CRB
CONCRETE REPAIR BULLETIN

January/February 2025
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2025 ICRI PRESIDENT
GERARD MOULZOLF

REPAIR TRENDS
FOR CRACKS AND JOINTS

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ON THE COVER: 2025 President Gerard Moulzolf. Read Gerard's message on page 3.

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FEATURE ARTICLES

DEPARTMENTS

ICRI Mission and Strategic Plan Benefit Members and the Industry

IN MEMORY OF

REMEMBERING ROBERT L. TERPENING

by Dale Regnier

It is with great sadness we must relay the news that founding ICRI Member and Past President, Robert L. (Bob) Terpening, passed away on December 15, 2024. He was born in South Nyack, N.Y. and moved to St. Petersburg, FL in 1948 after the blizzard of ’47 in New York State. He graduated from St. Petersburg High School in 1952 and attended Auburn University. His initial work as a reinforcing bar detailer and estimator led to additional education in Structural Engineering at Georgia Tech. He has been in Structural Engineering since 1963 as partners in Atlanta, GA with William E. Edwards Structural Engineers Inc., Nannis, Terpening and Associates, Inc., Planning and Parking Consultants Inc., and Carl Walker Inc. He has had his own firm, Robert L. Terpening, P.E., F.ACI., Inc. for 13 years.

Mr. Terpening was a member of the International Concrete Repair Institute since its beginnings in 1988. Bob served in many ICRI Board of Directors positions, was the National President in 1994, and is an ICRI Fellow. He was instrumental in forming the local ICRI Georgia Chapter in 1991 and even served as its President. Robert was preceded in death by his devoted wife and travel companion of 67 years, Barbara Terpening. Family and friends gathered in remembrance of Robert on Thursday, December 19, 2024, at 2 o’clock in the Chapel of Parrott Funeral Home. Interment followed at Forest Lawn Memorial Gardens in Newnan, GA. Robert will be deeply missed by all who knew him, and his legacy will live on in the hearts of those he touched throughout his long and fulfilling life.

PASSING OF JEAN-FRANÇOIS RONDEAU

by Michelle Nobel

It is with great sadness that I inform you of the passing of Jean-François Rondeau. Jean-François was a longtime advocate of ICRI. He served on the ICRI boards in Quebec and Central Florida. He was the immediate past president of the Central Florida Chapter, serving as president last year.

Jean-François practiced structural engineering in Montreal and the Central Florida area. While in the United States, he enjoyed staying in Daytona Beach and swimming in the ocean or the pool at his condominium. When he traveled to conventions and meetings, he always looked for a hotel with a pool so he could swim while he was traveling.

He had so many great things in his life, but the most important thing was his family. He adored his daughter and grandkids. He often showed me pictures of them.

Jean-François will be sorely missed at our great organization. His cheerful demeanor, playful attitude, and commitment to ICRI were qualities I always looked forward to when I saw him. We were close friends, and I looked forward to seeing him at events in Florida and the ICRI conventions.

I will miss you, Jean-François, and I look forward to our reunion in the great beyond.

“That it will never come again is what makes life so sweet.”
- Emily Dickinson

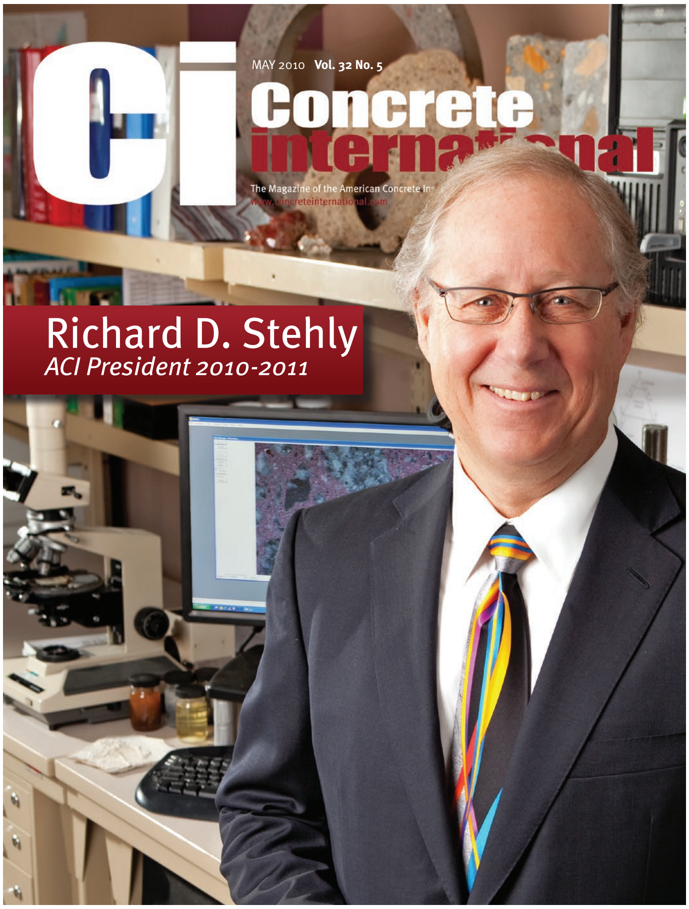
PRESIDENT'S MESSAGE

GERARD MOULZOLF

Well, this is my first president's message. Apart from leading a group of the most incredible people in this organization, attending as many meetings, shaking as many hands as I can over the next year, and making a few short speeches about how wonderful this organization is, writing these six columns seems like the hardest work I can see in my future!

Most of my writing for my actual job over the last 34 years has been technical writing. It has involved looking at concrete and repair materials under a microscope to determine reasons why they are working well together or why they are not. It is a job that involves being mentored by someone who understands concrete and has been looking at durability issues a lot longer than I have.

One of those people was my former mentor and boss, Richard "Dick" Stehly. He was the best. His knowledge of concrete was unmatched. In the background of my *Concrete Repair Bulletin* (CRB) cover photo is Dick's May 2002 cover from ACI International. It's there to honor his legacy of mentoring and empowering others to succeed. Dick tragically passed away halfway through his presidency. He believed his presidency of ACI (our partner in concrete repair knowledge) was the pinnacle of his career, as I believe my ICRI presidency is the pinnacle of my career to date.



Time is fleeting and life is precious, so if you are not having fun at what you are doing, you have to make it happen. My wish for all members during my presidency will be to have fun at ICRI. That means spending time with friends, peers, and clients at local chapter social and networking events and technical programs. Then, take that energy on the road! For me, attending our international conventions is like attending a family reunion. It is a chance to spend time and catch up with all the friends and business relationships that were cultivated through ICRI. And it's your chance to meet a bunch of new ones!

Active chapters feed the international membership and conventions. Throughout 2025, I will try to attend as many chapter events as I can. The only way I can do that is to know when things are going to happen. This involves creating a new calendar of events on the website that is up to date with all the information we can get from local chapters. If you're a chapter leader, please send chapter notifications to Dale (daler@icri.org), Eric (erich@icri.org), and me (gmoulzolf@teamAET.com), so we know what's on the horizon!

We have two very fun cities coming up for our convention locations: Austin (Spring 2025) and Chicago (Fall 2025). As you likely know, Austin is often referred to as the live music capital of the country. Chicago has one of the most active chapters in the organization and has big plans for our time there. We look forward to breaking attendance records for the next two conventions.

I have many people to thank as I take the reins for this year. But first and foremost, I thank the executive committee of the board of directors of ICRI and one of my best friends in the industry, Brian MacNeil. Those who know Brian as I do love the guy. He has a passion for people and concrete. As president in 2024, he set the table for continued organizational success in leading by example—as so many presidents before him. I can only hope to be as dedicated and inspirational as him.

Gerard Moulzolf
Gerard Moulzolf
President, International Concrete Repair Institute

DIRECTOR'S MESSAGE

ERIC HAUTH

ICRI'S IMPACT

ICRI's impact is only as big as our continued effort to tell our story, and it is an amazing story to tell! That's why I'm so excited about three recent opportunities to tell ICRI's story and expand our reach.

First, in November, ICRI finalized an MOU with the Japan Surface Treatment Association (JSTA) to jointly promote ICRI Guideline No 310.2, *"Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair"* (the "Translated Publication").

Translated into Japanese by the JSTA, this MOU came about after JSTA approached ICRI seeking our permission to promote this guideline throughout their network in Japan. Like other committees of ICRI, it's inspiring that the volunteer work of Committee 310 volunteers would improve the industry in North America and other countries around the world!

This partnership would not have happened without Matthew Carter, ICRI Technical Director, who worked extensively with JSTA's contact and guided this MOU to completion. Great work, Matthew!

Touring CBEI with Greg Hunsicker, CBEI Deputy Director

Second, the 2024 U.S. Thanksgiving holiday was anything but typical! After an invitation that began at the 2024 World of Concrete, I had the amazing opportunity on Thanksgiving Day to showcase ICRI as the opening presenter in Madrid, Spain at the 2024 European Conference of the ACRP, the **European Association for Construction, Repair, Reinforcement and Protection**.

Making it better, I was joined by ICRI's 2024 President Brian MacNeil, who participated on an expert panel to close the conference. This exceptional event, with over 240 experts from throughout Europe, explored a range of challenges and opportunities in infrastructure repair and restoration—many of which we share in North America.

We gained new international contacts, relationships, and insights that we will build on to extend ICRI's reach and impact in the future.

Third, In December, Matthew Carter and I participated in the year-end board meeting of the **National Concrete Bridge Council (NCBC),** a consortium of organizations focused on advancing the quality of concrete bridges in the U.S. NCBC provides an invaluable seat and important table focused on concrete bridge infrastructure. This meeting also allowed us to tour the University of Texas' Concrete Bridge Engineering Institute (CBEI), which generously hosted us for two days.

