

CRB

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CONCRETE REPAIR BULLETIN

John McDougall
2022 ICRI President

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NOTE FROM THE EDITOR



The new year has begun and hopes are high that the impact of COVID on our industry will start to decrease as the year continues. ICRI has started the year with its annual Kick-Off Party in Las Vegas at the start of World of Concrete.

Plans are being made for the 2022 ICRI Spring Convention at the Baltimore Marriott Waterfront on April 4-6 and hosted by the Baltimore-Washington Chapter. ICRI continues its program of certification classes this year at various locations around the country.

Details for both items are on the ICRI website.

This issue of the *Concrete Repair Bulletin* features the technical articles: Selection of Waterproofing Systems; Misconceptions about Liquid-Applied Waterproofing; Treating Cracks in Concrete with Epoxy Healer/Sealer Coatings, and an Introduction to the updated ICRI Technical Guideline No. 210.4R-2021 – *Guide for Nondestructive Evaluation (NDE) Methods for Condition Assessment, Repair, and Performance Monitoring of Concrete Structures*.

ICRI is continually looking for articles for the *Concrete Repair Bulletin*. Topics and article guidelines are available on the Resources Tab at www.icri.org. Please continue to send in your ICRI Chapter events and updates to Dale Regnier.

Have a safe and productive 2022!

Jerry Phenney
RAM Construction Services
Editor, *Concrete Repair Bulletin*

PRESIDENT'S MESSAGE



JOHN MCDUGALL

My name is John McDougall. I am honored to serve as the 2022 President of the International Concrete Repair Institute! Back in 2004, I joined ICRI and the Carolinas Chapter. I quickly learned the value of my membership and the value of ICRI, which for me was career development. As a 25-year-old who spent the early years of my career on the operations side of a contracting company, I was well versed in how to execute many of the methods we teach at ICRI, but I was not as connected to the industry as I thought I was. Then I met the Carolinas Chapter.

The Carolinas Chapter allowed me to serve on a golf committee where I learned how to chair a committee and present reports to the Board. My experience grew and I was ultimately elected to serve on the Board of Directors. The chapter members and leadership helped me grow as a professional, taught me the value of networking, and the value of continuing education. I see the chapter structure as a significant learning opportunity and career mentoring opportunity for our younger/early career members.

Thinking ahead to my term as ICRI President, I was taking stock of a few things last week, trying to better understand the impact that the COVID-19 pandemic has had on me personally and professionally. I haven't learned any new languages, still can't juggle, don't much like baking, but I have found that I do enjoy podcasts and really like to cook. Perhaps the biggest lesson learned is there are many contributing factors to each and every success.

For us to be successful as an industry, we need building owners to order repair work; property managers to assist the owner in funding projects; design professionals to develop repair solutions; materials manufacturers to develop and manufacture quality repair materials; distributors to manage the logistics of the materials and equipment; contractors to perform the work; and testing/inspections partners to ensure the work quality is as specified. If we remove any one piece in this chain, we all will struggle.

Throughout this entire chain, one element is constant—people. While we can engineer out many of the laborious

tasks we all encounter, no project can be successful without quality people making quality decisions.

ICRI is such a unique organization because our membership represents each piece of this chain. That's why I am so excited about the year ahead. We have weathered the worst of the pandemic and we are poised to expand our membership, extend the reach of our technical and educational products, and help the next generation see and appreciate the many great career opportunities in our industry.

This last point is especially crucial. We have all heard about the supply chain shortages, car manufacturers struggling to get chips to produce new cars, cargo ships anchored off the coast of Long Beach awaiting longshoremen to unload their goods, and shortages of truck drivers to deliver those goods across the US and elsewhere. The construction industry is feeling the same labor crunch. In the last few months, I have travelled across the country and Canada, talking with contractors, designers, and materials suppliers—they are all looking for more help.

As an industry and as an Institute, we have the opportunity to hire and train countless new employees. ICRI has the infrastructure to deliver the education for your new hires through our webinars, certification and education programs, and the many Chapter technical meetings throughout the year. Training new hires is time consuming and ICRI can help make the most of that time. If you have a specific training need, do not hesitate to bring it up; chances are, you aren't the only one needing that help.

If there are any questions I can help answer, if there are any requests, or any ideas or challenges that ICRI can help you address, please do not hesitate to contact me directly at jmcdougall@bakerrestore.com.

For now, I look forward to seeing you at upcoming ICRI events in 2022!

All the best,

John

John McDougall, CCSRT
2022 ICRI President



ICRI Mission: ICRI provides education, certification, networking, and leadership to improve the quality of repair, restoration, and protection/preservation of concrete and other material systems.

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MARK NELSON

ICRI TECHNICAL ACTIVITIES COMMITTEE (TAC) GOALS FOR 2022

ICRI TAC has set its goals for the upcoming year. Because we strongly believe in the importance of documenting and publishing our efforts, here is that list of four goals for 2022.

1. Implement Technical Committee Chair Training Program

—Last year we created the outline for a committee chair training program. This year we will roll out and implement the program. The purpose of the program will be to make sure our technical committee chairs are armed with the tools needed to run meetings in today's virtual meeting world. By providing this training, we will create uniformity throughout our technical committees along with making the choice of running a committee less intimidating for members who have never chaired a committee. By the end of this year, all ICRI technical committee chairs and vice-chairs will participate in an ICRI chair training program.

2. Increase ICRI Chapter Member Involvement in International Technical Committees

—The evolution to virtual technical committee meetings has created a wonderful opportunity to get new members involved. Because the majority of our technical committee meetings will now be run virtually, any ICRI local chapter member can provide their knowledge and support to an ICRI technical committee of their choice. Joining an ICRI technical committee is easy for all ICRI members. This year we will ensure all ICRI chapter members are aware of this opportunity.

3. Create ICRI Technical Committee "Sell Sheets"

—In light of our efforts to get more ICRI chapter members involved in our international technical committees, we recognize a need to produce documents that can better explain the roles and responsibilities for each ICRI technical committee. These documents will not only assist ICRI in promoting our technical committees but will also provide a benefit to technical committee membership by better defining the parameters for each technical committee. This year we will create a sell sheet for each ICRI technical committee and

publish those promotional documents for all ICRI members to view.

