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CRB

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2024 ICRI PRESIDENT BRIAN MACNEIL

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ON THE COVER: 2024 ICRI President Brian MacNeil. Read Brian's message on page 2.

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FEATURE ARTICLES

DEPARTMENTS

PASSING OF SALLY COLLINS, ICRI HONORARY MEMBER

Sally Collins was an integral part of the ICRI community since it began in the late 1980s, and it is with great sadness that we announce her passing on November 25, 2023, at the age of 90. There are no right words to express our sorrow, but we wish to share a moment of appreciation for the joyful life of a true friend of ICRI. With her husband Milt Collins as Executive Director, they ran ICRI from 1988 to 2001. Both Milt and Sally were granted honorary membership in the association in 2001.

Milt and Sally moved to Las Vegas after their retirement and have been instrumental in helping ICRI with certification programs there. Not only did they house our certification equipment used during the World of Concrete and Surfaces shows, they helped copy and assemble materials and ran errands for us, joined us occasionally for our Las Vegas Kick-Off Parties, and even brought home-made brownies to the booth every year to help make us feel welcome.

On her passing, Milt had the following to say, "Sally and I had a great life together, and ICRI was a very major part of it." She will certainly be missed by many in the ICRI family as well as those that were close to her.

PRESIDENT'S MESSAGE


BRIAN MACNEIL

Many moons ago, an industry friend of mine (and competitor at that point), Elena with Aquafin told me that an ICRI Convention was going to be held in Quebec City—and as a Canadian, I should attend. My colleague at the time, Kevin, and I thought it would be a good opportunity to see what the International Concrete Repair Institute was all about. We had a tabletop display, attended the networking sessions and met a few people to follow up with. A couple of the connections that stood out from the convention were Dale Regnier and Mark LeMay. Both were extremely engaging and had no problem communicating with us how we could get the most out of ICRI and (of course) how we could be more involved.

After the third convention, I was sitting on the Chapters and Marketing Committees, had made connections with new distributors, and had been introduced to various influencers in the contracting and specifying aspects of the concrete repair business. As the seasons passed and my involvement grew, I became part of an amazing group of professionals that started an ICRI Chapter in British Columbia, got the chance to host and cohost various national events such as the ICRI Awards Celebration, and continued to meet and engage with industry professionals wo are committed to making positive changes and advancements in the field of concrete repair and restoration.

The more I was able to positively engage with the organization, the more I got out of it professionally and personally. New distributors, new contractors, new specifiers, and new collaborative partners. I learned how "the other side" works. I saw the industry through the eyes of other trade professionals. It taught me how to better engage with industry peers. I learned new technologies that made me more valuable in the field and I truly learned how to work better on a project team.

So now we are 23 conventions later, I have been awarded my ICRI Fellow, and I am the 2024 President of the International Concrete Repair Institute. Many of those industry professionals I mentioned are now some of my closest friends. They are among the first people to reach out and celebrate my successes and have only reached out faster in times when my family and I have needed support. Truly an incredible group.

I am very honored to be this year's president and I hope to communicate and engage with our membership much like Elena, Dale, and Mark engaged with me years ago to get me involved and help me meet my professional and personal goals. All three are still around and I am sure there are many people who have similar tales about how people like that trio got them engaged in the organization.

ICRI is powerful because of the involvement and contributions of the membership, but also because of the dedication of the incredible staff we have. Eric, Dale, Marissa, and Matthew are constantly improving the member experience from all the operational aspects of the organization; without this team, we would be hard pressed to continue to grow. One of the many accomplishments by this team is the launch this month (January) of a new technology platform—association membership database and new website—that will help us better manage everything from memberships, conventions, and communications to the different services we can offer our chapters and members. It is a lot of hard work that will increase our abilities and position ICRI to be even more beneficial to the industry as a whole. On behalf of all of us, Thank You.

Pierre Hebert is the immediate past president, and a hard act to follow. John McDougall, Elena Kessi, Mark LeMay, Chris Lippmann, Ralph Jones, Brian Daley, and Katherine Blatz are just a few of the recent presidents that have done and continue to do amazing work with ICRI. I really hope I can continue the path of growth and success that they have maintained over the years.

The theme of this CRB issue is Sustainability. Sustainability in the concrete repair industry is a critical consideration for our environment, the availability of finite resources, and long-term economic viability. Traditional concrete production is resource-intensive and significantly contributes to carbon emissions into our atmosphere. By embracing sustainable practices in repair, the industry can keep concrete in place longer, extending a structure's service life.

Implementing innovative repair techniques—like carbon fiber reinforcement or advanced polymers—can extend the lifespan of structures, minimizing the need for frequent repairs and reducing overall material consumption. There are many repair materials that utilize recycled goods and by-products from other manufacturing processes that help reduce waste and the use of other raw materials that are in limited supply.

The energy efficiency of repair processes is another crucial part. Adopting low-energy methods and optimizing proper logistics can substantially decrease the industry's overall carbon emissions. We need to continue to invest in research and development for environmentally conscious technologies that will enhance the industry's ability to align with global sustainability goals and ever-changing project requirements.

Sustainability in the concrete repair industry is important when addressing environmental concerns and ensuring a resilient future for our industry and future generations. By prioritizing eco-friendly materials, efficient repair techniques, and energy-conscious practices, our industry can play a pivotal role in constructing a more sustainable building environment.

That being said, how do we sustain and grow the International Concrete Repair Institute and the contributions we make to the industry? That's easy. The people. We keep engaging with our people and continue to find and onboard more people to help us keep this momentum going. If they need an example of how passionate people work, ask them to attend one of our Professional Development Committee meetings and watch these amazing contributors as they plan out, create, discuss, and execute educational programs through a variety of available media. There are so many good things to come and just not enough room on these pages for me to illustrate it! Stay tuned!

Everyone can help. Communicate with your peers regarding what we can do together to make the industry better and engage with them to get involved.

I am looking forward to working with everyone this year and promoting all that ICRI has to offer. Thank you to everyone for your contributions, support, and friendship.

See you soon.

Also, Gord MacNeil with Mac & Mac Hydrodemolition Services Inc. is my father and one of the hardest working and most generous people you will ever meet. I'm just immortalizing that in writing because it is true and... because I can (presidential privilege).

Sincerely,

Brian MacNeil

Brian MacNeil
President, International Concrete Repair Institute

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Making the World Greener One Repair at a Time

by Michael Ireland

Bayway Bridge, Pinellas Bayway; St. Petersburg, FL

From solid foundations to durable structures, concrete is the cornerstone of our built environment. It's the second most-used material in the world after water, and as a result, there is a lot of concrete in place throughout the world. It's estimated that 33 billion tons (30 billion metric tons)[1] of concrete are used each year, or roughly 2.2 cubic yards (1.7 cubic meters) annually of concrete for every person on the planet. And while it is one of the most durable and versatile materials for construction, nothing lasts forever. Even concrete requires maintenance or repair from time to time. This simply underscores its enduring performance and reinforces its value, while further reducing its life cycle cost.

PORTLAND-LIMESTONE CEMENT (PLC)

Designers often choose concrete for their projects because it is durable, long-lasting, resilient, and versatile. As such, most construction rehabilitation professionals at some point will be presented with an opportunity to repair something made of concrete. Repairing an existing structure can extend its service life appreciably and portland-limestone cement (PLC) makes it possible to achieve any repair with all the expected characteristics that make concrete so attractive in the first place. PLCs can also achieve the added benefit of being more sustainable, meeting societal and regulatory demands to cut emissions and build for a better future, and doing so at scale.

PLC is engineered with a higher limestone content than traditional portland cement, resulting in up to 10% fewer emissions.[2] Most people consider cement and concrete to be basic building materials that have remained unchanged for decades; however, these materials are anything but mundane—cement and concrete are some of the most versatile, adaptable, and customizable materials in the world. Now with PLC, cement and concrete are an innovative pathway through which we can reduce the carbon footprint of concrete repair projects.

With PLC, construction professionals can now achieve repairs by factoring in sustainability of the repair materials along with other project requirements, like strength, that may have historically dominated the selection. They can also do this knowing that PLC has been used in virtually

every segment of construction, from residential homes and commercial office space to interstate paving and bridges, high-rise construction, parking lots, airport paving, and more.

The demand for low-carbon cement and concrete is increasing as more consumers understand the need for sustainable construction, and PLC is one of the most available options for cutting emissions in the immediate term and meeting that demand. It performs just like the cement that concrete repair professionals are used to working with, with the same specifications and mix design, simply with a better carbon profile.

As the cement industry is innovating its products to be more sustainable, the introduction of PLC has been an evolutionary process, which has been grounded in extensive testing and research.

In the laboratory, researchers studied fresh and hardened properties, directly comparing mixes made with PLC to those made with portland cement. Performance was first demonstrated in laboratory testing and then evaluated by observations of field performance over time. Areas studied include resistance to scaling and freeze-thaw, chlorides, sulfates, and alkali-silica reaction. Each type of exposure has been thoroughly investigated to confirm that PLC can produce strong, durable concrete.

PLC IS FINALLY GOING MAINSTREAM

PLC is not a new product. Similar blended cement formulations containing limestone have been used in America's cement infrastructure since the 1920s and have also been in mainstream use in Europe since the 1960s.

PLC is readily available through the same supply chain that already successfully serves developers, builders, and contractors. Using annual cement consumption data from the U.S. Geological Survey (USGS),[3] the Portland Cement Association (PCA) estimates that over the past three years, the U.S. cement industry has consumed a total of approximately 35 million tons [31.8 million metric tons (MMT)] of PLC. Consumption of PLC experienced massive growth in 2022 as adoption grew rapidly. In that year alone, the industry consumed an estimated 27.3 million tons (24.8 MMT) of PLC—more than four times as compared to the previous year. As a result, more than 2 million tons (1.8 MMT) of carbon was avoided in 2022. You can see more on how wider industry PLC use is driving down CO_2 emissions at cementprogress.com.