In just **36 years** *ICRI has:*

Become the leader in repair-related technical guidelines and tools

Helped thousands of repair professionals expand their networks, grow their business, and improve their technical knowledge

Set new benchmarks for industry quality and service life extension

Created the leading international standard for surface preparation

Elevated the concrete repair and restoration industry

On the repair/preservation front, NCBC has contracted with a leading bridge expert, Dr. Clay Naito, to produce an in-depth bridge stewardship document with comprehensive repair-related resources for the American Association of State Highway Transportation Officials (AASHTO). At our meeting, Dr. Naito presented an overview of his work to date. The document, with likely publication in 2025, leans heavily on related ICRI technical documents. We are excited to continue this partnership and find ways to apply ICRI's incredible book of knowledge to bridge repair, preservation, and service life extension.

None of these opportunities would be possible without the countless contributions of ICRI's many committees, volunteer leaders, supporters and you—our members, who've made this organization what it is.

We're not (yet!) a big organization, but we are one that continually finds new ways to shape, improve, and advance this industry.

If you agree, go out and tell the ICRI story in your networks! Encourage colleagues and other repair professionals to join this organization and discover what makes it so unique and impactful.

Here's to telling ICRI's story in 2025!

Eric Hauth
Eric Hauth
ICRI Executive Director

Brian MacNeil at ACRP

Eric Hauth at ACRP

TECH**DIRECTOR'S**MESSAGE


MATTHEW CARTER

THE REACH OF ICRI GUIDELINES

The work of ICRI's committees both strengthens and showcases the fundamental pillars of the organization—which include Industry Leadership, Professional Development, Organizational Strength, and Organizational Credibility. As a testament to the guidelines developed within ICRI, these technical offerings have led to their adoption within the United States and internationally. In this case, they have led to a new relationship with an industry organization in Japan.

Last year at World of Concrete, the ICRI booth received a visit by representatives from the Japan Surface Treatment Association (JSTA). These representatives, including point of contact Daniel Kanzaki, expressed their interest in having a Japanese translation of the ICRI Guideline 310.2, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair. After thoughtful consideration within ICRI, this conversation led to developing a formal agreement for the JSTA to translate the ICRI Guideline 310.2 into Japanese for their organization's reference in concrete surface preparation for flooring in Japan.

Over months of navigating the time differences, scheduling conflicts, and language barriers, the Executive Director of JSTA and ICRI Executive Director Eric Hauth have signed an agreement to cooperatively promote the ICRI Guideline in the Japanese flooring market. Both organizations look forward to celebrating the new international relationship and common goal of improving craftsmanship in concrete.

下地処理工業会

Japan Surface Treatment Association (JSTA) logo

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Concrete Cracks

by Matt Hansen

"Concrete Cracks." Is this a title of an article or a statement of fact? Well, believe it or not, with most concrete it is a statement of fact. Most standard concrete does, indeed, crack. Understanding why and where these cracks occur is an important key to successful concrete design, maintenance, and repair. In this article, we will discuss why some of the most common cracks in concrete occur. Further, we will discuss how to control cracking, how to prevent problem cracks, and the basics of how to repair and treat cracks when they do occur.

While it may be surprising to hear, most cracks in concrete are expected and are not indicative of any latent problems. Conversely, some cracks in concrete may be indicators of significant issues or deficiencies, the extent of which should be investigated. Knowing which are which and how to treat problem cracks can be extremely important in prolonging the life and sustainability of concrete structures. Taking this into account, a basic understanding of concrete's strengths and deficiencies is required to properly anticipate and address concrete cracking.

WHY DOES CONCRETE CRACK?

Concrete is one of the most versatile building materials known to man. For this and many other reasons, twice as much concrete is used in construction as all other building materials combined.[1] One primary benefit of concrete is that it is very strong in compressive strength. This means that it is capable of supporting very heavy loads pushing against it. However, concrete is also relatively weak in tensile strength, with tensile strengths sometimes reaching only 10 percent of the concrete's compressive strength.[2] This means that concrete is much more susceptible to damage and cracking when tensile (pulling) forces are present.

Some of these tensile forces (such as shrinkage forces) are inherent in most concrete. Other forces (such as expansive forces that can develop within the concrete and flexural forces encountered during loading and use) can create tensile strains that exceed the concrete's relatively low tensile strength. Any time tensile forces exceed the concrete's tensile strength, cracking occurs. Knowing this makes it easier to control cracks, prevent problem cracks, determine their causes once cracks have occurred, and to provide proper treatment and repair of cracks.

Cracks in concrete fall into two categories: Those that occur in concrete during its plastic state and those that occur in hardened concrete.[3]

PLASTIC CONCRETE CRACKS

Plastic concrete cracks are those that occur at the surface of the concrete before the concrete has hardened. These cracks typically occur shortly after placing the concrete, during the interval when it is still possible to remold it. Most plastic cracks in concrete are relatively shallow in nature and do not run through the full depth of the concrete. However, it is important to understand that while plastic cracks typically begin as shallow surface cracks, some can develop into full-depth cracks later in the concrete's life.

Fig. 1: "Map Cracking," a type of plastic shrinkage cracking

Plastic Shrinkage Cracks:

Plastic shrinkage cracks are the most common cracks that occur in plastic concrete. They typically occur during high evaporative conditions when water evaporates from the concrete surface faster than it can be replaced by bleed water leaving the concrete. As the water evaporates from the surface, the drying surface shrinks and wants to pull inward on itself (tensile forces). Because the concrete below the surface is still wet and not shrinking at the

Fig. 2: Longer plastic shrinkage cracks running parallel to each other

same rate, tensile stresses develop in the weak, still stiffening, plastic surface. This can result in shallow cracks at the surface that may form a polygonal pattern (map cracking) (Fig. 1) or be longer in nature and essentially parallel to one another (Fig. 2).

Concrete installers often try to combat high evaporative conditions by performing finishing early, while bleed water is still present on the surface, or by adding water to the surface. This is not recommended practice. Both actions weaken the surface of the concrete and exacerbate plastic shrinkage cracking. More successful measures can be taken during the placement of concrete to reduce surface evaporation and plastic shrinkage cracks (See ACI 305R-20).[4] These measures often include the application of liquid evaporation retarders to the surface, fogging the air above the concrete, plastic sheeting to cover the concrete between finishing operations, wind breaks, sunshades, and even placing at night. The addition of microfibers into the concrete mix has proven to be very successful in reducing plastic shrinkage cracking. Recently developed evaporation-reducing admixtures have proven to be very successful as well.

HARDENED CONCRETE CRACKS

Hardened concrete cracking occurs after the concrete has appreciably hardened. Common causes include restrained drying shrinkage and expansive forces within the concrete that introduce tensile strains.

Restrained Drying Shrinkage Cracks:

Restrained drying shrinkage is the most common cause of concrete cracking. It is the reason why most in the concrete business agree with the statement "Concrete cracks." Typical concrete shrinks roughly 0.05 to 0.06 percent at 28 days.[3,5] This equates to about 5/8 inch in 100 feet (16mm in 30.5m), or 1/16 inch in 10 feet (4mm in 3m).

Fig. 3: Cracking is common at reentrant corners in concrete

Shrinking Strains Outpacing Strength

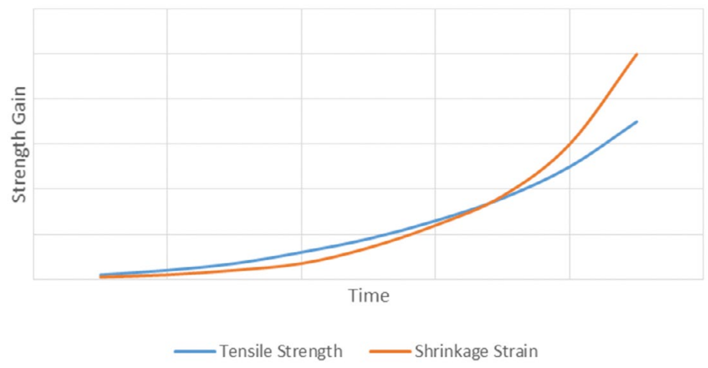

Fig. 4: When tensile forces due to restrained drying shrinkage exceed concrete tensile strength, cracks occur

As the concrete shrinks, it is pulling inward on itself. If it were able to pull and move unrestrained, the concrete would not crack. However, in the real world, concrete encounters a great degree of restraint while it is drying and shrinking. Anything that restrains movement of the concrete during drying and shrinkage can result in tensile strains and cracking, i.e., columns and bollards that penetrate through the concrete can limit the concrete's ability to move during shrinking, resulting in significant restraint. Reentrant corners in concrete are areas where shrinkage forces and restraint are concentrated (Fig. 3). In the case of slabs on grade, the subgrade itself introduces friction that wants to restrain the shrinkage movement of the concrete. Once all this restraint produces tensile strains that exceed the relatively low tensile strength of the concrete, especially at an early age, cracks occur. (Fig. 4). Knowing this, measures can be taken in design and placement to anticipate and "control" restrained drying shrinkage cracks.

Control joints are saw cuts or tooled joints that are placed in the concrete surface in areas where restrained drying shrinkage cracking is anticipated. This is done to reduce the occurrence of random cracking. These joints create a thinner section of concrete that is weaker than the thicker concrete around them. When tensile forces from restrained shrinkage occur, the thinner section cracks first. In essence, the control joint is telling the concrete where to crack. So, control or contraction joints, as some refer to them, do not actually prevent cracking. Rather, the cracks simply occur in a straight line beneath the joints.

