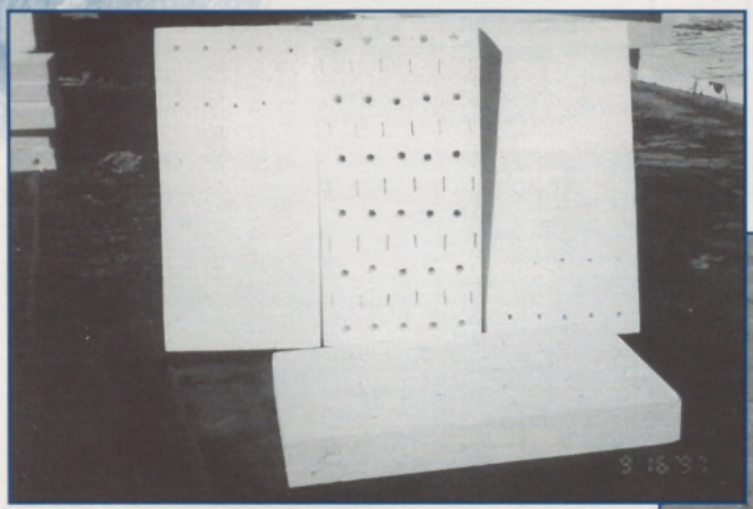
Carlisle SynTec Wins Suit

Carlisle SynTec Inc., a manufacturer of single-ply roofing systems and products, has concluded a patent infringement lawsuit against Elastomeric Roofing Systems Inc. (ERS) of Plymouth, MN.

On June 14, 1999, an injunction by consent was entered in the U.S. District Court in Cleveland, OH, permanently enjoining and restraining ERS from infringing Carlisle's U.S. Patent No. 4,9996,812, "Method of Membrane Application in Roof Construction." The patent protects Carlisle's FleeceBACK™ membrane roofing system when embedded in low-rise foaming or cellular adhesive.

TECHNICAL TIPS for OBSERVING INSTALLATION

BY JEFF CRAMER, RRC



Incomplete board vent holes (left) and "floaters" (below) are two conditions that are easy to spot if you look for them.

Board Vent Holes

Most manufacturers require filler board (typically a molded, expanded polystyrene product, or MEPS) to have holes through the board. The holes help prevent the creation of air pockets below the board and help secure the boards to the substrate.

The holes are made in the factory where the blanks are cut to size and slope. Occasionally, boards arrive on-site with holes that do not completely penetrate the board. Once they are identified, the installation crew should be advised to use only boards that meet the requirements of the specification.

Floaters

Sometimes a "floater" will appear during installation of the top layer of Lightweight Insulating Concrete (LWIC). This occurs when a filler board does not stay secured in the slurry coat. Part of a board will rise or "float" above the adjacent filler boards. It is usually fairly obvious the next day.

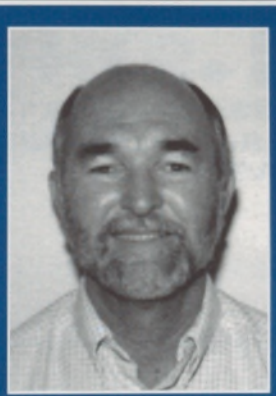
The consequences may be negligible if a specific R-value is not one of the project goals. If the top of the board is not too high, the proper thickness of LWIC can simply be installed over the board. Of course, the "floater" must be supported adequately by LWIC.

If the board is high enough to interfere with the planned slope of the finished LWIC, one simply cuts away enough of the protruding portion of the "floater" to allow the LWIC to be installed to the specified minimum thickness (e.g., 2").

If a specific board thickness is needed in order to achieve a specified R-value, the "floater" must be removed and replaced with one that stays in place.