4. Improve Causeway Committee Page Structure

—ICRI technical committees store information on our committee pages in an online system called Causeway. After starting with this format a few years ago, we now recognize the need to review and improve upon the current organization and structure. By the end of this year, all ICRI technical committee pages will be reorganized and actively utilized by our ICRI technical committee members.

ICRI Technical Committee Chairs

Following is a list of the ICRI Technical Committee Chairs. If you want to become more active in ICRI and the repair industry, please feel free to contact them directly to learn more about their committees.

- **Liying Jiang**, *Jensen Hughes*
Committee 110—Guide Specifications
- **Paul Farrell**, *Carolina Restoration & Waterproofing*
Committee 120—Environmental Health and Safety
- **Marthe Brock**, *BASF Master Builders Solutions USA*
Committee 130—Contracts, Warranties, and Agreements
- **Vincent LaPointe**, *SIMCO Technologies*
Committee 160—Life Cycle and Sustainability
- **Charles Mitchell and David Rodler**, *SK&A*
Committee 210—Evaluation
- **Peter Haveron**, *Texas Concrete Restoration*
Committee 310—Surface Preparation
- **Mark Kennedy**, *Construction Sales Group, Inc.*
Committee 320—Concrete Repair Materials and Methods
- **Tarek Alkhrdaji**, *Structural Technologies*
Committee 330—Strengthening and Stabilization
- **Jason Coleman**, *Wiss, Janney, Elstner Associates, Inc.*
Committee 410—Masonry
- **Jorge Costa**, *Durability, Inc.*
Committee 510—Corrosion
- **Eric Muench**, *Sika Corporation*
Committee 710—Coatings and Waterproofing

Mark Nelson is chair of the ICRI Technical Activities Committee (TAC).



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SECRETARIAT UPDATE



JON CONNEALY

The 2016 ICRI Spring Convention in Puerto Rico was incredibly exciting for me. It was then that I first engaged with ICRI at the international level. I was meeting members of ICRI's leadership for the first time, being introduced by my new ICRI Mentor, Ralph Jones. It was there that I first felt encouraged and emboldened to speak up during committee meetings and engage

at the international level of ICRI Leadership. Thank you, Ralph Jones!

It was impossible to not feel the excitement all around the convention. Ewald Consulting had just become our management company, the Strategic Vision and Plan was moving from its infancy and finding its feet, and the Strategic Implementation Committee was still toiling away making it all come together. It was an invigorating time to become involved with ICRI; the energy and excitement for the future of the organization and industry was intoxicating.

At this convention, somewhere between the convention space, the beach, and one of the many bars, conversations were continuing about the formation of a new committee of ICRI Leadership and Governance. A committee to oversee and direct the implementation of the ICRI Strategic Plan, support the development of new initiatives, create an avenue for new ideas, and to submit those new ideas for approval by the ICRI Executive Committee and Board of Directors. The committee I am speaking of came to be known as the Secretariat. Fred Goodwin said of the time prior to the formation of the Secretariat, "Expertise and enthusiasm required for development of worthy programs and processes existed within ICRI, but had previously lacked coordination—resulting in frustration and slow progress."

Communication and coordination became key to the eventual success of the Secretariat.

The initial class of the Secretariat included Mark Nelson, Rick Edelson, Jeff Barnes, and Bud Earley. Mark Nelson saw the Secretariat to have two purposes—to "work to improve communication between the administrative and technical committees within ICRI. Second (to) establish and monitor a system for ensuring that an idea from any ICRI member will be heard and acted upon." Rick Edelson added that the Secretariat should "provide guidance and direction necessary to facilitate our Strategic Vision from the creation of all ideas generated from within ICRI through their completion." In addition, the Secretariat would act as the leaders of the Coordination Committee, consisting of ICRI Committee Chairs and the Board of Directors. These four

individuals laid the groundwork for the Secretariat to follow. What they did in their tenure ensured the success not only of the Secretariat but also of the Coordination Committee.

Since then, 77 ideas from ICRI members have been submitted; many have been implemented and others are still being evaluated for their feasibility by ICRI's leadership. The Secretariat's role became that of "air traffic controllers"—ensuring that viable ideas were directed to the appropriate committees and kept on the radar to make sure that the plane lands. This role has served the organization well. The task of the Secretariat was difficult, at times arduous, but essential for our goals to be realized.

Now, the role of the Secretariat has evolved and progressed to its logical conclusion. Tasks once held by the Secretariat will be housed with the Executive Committee and TAC Chair. With their focus on strategic goal setting, new and pending ideas will be evaluated directly by the EC and assessed for their viability along with other strategic goals. The Coordination Committee will now be chaired by the ICRI President-Elect, with the Vice-Chair being the ICRI Vice President.

At the conclusion of the Secretariat Committee meeting at the ICRI 2021 Fall Convention, I moved that the Secretariat Committee, as it has stood, be dissolved. It has been my pleasure to serve ICRI as the final member appointed to the Secretariat and I thank the members who served with and before me. Those individuals in the order of their service tenure are: Rick Edelson; Mark Nelson; Jeff Barnes; Bud Earley; Pierre Hebert; Tim Gillespie; and Andrew Fulkerson.

Rest assured, the fundamental purpose of the Secretariat as a channel for members to improve our organization and industry remain.

If you have an idea that you believe can help ICRI advance its mission and improve our industry, submit your idea via the Idea Submission link located at the bottom of the ICRI website home page at www.icri.org.

Your ideas really do make a difference. The sense of ownership ICRI members have in this great institute is one of the many reasons ICRI is such a special and unique organization. Keep those ideas coming!

This article concludes the Secretariat Update column series in the *Concrete Repair Bulletin*.

Jon Connealy is an ICRI Board Director and past Secretariat



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Highlighting the Difference-Makers— the Women in the International Concrete Repair Institute

In 2020, ICRI proudly announced the first 40 Under 40 honorees. Nominated by their peers, these individuals demonstrated their commitment to continued professional growth, high potential for continued success in leadership roles, and a strong passion for and commitment to the mission of ICRI. This month we hear from two honorees to learn more about their career paths, thoughts on leadership and mentoring, and ideas about the future of the repair and restoration industry.