Steps can be taken to reduce restrained drying shrinkage cracks. By working closely with the ready-mix concrete supplier, the overall shrinkage of the concrete can be reduced or sometimes even eliminated. This is often done by using aggregates of proper quality, size and gradation, and admixtures such as water reducing, shrinkage, reducing, and shrinkage compensating admixture in the mix. Proper curing is also essential in controlling concrete shrinkage (See ACI PRC 308).[6] Post-crack strength, crack widths, and the opening of control joints due to shrinkage can also be controlled by introducing reinforcing steel or macro fibers (See ACI 544.4R).[7]

Expansive Freeze/Thaw Stresses:
When water freezes within concrete, it expands—resulting in tensile strains that can fracture and crack the concrete. "D-Cracking" (Fig. 5) is a common type of cracking that occurs when soft or deleterious aggregates within the concrete absorb water from a poorly-drained subgrade and expand during freezing. This type of cracking starts unseen at the base of the slab near the joints. Over time the cracking progresses upward, to the surface of the slab.[8] This results in a closely spaced cracking pattern radiating outward from joints and intersections of joints in concrete pavements.

Fig. 5: "D-Cracking" at or near pavement joints

Concrete in freeze/thaw environments should be air entrained for durability. "D-Cracking" can be prevented by using concrete with durable aggregates meeting ASTM C33, providing proper subgrade drainage and sealing pavement joints.[9] Unfortunately, while "D-Cracking" can often be arrested by reducing moisture intrusion, repair of more serious damage is often impossible, requiring removal and replacement of the concrete.

Expansive Chemical Reactions:
Expansive chemical reactions within the concrete itself can result in tensile strains and cracking. These reactions can be due to materials that are used to make the concrete or materials that come into contact with the concrete after it has hardened. Two of the most common expansive chemical reactions that cause cracking in concrete are sulfate attack and alkali silica reaction (ASR).

Sulfate attack occurs when sulfates from soils, ground water, sea water, or other sources come into contact with hydrated calcium aluminate in the concrete's hydrated cement paste. The reaction is expansive, resulting in closely spaced cracking and quite often a whiteish "bloom" on the surface. Sulfate attack can best be prevented by utilizing sulfate resistant cements with low calcium aluminate contents in areas where sulfate exposure is anticipated.

ASR takes place when reactive aggregates, sufficient alkalis, and moisture are present. The alkalis (typically in concrete containing

Fig. 6: ASR Cracking in distinctive Y pattern (FHWA)[15]

Portland cement) and moisture react with the aggregate to form an expansive gel around the aggregate. This expansion creates tensile strains which result in a distinctive Y-shaped crack pattern at the surface (Fig. 6).

ASR can be controlled and prevented. Nonreactive aggregates can be used where available. Alkali content of the concrete can be reduced by using low alkali cement and supplementary cementitious materials, or reducing exposure to water.

While measures can often be taken to arrest and slow damage occurring due to sulfate attack and ASR, repair of more serious damage is often impossible, requiring removal and replacement of the affected concrete.

Corrosion of Reinforcing Steel:
Corrosion of embedded reinforcing steel in concrete is expansive (2 to 3.5 times in volume[10]) and can create some of the most serious damage we see in concrete structures. Cracks due to corrosion are typically near or over embedded reinforcing steel and usually exhibit rust staining (Fig. 7).

Fig. 7: Rust staining at cracks is an indicator that cracking may be due to corrosion of reinforcing steel within

Fig. 8: Galvanic anodes protect repairs against "Halo Effect Corrosion"

Corrosion of embedded reinforcing steel can be reduced by providing low permeability concrete and adequate concrete cover in accordance with ACI Code 318.[11] Corrosion inhibiting admixtures can significantly delay onset of corrosion while sealers and coatings can protect against moisture penetration. Embedded galvanic anodes (Fig. 8) can also be used to help prevent corrosion of reinforcing steel at the perimeter of concrete repairs. This is sometimes referred to as "halo effect" corrosion.

Cracks and delamination of concrete due to steel corrosion should always be addressed as soon as possible. These types of cracks typically lead to further accelerated corrosion of the steel, eventually resulting in loss of load bearing capacity. ICRI 310.1R provides excellent guidance for preparing concrete for replacement in areas damaged by corrosion of reinforcing steel.[9]

Structural Cracks:
The most common structural cracks occur when in service loads or loads during construction exceed the design strength of concrete. These cracks are often present in structural members and may or may not have rust staining present (Fig. 9). Cracks in structural members and other suspected structural cracks should always be evaluated by a licensed engineer to determine the cause, severity, risk of danger, and proper treatment and repair.

REPAIR AND TREATMENT OF CRACKS

ACI PRC 224.1R is an excellent resource for information regarding "Causes, Evaluation and Repair of Cracks in Concrete Structures".[5] It tells us, "Cracks in concrete need to be repaired if they reduce the strength, stiffness, or durability of the structure to an unacceptable level, or if the function of the structure is seriously impaired." This would include cracks and joints that can allow migration of water to embedded reinforcing steel or subgrade.

When considering the repair of cracks in concrete, one should first determine the causes, locations, and severity of the cracks. As stated above, cracks can be a symptom of an underlying problem. Such underlying problems should be addressed prior to making crack repairs. If the crack is repaired without addressing the root cause, that same underlying cause will often result in failure of the repair or appearance of new cracks in the same general area.

Once the cause of the cracking has been determined, determine if the crack repair is being made in order to reinstate structural capacity. If so, structural repairs such as epoxy injection (ACI RAP Bulletin 1), or fiber reinforced polymer (FRP) (ACI PRC 440.2) may be required.[13,14] In some cases, additional steel can also be added to increase the strength across the crack.

If the repair is not structural in nature, determine whether future movement in the crack is anticipated. Often, non-structural, non-moving cracks can be repaired with cementitious materials or semi-rigid polymers. However, such rigid materials should not be placed so as to bridge moving cracks and joints. If movement is expected, repairs should be made with more flexible materials such as elastomeric sealants.

Fig. 9: Cracking with no rust staining present; could be indicative of structural cracking

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Matthew Hansen is a graduate of the University of Toledo, Ohio. He has more than 40 years of successful experience in design, sales, marketing, and technical services within the construction and concrete industry. He has been employed by the Euclid Chemical Company for over 27 years, and currently holds the position of National Business Development Manager. Matthew is a member of the American Concrete Institute committees ACI 362 Parking Structures, ACI 515 Protective Systems for Concrete, ACI 546 Repair of Concrete, ACI 563 Specifications for Repair of Structural Concrete in Buildings, and the International Concrete Repair Institute committees 110 Guide Specifications, 310 Surface Preparation, 320 Concrete Repair Materials and Methods and 510 Corrosion.

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EPOXY INJECTION OF DELAMINATED 12-INCH OVERLAY

Control Structure at Lilly Bayou, Louisiana

by Jay Dhuldhoya and Anthony Gaffney

SCOPE

The repair of Lilly Bayou Control Structure is part of the United States Army Corps of Engineers (USACE), Comite River Flood Control Project (Fig. 1). In 2011, a bonded, 12-inch thick (305 mm), reinforced concrete overlayment was installed at the Lilly Bayou Control Structure (Fig. 2, 3). Ten years later, the USACE discovered that the overlayment had delaminated or disbonded from the structural concrete substrate.

INITIAL CONSIDERATIONS

As part of the USACE initial investigation, two methods of repair were considered:

1. Demolish the overlay and replace it with 5,000 psi (34.5 MPa) concrete. Hydrodemolition or another method of removal that would not damage the remaining concrete would be required.
2. Epoxy injection with a structural adhesive epoxy that meets ASTM C881, Type IV, Grade 1, Class B & C.[1]

Replacing the Concrete: Replacing the concrete would be expensive and time consuming for the Comite Flood Control Project. The USACE had exceeded their budget of $900,000 by $600,000 due to additional material needs and supply chain inflation, so hydrodemolition of the concrete and replacement was deemed too costly. Epoxy injection was determined to be less costly and would return the structure to service quicker.

Epoxy Injection: USACE invited two epoxy injection manufacturers for their advice regarding the best repair methods of the delamination or disbondment. Both epoxy manufacturers provided initial recommendations; however, they did so before the USACE had completed full site evaluations. Both epoxy manufacturers recommended low viscosity, structural, injection epoxy resins, along with placement procedures and equipment recommendations.

NON-DESTRUCTIVE EVALUATION

USACE performed Ground Penetrating Radar (GPR) to determine the extent of the disbondment, which turned out to be worse than anticipated. The disbondment plane ran parallel to the concrete substrate surface and was not contiguous, with an estimated 40% disbondment. Not only was the percentage of disbondment higher than initially anticipated, but the structural concrete below was riddled with large and small honeycombed pockets and voids.