Similarly, the production of PLC has grown significantly in recent years. Currently, 34 states in the U.S. house cement plants. PLC is produced in at least 24 of these states. A large share of the industry has already announced plans to shift to 100% production of PLC in cement manufacturing plants. Based on public announcements, PCA has determined that at least 35% of the domestic cement industry, measured by clinker capacity, has announced the transition from traditional portland cement production to full PLC production. This translates to roughly 37.5 million tons (34 MMT).

Dakota Project 11.

This trend is expected to grow further. At least 50 plants are producing or have announced plans to produce PLC in the United States. Overall, this accounts for more than 60% of U.S. clinker capacity.

But as with any new product, education, knowledge, and information is key, and to specify PLC for projects, you must know what to ask for. In the U.S., PLC is specified as ASTM C595[4] Type IL cement, and in Canada, PLC is specified as CSA A3000[5] Type GUL (read as "G-U-L").

While many transportation departments permit Type IL cements in their construction projects under ASTM C595, for others, AASHTO M 240[6] Type IL is the proper specification reference. Note that all the technical requirements of ASTM C595 and AASHTO M 240 have been harmonized.

Type IL is permitted by the following:

- Codes, like ACI 318[7], Building Code Requirements for Structural Concrete;
- Specifications, like ACI 301[8] Specification for Structural Concrete;

- Standards, like ASTM C94[9], Specification for Ready Mixed Concrete; and
- AIA MasterSpec[10] that is used by design firms to develop their specifications for private projects.

PREPARING FOR A SWITCH TO GREENER CEMENT BLENDS FOR REPAIR PROJECTS

In any industry, there are challenges and benefits to making a major change. In the construction industry, introducing a new cement type is a major change. For PLC, the benefit is improved sustainability. PLCs have already gained traction throughout the concrete industry for new construction projects. That success has depended in part on the switch to PLC from traditional portland cement, posing minimal disruptions to anyone along the concrete supply chain. Cement manufacturers produce PLC using the same equipment needed to produce portland cement. Ready mix producers use the same equipment to batch and deliver PLC concrete. Concrete contractors (whether for new construction or repair), use the same equipment, methods, and crews to place PLC concrete.

But as the old saying goes, "the devil is in the details." Those details may include proprietary blends of cement-based repair products, demanding project requirements such as rapid strength development, or placing conditions that vary due to region, climate, or season.

Proprietary repair products are formulated by manufacturers to meet specific needs. Manufacturers have matched performance to available materials to best satisfy most applications. Generally, these products undergo extensive research to optimize setting time, strength development, durability, and other properties. When new cement formulations are available, manufacturers must re-verify performance of the modified mixes versus the ones based on portland cement. Requalifying proprietary mixes may require a bit of work, time, and expense. As no two cements are the same, properties of a proprietary mix can vary when PLC or any other new material is introduced, whether that be an admixture, aggregate, or any other component.

Strength development of repair products can be a primary consideration. Often, a deteriorated or damaged concrete member has been taken out of service temporarily and must be put back into service quickly. For instance, a paving application that must be ready for traffic in a very short time frame requires a rapid-strength product. Fast strength gain may also be needed in winter conditions, where protecting the repaired area from cold temperatures disrupts the use of the structure and must be the minimum necessary to ensure durability of the repair.

It's not just cold temperatures that may pose demanding conditions. Hot weather poses a risk of dry-out, fast set, or overly fast strength development. For the wide range of temperature and moisture conditions that exist in the U.S., season and climate both present potential challenges for repair contractors.

An important consideration in achieving success with any repair, whether using proprietary mixes or individual ingredients combined at a project site, is making sure that users know what materials they are working with and understand how to modify practices when necessary. As an example, PLCs are generally ground finer than portland cement to achieve similar strength development and ultimate strength, and the repair contractor needs to know how the increased fineness may affect the fresh properties.

LOOKING AHEAD

From new regulations to shifting consumer demands, every industry is currently being challenged to reduce its carbon footprint. Supplying the majority of construction projects in the United States, the members of PCA (representing most of the U.S. cement industry) are meeting this charge with the production of PLC—while also continuing to explore new, lower emission ternary cement blends. The U.S. cement industry is engaged in an aggressive, multifaceted approach to reach carbon neutrality by 2050,[11] and optimizing the clinker-to-cement ratio is an important ingredient of this initiative.

However, the full impact of innovative cement blends cannot be realized without collaboration from partners across the value chain. Companies shifting to 100% PLC production or 100% PLC production in certain regions, which benefits the emissions profile of the cement industry, presents a massive benefit to those using concrete as it enhances the sustainability aspects of construction projects.

There is a huge opportunity to directly impact the sustainability outcome of a repair project with the product specified and we have the tools—like PLC—that can drive us toward carbon neutrality. Now is the time to start using them.

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Michael "Mike" Ireland is President and CEO of the Portland Cement Association (PCA). Previously, Mike was associate executive director of the American Society of Mechanical Engineers (ASME), as well as CEO of two other professional associations. He is a seasoned association executive with expertise in all phases of organizational management, including executive leadership, marketing and communications, workforce development, philanthropy and fundraising, and membership development. Throughout his career, he has been known for fostering a culture of camaraderie and customer focus, thanks to his sense of creativity and ability to help organizations positively navigate strategic change.

2023 ICRI Sustainability Project Award

I-75 Bridge Over Kirkwood Road—18 Years Later and Still Going Strong

How Ohio DOT is Getting Ahead of the Aging Bridge Maintenance Bubble

by J. Chris Ball and Matt Miltenberger

Fig. 1: Abutment condition prior to repair in May 2005

INTRODUCTION

The Ohio Department of Transportation (ODOT) District 7, located in Sidney, Ohio, is responsible for the roads and bridges of the greater Dayton, Ohio metropolitan area along with Auglaize, Champaign, Clarke, Darke, Logan, Mercer, Miami, Montgomery and Shelby Counties. District 7 is responsible for maintaining over 4,600 lane miles of interstate, federal, and state highways and 1,408 bridges. Most of these bridges are small 2 or 3 span general bridges that were built in the 1950s through the 1970s. Many of the older bridges carry Interstate 75 (I-75) through the district. I-75 is a major north-south highway that runs 1,786 miles from the Great Lakes to the Southeast regions of the United States. It begins at the Canadian border at Sault Ste. Marie, Michigan, and ends near Miami, Florida.

Maintenance of the bridges is key to keeping heavy commercial and noncommercial traffic flowing on this important route. Maintaining this inventory of older bridges is a constant process involving assessing, planning, prioritizing, budgeting and conducting repairs or preventative maintenance.

Through the years, the district struggled to keep up with the number of bridges needing repairs because the area adjacent to the last repairs would require repair within 5 to 7 years. With 1,408 bridges to maintain, they just couldn't sustain the increasing rate of maintenance repair projects each year to keep up with the deterioration rate. When they fell behind, the substructure would deteriorate to a point where the abutment would need to be replaced. However, the decks that had a concrete or asphalt-wearing course normally had minimal distress and years of remaining service life.

BRIDGE ABUTMENT CONDITION

It has become common for abutments to experience concrete damage and deterioration on these slab bridges (Fig. 1). Corrosion was the cause of failing abutments due to the deck joint being directly over the abutment. The joint seals would fail, allowing deicing salt, grit, and water to enter the joint, which would then contaminate the abutment stem wall. These typical 1950s vintage slab bridges would have a 19 to 22 in (0.5 to 0.55 m) thick slab cast onto a key joint at the top of the abutment. As the deck would cool in the winter, thermal contraction would put tension on the key as it pulled the abutment stem walls toward each other (Fig. 2). This movement likely initiated a crack at the base of the key that accelerated salt contamination of the stem wall reinforcing. Once corrosion started, the top of the stem wall would spall.

REHABILITATION OPTIONS AND STRATEGY

The options considered to address the ailing abutments were:

- Do Nothing—Not a feasible alternative for deficient bridges on the interstate system;
- Repair bridge—With appropriate repair, most of these bridges have remaining service life; or
- Replace bridge—Not cost-effective to remove a good slab, and extremely disruptive to traffic.

In 2005, The District Bridge Engineer strategized that if the entire abutment were repaired in such a manner that the repairs could last 20 years, it would allow the district to get ahead of the repair cycle, allowing the district more time to program bridge replacement. The intent of this strategy was to provide additional service life to the abutment to match or exceed the remaining service life of the deck.

As a result, ODOT District 7 conducted an experiment with the objective of finding a method to get ahead of a seemingly constant substructure repair cycle. This experiment replaced the normal process of performing substructure patch repairs with an abutment refacing strategy using self-consolidating concrete (SCC) with galvanic cathodic protection to prevent reoccurring corrosion activity, allow thermal joint movement, and reestablish the slab-bearing surface (Fig. 3).