An Interview with Kristen Foreman

by Sarah Thaxton



KRISTEN FOREMAN

Principal Structural Engineer Kristen Foreman is one of our highlighted “40 Under 40” Women in ICRI. As one of ICRI’s “Tomorrow’s Leaders in Concrete Repair” it was great to

speak with her about her journey. It was also a powerful reminder that educating our next leaders is vital to success.

As a person who has always loved construction, she moved from the imported horse industry into the world of structural engineering. After years of working with horses, Kristen developed hands-on talent and a keen eye. These skills not only apply to life but add tremendously to her structural engineering toolbox.

With her work on existing structures where constraints are much tighter, she enjoys the variety of projects; no project is the same and there is always something new. The stride and process of a project is the same for all, one step to the next and repeat. Although each project is unique, there is a process. There may be roadblocks along the way, but the team works together throughout the process and completes the work.

With support from her mentor and employer, she was assigned to initiate a branch for Biller Reinhardt Engineering in southern Florida. This was a one-woman show for some time, and she has

since developed quite a team. Her mentor may still be her go-to, but Kristen now invests her time and energy in mentoring others. Although it is a big commitment along with a lot of work, she feels extremely rewarded through mentoring. Her mentor made a commitment to support her journey, and now she can work with her own mentees with that same intention and attention. The more you grow professionally and gain responsibility, the more deliberate you need to be with carving out time to invest in the next generation.

Over the years, role models have come and gone — but what she remembers the most and utilizes the most are compassion, respect, and education. Those who taught her did so in a compassionate way, helping her learn to moderate her responses. This has helped her lead with an even hand and great respect for others. With her prior experience, she finds that she is still a teacher, educating not only owners but team members as well. Kristen noted that during projects, when you explain the process in a way that your client understands, they better understand the facts. This allows a project to fall in line more efficiently.

As she continues to be active at the national level within ICRI, she also supports the board of her local chapter. Kristen involves her mentees in the local chapter as well, which provides them access to many more professionals in our industry.

Kristen sees a bright future noting, “there are always buildings that need attention.” Those buildings keep her as well as her team busy and progressing to the next step.

An Interview with Natalie Faber

by Monica Rourke



NATALIE FABER

Natalie Faber is one of the “40 Under 40” Women in ICRI who definitely “talks the talk and walks the walk”.

Natalie decided to enter the concrete repair industry after realizing there were more opportunities she wanted to pursue in life in addition to motherhood and being a personal assistant. With

the support of her husband, she embarked on a new career that would not only include concrete repair and waterproofing but an opportunity to serve her community.

Natalie’s boss at National Waterproofing encouraged her to use her talents and abilities by involving her firsthand in the field and by introducing her to ICRI. Natalie was able to experience ICRI through her boss’s endorsement as an active member.

While Natalie has held leadership positions in other trade organizations, she had never experienced a solid connection between local and national branches as she did with her introduction to ICRI. After attending her first national convention in Philadelphia, she left feeling surprised and pleased at how ICRI reached out to engage members and attendees at all levels and geographic regions. The support, networking, and encouragement in striving to better the concrete repair industry made a huge impression on her.

That experience prompted her to realize that she could make a positive contribution to the industry not only through her personal career, but on a larger scale. The more time Natalie spent in the field and working in the concrete repair industry, the more she realized that there was a need to mentor and help young people find a path to success. She

recognized that children aging out of the foster care system and graduating high school as young adults often entered the work world with little guidance or support in finding a career.

Natalie reached out to the ICRI Rocky Mountain Chapter to help create a new internship and mentoring program called Concrete-Construction Careers (or 3C). The transition from high school to the working world or to college can be a difficult time, especially for those teens who are aging out of the social services system. Through the 3C program, local high school students can participate in a program that will support them with training and skill development while they decide their future goals. Please look for the article about the 3C Program highlighted in the May/June 2021 issue of the *Concrete Repair Bulletin*.

Natalie has an incredible work ethic which focuses on accountability and commitment to quality. She is steadfast in her quest to make sure our industry values these goals no matter how many times someone may want to cut corners. It is critically important to her that participants in the 3C program or anyone she is working with understands she is going to follow the specifications no matter what. That quality and accountability means doing it over until you get right. That just “OK” is not good enough.

One of the most important aspects of my interview with Natalie was our conversation involving the future of ICRI, not just from the viewpoint of one of the 40 Under 40 award winners, but also from one of the women in ICRI who is charged with the responsibility of being a leader now and mentoring those who will emerge as leaders in the next 10 to 20 years.

She noted true leadership comes when our vision for the future includes being true to ourselves and our values. Natalie Faber’s ability to define power through inclusion and diversity will truly make a difference now and in the future.



ICRI would like to thank its Supporting Members, whose dedication to ICRI is greatly appreciated, and...



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Preliminary Selection of Exterior Waterproofing Systems

by Los Angeles Chapter of Construction Specifications Institute—Technical Committee