RETHINKING THE SOLUTION

The results of the non-destructive evaluation revealed an issue with using standard injection epoxy resins for repair. The GPR testing identified dozens of honeycombs and empty voids at

Fig. 1: Lilly Bayou Control Structure

Fig. 2: Original 2011 installation of the overlay at the Lilly Bayou Control Structure

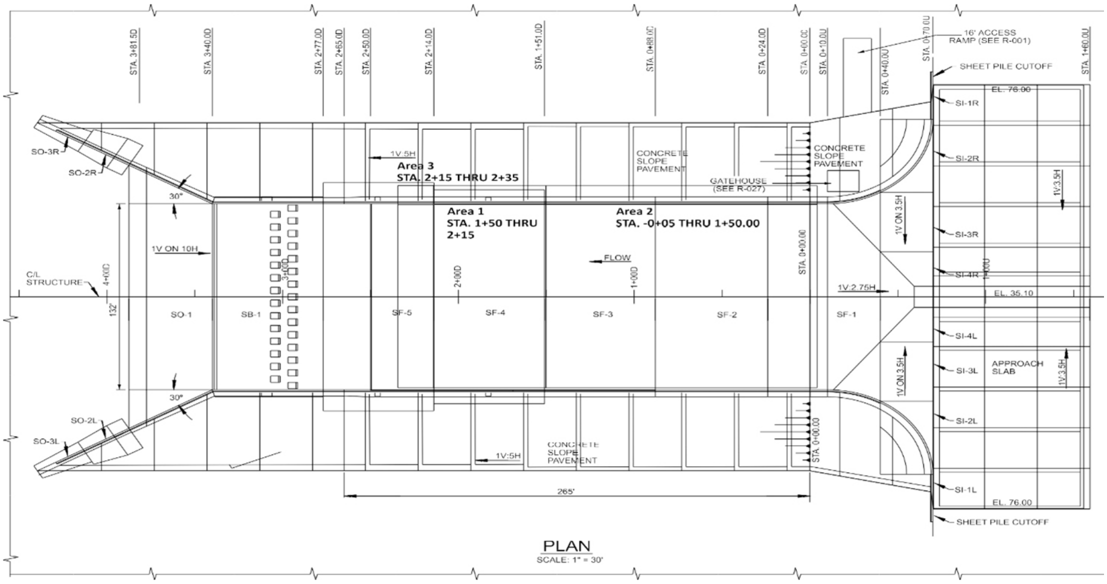


Fig. 3: Plan view of the Lilly Bayou Spillway

depths of up to 7 feet (2.1 m) and up to 1 cubic foot (7.48 gallons or 28 liters) in volume. For voids of this size, the standard epoxy injection peak exothermic could exceed 300°C (572°F), leading to autoignition of the injection material, potentially creating a dangerous job site working condition. To demonstrate the peak exothermic hazard to the USACE, a quart of low viscosity, structural epoxy adhesive was mixed and let stand, where it heated up, foamed, smoked, and eventually caught fire.

The USACE then inquired whether there was a suitable material. The answer was yes; an isothermic-cured epoxy material, which cures without generating heat during the curing process could be considered. Isothermic-cured structural epoxy adhesives are not new; however, they are not commonplace in the construction industry. This is because the standard exothermic reaction is typically an advantageous property that accelerates the cure of the material. An isothermic-cured material has a much slower reaction time (gel time of several hours as opposed to several minutes), but it can be injected in a large mass without the potential consequences of an exothermic material.

Thus, an isothermic cure material, which had decades of proven history, was selected as a substitute for the specified injection material for the repair of Lilly Bayou spillway. A similar example was performed for the USACE by mixing a quart of isothermic-cure material, which eventually cured without any smoking or foaming to the satisfaction of USACE.

PREPARATION AND APPLICATION

The estimated volume of injection resin after the GPR test report was 4,000 to 11,000 gallons (15,142 to 41,640 lt.) of injection required to fill roughly 535 to 1,470 cubic feet (15.1 to 41.6 cubic meters) of honeycombs and empty voids under the structural concrete overlayment and to bond the overlayment to structural concrete below.

The three-stage injection process started with drilling over 8,000 holes to a depth of 2 feet (610 mm) grid across the overlay (Fig. 4). These holes were then fitted with polyethylene tubing for initial water flushing.

Water was injected into the honeycombs and empty voids to remove silt and dirt that had been deposited in the gap between the overlayment and structural substrate since 2011. Flushing was done until the water came out clean; however, in some cases, due to lack of continuity between flushing ports, all residual silt deposits were not flushed clean.

Once flushed, rebar anchors were introduced, followed by the epoxy injection. Due to the severe degree of slope in the spillway, injection started at the lowest point, progressing up the slope (Fig. 5).

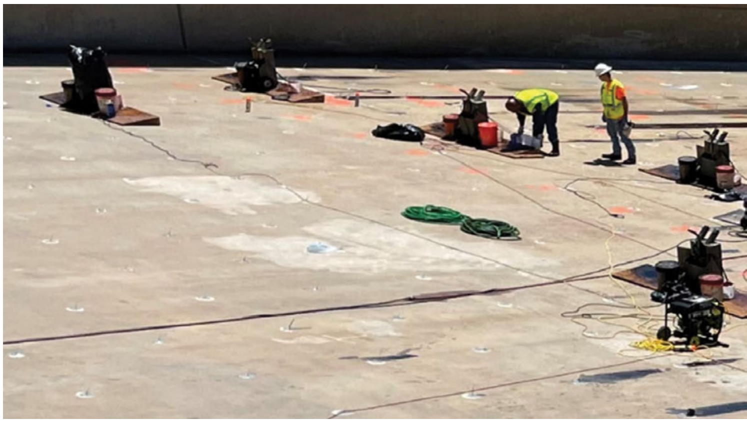
VERIFICATION

Verification cores were taken and examined for the percent of epoxy penetration and filling. The injection success ranged from 90% to 100% (Fig. 6, 7). In areas of less than 100% penetration, injection was hindered by compacted dirt that was not removed during flushing (Fig. 8). Regardless, the majority of the delamination was successfully re-bonded with epoxy resin.

SPECIFICATION CHALLENGES

Standards for the repair of delamination of reinforced structural concrete overlays are not readily available in industry literature. The USACE listed in their specification for the repair of Lilly Bayou Spillway Repair two ACI documents—ACI 503.7 and ACI RAP Bulletin 1.[2,3] ACI 503.7 states in the scope, “It does not cover the repair of delaminations where the intersection of the cracked concrete with the surface of the concrete member is not accessible nor can be made accessible.”[2] Further research finds that ACI 548.15-20, which supersedes ACI 503.7, but does not appear in the USACE documents, also notes, “It does not cover the repair of delaminations where the intersection of the cracked concrete with the surface of the concrete member is not accessible nor can be made accessible.”[4]

Fig. 4: Drilling over 8,000 holes for flushing, injecting, and anchoring



SUSTAINABILITY

The choice of performing epoxy injection repairs over the demolition and replacement of 1070 cubic meters (1,400 cubic yards) of concrete saved an estimated 180 tons of carbon dioxide (calculations available upon request).[5] This is in addition to the potential CO_2 generation of demolition, hauling, and disposal of the existing concrete.

CONCLUSION

The Lilly Bayou, Louisiana, Control Structure that ultimately drains into the Mississippi River 2.5 miles (4 km) away required 4,500 gallons (17,034 lt.) of isothermic structural epoxy adhesive injection resin to fill 535 cubic feet (15.1 cubic meters) of honeycombs and empty voids. The intent of the specification and application was to structurally bond the 12-inch thick (305 mm) structural concrete overlay to the structural concrete substrate, while avoiding the hazards of an exothermic epoxy curing reaction. Upon completion, the United State Army Corps of Engineers put the structure back in service immediately, with the control structure performing as originally designed.

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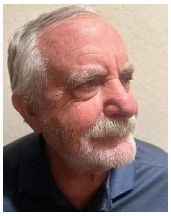


Anthony Gaffney is a senior consultant at ChemCo Systems, an American Polymers Company. Mr. Gaffney has 48 years of experience, holding positions from sales engineer, technical manager, VP of Marketing, Sales and Technologies, and General Manager. He is currently the co-owner and Senior Consultant of Floor and Deck Solutions TM2S Inc., a DAG2 LLC Company.

Fig. 5: Degree of slope in the spillway

Fig. 6: Core 2—Darker, black section is filled with epoxy resin

Fig. 7: Core 3—Darker, black sections indicate filling with epoxy resin

Fig. 8: Core 5—Partially Filled Core, left dark areas filled with epoxy and right area (bottom of core) partially filled

Epoxy Crack Injection to Refusal through Manifolds

by Robert Trout

Following the catastrophic collapse of the Surfside Condominiums in Florida, epoxy injection as a method of protecting the reinforcing steel in structures has become a hot topic. It can be a permanent solution to protecting reinforcing steel from chlorides and other detrimental materials.

Most people in the construction industry are familiar with the epoxy injection of cracks in concrete. But many are mistaken as to the proper method of porting and injecting the crack. Specifications often call for the injection port placement to be determined by the thickness of the concrete member. They also require that the injection process use what is called the "port-to-port" method. These methods can be misguided, as alternative injection methods are available.

PORT PLACEMENT

Port placement should be determined by the width of the crack, not the depth of the crack. The thought is that if the member is 8" (200 mm) thick, the ports should be placed 8" (200 mm) apart. The hope is that when the injected resin appears at the adjacent port, it is also 8" (200 mm) back into the void. This can be problematic. The assumption is that the crack will fill uniformly. In other words, like a bathtub. The resin would self-level within the crack. This assumption is often erroneous.

First, cracks are not uniform. Most of the time, they are "V" shaped—wider at the face than within the member. As freshly poured concrete cures, the excess water in the mix will evaporate much faster at the surface than the core, before it can reach sufficient strengths to withstand the shrinkage forces. The core will have more time to reach these strengths and therefore result in a narrower void near the center. As noted in the research by Tammo and Thelandersson, "Test results by a number of researchers show that the surface crack widths are approximately twice the crack width close to the bar surface for normal thickness of concrete cover."[1]

Additionally, the viscosity of the resin in narrow cracks will prevent the resin from self-levelling. Resin appearing at the adjacent injection port only indicates that the resin is penetrating, not that the crack is filled to that point. So, port placement based on the thickness of a crack can be irrelevant to filling the full depth of the crack.