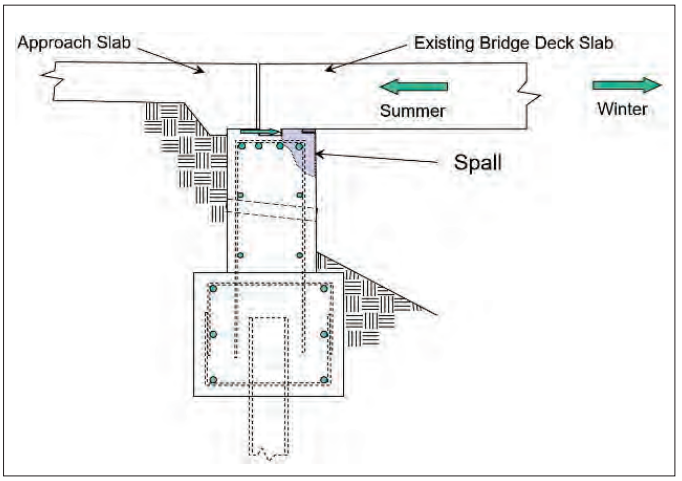

Fig. 2: Original 1950s abutment stem wall detail

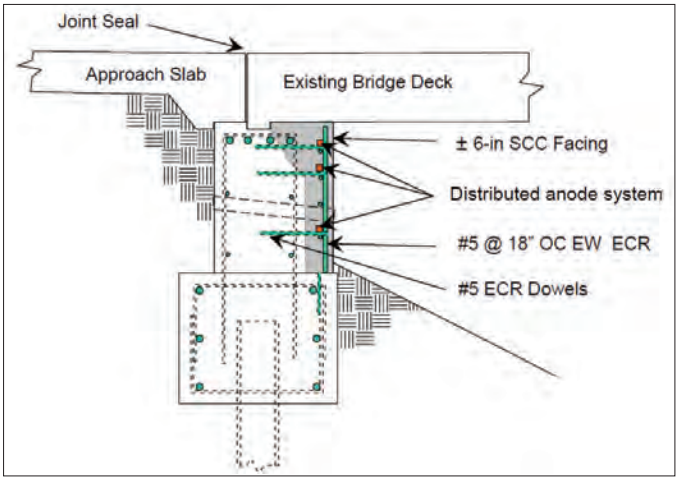

Fig. 3: Galvanic encasement rehabilitation detail

REPAIR PROCESS

In general, the repair steps were as follows:

- Excavate the soil to expose and clean the pile cap;
- Remove all unsound concrete at the wall and behind reinforcing steel (Fig. 4);
- Abrasive blast the concrete substrate and reinforcing steel to remove rust and residual concrete;
- Drill and install epoxy-coated dowels and form anchors in sound concrete;
- Connect alkali-activated distributed galvanic anodes to existing reinforcement (Fig. 5);
- Install monitoring instrumentation (Fig.6);
- Install new layer of epoxy-coated reinforcing and extend weep holes;
- Pressure wash to moisten and remove loose concrete, and deleterious material;
- Install forms to increase concrete section and seal seams (Fig. 6);
- Pump SCC into forms from bottom up, and plug top of form as concrete fills formwork;
- Remove forms after 72 hours and abrasive blast wall surface; and


Fig. 4: Concrete spall removal


Fig. 5: Dowels and galvanic anodes installed

- Coat entire abutment wall surface with a low viscosity penetrating epoxy primer and an aliphatic urethane topcoat (Fig. 7).

In addition to the abutment stem wall repair and section enlargement, deck joint glands were typically removed and replaced. A lane was closed during concrete operations to minimize vibration, and the abutment refacing was conducted in two phases. Traffic was shifted from the side where concrete was cast to minimize vibration, and forms were left in place to promote curing. Use of a curing agent was not allowed prior to coating.

Fig. 6: Formwork and monitoring station prior to pumping SCC

Fig. 7: Abutment of I-75 Bridge over Kirkwood Road (mm 87) in July 2005 (completed repair)

Date	Temperature, degree C	On Potential E_{ON}, mV	Instant Off E_{IOFF}, mV	Current Density Icp, mA/m²	Polarization, Epol, mV
5/6/2005	("Native")		"-654"	37.7	
7/20/2005		-1061	-990	14.0	346
8/16/2005	30.6	-1136	-998	12.7	344
10/26/2005	12.2	-1082	-1023	5.4	369
12/7/2005	10.6	-982	-964	2.9	310
5/1/2006	13.9	-1051	-967	7.3	313
12/20/2006	4.6	-1176	-1113	3.7	459
5/30/2007	26.3	-1212	-1104	7.5	450
9/20/2007	23.9	-1238	-1136	9.1	482
12/19/2008	4.4	-1174	-1105	3.5	451
7/9/2009	23.3	-1146	-1125	2.8	471
5/11/2010	12.2	-1160	-1139	3.4	485
10/16/2011	22.2	-1193	-1142	5.9	488
4/22/2013	21.1	-1113	-1079	3.1	425
3/24/2015	1.7	-1060	-1035	2.0	381
9/17/2018	25.6	-1044	-1007	5.3	353
9/9/2020	26.7	-1036	-1005	3.6	351
8/23/2022	26.7	-1008	-986	2.0	332

Fig. 8: Galvanic cathodic protection performance data for Bridge SHE-75-0152

CATHODIC PROTECTION

The installed rod-shaped distributed galvanic anode system, commonly referred to using the acronym D.A.S., is an alkali-activated zinc anode encased in a mortar shell. The anodes were sized to protect the existing reinforcing under the joint for a minimum of 20 years of service life. The alkali-activated galvanic anode technology was commercialized in the late '90s. At that time, the larger elongated anode shape was being introduced to provide global (entire element) cathodic protection. Previously, embedded galvanic anodes were being used around the perimeter of patch repairs and drilled-in anodes were used for localized corrosion control in sound concrete. The longer rod-shaped anodes were designed to protect 100% of the original stem wall reinforcement, and in some cases, were also used to protect the epoxy reinforcement used in the refacing portion.

The table in Figure 8 shows the manual data collected indicating the galvanic cathodic protection system is meeting AMPP/NACE performance criteria. Figure 9 shows the cathodic protection data collected over the years indicating the galvanic anodes are providing full cathodic protection. These data were collected using battery powered data loggers, and over time, these failed due to nearby lighting strikes or depleted batteries. The data clearly show the galvanic output of the anodes is influenced by temperature and that the galvanic current generally decreases over time.

RESULTS AND SUSTAINABILITY

Over the last 18 years, the bridges included in the ODOT refacing experiment have performed remarkably well (Fig.

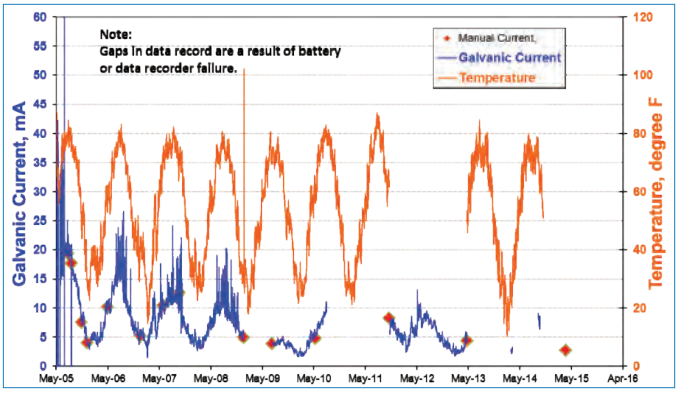

Fig. 9: Cathodic protection performance data

Fig. 10: Abutment of I-75 Bridge over Kirkwood Road (mm 87) in 2022 (Note efflorescence from leaking joint and weep holes)

10), eliminating two full 7-year repair cycles so far and appearing to have many more years of service to go. This strategy has proven exceptional progress in sustainability by reducing the natural resources consumed, reducing the growth of the DOT's yearly bridge maintenance costs, and minimizing traffic disruption costs. Keeping structures intact ensures their embodied carbon and energy stay in place and avoids adding solid waste to landfills.

Satisfied with the performance of the galvanic cathodic protection system, ODOT District 7 continues to use this strategy on numerous abutment repairs and uses galvanic cathodic protection on slab bridge deck widening and guard rail replacement projects. With 250 slab bridges in the district's inventory, the common sentiment in 2005 was, "We never seem to get ahead of the repairs." Now, this strategy has been successfully used to extend the service life of dozens of bridges.

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Project: I-75 Bridge Over Kirkwood Road

OWNER
State of Ohio Department of Transportation
Sydney, Ohio

DESIGNER
State of Ohio Department of Transportation
Sydney, Ohio

REPAIR CONTRACTOR
Complete General Construction Company
Columbus, Ohio

MATERIAL SUPPLIER/ MANUFACTURER
Kryton International, Inc.
(hydraulic cement, crystalline repair grout, crystalline slurry treatment)
Vancouver, British Columbia, Canada

MATERIAL SUPPLIER
Vector Corrosion Technologies, Inc.
U.S. Office: Lexington, Kentucky
Headquarters: Winnipeg, Manitoba, Canada

What Is Causing the Sudden Rise of EPDs?

by Lionel Lemay and Chris Erickson

Environmental Product Declarations (EPDs) are emerging as the centerpiece of a worldwide transformation in how buildings and infrastructure projects are designed, and materials specified (Fig. 1). In this article, we explore the rise of EPDs, the main drivers behind the rise, and how EPDs are changing and accelerating cement and concrete innovation.

WHAT ARE EPDS?

Environmental Product Declarations (EPDs) are quite new. They are based on ISO 14025,[1] Environmental labels and declarations—Type III environmental declarations—Principles and procedures, first published in 2006. This standard provides basic guidelines for producing EPDs.

Fig. 1: Bank of America Tower, a 35-story, 750,000-square-foot, Class A office building in Houston features concrete pan formed beams with post-tensioned girders, a mat foundation and concrete core/shear walls. This LEED Platinum certified project demonstrates significantly lower environmental impacts over a typical building and meets the rigorous Life Cycle Assessment (LCA) credit in LEED v4 by using high volume supplementary cementitious material concrete mixes. Image: courtesy of Skanska USA Commercial Development, Inc.

An EPD is a communication document that quantifies environmental impact data from a manufacturing process or product. It is a summarized report (Fig. 2) extracted from an in-depth Life Cycle Assessment (LCA) that complies with the ISO 14040[2] series of standards. Like financial statements, EPDs are audited (verified) to add credibility to the reported data and to the reported environmental performance of a product. Principally because of this veracity, EPDs have emerged as the gold standard for measurement of environmental performance. While EPDs measure 20 or more environmental impacts, Global Warming Potential (GWP), more commonly known as the carbon

ENVIRONMENTAL IMPACTS

Declared Product:
Mix 40KL30H6G • Denver Plant
Description: 4K 20% 467 INT GENERAL
Compressive strength: 4000 PSI at 28 days

Declared Unit: 1 m^3 of concrete

Global Warming Potential (kg CO_2-eq)	311
Ozone Depletion Potential (kg CFC-11-eq)	7.30E-6
Acidification Potential (kg SO_2-eq)	0.95
Eutrophication Potential (kg N-eq)	0.35
Photochemical Ozone Creation Potential (kg O_3-eq)	21.4
Abiotic Depletion, non-fossil (kg Sb-eq)	6.13E-5
Abiotic Depletion, fossil (MJ)	693
Total Waste Disposed (kg)	90.0
Consumption of Freshwater (m^3)	3.52

Product Components: natural aggregate (ASTM C33), crushed aggregate (ASTM C33), Portland cement (ASTM C150), batch water (ASTM C1602), fly ash (ASTM C618), admixture (ASTM C494)

Additional detail and impacts are reported on page three of this EPD

Fig. 2: Summary table from EPD presenting environmental impacts of a concrete mix. Image: NRMCA

footprint of a product, is nearly always the single measure evaluated by users of EPDs.