Both conditions are relatively easy to correct if they are identified and the contractor is advised while equipment, materials, and personnel are still on-site. ■

ABOUT THE AUTHOR



Jeff Cramer started working in the roofing industry in 1975. He has a broad range of experience in sales, contracting and consulting. He has been a Registered Roof Consultant (RRC) since 1994. Jeff is part of The Bright Group in Northern California, sales representatives for several manufacturers.

JEFF CRAMER

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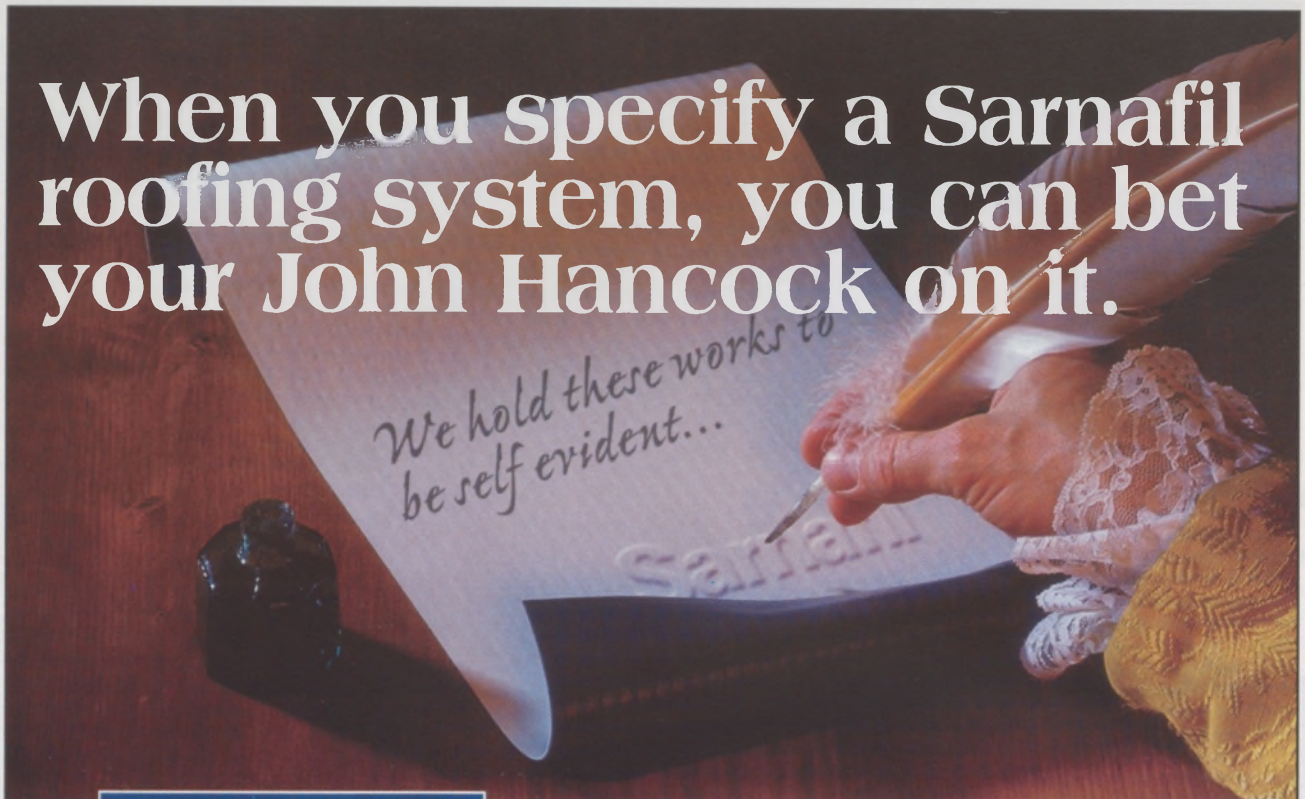

Consulting Engineer: Simpson Gumpertz & Heger

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Dow Offers Educational Credit on Roofing Programs

The Dow Chemical Company, manufacturer of Styrofoam® insulation, is offering AIA Continuing Education System (CES) Programs to help architects and specifiers achieve the Learning Units (LUs) required to maintain membership in the American Institute of Architects (AIA). Many of these courses also qualify for CEUs needed to earn or maintain RRC and RRO status through RCI.