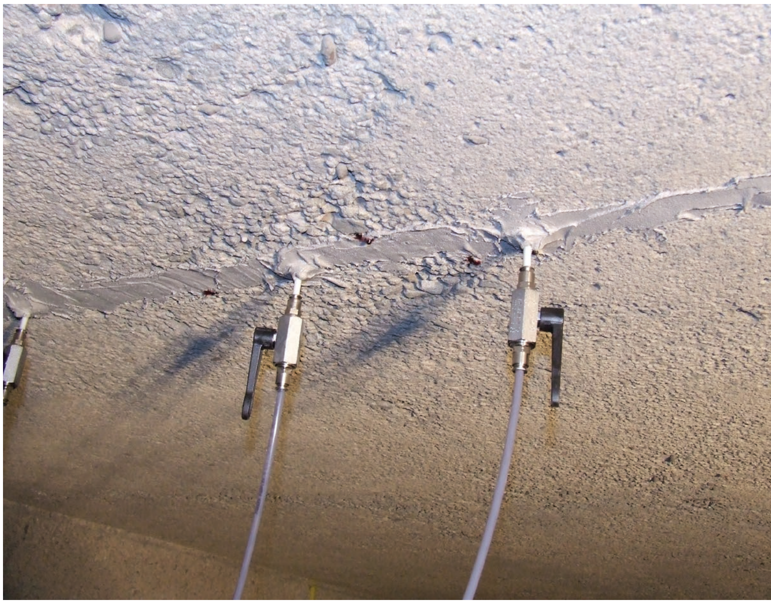


Fig. 1: Example of manifold epoxy injection

Port placement should be determined by the width of the crack. If the crack is wide, the ports can be placed further apart because the resin will flow readily. Very narrow cracks will require closer placement to achieve sufficient penetration. Note that ICRI 110.2 recommends, "Spacing of the entry points shall be no greater than half the thickness of the concrete member at that location. Tighter cracks may require closer spacing of injection points."[2]

As to "wide" and "very narrow" cracks, this is difficult to quantify as resin viscosity, concrete temperature, and injection pressures will vary. What may be considered wide at 85°F (30°C) may require closer port spacing at 50°F (10°C). The resin will now be much more viscous as soon as it enters the crack. Lower injection pressures will require closer spacing to achieve the necessary results. Injecting with a resin of 100 centipoise will not need the closer spacing of a resin with a viscosity of 500 centipoise. With so many variables, consider taking cores early in the project, so the process can be amended as necessary due to those variables.

INJECTION TO REFUSAL

Because the port-to-port method of injection can be unreliable, how should it be performed? Consider injection to refusal. This means to inject until the epoxy dispenser stops and indicates that every void that can be filled at the selected pressure, resin viscosity, and concrete temperature has been filled.

This method allows the contractor to begin the injection process, not at the crack's extremity, but at the widest part of the crack. This should be identified and marked before applying the surface seal. It is much faster to fill a bucket from the wide end of a funnel than the narrow end. As the resin fills the crack, the adjacent ports are simply sealed, and the process continues. No need to move from a wide section of the crack to a narrower location. This allows the resin to penetrate the tighter portions across a wider front, increasing production.

Injecting to refusal allows the contractor to inject multiple ports simultaneously (Fig. 1). This is called manifold injection. Now a contractor can inject three or more times as much resin as they would injecting only one port. A concern often brought up is the potential of entrapping air within the crack, though it is rarely a problem.

First, concrete is not impervious. Millions of dollars are spent each year to waterproof concrete. Why? Because concrete is porous. The small volume of air within a crack is readily driven into the adjacent concrete under the injection pressures.

Second, most of the air will be vented through the open ports as the resin fills the voids.

Last, the air is compressible. Boyle's Law in physics indicates that the volume of air is inversely proportionate to the pressure exerted on it.[3] One cubic foot (.03 m^3) of air placed under 150 psi (1.0 MPa) will only occupy 9% of the original volume. At 200 psi (1.4 MPa), it will drop to 7%. Assuming no air escapes from open ports and no air is driven into the concrete, these results will still exceed the requirements of most specifications asking that 90% of the crack is filled. These are common injection pressures.

There are, of course, exceptions (including injection between metal plates or extremely dense concrete) where special steps may then be required.

CONSIDERATIONS IN ROUTING OR DRILLING FOR INJECTION

The routing out of cracks and/or the drilling of holes into the crack can often create more problems than they solve. If the cracks are open and clear, they can usually be injected without routing or drilling. As long as there is an open path into the crack, surface mounted injection ports can be used. This eliminates the labor intensive and unsightly routing and drilling.

The routing of cracks is often used, thinking that it will open the crack for faster filling. The width of the crack will not be increased. It will remain the same. A routed crack may also require drilling of holes for a port, as now the use of a surface mounting port is not possible due to the wide gap at the surface.

Drilling holes for the placement of an injection port is only recommended if the crack is filled with debris or efflorescence that would impede the flow of resin. Often the hammering action or grinding of the drill bit simply drives the drilling dust back into the crack, creating another blockage. Great care and time may be required to clear the obstruction. Vacuum bits are available to remove the drilling dust from the hole, but their success may not be guaranteed.

Small water-fed core bits work very well but are expensive, time consuming, and will require a waiting period before proceeding to allow the water accumulated within the crack to drain or be absorbed into the concrete.

QC BEFORE AND AFTER THE INJECTION

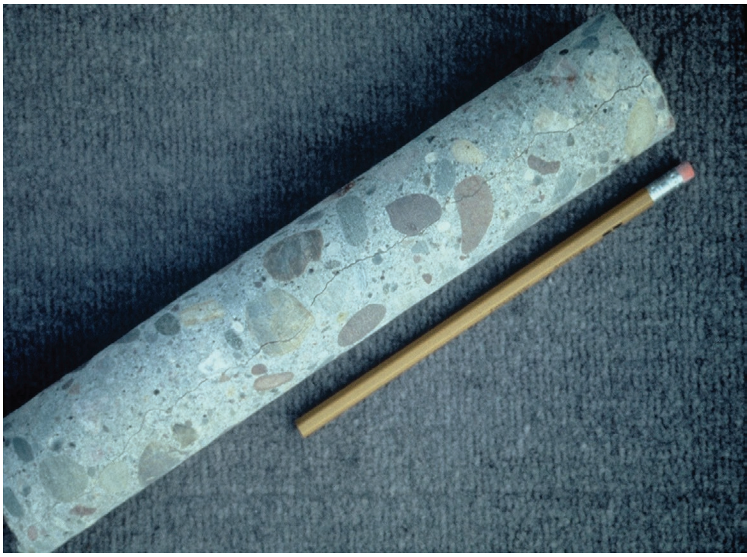
Before:

The last step before beginning the injection process might be an air test. Although not required on every project or with an experienced crew, it can significantly improve the odds of a successful project and is recommended in ICRI 110.2.[2] An air test is a simple process of closing all the ports on a crack except one. Compressed air is then pumped into the crack. Any leaks or failures in the surface seal can then be addressed before injecting. If the epoxy is coming out, it is not going in. Leaks in the surface seal can affect the results, create more work cleaning the drainage, and reduce the confidence of the inspector in your ability to achieve the desired results.

Occasionally, the air test will reveal the crack has reflected through the surface seal. This is likely due to the thermal contraction of the concrete caused by an overnight temperature drop, which is not uncommon. When this happens, the crack can be resealed with a very fast setting surface seal material and injected before the concrete can shrink again.

This occurrence is frequently regarded as a "moving crack" or a crack that cannot be injected. When this occurs, the question to ask is, "Does it need to move?" not, "Is it moving?" If a structure

Fig. 2: Cored sample of a full depth crack



has been designed properly, built correctly, and is being used in the way it was designed and built, it should then be able to be injected, gluing the sections together. Any thermal or loading movement will then be transferred to the location that was designed to move.

Finally, before the first injection, ratio and pressure testing of the injection dispenser is critical to a successful project. If a resin is injected "off ratio," there is no way to remedy it. Far too often, the testing method and/or calibration of the units are dictated in the specification. Many times, these procedures are inappropriate. An example includes testing methods designed for gear driven pumps with spring actuated check valves being required for positive displacement dispensers utilizing pneumatically operated ball valves. You do not tune up a Maserati with a Volkswagen owner's manual. Dispensers should be tested in accordance with the manufacturers' printed instructions. Who knows better than the manufacturer how their equipment should be tested and maintained? A copy of the test procedure and frequency of testing should be supplied to the proper authority prior to starting the project.

After:
Injecting to refusal is a good indication that the voids have been filled. But the only way to truly know is to take core samples. A 2" (50 mm) core is normally sufficient for visual confirmation to confirm that the specified depth of penetration has been achieved (Fig. 2). Larger cores are required for splitting tensile strength testing per ASTM C496.[2,4] Core sampling for verification is outlined in ICRI 110.2, 210.1 and obtaining core samples should be in accordance with ASTM C42.[2,5,6]

Commonly, three core samples are taken within the first 100' feet (30.5 m) of injection. A single core is then removed for every additional 100' (30.5 m). Obviously, reinforcing steel concentration, embedded conduits, and other factors will play a role in the selection of coring sites and the number of cores taken.

Recommendations for epoxy injection specifications and quality control testing can be found in ICRI 110.2 and 210.1.[2,5]

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Robert Trout is the President of Lily Corporation, a manufacturer of proportioning dispensers and other hardware for the construction industry and concrete repair. Trout holds a Bachelor of Science degree in Business Administration from St. John's University, Collegeville, Minnesota, and has been affiliated with Lily Corporation for more than 30 years. Trout's memberships with Lily Corporation include International Concrete Repair Institute as a charter member and the American Concrete Institute.

Trout participated in the development of cold weather epoxy injection at the University of Ghent in Belgium and has been a guest instructor at the University of California in Chico. He is a frequent presenter for ICRI, and performed epoxy injection training in the United States, China, Chile, England, Saudi Arabia, Turkey, Mexico, New Zealand, and elsewhere overseas.