WHAT IS CAUSING THE RAPID INCREASE IN USE OF EPDS?

Increasing recognition of the threat of climate change is the overriding factor as the cause to the rapid increase in EPD use—but secondary, more immediate influences are responsible for the current sense of urgency. These immediate influences come from green building standards and initiatives, financial markets, government "buy clean" policies requiring EPDs for construction, and from global developers, such as Amazon and Microsoft requiring EPDs on their projects worldwide.

These factors are playing out in different ways and at different paces in Europe, the Americas and Asia, but the worldwide result is sustained focus on sustainability and the use of EPDs for measurement of Global Warming Potential (GWP) reductions.

GREEN BUILDING STANDARDS AND INITIATIVES

As an old saying goes, you can't improve what you don't measure. EPDs are the mechanism by which a project team can estimate the greenhouse gas emissions and other environmental impacts associated with the materials used on their projects. With a bill of materials and a product-specific EPD for every material, a carbon estimate can be generated just as easily as a cost estimate. As the primary liaison between the developer, design team, and subcontractors, general contractors (GCs) are starting to assess how to evaluate and utilize the information in an EPD. "Carbon value engineering" is a concept that is gaining traction. A GC will collect lower carbon alternate ideas from subcontractors during the bidding phase and communicate cost, schedule, and other ramifications in a typical value engineering format, with carbon impacts included.

In 2011, the U.S. Green Building Council (USGBC) began the process of developing a revolutionary new version of Leadership in Energy and Environmental Design (LEED), eventually adopted in 2016 as LEED v4,[3] which included more rigorous provisions to demonstrate lower environmental impacts, including embodied carbon emissions (Fig. 3). The provisions were more scientifically based and included requirements to submit EPDs on projects and conduct life cycle assessments, the foundation of EPDs. At the same time, a new voluntary initiative called Architecture 2030[4] issued the Challenge for Products that called for reduction of embodied carbon by 50% by 2030 and 100% by 2050. Since then, several other standards and initiatives have adopted similar requirements including Green Globes,[5] Living Building Challenge,[6] International Green Building Code[7] and SE 2050[8] (structural engineers). At first, the acceptance of these new standards and initiatives was slow, but more recently, building owners and design professionals are designing their projects with embodied carbon as a focus and measuring progress on projects and construction overall.

In the last several years, state and local governments have been proposing and, in some cases, adopting legislation that requires product suppliers to meet maximum embodied carbon for building products. They are sometimes identified under different names, including embodied carbon or "buy clean" legislation. Sometimes, they include requirements for most building materials, but often, they focus on concrete and cement. But in all cases, the legislation turns to EPDs as the way to measure embodied carbon.

Finally, many building owners and developers are not waiting for legislation or building code requirements to reduce the carbon footprint of their building products. Most major architects and engineers are writing specifications that require product suppliers to demonstrate a lower carbon footprint. Often, these specifications focus on concrete, because nearly every project uses concrete to some degree and many choose concrete as the main structural system. The largest architecture firms in the world are requiring carbon footprint reduction on their projects driven by their clients' carbon reduction goals—including some of the largest developers and owners in the world. Companies such as Lendlease, Hines, Microsoft, Amazon, Google, and Meta have declared carbon neutrality goals. Even the General Services Administration (GSA), the U.S. government agency that owns and operates government properties and the largest property owner in the U.S., recently adopted specifications that will require concrete on projects to meet specific embodied carbon targets.

FINANCIAL MARKETS

The largest money manager in the world, BlackRock, which oversees $10 trillion in assets, has made it clear that they are not interested in investing in companies that do not decarbonize. Larry Fink, the CEO of BlackRock, in his "An-

Fig. 3: The design team for the $24 billion San Francisco Airport Terminal 1 Redevelopment project used LCA software to quantify and explore opportunities to reduce environmental impacts of the project. They used the National Ready Mixed Concrete Association benchmark mix designs for the baseline building and mix design data for low-cement concrete mixes from the concrete producer's product-specific EPDs for the proposed building to meet the LEED v4 LCA credit. Image: Courtesy of HKS.

nual 2022 Letter To CEOs"[9] said, "Engineers and scientists are working around the clock on how to decarbonize cement, steel, and plastics; shipping, trucking, and aviation; agriculture, energy, and construction. The decarbonizing of the global economy is going to create the greatest investment opportunity of our lifetime." He also said, "And today, every car manufacturer is racing toward an electric future. The auto industry, however, is merely on the leading edge—every sector will be transformed by new, sustainable technology." Simply put, investor sentiment is a major driving force causing every cement and concrete company to commit to carbon neutrality by 2050, and to make the enormous research and development (R&D) and capital investment required.

While measuring smokestack emissions is common and mandated in many countries, these emission measurements are incomplete as compared to EPDs that measure all emissions, from mining the limestone to emissions from basic plant maintenance. In addition, EPD systems are capable of calculating "What if" scenarios, such as what if I change fuels, or what if I change blends? In combination with smokestack emission measurement, EPDs provide a complete picture, the critical insights for innovation and improvement, and a trusted and concise method for reporting.

LOCAL OPERATIONS SEE FORCES FOR CHANGE

When managing a cement or concrete company, investor pressure can seem abstract. However, significant day-to-day business pressures for decarbonization have emerged in many markets and the trend is rapidly expanding to all markets. Unlike top-down investor pressure to decarbonize, market and customer demand to buy reduced carbon concrete is immediate and can impact today's revenue and profit.

Direct commercial demand is most visible in North America, where the more unfettered capitalism has taken hold.

Fig. 4: The Oracle Waterfront Campus in Austin, Texas is a corporate office building with 550,750 square feet of floor space with a 147,000-square-foot attached ground level parking garage and 646,800-square-foot detached parking garage. The design team used LCA and EPDs to meet rigorous LEED Whole Building LCA credit by showing at least a 12% reduction in Global Warming Potential. Photo: Casey Dunn.

Among major owners and engineering and architectural firms, and the largest general contractors and developers, many have implemented EPD programs (Fig. 4), established specifications for EPDs and often encouraged their customers to require EPDs.

THE EMERGENCE OF DIGITAL TOOLS FOR EPD ANALYSIS

Leading architecture, engineering and construction (AEC) firms are investing in software such as Building Transparency's[10] free, open-access tool called the Embodied Carbon in Construction Calculator (EC3) designed specifically to use digitized EPD data for purchase decision analysis. In just over 2 years, EC3 has over 22,000 users in 70+ countries and has been utilized in over 2,500 projects.

In Europe, the InData network[11] with eleven member countries is working to establish an open web based international data network structure for EPD/LCA data. InData has partnered with ECO Platform, a European Association made up of EPD verification administrators, industry associations, and life cycle analysis experts, and is adopting the ILCD+EPD Data format from ECO Platform to provide a common data format. InData currently has an EPD search engine of all major program operators in operation[12]). InData does not yet have the EPD analysis tools like those available from EC3.

GLOBAL INCONSISTENCY HINDERS GROWTH OF EPDS

While the details go beyond the scope of this article, two standards for digital interchange and analysis of EPDs exist as described above, one from ECO Platform and the other from Building Transparency. In October 2021, the two organizations formed a partnership to collaborate on harmonization.

In addition, two baseline standards in North America, EN 15804[13] (drafted and maintained by CEN, the European Committee for Standardization) and ISO 21930,[14] provide guidance for developing EPDs for construction products and services. Both strive to harmonize the structure for EPDs in the construction sector to improve transparency and comparability. While the two standards are merging, ISO 21930 is now more like EN 15804.

The challenge of evolving standards is twofold. For global producers, buyers, and specifiers of construction products, the challenge is that EPDs from different regions are different and produce different results. The challenge for producers and verifiers, as well as the consumers of EPDs, is that multiple standards increase the cost of EPDs.

THE FUTURE IS INSTANT ALL DIGITAL EPDS

While we live in a digital world, with expectations for instant data availability, EPDs were born in 2006 as a complex, expensive, and static report developed by specialized life cycle assessment (LCA) professionals with expectations that each EPD would remain unchanged for 5 years. This approach to create EPDs was taken as EPDs were new

and born out of the discipline of the LCA, but the prohibitive cost and static nature is anathema to rapid innovation and regular periodic environmental reporting.

In recent years, we have seen instant digital EPDs emerge as the dominant form in North America for ready mix concrete and concrete masonry units (CMU), and now becoming available for cement in Europe.

Two companies in the US, Climate Earth and WAP Sustainability, work within the National Ready Mixed Concrete Association (NRMCA) EPD program (and others) to offer on-demand digital EPDs. There has been resistance to automated EPDs due to concerns about data quality, and the need to adopt more advanced software verification processes. Today, much of the LCA community, and verifiers, recognize that sophisticated software algorithms combined with easy-to-use verification reports make for a higher quality EPD than manual verification entailing in-depth review of large complex process models and multi-page spreadsheets. Of course, the appeal to users to have an EPD in hand in seconds, rather than waiting weeks for a consulting report, was immediate.

Instant digital EPDs also give producers the ability to do immediate 'what if' analyses. For example, what if analysis answers questions like: what if I change processes, fuels, or blends? Instant EPDs immediately demonstrate the improvements of such changes and become a critical tool for accelerating concrete mix design and cement blend and fuel innovation.

WHAT CAN WE CONCLUDE ABOUT EPDS?