The educational programs offered by Dow address topics for the commercial, roofing, low-temperature, and geotechnical markets. Each hour-long program earns two LUs (.1 CEUs) and is set up as a box lunch session.

Available roofing-related programs include: Plastic Foam Education, Cavitywall Application, Precast Wall Insulation, Protected Membrane Roofing Assemblies, Direct Metal Deck Applications of XEPS in Conventional Roofing, Insulation Warranties, and New Energy Codes.

For more information or to arrange for a program in your geographic area, contact the Customer Information Group at Dow, PO Box 1206, Midland, MI 48674, or call 1-800-441-4369. Visit Dow on-line at www.styrofoam.com.

Expanded Polystyrene Growth Continues

Expanded polystyrene (EPS) domestic resin sales reached an all-time high of 874 million pounds in 1998, representing a 50% increase over 1988 sales of 586 million pounds. Sales now represent nearly 15% of the overall domestic polystyrene market, according to the EPS Molders Association and the Alliance of Foam Packaging Recyclers. The groups' figures show:

- EPS block market sales increased nearly 7% in 1998 to 379 million pounds, representing 44% of the total EPS sales.
- EPS shape molded resin sales remained steady last year at 210 million pounds, representing 24% of resin sales.
- The remaining sales (which include EPS resin sales to food service and other applications) declined slightly to 286 million pounds, or 32% of the market.
- Global demand for EPS is forecast to rise 3.3% per year through 2002. EPS used in insulation markets is expected to rise nearly 30% over the next ten years.

Domestic sales figures were based on studies by the Society of the Plastics Industry, Inc.

Industry News

PUBLICATIONS

ARMA Publishes Three-Tab Guide

The Asphalt Roofing Manufacturers Association (ARMA) has published a revised and updated edition of "ARMA Good Application Makes a Good Roof Better." The brochure-style publication is a general guide to recommended application procedures for installing typical three-tab asphalt strip shingles. For additional information, phone 301-348-2002.

PROMOTIONS

Globe Has New Web Site

Roofing products manufacturer Globe Building Materials has a new web site offering education on roofing products and answers to frequently asked questions. Go to www.globebuilding.com.

PEOPLE

Roger Kyle Named Integrated VP

Integrated Roofing & Waterproofing, Inc. has named Roger Kyle as vice president of roof service management. Kyle has more than 17 years of experience in the commercial roofing industry, serving in various capacities with three national commercial roofing contractors and with Firestone Building Products Co., Carmel, IN.

PRODUCTS

CPI Unveils Minute Man System

CPI (Construction Polymers International, LLC) introduces its new Minute Man System. The system is mounted on a small cart and shoots foam from pressurized tanks to a Gusmer® Air Purge (GAP) gun modified with a necluation kit. It is said to deliver 3,000 square feet/hour of polyurethane adhesives or five pounds/minute of spray foam. For information, phone 877-CPI-2100.

PURCHASES/ PARTNERSHIPS

Metal-Era Makes Kop-Klad Fascia

Metal-Era Inc., Waukesha, WI, is now manufacturing metal roofing products for Koppers Industries. It is producing Kop-Klad fascia and coping products. Product names will remain the same.

Hennes-Johnson Equipment Formed

Hennes-Johnson Equipment Co., New Prague, MN, is the newest manufacturer of cold process application equipment systems. The company was formed by Dean Hennes, formerly of AM Roof Systems Inc., and Craig Johnson, formerly of AM Roof Systems.

FMI Acquires Brian J. Lewis Co.