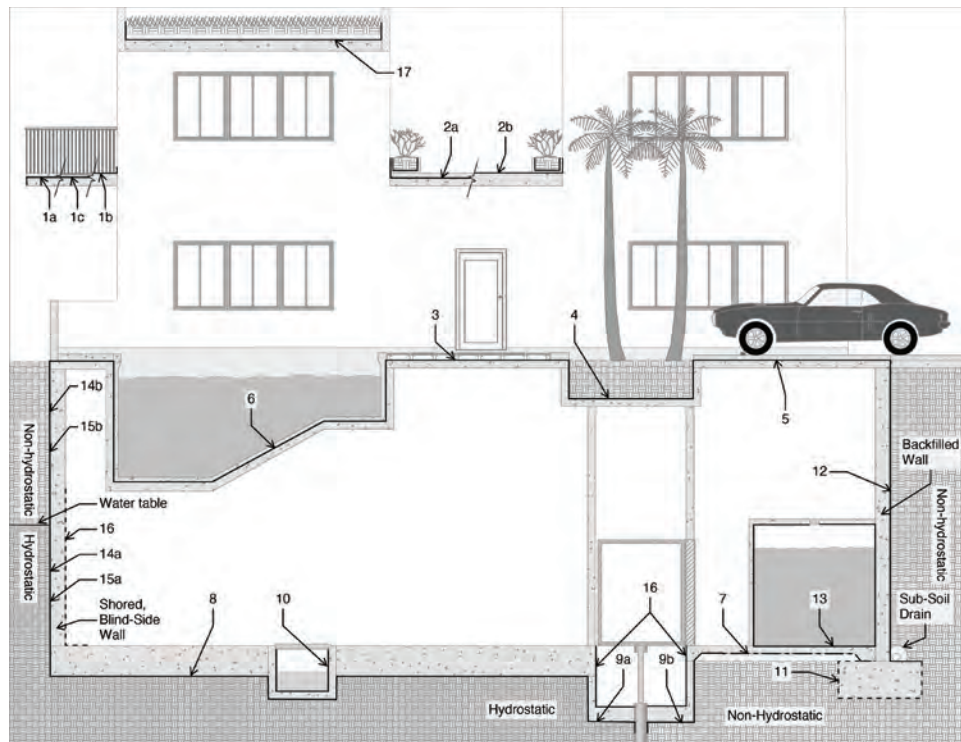


Fig. 1: Illustration identifying waterproofing applications presented in the guide

Selection of a suitable waterproofing system can present a building project team with a baffling array of choices. With dozens of manufacturers and hundreds of products to choose from, there is a formidable amount of data to evaluate to conduct a thorough investigation. The task is especially daunting for novice designers and specifiers with limited personal experience to draw upon. Even seasoned design and construction professionals can find themselves stymied when confronted with unusual project conditions.

Prior to 2002, there did not appear to be a standard, easy-to-follow methodology for making waterproofing product selections. To address this concern, the Technical Committee of the Los Angeles Chapter of the Construction Specifications Institute (LA-CSI) developed a guide to Preliminary Selection of Waterproofing Systems in 2002. “The goal was to help the design team make better waterproofing decisions more efficiently,” said Roger A. Cormier, CSI, CCS, committee chair at that time. The committee looked at waterproofing as defined in MasterFormat (1995 Edition), a master list of division and section numbers and titles used to organize information about construction and associated activities. It says the category includes: “Imper-

vious, waterproofing membranes, coatings, and other materials applied to walls, slabs, decks, and other surfaces subject to continuous and intermittent hydrostatic pressure or water immersion.”¹

The Committee’s report was published in *The Construction Specifier* (August 2002)² and reprinted in the International Concrete Repair Institute’s *Concrete Repair Bulletin* (September/October 2003)³ and several construction industry newsletters, and posted to the internet.

“During nearly two decades since then,” according to Melisa Sharpe, Architect, CSI, CDT, DBIA, LEED-AP, current chair of the LA-CSI Technical Committee, “there have been numerous changes in waterproofing technology, conditions of use, and industry best practices. The LA-CSI Technical Committee developed the updated guide taking into consideration the changes in the MasterFormat (2020 Edition), creating a new version of the guide that makes it even easier for novices and veterans alike to make preliminary product selection decisions about waterproofing systems and to find products that address the specific project’s needs.” A version of this report is available in *The Construction Specifier* July 2021.⁴

The new guide seeks to simplify the selection process by including a diagram of a structure illustrating typical waterproofing applications (Fig. 1 through 5). These applications are referenced by numbers to a waterproofing application matrix which cross-references the types of waterproofing system technologies (along with the MasterFormat section names and numbers in which these materials are typically specified), with a rating of their suitability for the application (Fig. 6).

LIMITATIONS

The diagram and matrix are useful guides to waterproofing systems that are generally suitable for the intended application. The diagram and matrix should not, however, be used as a “cookbook” for complete and comprehensive specification of waterproofing.



Fig. 2: Condition 8 Mat Foundation – Hydrostatic; received Section 07 17 16 - Bentonite Composite Sheet Waterproofing (photo courtesy of Simpson Gumpertz & Heger)

Material manufacturers, waterproofing consultants, experienced professionals, and specialty installers can help greatly in “tailoring” a system or systems to project conditions as well as help assess risks, pitfalls, and reasonable performance expectations. However, each individual will have their own basis of experience and will have biases for and against various systems in various applications. It can be useful, therefore, to consult multiple parties to obtain a clearer picture of the range of options, and each option’s pros and cons, for a given installation (Fig. 7).

DETAILING

Selecting an appropriate system is the first step in a long journey to a successful waterproofing project. Detailing and focused specifying are critical to the success of the waterproofing installation.



Fig. 3: Condition 8 Mat Foundation – Hydrostatic; the waterproofing was specified in Section 07 13 26 - Self-Adhering Sheet Waterproofing (photo courtesy of AVM Industries, Inc)



Fig. 4: Condition 15a Shored Blind-side Wall – Hydrostatic (Shotcrete); a dual waterproofing system was used, combining Section 07 13 26 - Self-Adhering Sheet Waterproofing with Section 07 17 16 - Bentonite Composite Sheet Waterproofing (photo courtesy of AVM Industries, Inc)



Fig. 5: Condition 15a Shored Blind-Side Wall – Hydrostatic (Shotcrete); wall received Section 07 17 16 - Bentonite Composite Sheet Waterproofing and repairs will be required when the rakers that brace the wall are removed (photo courtesy of Simpson Gumpertz & Heger)

Preliminary Waterproofing Selection Guide - Los Angeles Chapter, Construction Specifications Institute