The first clear conclusion is that EPDs are here to stay. EPDs have become the de facto measure of GWP and carbon reduction performance. The second conclusion is that the process of producing EPDs has become more efficient and cost effective. Measuring environmental impact will soon be as commonplace as measuring concrete compressive strength or set time. NRMCA saw this trend early on and launched its EPD program and helped migrate to the digital on-demand process for developing EPDs.

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To learn more about EPDs and the NRMCA EPD program, visit www.nrmca.org/sustainability.

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Chris Erickson is president and chief executive officer at Climate Earth, Inc. Chris founded Climate Earth to make environmental performance integral to every business decision. He is a Fortune 500 executive and CEO with vast experience from several venture-funded big data and software start-ups. He holds an MBA from UC Berkeley.

Introduction to ICRI Technical Guideline No. 210.5–2023

Guide for Selecting and Specifying Reinforcing Bar Cleaning Levels

by Charles Mitchell

ICRI Technical Guideline No. 210.5–2023,[1] *Guide for Selecting and Specifying Reinforcing Bar Cleaning Levels*, was published recently. The guideline offers an overview of how to provide an objective, standards-based comparison for the specification, evaluation, and approval of the degree of surface preparation of exposed conventional reinforcing steel by abrasive media blasting and mechanical hand tool methods.

Cover of ICRI Guideline No. 210.5–2023

SURFACE PREPARATION/CLEANING OF CORRODED REINFORCING STEEL

Specifications for cleaning exposed steel reinforcing in concrete repair projects are typically rather vague and subjective. The focus has been on the unsound concrete and how to remove it from around the steel reinforcing. For example, a structural engineer may indicate in the project specifications that all exposed reinforcing be undercut to a specified depth (Fig. 1). When referring to the removal of delaminations, the attention is directed toward the condition of the existing concrete, while the condition of the in-situ steel reinforcing is typically mentioned only in terms of the observed section loss and any contaminants remaining on the surface. The specification may go on and state that the concrete substrate and exposed reinforcing must be cleaned by abrasive blasting/high-pressure water jetting, and all concrete fragments, corrosion products, mill scale, and other contaminants removed from the existing reinforcing bars.

This guide provides owners, structural engineers, specifiers, contractors, and manufacturers with the tools needed to select and specify the minimum degree of desired reinforcement cleaning using mechanical equipment or abrasive media blasting.

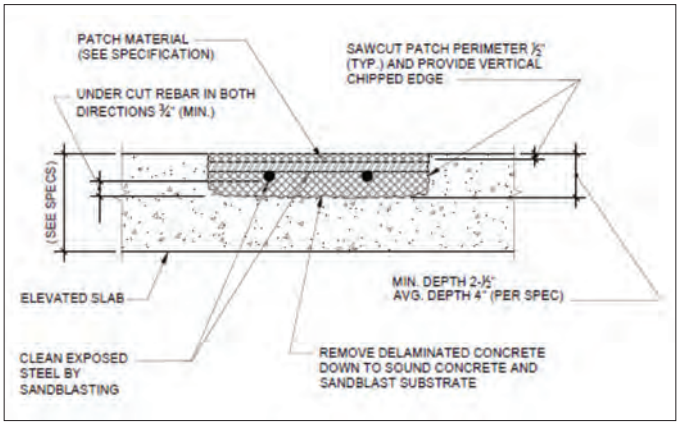


Fig. 1: Top Surface Partial Depth Repair (image courtesy of SK&A Structural Engineers)

The challenge has always been determining a sufficient level of rebar cleanliness on a concrete repair project where the bars are exposed after demolition of deteriorated/unsound concrete. This guide, along with the digital application and physical set of rebar cleanliness level samples is designed to facilitate the evaluation of the exposed reinforcing. The structural engineer specifies a level of cleanliness; the contractor executes the work to the structural engineer's specifications; and the inspector performs quality assurance confirming the contractor achieved the level of rebar cleanliness specified by the structural engineer. The objective is to get all stakeholders on the same page with respect to the cleanliness level of the bars. The contractor will understand what the structural engineer is looking for, and the inspector will know what the design

criteria are. It eliminates a great deal of subjectivity by each stakeholder in determining how clean the bars are.

CORROSION IN CONCRETE

The guide gives a brief description of corrosion in concrete. Repairs are often performed due to deteriorating concrete resulting from the corrosion of in-situ reinforcing bars. Spalling occurs because iron oxides resulting from steel corrosion occupy a volume up to 6.5 times larger than that of the original steel (ACI 222R[2]). The volume increase creates internal tensile stresses within the concrete cover, which cause cracks to develop when the resulting stress exceeds the tensile capacity of the concrete. The cracking increases exposure of the steel to chlorides, oxygen, carbon dioxide, and moisture, contributing to increased corrosion activity in the steel reinforcing. As corrosion continues, delamination and spalling occur (Fig. 2).

As described in ICRI 510.2[3] and ACI 222R, corrosion of reinforcement within concrete generally requires oxygen, moisture, and the presence of chlorides or carbonation that affect the protection normally offered to the reinforcing steel by the alkaline environment of the concrete. Preventing the reoccurrence of the corrosion which caused the delamination requires the chlorides and/or carbonated concrete be removed, and that the alkaline environment be re-established in the proximity of the in-situ steel reinforcing, therefore requiring that the steel reinforcing is sufficiently cleaned.

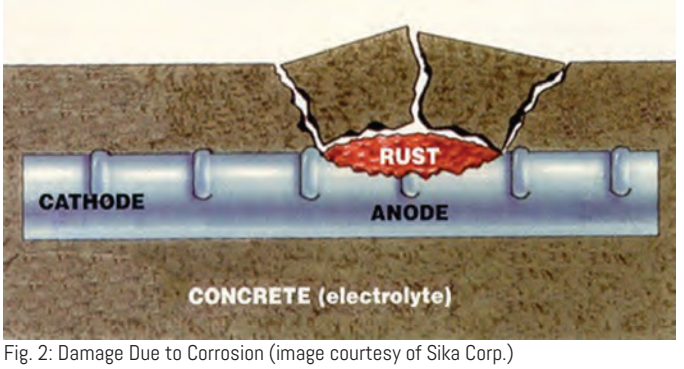


Fig. 2: Damage Due to Corrosion (image courtesy of Sika Corp.)

METHODS OF REINFORCING BAR CLEANING

The guide mentions the NACE/SSPC Joint Surface Preparation Standards (SSPC-SP[4]) often specified for reinforcing steel surface preparation. These standards are based on flat surfaces and are not directly applicable to reinforcing bars. Cleaning and surface preparation of reinforcing steel are critical for the removal of corrosion products and the contaminants (e.g., chlorides) that contribute to the corrosion process.

The degree of surface preparation required, however, is not universal for all repair projects and design professionals. This document establishes three levels of surface preparation for each cleaning method, that may be used in project specifications to establish the degree of cleaning required.

The guide describes two methods for cleaning in-situ rebar: abrasive media blasting, and mechanical cleaning. Abrasive media blasting (AMB) uses high-pressure air to propel an abrasive media to remove corrosion products, cement paste, and contaminants from reinforcing steel. For further discussion on AMB, reference Section 8.1 of ICRI 310.2R.[5] Mechanical cleaning involves the use of either power or hand tools to clean the surface of reinforcing steel. The most common power tool is a wire wheel disc on a grinder. There are advantages, and of course disadvantages, to using either method as described in Figure 3.

Method	Advantages	Disadvantages
Abrasive Media Blasting (AMB)	• Rapid • Backside of reinforcing can be cleaned more easily • Application to nearly any repair geometry • Cleans the surface of the concrete and opens up the concrete pores which promote better adhesion of the new concrete	• Considerably more protection of adjacent area required • Containment and collection of blasting media generally extensive • Costly equipment
Mechanical Cleaning	• Less expensive equipment • No abrasive media to contain/ collect • Less setup is required	• Cleaning backside of reinforcing may require deeper concrete removal for access • Generally slower and more labor intensive

Fig. 3: Advantages and Disadvantages of AMB and Mechanical Cleaning

Preparation Method Corrosion Type	Abrasive Media Blast		Degree of Cleaning Required to Achieve	Mechanical Equipment	
Uniformly Corroded Without Preparation: U0	AU1	Level 1 Clean	Least ↓ Most	MU1	Level 1 Clean
	AU2	Level 2 Clean		MU2	Level 2 Clean
	AU3	Level 3 Clean		MU3	Level 3 Clean
Pitted Without Preparation: P0	AP1	Level 1 Clean	Least ↓ Most	MP1	Level 1 Clean
	AP2	Level 2 Clean		MP2	Level 2 Clean
	AP3	Level 3 Clean		MP3	Level 3 Clean

Fig. 4: Preparation Method and Cleanliness Level Matrix

The method of cleaning must be selected, initially, then the type of corrosion must be identified. Subsequent to selection of the cleaning method and identifying the corrosion type, the engineer must decide the amount of cleaning that will be required. The guide outlines the highest level of cleaning (most clean) as Level 3 and the lowest level of cleaning represented by the samples (least clean) as Level 1, as shown in Figure 4.

CEMENT PASTE OR CONCRETE REMAINING ON REINFORCING BARS

The more contaminants removed from the in-situ rebar, the greater the likelihood of the new repair material, or rebar coating, to be well bonded. Cement paste or concrete residues on the reinforcing, as shown in Figure 5, allow for the potential of corrosion of the reinforcing to continue because it may contain chlorides or may be carbonated.

REINFORCING BAR CLEANLINESS LEVELS

The remaining cement paste and concrete residue can interrupt load transfer between the existing reinforcing in the concrete substrate and the area being repaired. The guide further illustrates that the cleanliness level applies to all surfaces of the bar, including the backside of the bar. All cement paste and concrete residue should be removed as reflected in Figure 6. The cleanliness levels from abrasive cleaning for both pitting and uniform corrosion are shown in Figure 6a, and from mechanical cleaning in Figure 6b.