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- Promote, identify, and correct hazards before they can cause injury.
- Promote safe working practices and facilitate safety training.

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- Provide our association with a learning experience that promotes a safety awareness culture.
- Provide our association members with education that mitigates safety concerns in the concrete industry.

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2. Promoting and administering of the ICRI Safety Award.
3. Developing innovative ways to promote a safety culture among our community.
4. Working on an interactive app that will tie into our safety database and link other informational sites.
5. Developing short YouTube safety videos.

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YVR Runway Dowel Bar Retrofit Project

by Dave Clarke

INTRODUCTION

Vancouver International Airport (YVR) located in Richmond, British Columbia, Canada, is one of the busiest airports in Canada. As a major hub for both domestic and international air travel, it handles significant passenger and cargo traffic, with over 650 aircraft runway movements per day as of March 2023.

YVR consists of two parallel runways and one crosswind runway. The main North Runway suffered from concrete surface deterioration due to the loss of load transfer between the panels. In the original concrete runway construction, dowels were used along longitudinal construction joints only. For the transverse pavement joints, construction was based on using aggregate interlock between the slabs across the transverse joint. The deterioration led to faulting, spalling, cracking, and more frequent panel replacement.

CONSTRAINTS

The challenge was to repair the runway amid YVR's high flight activity without closing it. A Vancouver engineering firm was engaged by the airport to lead the North Runway Rehabilitation Project. The engineering firm led a team of industry experts to develop an innovative dowel bar retrofit (DBR) process to enhance pavement load transfer by installing 60,000 dowel bars to stitch together the concrete panels (Fig. 1).

A short work shift created a significant constraint to achieving the goal. All work had to be completed in an 8-hour window so that the runway could return to service by 6 a.m. each day. This included a full mobilization of crews and equipment onto the runway, precise sawing and removal of the concrete, dowel installation, concrete patching, quality control check, clean up, and a full demobilization.

PRECISION CUTTING

Each dowel slot had to be cut to specifications with a maximum 5 mm variance allowed in length, width, and depth. The ends of each slot had to be core drilled so there was no risk of spalling. The necessity for technical accuracy and consistency eliminated the use of conventional concrete cutting and coring methods with industry standard equipment. Custom equipment would be needed to achieve the accuracy and performance requirements.

A joint venture (JV) of two Canadian leaders in concrete cutting designed and manufactured a custom automated saw head that met the exact project specifications. An automated saw head and slurry vacuum system were mounted on a large skid steer cutting the dowel slots, core drilling the corners to prevent spalling, and cleaning up the concrete slurry in one automated process (Fig. 2).

Fig. 1: Dowel bar retrofit plan detail

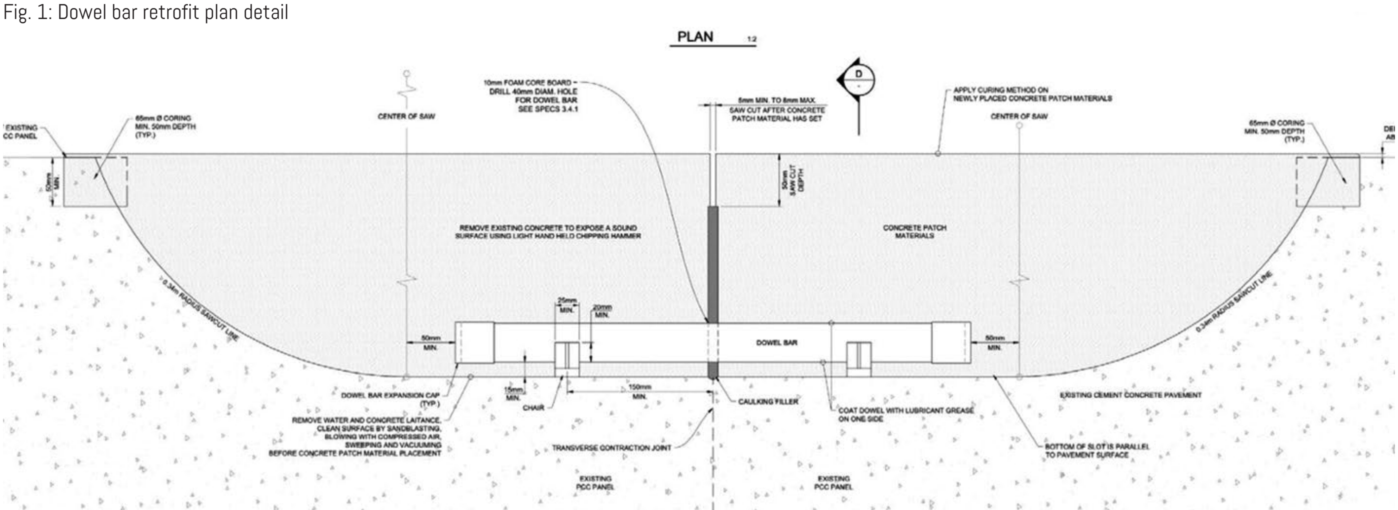


Fig. 2: Custom skid steer mounted coring and slotting attachments

The machines were designed using programmable logic controllers (PLCs), which are specialized industrial computers designed to control and automate manufacturing processes.

The nature of the PLC-controlled machines provided a product far superior to typical conventional concrete cutting methodologies. The result of the saw cut is like CNC (computer numerical control) precision machine shop work (Fig. 3, 4).

Because the machines automated the task, the number of operators required and the time to cut each slot and core the holes were reduced. The PCL-controlled machines allowed operators to keep their distance from the actual cutting operation, increasing safety and resulting in no injuries on the project.

Fig. 3: Precision doweling and cuts performed

Operators had a brief timeframe each day to mobilize to the runway, meet the engineer's design specification of 500 slots, demobilize operators and equipment, and leave the runway clear of foreign object debris (FOD). The maximum production achieved using five machines on a single night exceeded expectations at 720 slots per night.

DOWEL BAR INSTALLATION

The general contractor managed the next phase of the process, which was removal of the concrete, profiling the slot, cleaning, dowel placement, and placing backfill material (Fig. 5). Prior to backfilling, the existing joint or crack intersecting within each dowel bar slot was sealed to ensure that no backfill material entered the joint or crack once poured.

Primer was applied evenly to the dowel slot surfaces. The DBR assembly (dowel bar, support chairs, foam core board, and end caps) was placed in each slot, leveled, and centered horizontally over the joint or crack. With the slots properly sized and prepared, each dowel was positioned at mid-depth of the slab with a clearance of at least 0.75 inches (19 mm) between the bottom of the slot and the underside of the dowel.

Fig. 4: Initial concrete removal from cuts

Backfilling the slot is one of the most critical steps in the DBR process and is often overlooked regarding its importance. The biggest risk in dowel retrofit projects is related to the failure of the backfill material due to inadequate consolidation, poor bond between backfill material and existing concrete, and spalling and cracking of the backfill materials. The vital elements of properly placing the backfill material included:

- Ensuring the placement does not disturb the dowel bar or the foam core board.
- Consolidating the material so that it easily flows around and fully surrounds the dowel, filling the entire slot space, including the underside of the dowel.
- For this application, consolidation of the backfill material was performed using a small spud vibrator, carefully avoiding misalignment of the dowel.

Fig. 5: Slot preparation for dowels and backfill

The type of backfill material used was also a critical component to the success of the project. The backfill material properties needed to achieve the following critical requirements:

- Early strength to enable runway into service at the end of the nightly work shift.
- Ability to support bearing stress exerted by the dowel during load transfer under aircraft traffic.
- Demonstrated stability and durability for long-term performance.

The required properties for the backfill material included compressive strength, flexural strength, modulus of elasticity, bond (adhesion) strength, abrasion (wearing) resistance, shrinkage, and freeze-thaw resistance. The backfill material also needed to flow around the dowel bar assembly to ensure proper consolidation and prevent any voids under the dowels.

With these characteristics in mind, polyester polymer concrete (PPC) became the preferred choice for use in this project. This material also showed improved crack resistance and reduced risk of premature failure, thereby enhancing pavement performance and longevity.

QUALITY CONTROL

Quality control measures were integral throughout the YVR airport project. After saw-cutting operations, the slots were inspected for dowel bar spacing, edge distances, and alignment with the existing transverse joint (slot width and length).

Following concrete removal, the slots were checked for depth, width, and levelness. Prior to placing PPC, the dowel bars were checked for vertical and horizontal alignment within the dowel slot. Last, after placing the PPC, a sufficient Schmidt hammer reading was achieved.

In addition to nightly on-site field checks, material samples were taken for cube breaking at 1, 28, and 56 days, as well as specific gravity and absorption tests to ensure product quality. Selected dowel slots underwent core testing to confirm PPC consolidation and bond.

CONCLUSION

The replacement of aging concrete runways is a disruptive and costly endeavor. The Dowel Bar Retrofit program at YVR airport allowed rehabilitation of existing concrete runways during overnight runway closures in a cost-effective manner to extend the runway's service life (Fig. 6). This innovative approach exemplifies what can be achieved when expertise, technology, determination, and a committed project team converge.