Legend / Locations of Use (keyed to drawing)		Waterproofing Types, MasterFormat 2020 Edition														
R	Recommended: Published recommendation in at least one manufacturer's literature.	03 64 00 Injection Grouting	07 13 26 Self-adhering Sheet Membrane Waterproofing (Pre-applied)	07 13 26 Self-Adhering Sheet Waterproofing	07 13 52 Modified Bituminous Sheet Waterproofing	07 13 54 Thermoplastic Sheet Waterproofing	07 14 13 Hot Fluid-Applied Rubberized Asphalt Waterproofing	07 14 16 Cold Fluid Applied Waterproofing (with Sheet Membrane)	07 14 16 Cold Fluid-Applied Waterproofing	07 16 13 Polymer Modified Cement Waterproofing	07 16 16 Crystalline Waterproofing	07 17 13 Bentonite Geotextile Panel Waterproofing	07 17 16 Bentonite Composite Sheet Waterproofing	07 18 13 Pedestrian Traffic Coatings	07 18 16 Vehicular Traffic Coatings	07 26 16 Below Grade Vapor Retarder
Q	Qualified: Not commonly recommended, may be acceptable depending on project conditions and desired performance. Consult with manufacturer and waterproofing specialists to confirm acceptable use.															
X	Unacceptable: Not recommended by manufacturers.															
Concrete, Shotcrete and Concrete Masonry Unit (CMU) Substrates																
1a	Balcony - Split Slab	X	X	R	R	Q	R	Q	R	X	X	X	R	X	Q	X
1b	Balcony - Traffic Bearing Coating	X	X	X	X	X	X	X	X	R	X	X	X	R	R	X
1c	Balcony - Thinset Tile	X	X	X	X	X	X	X	X	Q	X	X	X	Q	R	X
2a	Elevated Walkway - Split Slab	X	X	R	R	Q	R	Q	R	X	X	X	R	X	Q	X
2b	Elevated Walkway - Traffic Bearing Coating	X	X	X	X	X	X	X	X	R	X	X	X	R	R	X
3	Pedestal Pavers - On Concrete Deck	X	X	R	R	Q	R	X	R	X	X	X	R	Q	R	X
4	Planter	X	X	R	R	Q	R	X	R	X	X	X	R	X	Q	X
5	Plaza - Concrete Paving	X	X	R	R	Q	R	Q	R	X	X	X	R	X	Q	X
6	Pool - Primary Waterproofing	X	X	X	X	X	R	X	Q	X	X	X	Q	X	X	X
7	Underslab Vapor Barrier - Non-Hydrostatic	X	R	X	X	X	X	R	X	X	X	X	X	X	X	R
8	Mat Foundation - Hydrostatic	X	R	X	X	X	X	R	X	X	X	X	R	X	X	X
9a	Elevator Pit - Non-Hydrostatic	X	R	R	R	X	Q	R	R	X	Q	R	R	X	X	X
9b	Elevator Pit - Hydrostatic	X	R	Q	Q	X	X	R	Q	X	X	X	R	X	X	X
10	Sump Pit	X	X	X	X	Q	X	X	R	Q	Q	X	X	X	Q	X
11	Spread Footing - Non-Hydrostatic, Backfilled	X	Q	R	R	X	Q	R	Q	X	X	R	R	X	Q	X
12	Backfilled Wall - Non-Hydrostatic (Drained)	X	X	R	R	Q	Q	R	R	X	X	R	R	X	Q	X
13	Fire-Water Tank	X	X	X	X	Q	X	X	R	X	X	X	X	X	Q	X
14a	Shored, Blind-Side Wall - Hydrostatic (Cast in Place Concrete)	X	R	X	X	X	X	R	X	X	X	X	R	X	X	X
14b	Shored, Blind-Side Wall - Non-Hydrostatic (Cast in Place Concrete)	X	R	X	R	Q	X	R	X	X	X	R	R	X	X	X
15a	Shored, Blind-Side Wall - Hydrostatic (Shotcrete)	X	Q	X	Q	Q	X	Q	X	X	X	Q	R	X	X	X
15b	Shored, Blind-Side Wall - Non-Hydrostatic (Shotcrete)	X	Q	X	Q	Q	X	R	X	X	X	R	R	X	X	X
16	Negative Side - Supplemental or Remedial	R	X	X	X	X	X	X	X	Q	R	X	X	X	X	X
17	Vegetative Roof	X	X	Q	Q	Q	R	Q	Q	X	X	X	R	X	X	X
Wood Framing and Decking Substrates (Above-Grade Only) These applications not shown in building diagram.																
A	Balcony or Walkway - Concrete Paving	X	X	R	R	X	R	R	R	X	X	X	Q	X	Q	X
B	Balcony or Walkway - Traffic Bearing Coating	X	X	X	X	X	X	X	X	R	X	X	X	R	R	X
C	Pedestal Pavers	X	X	R	R	Q	R	X	R	X	X	X	X	X	X	X
D	Vegetative Roof	X	X	Q	Q	Q	R	X	R	X	X	X	X	X	X	X

Ratings are generalized in nature. Qualified design or construction professionals must determine products to be used for specific projects and applications.
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Fig. 6: Preliminary waterproofing selection chart presented in the guide

Manufacturers generally provide details and specifications that do a good job of defining typical installations for their product. The details, not surprisingly, show only conditions that are within a system or terminate generically to the adjacent architecture. Additional details are required for termination to other waterproofing materials. The specifications, similarly, will need to direct coordination of adjacent systems and guide the installers toward a successful interface.

QUALITY

The performance of a waterproofing design is influenced by the skill and care of the installer. It is important, therefore, that the specifications include clear requirements on the minimum qualifications of the installer (as well as the manufacturer) and measures necessary to help ensure quality, including detailed shop and installation drawings, mockups, field testing, and observations. Many systems require part-to-full-time monitoring as a condition of warranty. In some cases, the manufacturer's technical representative can provide adequate field oversight. However, it is often advisable to retain a third-party consultant or inspector to check the work in progress.

OTHER CONSIDERATIONS AND PITFALLS

Waterproofing is subject to the environmental conditions of the site as well as the built conditions that it is intended to protect. The following summary includes items of typical site and built conditions for the specifier to consider:

- **Site soil and water table:** Will the ground have hydrostatic conditions? Will there be soil or groundwater conditions that are deleterious to the waterproofing? How does the structure resist hydrostatic loading? The waterproofing specifier needs to coordinate these considerations into the design. Vapor barriers can be used in non-hydrostatic conditions if required to prevent water vapor migration impacting impermeable finished flooring. Vapor barriers are not waterproofing and should not be used in hydrostatic conditions. Typically, hydrostatic grade waterproofing also functions as a vapor barrier.
- **Shoring:** Many urban projects require perimeter shoring, such as steel wide-flange soldier beams with treated wood lagging. The soldier beams often have tie-backs or rakers to resist loading from adjacent soil. Tie-backs often, and rakers always, need to be removed after concrete placement; this presents out-of-sequence repair of waterproofing which needs to be addressed in the details and specifications (Fig. 8).
- **Waterproofed surfaces:** Each structural material has characteristics and limitations that must be considered in the waterproofing design. Shotcrete, for example, can be challenging due to the tendency for voids and slump to form during placement. The design should anticipate the unique challenges of each substrate and specify compensating and mitigating measures.