FLASH RUST

Lastly, the guide gives a brief description of when a thin layer of water and moisture can occur on exposed steel

Fig. 5: Cement Paste Remaining on In-Situ Rebar

Description	Level
Pitted	1
	2
	3
Uniform	1
	2
	3

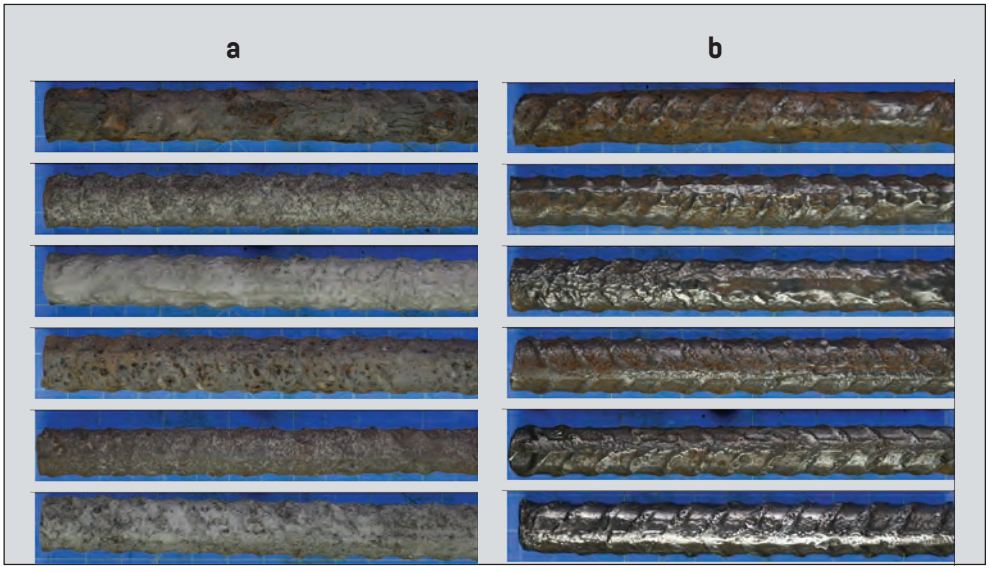


Fig 6. Cleanliness Levels: (a) Abrasive Cleaning and (b) Mechanical Cleaning

reinforcement, starting the corrosion process. This occurrence is defined as flash rust and the corrosion process can be seen when the steel reinforcement is covered with a bright orange color. Flash rust can develop on cleaned bars, and depending on the environmental exposure of the repair location, corrosion may be accelerated by the presence of chlorides. The orange rust will not affect the structural integrity of the steel reinforcement but will affect the bond of any waterproofing or anti-corrosive coating. In Figure 7, photographs from top to bottom for abrasive and mechanically cleaned bars show the original cleaned condition, then the flash rusted condition.

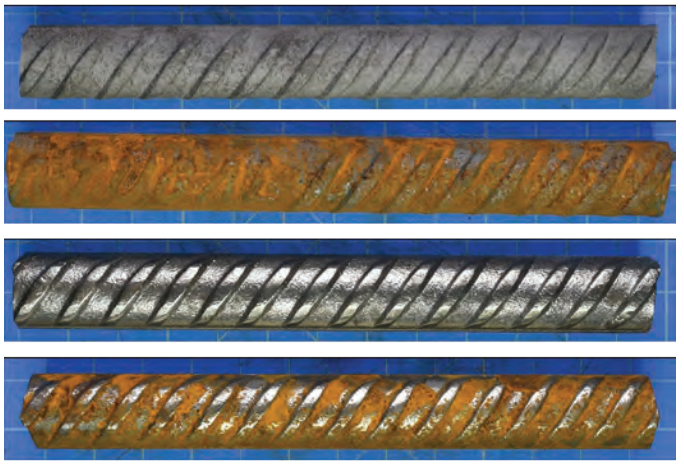


Fig. 7: Flash Rust Examples

SUMMARY

The intent of the document is to provide objective, standards-based comparison for the specification, evaluation, and approval of the degree of surface preparation of exposed conventional reinforcing steel by abrasive media blasting and mechanical hand tool methods. The guide is designed for use with associated illustrative materials available in digital or physical form through ICRI. The digital application will be available by Spring 2024. The physical bar samples are still in the process of development, and future progress of their production will be made public in the coming months.

REFERENCES

1. ICRI 210.5, *Guide for Selecting and Specifying Reinforcing Bar Cleaning Levels*, International Concrete Repair Institute, Minneapolis, MN, 2023, 5 pp.

2. ACI 222R, *Guide to Protection of Reinforcing Steel in Concrete against Corrosion*, American Concrete Institute, Farmington Hills, MI, 2019, 6 pp.

3. ICRI 510.2, *Guide for Use of Penetrating Surface Applied Corrosion Inhibitors for Corrosion Mitigation of Reinforced Concrete Structures*, International Concrete Repair Institute, Minneapolis, MN, 2019, 24 pp.

4. NACE/SSPC (SSPC-SP), *Joint Surface Preparation Standards*. (NACE and SSPC have recently merged to form AMPP, the Association for Materials Protection and Performance), Houston, TX.

5. ICRI 310.2R, *Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair*, International Concrete Repair Institute, Minneapolis, MN, 2013, 55 pp.

Charles Mitchell, Director of Testing & Inspection at SK&A Structural Engineers, is responsible for the management and oversight of the technical aspects of Testing & Inspection (T&I) services in SK&A's Repair and Restoration Division. He has been involved with construction services on structural design projects for over 42 years, the last 16 years with SK&A. Charles was recently the Vice President and Manager of Operations for Eastern Testing & Inspection Corporation, until its transition into SK&A. Charles provides project management and oversees quality control regarding T&I services performed by all staff, ensuring compliance with national and local standards, and is also responsible for client relations as well as marketing and business development for T&I services.

Charles serves as chair of ICRI's Committee 210–Evaluation and is a member of the ICRI Surface Preparation, Concrete Repair Materials and Methods, and Coatings and Waterproofing committees. He is a past president and serves on the Board of Directors of WACEL (Washington Area Council of Engineering Laboratories), a member of ASTM Committee C09 on Concrete and Concrete Aggregates, the National Chapter of ACI, and a member of the American Welding Society (AWS).

ASSOCIATIONNEWS

TACA CELEBRATES THE ENVIRONMENT, SUSTAINABILITY & SAFETY

The Texas Aggregates & Concrete Association (TACA) welcomed 124 attendees to its annual Environmental, Sustainability & Safety Seminar on Oct. 19-20 at The Westin Irving Las Colinas in Irving, Texas.

In addition to hearing from industry experts on climate change, air quality monitoring, truck safety and TCEQ permitting regulations, members enjoyed learning about a unique Texan by Nature (TxN) program that encourages private companies to adopt voluntary best practices that are sustainable, but that also make good business sense.

TxN, which unites conservation and business leaders who believe Texas' prosperity is dependent on the conservation of its natural resources. TxN, founded by former First Lady Laura Bush, acts as an accelerator for conservation groups and a strategic partner for business. TxN supports 140+ conservation organizations and has accelerated projects and programs that have impacted seven million-plus people, 20 million acres and all of Texas' 254 counties.

TxN is working with TACA member companies to develop similar conservation projects, such as the use of a closed-loop water recovery system and vegetated buffer zones. Companies that adopt Texan by Nature initiatives will receive TxN Certification by the group, which can then be used to highlight their sustainability programs.

For details, visit www.tx-taca.org.

THE WINNERS OF THE 9TH ANNUAL ACI EXCELLENCE IN CONCRETE CONSTRUCTION AWARDS

The ninth annual ACI Excellence in Concrete Construction Awards showcased dozens of innovative concrete projects from around the world at the ACI Excellence in Concrete Construction Awards during the ACI Concrete Convention in October 2023.

The "Overall Excellence" award was presented to Quay Quarter Tower, located in Sydney, New South Wales, Australia. It also received first place in the repair and restoration structures category.

The Quay Quarter Tower is the world's tallest adaptive reuse project. Adaptive reuse refers to a transformation of use from

a building's original purpose, while preserving its architectural and cultural heritage. Quay Quarter Tower, a 45-year-old concrete building, was repurposed with partial demolition and the addition of new elements—expanding both the ground width and height of the original structure. The new upcycled tower is a 709 ft tall building using a mixture of material solutions that extend service life until 2070. The project overcame unprecedented structural engineering challenges with innovative solutions that have set a new global standard for the effective conservation and lifetime extension of tall concrete buildings. Through a rigorous assessment and verification process, this project is the world's first example of the adaptive reuse of a concrete skyscraper.

For additional projects recognized, visit ACIExcellence.org.

INDUSTRYNEWS

DOKA ANNOUNCES PARTICIPATION IN THREE INNOVATIVE PROJECTS

Doka USA, the leader in providing innovative formwork and safety solutions, announces Doka's participation in three innovative projects in the United States.

Building Alloy with Doka's Full Package Solution—An innovative skyscraper in the historic area of Los Angeles. For details, visit https://www.doka.com/us/news/press/alloy-tower for details

Hyundai Electric Vehicle Plant Fast-Tracks Multiple Projects—A massive three-building Hyundai Motors project that is relying on a fast timeline. For details, visit https://www.doka.com/us/news/press/hyundai-electric-vehicle-plant

Doka's Unique Slipform System Delivers Essential Solution to State-of-the-Art Facilities—A state-of-the-art anaerobic digester facility coming to the Bronx, a New York City borough. For details, visit https://www.doka.com/us/news/press

FACILITY AND PRODUCTION CAPACITY INCREASE MARKS COMPOSITES GROWTH OF DETECTABLE WARNING SYSTEMS' SAFETY PRODUCT LINE.

With one of the industry's most complete line of tactile warning products for visually impaired pedestrians, Mar-Bal continues to expand its growth trajectory into this growing market by increasing the production capacity of their manufacturing plant in Dublin, VA. In addition to installing two new large compression presses, their warehouse at the Pulaski, VA location was also expanded to approximately 2X (72k sq.ft.) its previous size.