FMI, the nation's largest management consulting firm specializing in the design and construction industry, has acquired the Brian J. Lewis Co., Castle Rock, Colorado. Brian Lewis, PE, now becomes a principal consultant in FMI's engineering and architectural services group.

PROGRAMS

OSHA Endorses Computer-based Course

A 10-hour construction safety and health training course is being developed by the International Training Institute (ITI) and the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA). The program, scheduled to be completed by year's end, has been endorsed by the Occupational Safety and Health Administration (OSHA). For more information, phone 703-995-4027.

NRCA Creates Safety Consulting Service

The National Roofing Contractors Association has created a Safety Consulting Service program which evaluates roofing companies' written safety programs and provides on-site safety consultations. For more information, contact Ken Brown, 847-299-9070, ext. 262.

PLAUDITS

FiberTite® Awarded Energy Star®

Seaman Corp.'s Fibertite® Roofing System has been awarded the Energy Star® rating on the basis of excellent solar reflectivity and reliability. Energy Star is the result of a collaboration between the U.S. Dept. of Energy (DOE) and the U.S. Environmental Protection Agency (EPA), and many other agencies and companies encouraging the prevention of pollution by helping consumers buy more energy-efficient products.

Seaman Involved in Special Olympics

Seaman Corp. of Wooster, OH, joined nearly 300 other companies in transporting over 2,000 athletes to the 1999 Special Olympics Games in Raleigh-Durham, NC. Each of the companies donated the use of its Citation aircraft as part of the Citation Special Olympics Airlift. Seaman provided round-trip transportation to seven members of the soccer team which won the gold medal in the games.

BOCA Earns "Cool Site" Award

BOCA International's on-line virtual campus received an Anbar Civil Engineering "Cool Site" award for intelligent access to Internet resources. BOCA's virtual campus allows anyone in the construction industry to take a training course anytime, anywhere. Anbar reviewers gave the "campus" a four-star honors rating for educational innovation. It currently offers almost 40 courses which can earn continuing education units. For a free, interactive demonstration, look at www.uol.com/boca.

Industry Calendar

SEPTEMBER 1999

12-15 Polyurethanes Expo '99
Orlando, Florida
Info: (202) 974-5362

16-17 North American Conference on Roofing Technology
Toronto, Ontario
Info: (847) 299-9070, ext. 276

OCTOBER 1999

3-5 International Facility Management Association Conf.
Los Angeles, California

6-8 Roofing Contractors Association of Texas Conference
Arlington, Texas
Info: (512) 251-7690

10-14 SMACNA Convention
Palm Desert, California
Info: (703) 803-2980

12-14 METALCON International '99
Rosemont, IL
Info: (617) 965-0055

27 FedCon 2000
Washington, DC
Info: (800) 598-6434

28-29 Midwest Roofing Contractors Association Convention
Kansas City, Missouri
Info: (800) 497-6722

NOVEMBER 1999

7-9 Restoration & Renovation
Charleston, SC
Info: (800) 982-6247

8-11 Computers for Contractors '99
Chicago, IL
Info: (610) 458-7070

8-13 Batimat
Paris, France
Info: (847) 299-9070, ext. 231

JANUARY 2000

15-18 RCMA and the New Millennium
Santa Monica, CA
Info: (301) 348-2003

ADVERTISER INDEX

Unlike other widely specified roofing systems, Millennium resists many destructive chemicals —like water.

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Exposure to sunlight breaks down the chain-like molecules of asphalt and EPDM roofing to create dangling bonds, which make them chemically reactive.

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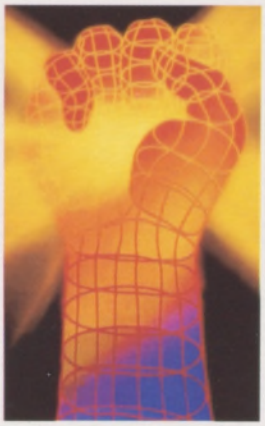

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