Fig. 7: Cold fluid-applied waterproofing systems offer designers versatility when sheet membrane and hot-fluid-applied systems are not an option (photo courtesy of DTR Consulting Services)



Fig. 8: Rakers, the braces used to temporarily support foundation walls, will be removed after the grade-level floor plate is constructed, leaving gaps in the waterproofing that will have to be repaired (photo courtesy of Simpson Gumpertz & Heger)



Fig. 9: Thermoplastic sheet waterproofing installed before reinforcing steel—manufacturers typically require inspections after the initial membrane installation and after reinforcing steel has been placed to check for trade damage (photo courtesy of DTR Consulting Services)


- **Drainage:** Non-hydrostatic walls usually have drainage to a base-of-wall collection system that conveys water away from the structure to a sump or a storm sewer. The drainage must be designed to accommodate expected site drainage in service. Misdirected surface water and/or unexpected “perched” below-grade water can increase demand on the drainage system capability. The waterproofing specifier may have to confirm that adequate drainage exists for proper waterproofing performance.
- **Damage during construction:** Waterproofing generally is installed early in a project schedule and may remain exposed for weeks or months depending on its location. It is important to consider means and methods to protect and/or repair the waterproofing system through the remainder of construction until it is properly covered (Fig. 9).
- **Post construction repairs and supplemental waterproofing:** Grout injection to help mitigate leakage can be used to repair cracks and voids in below-grade concrete walls. Grout injection can also be used as a supplement to help seal conditions that are not easily waterproofed using sheet or fluid waterproofing or water stops (Fig. 10). Crystalline coatings or slurries can be used on the “negative” side to help repair minor seepage or address dampness on below-grade walls and slabs or used as a supplement to waterproof on the “positive” side of the below-grade structure. On the negative side, hydrostatic pressure tends to push waterproofing away from the structure. On the positive side, hydrostatic pressure tends to push waterproofing against the structure. When waterproofing a basement, for example, the occupied space is on the negative side and the positive space on the exterior. When waterproofing a pool or tank, however, the negative side is on the exterior of the structure and the positive side is on the interior.



Fig. 10: Injection grouting, typically specified in Division 03, can play an important role in a building’s waterproofing solution as both a corrective measure and as an injectable waterstop (photo courtesy of DTR Consulting Services)

SUMMARY

Other factors that affect waterproofing are beyond the scope of the guide. For example, how will continuity and compatibility be assured where a horizontal and a vertical condition meet, especially when products from more than one manufacturer are being considered? Once a broad category of product is selected, performance and product variables such as application thickness, availability of materials and labor costs, warranty provisions, environmental factors, project limitations, and other factors must be considered to refine options within the category. Moreover, the guide does not address dampproofing, water repellents, or roofing — processes that are sometimes grouped inappropriately with waterproofing.

Guide users are encouraged to read manufacturers’ technical literature, industry reference materials, and codes, and carefully evaluate proposed materials before specifying or using them for a specific application. When necessary, advice should be obtained from trusted manufacturers’ representatives or qualified waterproofing consultants. Information from independent testing facilities should be considered and, if necessary, tests can be performed on a mock-up to demonstrate the effectiveness of a product in a particular application. 

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Liquid-Applied Waterproof Membrane Misconceptions

by Daniel Aleksov

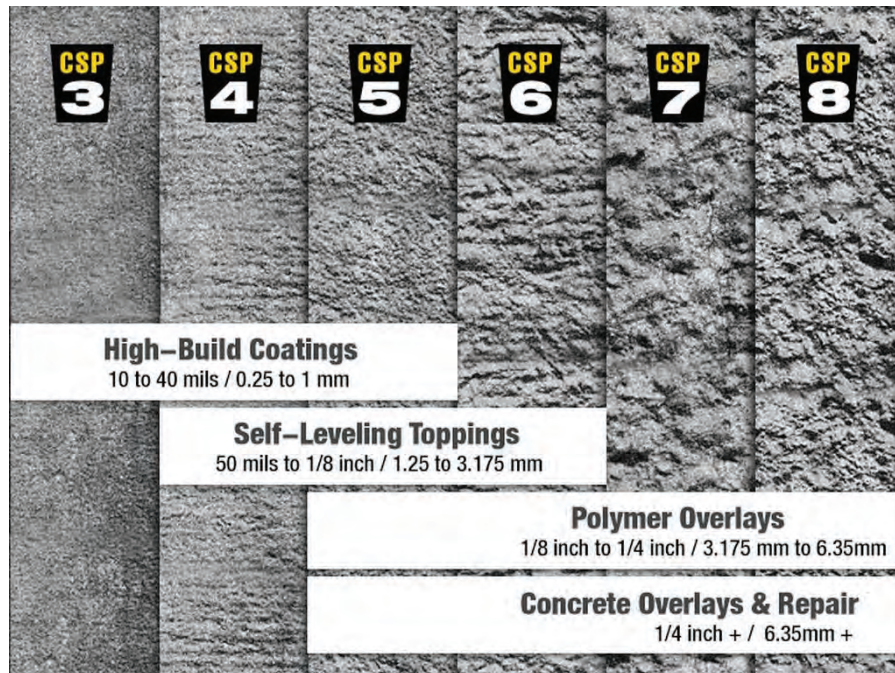


Fig. 1: Prepared concrete surface profiles (CSP) for protective systems (image courtesy of Graco)

Waterproof membranes act as water barriers and protect the underlying structure. Good performance of waterproof membrane systems is seen as having a direct correlation to the health of a structure. Over the past 50 years, the knowledge that prestressed and conventionally reinforced concrete structures require waterproofing protection is well established.¹ When concrete cracks, the underlying steel reinforcement is susceptible to corrosion when these cracks become pathways for water, oxygen, chlorides, and other aggressive contaminants to reach the reinforcement. Premature failure of a waterproof membrane system can expose the concrete structure to these vulnerabilities and lead to deterioration, which has substantial cost implications to building owners.