Fig. 6: Complete retrofitted joints

OWNER | **Vancouver International Airport (YVR)**
Langley, BC, Canada

ENGINEER | **Associated Engineering**
Vancouver, British Columbia, Canada

CONTRACTOR | **Flatiron/CanWest & Westcoast JV**
Richmond, British Columbia, Canada

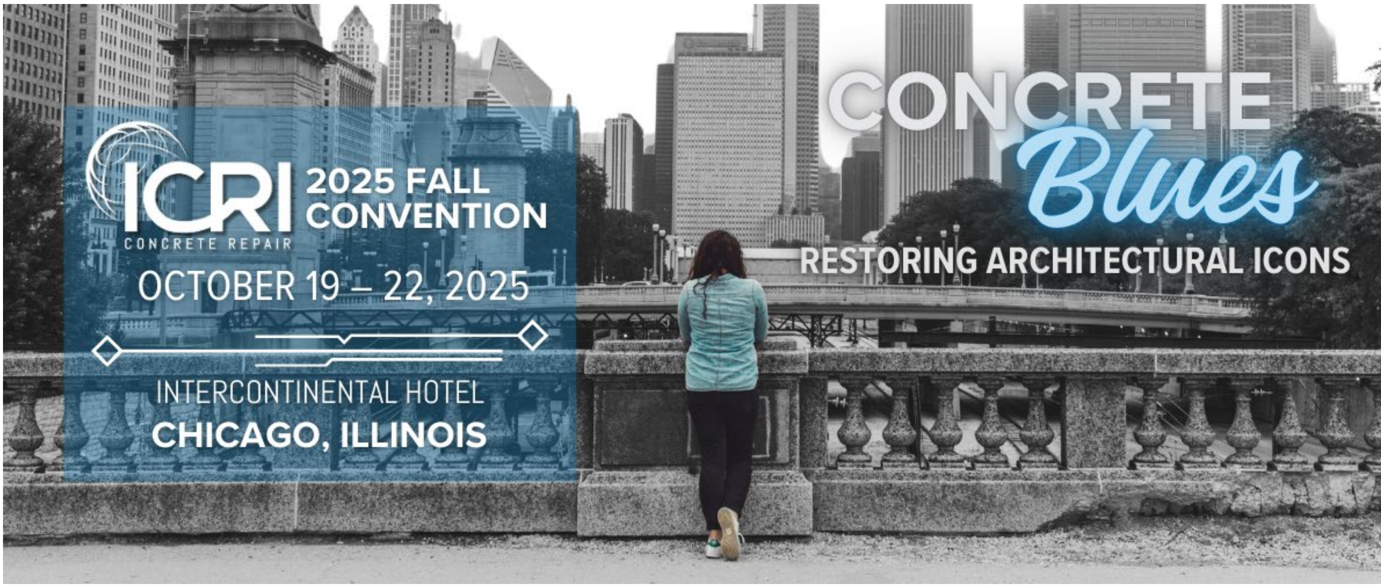
MATERIAL SUPPLIERS | **Kwik Bond Polymers**
Benicia, California

PROJECT SIZE | **28.5 million CND**

COMPLETION | **May 2022**

Dave Clarke has been involved in the British Columbia construction industry for the past 25 years, and specifically in concrete restoration and concrete cutting for the past 15 years. Dave has a keen interest in business leadership, organizational systems and business innovation and earned his MBA from the Beedie School of Business at Simon Fraser University 2015-2017. He is a founding member of the ICRI Chapter in Vancouver, British Columbia. Dave is an operating principal with CanWest Concrete Cutting & Coring located in Vancouver, British Columbia. A recent business focus with the Westcoast & CanWest JV is on extending the service life and capacity of concrete runways with CNC precision concrete cutting and dowel insertion process in North America and beyond. In his personal life, Dave enjoys boating, playing squash, and spending quality time with his wife Lori and their four children.



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ICRI's volunteer program strives to create an environment that is friendly and welcoming. As an ICRI volunteer, you work closely with volunteer leaders and ICRI staff—active parts of each committee—and available to assist you to answer questions about how ICRI operates, and to help you be the most effective volunteer possible.

Follow Your Interests

Check out the administrative and technical committees of ICRI, attend their meetings and learn what each is working on. Then decide where your area(s) of interest fit best. The ICRI staff is here to answer your questions and help align you with your interests. You are welcome to attend any meeting of any committee on the administrative or technical committee list. You attend—you can decide if you want to join.

Length of Commitment

Most volunteer commitments are ongoing; leadership positions are a 3-year commitment. Committees usually meet monthly for 1-1.5 hours. In addition, committees often require tasks to be completed outside of the meetings on the volunteer's own time. **Visit www.icri.org for more information**.

ICRI**CHAPTER**NEWS

CHAPTERS COMMITTEE CHAIR'S LETTER

DAVID GRANDBOIS
Chapters Chair

Happy New Year! Welcome to 2025! Here we are, starting off another new year. I hope you all enjoyed the holidays and spent some quality time with your families. I want to thank you all for putting up with me in 2024 as it was my first year as Chapters Committee Chair. The New Year brings new beginnings, and from the previous, we have endings. I hope you all have a successful and rewarding year; I want to share some reminders with you for the past and upcoming year:

Chapter elections for each of your chapters should have come and gone. This could bring new faces to your chapter and could also bring some goodbyes as some board members exit. Chapter elections are required to be completed before the end of the year and the list of all 2025 Officers and Directors is due by January 17, 2025.

I would also like to encourage you to set up your annual calendar for the year and post it to your website. Doing so will set expectations for the year and give people an opportunity to plan for Chapter events and have something to look forward to. Also, please share this calendar of events with Dale Regnier so that this information can be shared nationally.

The Chapter Awards forms for 2024 activities are due to ICRI no later than February 14, 2025. Those forms are in the Chapter Resource Section of the ICRI website and have also been mailed to each Chapter President for 2024. The ICRI Chapter Awards Program is a way to recognize the chapters for all their commitment to success, and is a playbook for your chapter to succeed.

Remember that the **Chapter President's Guide** is on the website for your use. It comes across as a lengthy list, but can be broken down into a few strong commitments monthly:

- Check the monthly roster and update contacts, welcome new members, and check on and follow up with renewals.
- Complete event checklists and provide event information to ICRI national to be shared on the website.
- Email chapter news items to ICRI national so the newest information is shared.
- Update the calendar of events to have the most current information and share this information with ICRI national.
- Update the chapter website and webpage so that all information about events and the chapter is current.
- Promote chapter events, national events, and ICRI certifications.

Along with the Chapter President's Guide, you can find all the Chapter Resources under the "Chapters" tab at the top of the page. If you scroll down to the middle of the page and click "Chapter Resources" the following are provided for you:

- Tools
    - President's Guide
    - Leadership Recruitment
    - Chapter Membership Recruitment Guide
    - Incorporation and 501(C)(6) Status
    - Financial Responsibility—the IRS
    - Chapter Bylaws
    - Operations Guide
- How-Tos
    - Convention Delegate Program
    - Apply to Host a Convention
    - CRB Deadlines
    - Insurance
    - Guest Speaker Presentation Guidelines
    - How to Post to the ICRI Website
- Marketing
    - ICRI Promotional Membership Video 2023
    - Safety Guideline Presentation
    - Intro to ICRI Template
    - Operations Guide
- Programs
    - Roundtables
    - Chapter Awards
    - Chapter Regions

Lastly, the 2025 National Convention locations and dates are set. Spring Convention: April 13-16, 2025, at the Austin Marriott Downtown in Austin, Texas; the theme is "Keep Concrete Weird: Unusual Projects."

Fall Convention: October 19-22, 2025, at the Intercontinental Hotel in Chicago, Illinois; the theme is "Concrete Blues: Restoring Architectural Icons."

I hope to see you all in Austin, where we can hopefully all continue to hold true to the city's motto and "Keep Austin Weird."

Best Regards,

David Grandbois, ICRI Chapters Committee Chair
Western Specialty Contractors – Minneapolis, MN

ICRI CONCRETE REPAIR CHAPTERS

ICRI has 38 chapters, including two student chapters, in metropolitan areas around the world. Chapters hold technical presentations, educational meetings, symposia, and local conventions on repair-related topics.

FLORIDA FIRST COAST CLAY SHOOT

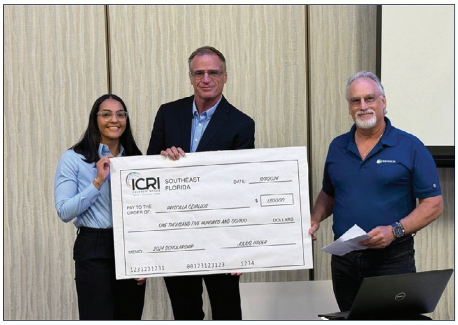
The ICRI Florida First Coast Chapter hosted their 3rd Annual Clay Shooting Tournament on Monday, November 11, 2024, at the Jacksonville Clay Target Sports facility in Jacksonville, Florida. Members and guests enjoyed the beautiful weather that day and the fantastic facilities.

SOUTHEAST FLORIDA SCHOLARSHIP WINNERS

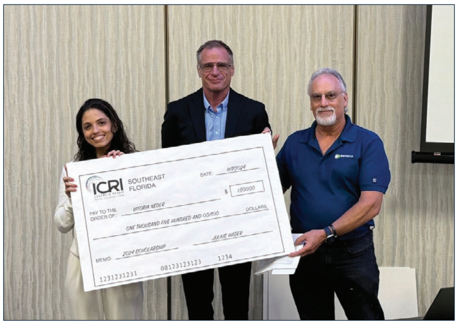
The Southeast Florida Chapter of ICRI is proud to announce the recipients of this year's prestigious chapter scholarship awards. With an unwavering commitment to advancing the field of concrete restoration, the ICRI recognizes the outstanding academic and professional achievements of students who have demonstrated exceptional dedication and potential in this vital industry. This year's awards have been conferred upon three remarkable individuals: Priscilla Cevallos, Vitoria Neder, and Richmond Carlton. Each recipient has demonstrated significant promise and has made notable contributions to their respective fields of study.