The Dublin, VA plant, one of Mar-Bal's three manufacturing facilities in the US, produces all of the DWS composite panels.

The expansion secures Mar-Bal's ability to grow the business which, in turn, provides employment opportunities–not only for the VA plant, but also its OH plant.

The increase of production capacity, warehousing, and sales/service force will allow DWS to penetrate deeper into the concrete, asphalt, and paving-focused entities at a competitive cost.

For further information on the expansion and Mar-Bal's product line, visit www.detectable-warning.com.

INTERESTED IN SEEING YOUR NEWS IN HERE?

Email your 150-200 word news/press release to editor@icri.org. Content for the March/April 2024 issue is due by February 1, 2024, and content for the May/June 2024 issue is due by April 1, 2024. ICRI reserves the right to edit all submissions.

CONCRETEREPAIRCALENDAR

JANUARY 22, 2024
2024 ICRI Kick-Off Party
Las Vegas, Nevada
Website: www.icri.org

JANUARY 22–25, 2024
World of Concrete
Las Vegas, Nevada
Website: www.worldofconcrete.com

FEBRUARY 21, 2024
The Concrete Durability Webinar Series #5
Extending Bridge Life Using Targeted Cathodic Protection
Website: www.icri.org

MARCH 20, 2024
The Concrete Durability Webinar Series #6
Surface Applied Cathodic Protection
Website: www.icri.org

MARCH 24–28, 2024
ACI Concrete Convention
New Orleans, Louisiana
Website: www.concrete.org

APRIL 22–24, 2024
2024 ICRI Spring Convention
Transportation: Roadways, Bridges, and Tunnels
Boston, Massachusetts
Website: www.icri.org

PEOPLEONTHE MOVE

CTLGROUP PROMOTES DAVID CORR

CTLGroup is pleased to announce the promotion of David Corr, PhD, PE, from his previous role as Principal Engineer and Materials Consulting Group Director to Vice President, Consulting Services.

In his new capacity, Dr. Corr will assume responsibility for overseeing CTLGroup's structures and materials business units, both of which operate on an international scale.

CORR

With a distinguished career as one of the nation's leading experts in structural performance, material characterization, and material development, Dr. Corr has been a pivotal contributor to CTLGroup's success. His extensive knowledge encompasses traditional and emerging building materials, with specific expertise in concrete durability, rheology, fresh-state behavior, and fracture analysis in cement-based materials.

For more information visit www.ctlgroup.com.

MEET OUR NEW MCI® REGIONAL SALES MANAGER

We are pleased to introduce Mike Bosman as our new MCI® Regional Sales Manager for the Midwest! Mike started in October and fills a huge need for MCI® support in the states of Minnesota, North and South Dakota, Wisconsin, Iowa, Illinois, Nebraska, Missouri, Kansas, and Colorado. We look forward to having him become a dynamic part of our MCI® team!

BOSMAN

Mike will be educating contractors, distributors, specifying engineers, and other potential customers about what our MCI® portfolio has to offer them and how those materials will fit best into their existing processes. His goal is to become an expert resource for his clients and to eventually be able to contribute new ideas to the world of reinforced concrete corrosion protection.

For more information visit www.cortecmci.com.

INTERESTED IN SEEING YOUR NEWS LISTED HERE?

Email your 150-200 word news to editor@icri.org. Content for the March/April 2024 issue is due by February 1, 2024, and content for the May/June 2024 issue is due by April 1, 2024. One (1) high resolution product photo may be included. ICRI reserves the right to edit all submissions.

ICRI
CONCRETE REPAIR
Restore | Repurpose | Renew

PRODUCTINNOVATION

WINTER'S COMING: WHAT'S YOUR PT CORROSION INHIBITOR PLAN FOR GROUTING DELAYS?

Winter weather and freezing temperatures will soon mean that construction projects are delayed in many parts of the Northern Hemisphere. For concrete PT (post-tensioning) structures such as bridges or parking ramps, this delays the grouting that should be done as quickly as possible after the placement of bonded PT strands.

The best option on the market for corrosion protection of PT tendons that have been installed but not grouted is MCI®-309. This Migrating Corrosion Inhibitor™ powder is easily fogged through ducts using a low-pressure air hose and sandblast cup—no special equipment required. MCI®-309 releases corrosion inhibiting vapors that diffuse throughout the entire void space. An attraction to metal allows the corrosion inhibitors to adsorb onto tendons, forming a protective molecular layer. When better weather comes, grout can be applied as normal without flushing the corrosion inhibitor out of the duct.

Find out more at www.cortecmci.com.

NEW FIVE-POUND MCI® GRENADE™ MAKES CONCRETE ADMIXTURE DOSING EASIER!

Dosing corrosion inhibiting admixtures into the ready-mix truck has simply gotten easier with the creation of MCI® Grenades in 5-pound (2.3 kg) bags! Rather than having to add 10 regular MCI® Grenades to the concrete truck, ready-mixers only need to add two 5-pound MCI® Grenades to ensure the batch has enough Migrating Corrosion Inhibitors to protect embedded reinforcement. That means just one 5-pound MCI® Grenade is needed per half truck!

MCI® Grenades are water-soluble pouches that contain pre-measured MCI®-2006 NS powder, a Migrating Corrosion Inhibitor™ admixture for reinforced concrete. The bag and corrosion inhibitors easily dissolve in contact with concrete mix-water and disperse throughout the batch during mixing. Once inside the structure, this blend of amine carboxylates forms a protective molecular layer on embedded reinforcing steel, helping enhance the durability and service life of concrete structures.

Not only can MCI® Grenades be specified in new construction and repair projects, but they are also a great backup plan to have when dosing liquid admixtures such as MCI®-2005 NS. In a worst-case scenario where MCI® dosing equipment becomes clogged with foreign materials midpour, or a shortage of MCI®-2005 NS is discovered too late, contractors will be relieved to have MCI® Grenades on hand to continue an already stressful job without unnecessary delays.

Find out more at www.cortecmci.com.

OIL-EATING MICROBES HELP CLEAN AUTO REPAIR SHOP FLOORS!

Cortec® MCI®-2061 is a biological-based cleaner/degreaser formulated for cleaning concrete, asphalt, and other hard surfaces. It combines powerful cleaning chemistry with microorganisms capable of biodegrading hydrocarbons that stain concrete and other hard surfaces. In simple terms, biodegradable surfactants (specially suited to hydrocarbon cleaning) loosen and disperse hydrocarbons, making them more available to microbes that eat them.

Find out more at www.cortecmci.com.

NEW IRONCRAFT 4-IN-1 POWER RAKE FEATURED IN WOC BOOTH #C7203!

IronCraft, LLC, formerly branded Titan Implement, will feature the patented 4-in-1 Power Rake in World of Concrete booth #C7203. Combining all the advantages of a versatile 4-in-1 bucket with a rugged power rake, this unique product is a powerful and practical soil conditioning machine. Users can dig, load, grab, and back drag as well as prepare the soil bed without changing attachments, thus saving time, and enhancing efficiency on the jobsite. With many timesaving uses, IronCraft 4-in-1 Power Rakes are ideal for a construction site application as well as landscape projects, and those on farms, orchards, vineyards, and more.

Visit www.ironcraftco.com for more information.

NEW STAIR SAVER FROM WOOSTER PRODUCTS REJUVENATES NON-SLIP STAIR TREADS

Wooster Products introduces the Stair Saver Epoxy Kit, which rejuvenates non-slip stair nosings and treads, restoring them to like-new condition. This unique, easy to use kit will restore any brand of nosing or tread where the abrasive fill is missing. Treads repaired with Stair Saver meet or exceed all codes and standards for coefficient of friction. It is far more economical than replacing the empty nosing shells, which are a trip hazard due to the missing abrasives. The Stair Saver Epoxy Kit is ideal for interior or exterior usage on any brand of nosing or tread and can be applied in less than 2 hours. Repaired treads are ready for foot traffic in just 24 hours.

Visit www.WoosterProducts.com for more information.

ICRI**CHAPTER**NEWS

CHAPTER CALENDAR

ICRI Chapters are hosting events in 2024. 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 about added events.

METRO NEW YORK
January 18, 2024
PANEL DISCUSSION
Understanding and Maneuvering through LL 126: Periodic Inspection of Parking Structure (PIPS)
Club 101
New York, NY

MINNESOTA
February 2, 2024
ANNUAL MEGADEMO
Topic: New Construction Technology
Cement Masons Training Center
New Brighton, MN

NORTH TEXAS
February 8, 2024
MEMBERSHIP MEETING
To Be Determined
Dallas, TX

INTERESTED IN SEEING YOUR CHAPTER NEWS & EVENTS LISTED HERE?

2024 Chapter News & Event Deadlines

MAY/JUNE 2024 CRB
Deadline: March 1, 2024

JULY/AUGUST 2024 CRB
Deadline: May 1, 2024

SEPTEMBER/OCTOBER 2024 CRB
Deadline: July 1, 2024

NOVEMBER/DECEMBER 2024 CRB
Deadline: September 1, 2024

Send Chapter News and Events by the deadlines above to Program Director Dale Regnier at daler@icri.org.

ICRI CONCRETE REPAIR CHAPTERS

CHAPTER ACTIVITIES

FLORIDA WEST COAST TECHNICAL PRESENTATION

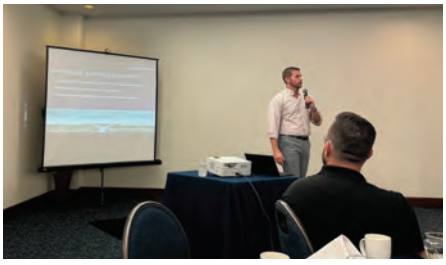
The Florida West Coast Chapter hosted its October Technical Meeting on Building Safety and Property Insurance on October 4, 2023, at the St. Petersburg Yacht Club. Chris Dawson of Gray-Robinson, a designated professional lobbyist serving private and public sector clients with government relations needs across Florida, discussed recent legislative action aimed at establishing a statewide building inspection and maintenance program for condominiums and co-op buildings across the State of Florida. Chris also discussed the legislative process and regulatory and procedural hurdles that can accompany policy-making, funding, and appropriations of the initial bill passed in 2022 and the "glitch" bill in 2023 with additional considerations and clarifications added to the new language in the state statutes pertaining to the Milestone Inspections, Structural Integrity Reserve Studies, and the relationship to property insurance challenges present in the state.