WHY WATERPROOF MEMBRANE SYSTEM MISCONCEPTIONS EXIST

Given the long history and proven track record of waterproof membrane systems, why do misconceptions about waterproofing exist in the industry? There are several reasons which can account for this.

1. **Lack of knowledge and experience in waterproofing.** Post-secondary institutions generally focus

more on design and repair of concrete structures versus waterproofing of concrete structures. For many professionals graduating from post-secondary institutions, the subject of waterproofing is first encountered on a job site.

2. **Not having a comprehensive understanding of site conditions prior to applying a waterproof membrane system.** Understanding the type of the existing structural decking system and how weather conditions impact application including temperature, moisture, contaminants, etc., are not always adequately comprehended and taken into consideration.
3. **Incorrect assumptions about waterproof membrane systems and what actually works.** Identical waterproof membrane systems may not perform similarly when applied on projects with varying site conditions, traffic, and weather patterns. In the investment world, the common phrase uttered is, “past performance does not guarantee future results.”² Waterproofing should be viewed similarly, with all the proper due diligence made beforehand

by designers, installers, and reviewers during construction.

10 COMMON MISCONCEPTIONS ABOUT LIQUID-APPLIED WATERPROOF MEMBRANE SYSTEMS

The following common misconceptions specifically related to liquid-applied membrane systems will be debunked by combining various technical standards, guidelines, and the experiences of various stakeholders within the industry. The following misconceptions are in order of a typical waterproof membrane system application sequence which includes surface preparation, substrate conditions, application, and maintenance and repairs.

1. *Newly placed concrete with a broom/trowel finish does not require surface preparation.* This is not correct, as concrete substrates require proper surface preparation to achieve the necessary concrete surface profile (CSP) and to remove laitance or any other detrimental surface concrete conditions. A surface that appears rough or patterned is not sufficient to achieve an acceptable mechanical bond between the concrete substrate and waterproof membrane system. Standard practice for both new construction and restoration includes abrasive blasting or shotblasting to obtain the appropriate CSP. Cleaning is also necessary to remove any loose material and contaminants present on the concrete surface following surface preparation to ensure a good adhesive bond of the membrane system to the concrete substrate.
2. *Using handheld grinders is sufficient surface preparation for waterproofing application.* Grinding using many available handheld tools will not achieve the appropriate CSP 3-4 that is typically recommended by manufacturers. Most of these tools without specialized wheels and proper technique will achieve a maximum CSP 1-2 and can sometimes “polish” the concrete surface if not used properly. Liquid-applied membranes typically fall within the category described as high-build coatings illustrated in Table 7.1 of ICRI Technical Guideline No. 310.2R.³ Figure 1 illustrates ICRI’s concrete surface profiles superimposed with Table 7.1 descriptions. Table 7.2 from the same guideline illustrates that grinding produces an approximate surface profile range of CSP 1-2 and abrasive blasting and/or shotblasting can achieve a surface profile in the approximate range of CSP 2-9. In some scenarios, an applicator may be unable to effectively use blasting methods in tight spaces or in sensitive areas such as balconies. In these areas, the waterproofing membrane manufacturer may offer required surface preparation options. As a general principle, however, grinding is not the preferred surface preparation method for liquid-applied membranes. A beneficial tool for evaluating the in-situ surface preparation is a set of ICRI concrete surface

profile (CSP) chips that provide a qualitative visual comparison when the chips are placed on the top surface of the prepared concrete surface.

3. *Using high early strength ready-mix concrete means you can apply waterproofing sooner.* This is a prevalent misconception that incorrectly correlates concrete strength as a benchmark for timing of waterproofing membrane application. Proper adhesion and curing of waterproofing membranes is contingent on the level of moisture present in the concrete irrespective of meeting concrete strength requirements. There are a few different ways to verify moisture levels in concrete, including the plastic sheet method in accordance with ASTM D4263⁴ where an 18 in (450 mm) square plastic sheet is taped to the surface of the concrete deck for a minimum of 24 hours. Subsequently, the polyethylene sheet is removed and reviewed qualitatively for traces of moisture underneath the plastic. A moisture meter can also be utilized to obtain a measurement of moisture content. Moisture observed from the plastic sheet method or a measured reading of moisture exceeding the waterproofing membrane manufacturer’s specified limits are indications that the concrete slab may not be adequately dried. Another method for assessing moisture that measures the relative humidity within a concrete slab is ASTM F2170;⁵ however, it is generally accepted that this test method will not provide accurate information when used in an exterior environment where the test area cannot be properly conditioned.

If waterproofing is applied to a concrete slab with moisture exceeding the manufacturer’s maximum threshold, it can potentially result in a debonded waterproof membrane (Fig. 2). This type of failure of the waterproof membrane can be identified with a knife adhesion test in accordance with ASTM D6677.⁶ Although this is a subjective test, it can



Fig. 2: Debonded waterproof membrane due to excessive moisture in balcony slab



Fig. 3: Trapped moisture below waterproof membrane due to unvented composite steel deck



Fig. 4: Trapped water pouring from vent hole installed at the soffit of a hollow core slab



Fig. 5: Lateral movement of moisture in slab from trench drain causing debonding of the surrounding membrane coating

provide indications to an experienced reviewer if the waterproof membrane bond to the substrate is acceptable. An alternative quantitative method is to measure the adhesion pull-off strength using a portable adhesion tester in accordance with ASTM D7234.⁷ For liquid-applied elastomeric membranes, the Canadian Standards Association (CSA) S413 Parking Structures Standard⁸ specifies a minimum bond strength of 200 psi (1.4 MPa).