As these exemplary students continue to pursue their academic and professional goals, the Southeast Florida ICRI chapter is honored to support their journeys. The ICRI scholarship awards are not only a recognition of past accomplishments but also an investment in the future of concrete restoration and infrastructure resilience.

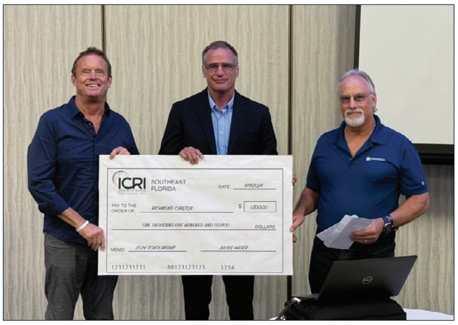
The ICRI remains committed to fostering the growth of talented individuals who will drive the industry forward, ensuring safer and more durable structures for generations to come.



Priscilla Cevallos (left) accepting her scholarship award



Vitoria Neder (left) accepting her scholarship award



Richmond Carlton (left) accepting his scholarship award

PRISCILLA CEVALLOS

Priscilla Cevallos has distinguished herself through her innovative research in structural engineering and materials science. Her work focuses on developing sustainable and resilient concrete mixtures that can withstand extreme environmental conditions. Priscilla's passion for sustainable development and her academic excellence makes her a deserving recipient of the ICRI scholarship.

VITORIA NEDER

Vitoria Neder has shown a profound commitment to the field of concrete repair and restoration. Her research on advanced repair techniques and durability assessment has garnered attention and accolades from industry professionals. Vitoria's dedication to enhancing the longevity and performance of concrete structures exemplifies the core values of the ICRI.

RICHMOND CARLTON

Richmond Carlton's contributions to the field of civil engineering have been truly commendable. His focus on innovative repair methodologies and the application of cutting-edge technologies in concrete restoration sets him apart. Richmond's academic achievements and practical insights have earned him the respect of his peers and mentors alike.

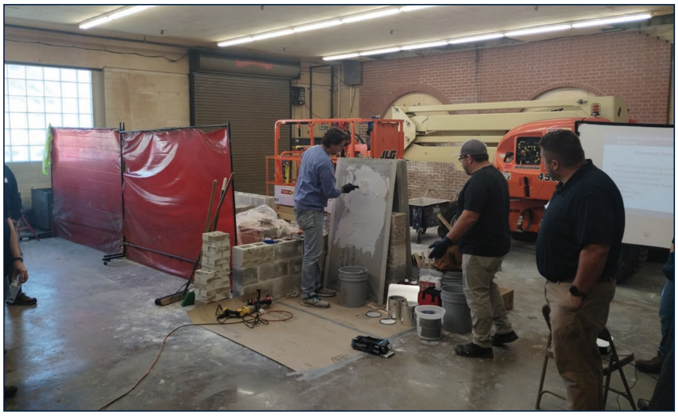
ICRI**CHAPTER**NEWS

PITTSBURGH DEMO DAY

The ICRI Pittsburgh Chapter held their 2nd annual Technical Demo Day on October 11, 2024, at the local 9 BAC IMI training center in Monroeville, Pennsylvania. The event was a huge success once again, growing from their inaugural event in 2023. A great mix of more than 60 members and non-members with diverse backgrounds and positions in the industry participated. There were six showcase technical demonstrations providing hands-on training opportunities to participants. A vendor fair was added to the event this year as well.

The round-robin style demonstration program had attendees moving from room to room for hands-on learning about various product and application processes. This year, that included direct applied waterproofing, carbon fiber fabric and plates, galvanic anode installation, epoxy mortar repair in manhole restoration, masonry restoration anchors, and jobsite testing procedures.

The Pittsburgh Chapter extends a huge thank-you to all the demonstration providers, vendors, the venue, sponsors, and volunteers who made the day so successful. The chapter hopes to continue this tradition forward and has already begun planning the 2025 demo day event!


Pat Allen (AES) trying his hand at epoxy mortar repair application


Participants watching how to install carbon fiber


Vendor fair space


Participants learning about direct-applied waterproofing coatings


Day wouldn't be complete without CSP chips!

PITTSBURGH GATHERS FOR ROUNDTABLE

The ICRI Pittsburgh Chapter held another well-attended event on September 10, 2024. It was part of the group's 2024 technical roundtable series. The topic was Mix Design and Placement. The Chapter had a fantastic turnout and some great discussions. An extraordinarily diverse panel covered essentially every player involved in the process of mix design and placement.


For this roundtable discussion, the panelists were (in the front of the room, on the left side of the photo, from left to right), Matt Watson from Euclid, Tom Bryan with Bryan Materials Group, Lorenzo Scuilli with Mosites, Jim Fitzroy with Local #526, Evan Rowles from AES, and moderator Mike Payne from BECS, for an informative session

NORTH TEXAS TALKS EPOXY INJECTION

A large crowd of North Texas Chapter members gathered at their November meeting to hear about “Epoxy Injection: Myths and Misunderstandings” from injection guru Robert (Bob) Trout from the Lily Corporation. With over 30 years’ experience in the epoxy industry, Bob stressed that surface preparation is critically important to a successful injection process. Cleaning epoxy resin leaking onto the surface can be a costly and time-consuming endeavor! Bob also pointed out the benefits of air-testing the port placement and surface seal application prior to injecting. He reviewed the best method for cleaning the crack and warned against using acids and/or detergents. For the actual injection process, Bob argued that a port-to-port method may not be the best approach, nor is beginning at the lowest point working your way up on a vertical crack, or at one end working your way to the opposite end of a horizontal crack—who knew? Finally, Bob reviewed the advantages of employing a manifold injection process, whereby several ports are injected simultaneously. This method can substantially increase production rates!

HOUSTON HITS THE POKER TABLES

The ICRI Houston Chapter held its annual poker tournament at the Buffalo Soldiers National Museum to raise money for the chapter’s scholarship fund, which goes to students in Texas universities studying engineering, construction, or architecture with a focus on restoration and renovation. The location was selected, in part, because the facility was part of a recent renovation project for several local chapter members. The chapter awarded raffle prizes throughout the night and any participant who made the final table won a prize. The Chapter thanks all the sponsors and attendees for supporting this chapter activity and the scholarship fund!

The room filled with eager and interested poker players

The excitement at the final table was intense

OKLAHOMA SHOOTS SKEET

CHAPTER CALENDAR

ICRI Chapters are hosting events in 2025. Be sure to check with individual chapters by visiting their chapter pages to determine if they have made any plans after this publication went to print. You can also contact a Chapter Leader from any chapter to ask if they have added an event.

BALTIMORE-WASHINGTON
February 6, 2025
FIRST QUARTER DINNER MEETING
Joint meeting with ACI
Topic: Concrete Anchors
Speaker: Michael Morrison with ACI
Maggiano's Little Italy, Tysons Corner
McLean, VA

CHICAGO
January 9, 2025
JOINT ICRI/SEAOI TECHNICAL SEMINAR
Topic: Non-Destructive and Destructive Evaluation
WJE Offices
Northbrook, IL

FLORIDA WEST COAST
January 30, 2025
9th ANNUAL SPORTING CLAYS TOURNAMENT
Tampa Bay Sporting Clays
Land O' Lakes, FL

MINNESOTA
January 10, 2025
CHAPTER MEGA DEMO
Topic: Corrosion
Cement Masons Training Center
New Brighton, MN

NEW ENGLAND
January 14, 2025
DINNER MEETING AND PRESENTATION
Topic: Precast Double-Tee Flange Connection Failures
Speaker: Lawrence Keenan, AIA PE
Granite Links Golf Club
Quincy, MA

QUEBEC PROVINCE
February 20, 2025
CHAPTER DINNER CONFERENCE
Save the Date – Details to follow
Laval, Quebec, QC

BALCO LAUNCHES NEW ELASTOMERIC EXPANSION JOINT SEAL SYSTEM FOR PARKING AND OPEN-AIR APPLICATIONS

Balco recently announced the launch of its new ESS System. This elastomeric expansion joint seal system tackles common challenges faced with traditional joint seals in parking and open-air applications.

The ESS System uses Santoprene, a flexible material with a multi-chamber design. This improves both performance and ease of installation, making it an ideal addition to Balco's DuraSpan™ Parking & Open-Air Systems product line. This new system provides a water- and debris-resistant solution that's simple to install using epoxy for new construction but also ideal for retrofits, replacing Balco's previous ES System with improved performance and handling.

Learn more at www.balcousa.com.

NEW MCI®-2019 X ADDS GREATER FLEXIBILITY TO MCI® PORTFOLIO

Cortec® Corporation is pleased to announce a new addition to its line of concrete surface treatments. MCI®-2019 X is a 40% silane penetrating water repellent minus the typical Migrating Corrosion Inhibitors of MCI®-2019. The reason for not including MCI® is the same reason that Cortec® released MCI®-2018 X without MCI® in early 2024: some contractors need more options to adapt to specific project budgets and parameters.

For more information, visit our website at www.cortecmci.com.

NEWMEMBERS

COMPANY MEMBERS

CMC
Suwanee, Georgia
United States
Jaimie Martin

ADDITIONAL INDIVIDUALS FROM COMPANY MEMBERS

Jason Peddle
AK Industrial Services, LLC
Everett, MA
United States

Niels Berg
Robert E. Porter Construction Co., Inc.
Phoenix, Arizona
United States

Ronald Davis
GCP Applied Technologies, Inc.
Malvern, Pennsylvania
United States

Nicholas Floyd
Simpson Gumpertz & Heger Inc.
Houston, Texas
United States

Joshua Katz
Suncoast Restoration and Waterproofing
Fort Lauderdale, Florida
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