This was a legal update to his 2022 presentation of newly passed Senate Bill 4D, which in part required:

1. condominium and cooperative association buildings that are three or more stories in height to have a "milestone inspection" of the buildings' structural integrity by an architect or engineer when a building reaches: 30 years of age and every 10 years thereafter,
2. condominium associations and cooperative associations to complete a structural integrity reserve study every 10 years for each building in an association that is three stories or higher in height.

This was a well-attended and very informative presentation with a subject that directly impacts the restoration of concrete structures, and all parties involved from engineering to general contractors and construction material suppliers. The ICRI Florida West Coast chapter thanks Chris for taking the time to present to the chapter.

Florida West Coast Chapter members and guests enjoyed dinner at the St. Petersburg Yacht Club for their October meeting



The October presentation was given by Chris Dawson of Gray-Robinson (center), a designated professional lobbyist who discussed recent legislative action aimed at establishing a statewide building inspection and maintenance program for condominiums

MICHIGAN CHAPTER CONGRATULATES A CLOSE FRIEND

The Michigan Chapter hosted their successful November Dinner Meeting at Uptown Grill in Commerce, Michigan on November 9, 2023

The Michigan Chapter thanked long-time chapter member Doug Barron for his 11 years as Treasurer and 20 years in the industry as he plans his retirement—CONGRATULATIONS DOUG!

NORTH TEXAS AND THE JESS POINTS MEMORIAL GOLF CLASSIC

The North Texas Chapter's finest golfers gathered at Waterchase Golf Club in Fort Worth for a competitive scramble round on Friday, October 6, 2023. The morning weather proved perfect for low scoring as the group stroked drives and sank putts all over the course. The group of 17 teams wrapped things up after an efficient round with a delicious smashburger lunch provided from a local food truck.

For the 22nd year, the tournament was a massive success, raising thousands of dollars to support the North Texas Chapter scholarship program. The Chapter thanks all participants and sponsors for their continued support of this tradition!

- 1st Place Team: Western Specialty Contractors with Bob Scheelar, Tyler Bishop, Parker Mink, and Bryan Staffel
- 2nd Place Team: Macias Specialty Contractors represented by Abe Jackson, Thomas Alonzo, Kyle Smith, and Thomas Hernandez
- 3rd Place Team: CMC with Brad Court, Chaser Gilley, Alex Shelby, and Skelly
- Most Honest went to Sunbelt Waterproofing with Donnie Willey, Chris Joliff, Marco Mejia, and Nick Cseresznye
- Contest Holes: Kyle Smith (#2), Ryan Spans (#6), Alex Shelby (#7), Riley Summer (#12 and #14), Bryan Staffel (#16), Nick Cseresznye (#18)


Golfers prepare for the shotgun start

Chapter President Casey Jones addresses the golfers after the round


Winning team (left to right): Tyler Bishop, Bob Scheelar, Parker Mink, and Bryan Staffel

FLORIDA WEST COAST HOSTS CLAY SHOOT

The Florida West Coast Chapter recently hosted its 8th Annual Sporting Clays Tournament at Tampa Bay Sporting Clays and it was a classic success story yet again.

With a great turnout, the sporting clays tournament is one of the most popular and really the chapter's marquee event of the year. And for good reason! With all the work that goes into the event behind the scenes, from both ICRI Board Members and industry volunteers, the event keeps getting better year after year. In a return for the 8th year to Tampa Bay Sporting Clays in Land O' Lakes, Florida, they couldn't have asked for better conditions. The weather was the best in the country, no rain was forecast, and amazing BBQ was provided by local company Mission BBQ, so no one was left disappointed.

The chapter thanks all their sponsors and the people involved who helped put this great event together, but also especially want to thank Jim McKiney from Sika, and Wayne Heironimus with the Delta Rep group, for all the hard work and attention to the little details like the trophies and the challenge coin, and the very fashionable ICRI embroidered polos that really brought the event to the next level.

Wayne's group went on to win the team event with a very impressive score. It should also be noted that the top shooting engineer, West Coast Chapter Vice President Vince Barnes, PE, won the tie breaker shoot off for top individual shooter! Congrats Vince! Everyone is looking forward to the 9th annual event which is locked and loaded already. See you then.


GREAT crowd for the FWC 8th Annual Sporting Clays Tournament


Marksmen take aim at the Tampa Bay Sporting Clays venue


Awards and recognition are all part of the tournament


More accolades to hand out


The gorgeous day was perfect for taking aim

Tampa Bay Sporting Clays was a great host

CHAPTERS COMMITTEE CHAIR'S LETTER

JON CONNEALY
Chapters Chair

I must admit—this is the hardest CRB submission I have ever written. In fact, I have been avoiding writing it for weeks, and Dale (bless his heart) has been incredibly understanding. But the drop-dead deadline for getting this in the Jan/Feb issue of the CRB is in less than 4 hours. I can't put it off any longer.

Last week, I addressed the Great Plains Chapter and informed them that I was stepping down from the Leadership Team after being involved for 11 years. Today, I'm writing to all of you that I will be taking an extended absence from my involvement at the national level. This is the last time I will be addressing you, the ICRI membership, as the Chapters Chair. I've entered a time when the most important thing for me to be is a good husband and father. For the past 18 months I have been reducing my commitments in my professional life so that I can increase my commitments to my family. I'm pretty sure it is a wise choice—even though it is not an easy one.

The good news, though, is that a friend of mine will be taking the wheel. David Grandbois from the Minnesota Chapter, and an incoming ICRI Director, will be running the Chapters Committee from here on. I met David at a Chapter Roundtable in 2017, which was my first year as the Director for Region 5. I could tell then that David was passionate about his chapter and ICRI. Since then, I have had the opportunity to get to know him better as our paths continued to cross through our involvement in ICRI leadership. I am confident that the Chapters Committee is being left in the very competent hands of someone who loves this organization as much as I do.

So, do everything you can to support this organization—at National and at your Chapters. Invite a friend or colleague to become a member. Go to the next convention. Sign up for the webinars, get certified in CSMT and CSRT. Find a technical committee where you can contribute—even if you're like me and can't contribute anything but enthusiasm and opinions. ***Ask questions and make waves!*** That's how organizations grow and improve.

And make sure you attend the next Chapters Committee Meeting. Harass David for me. Tell him the ***old*** chair was way better (and better looking) than he is.

Until next time—I'll see you all later.

Jon Connealy, ICRI Chapters Committee Chair
BASF Master Builders Solutions USA

Concrete Surface Repair Technician (CSRT) Program

Education Course—Gain essential knowledge and training from your office or home

- ✓ Build a foundation for concrete surface repair, inspections, and testing
- ✓ Full online training that includes five competency-based modules
- ✓ Take this course by itself or get certified through the certification course

Certification Course—Demonstrate knowledge and competency to stand out from the crowd

- ✓ Qualifies you to perform pre- and post-placement inspections and testing
- ✓ Includes the five online training modules in the education course, an online knowledge exam, and performance exam on ASTM test methods (video recorded or live)

Concrete Slab Moisture Testing (CSMT) Program

If you are involved with the measuring or assessment of moisture in concrete floor slabs, ICRI's CSMT program is for you!

Comprehensive Education and Certification Courses will give you the knowledge and skills to:

- ✓ Improve the performance of concrete slab moisture testing
- ✓ Report more consistent, accurate, and reliable test results
- ✓ Make better decisions on when a concrete slab is ready for a floor covering installation
- ✓ Reduce risks for your clients and your team

ICRI CONCRETE REPAIR CERTIFICATION

Learn more at **www.icri.org**

Questions? Contact ICRI Program Director Dale Regnier at daler@icri.org

NEWMEMBRS

COMPANY MEMBERS

ARC Restoration & Waterproofing, Inc.
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United States
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Corrtech
Lapulapu City, Cebu Province
Philippines
Allan Go

Gemstone Concrete Coatings
Clearwater, Florida
United States
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Les Scellants S.G., Inc.
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ADDITIONAL INDIVIDUALS FROM SUPPORTING MEMBER COMPANIES

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Canada

ADDITIONAL INDIVIDUALS FROM COMPANY MEMBERS

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Kyle Laws
Valcourt Building Services
Lanham, Maryland
United States

Srini Neel
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Jessup, Maryland
United States

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Canada

Claude Maille
Anjou, Quebec
Canada

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NEWMEMBERS

...continued from page 34.

Bailey Morris
Pompano Beach, Florida
United States

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Port Washington, New York
United States

Jeffrey O'Connor
Fort Pierce, Florida
United States

Lloyd Welker
New Albany, Ohio
United States

Brian Wilson
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United States

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Christopher Morris
NAVFAC
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RE-CON LINE

SUSTAINABLE CONCRETE SOLUTIONS

Sustainable concrete production means reducing the consumption of natural resources and eliminating waste material streams. MAPEI has developed products and solutions that do just that:
RE-CON ZERO EVO transforms returned concrete into aggregates;
RE-CON DRY WASHING utilizes these aggregates to greatly reduce slurry from washing truck mixers;
RE-CON AGG helps use higher dosages of recycled aggregates or other demanding raw materials.

Transforming concrete production together – from linear to circular towards a sustainable future

MAPEI USA

MAPEI®

Learn more at **www.mapei.com.**

Sika & Master Builders Join Forces!

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BUILDING TRUST

MASTER® BUILDERS SOLUTIONS

The construction systems portfolio of Master Builders Solutions is now part of Sika! This includes the expansion joint systems of Watson Bowman Acme. This impressive combination of customer solutions is now all available from one source: Sika. For more information on this exciting industry development, scan the QR code below!

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