4. **Waterproofing can be applied to a non-vented composite deck or hollow core slab.** Most waterproof membrane manufacturers do not recommend this type of application. The CSA S413 Parking Structures Standard under Section H.9.3.1 requires that the composite steel deck be perforated to promote drying of the concrete topping. If the steel deck is not perforated, there is a significant risk of moisture accumulation which can result in a debonded waterproof membrane system (Fig. 3). Similarly, according to CSA S413 Section H.7.8.4, drainage holes in precast concrete slabs with voids (i.e., hollow cores) are required to drain out any water that enters the voids (Fig. 4). It is imperative to understand the existing site condition and the type of floor slab that has been constructed prior to the waterproofing application.
5. **Moisture only moves vertically in a slab.** Moisture moves vertically due to gravity, but moisture can also travel laterally from walls and potentially debond a waterproof membrane on suspended slabs. Moisture can also contribute to debonding of the surrounding membrane when moisture enters a breach at a penetration or crack in the waterproof membrane. Another common source of lateral movement of moisture is failed waterproofing within underground parking garage trench drains. Water ponding in the trench drain will penetrate the surrounding slab and can cause significant debonding of the membrane (Fig. 5).
6. **Chloride contaminated concrete surfaces are acceptable to waterproof.** If chloride contamination of suspended concrete slabs is suspected, testing should be done by extracting concrete cores and tests performed at the top surface and depth of the steel reinforcement (Fig. 6). If the concrete testing confirms top surface chloride contaminated slabs, this can potentially cause premature waterproofing failure by attracting moisture to the concentration of chlorides through the process of osmosis. If the waterproof membrane prematurely fails, another sign of chloride contamination is a white powdery layer on the surface of the concrete and backside of the waterproof membrane (Fig. 7). Should chloride contamination be identified, additional preparation measures may be necessary to ensure that the chlo-

ride affected area has been treated prior to waterproof membrane application.

7. **Thicker polyurethane membrane systems are better.** Waterproof membrane systems are engineered to a certain thickness and tested to achieve the appropriate characteristics. Applying a waterproof membrane too thick can reduce the flexibility and elongation capability of the coating. Splitting develops when the waterproof membrane system cracks due to excessive movement beyond its elongation capability. Additionally, blistering can occur when liquid-applied polyurethane membrane layers are applied too thick, causing the coating to become spongy and soft. During waterproof membrane installation, it is important to perform quality control measures such as measuring the wet film thickness.

8. **Thinner (light-duty) polyurethane membrane systems can be applied to the top (roof) decks of multi-story garages.** It is difficult to pinpoint the precise useful service life of thinner (standard or light-duty) polyurethane membrane systems for this application because it can vary substantially depending on the extent of vehicle traffic. On the roof levels of parking decks, installing a thinner (light-duty) membrane system will make it more susceptible to damage (including snowplow damage in cold climate zones) and high wear-and-tear conditions. If greater durability and service life are desired, a thicker, heavy-duty membrane system, or combination of light-duty membrane installation in parking areas and heavy-duty membrane installation in drive lanes, could be considered. To improve abrasion resistance, it may be more appropriate to install a bonded concrete topping or a high-performance thin membrane system such as a PMMA (polymethyl methacrylate) or PUMA (polyurethane methacrylate). Every site should be carefully examined, with previous waterproofing history taken into consideration where applicable, along with the type of environmental conditions and risk of damage that can occur over time.

9. **Crystalline coating is considered a traditional waterproofing system.** Crystalline coating systems are classified as plugs, meaning they stop the flow of water through a discontinuity (crack, joint) in the concrete element from the interior side, and are not typically used as a positive (exterior) side waterproofing system. Without a doubt, crystalline coating can be effective to prevent water penetration from the negative (interior) side of a structural element that is difficult or cost-prohibitive to waterproof from the positive side. However, it should not be a substitute for replacement of the existing failed water barrier on the positive side if easily accessible (Fig. 8).

10. **The waterproofing will last 20 years without any maintenance.** Failures are inevitable at penetrations, joints, and high-traffic areas (Fig. 9). Ignoring areas with signs of failure can result in further deterioration of the waterproofing as well as the underlying structure. Localized repairs and replacement of worn and debonded waterproof membranes should be anticipated and addressed as part of a maintenance plan to avoid leaving the concrete unprotected



Fig. 6: Concrete core extraction for chloride testing at a garage roof slab

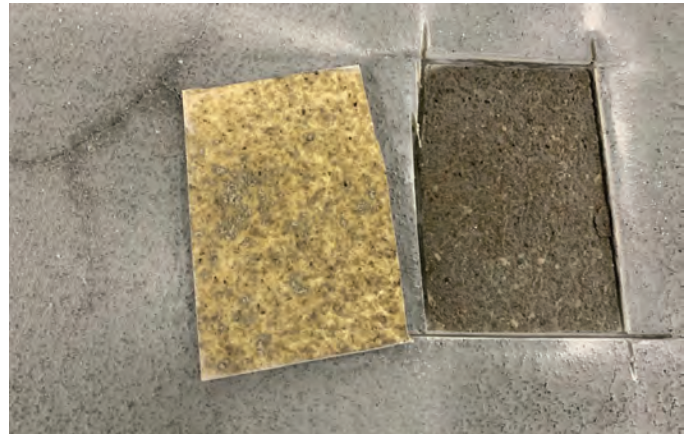


Fig. 7: White powdery substance exhibited on underside of debonded waterproof membrane due to chloride contamination



Fig. 8: Crystalline coating applied below a garage ramp trench drain and wall upturn




Fig. 9: Water penetration at an expansion joint and drain in a newer building

ed and exposed to water and de-icing salts which can lead to corrosion of the embedded reinforcing steel. The CSA 413 Parking Structures Standard under Annex E.1 Routine Maintenance clearly states, “the cost of repairs to protection systems is a small fraction of the cost of repairing consequential damage to the structure.”

SUMMARY

Based on the preceding list of waterproof membrane misconceptions, there is a need for improved education of all stakeholders in this industry. Education and practical training by organizations and industry experts specialized in this type of work is crucial to improve the application and review process for waterproof membranes. As previously mentioned, understanding the existing site conditions is fundamental to reducing risk by ensuring proper surface preparation and implementation of appropriate membrane systems and application methods. Making hasty assumptions can have severe repercussions in terms of liability and cost implications should the waterproofing prematurely fail. It is imperative that the limitations and appropriate use of various waterproof membrane systems are adequately understood so that they are designed and in-

stalled to suit the specific site conditions. Increasing quality control measures prior to, during, and following waterproof membrane application should produce a successful project outcome and overall structure longevity. 

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Treating Cracks in Concrete with Epoxy Healer/Sealer Coatings

by Jennifer Crisman



Fig. 1: Penetrating concrete sealers repel water

Today's concrete technology provides several ways to help limit the size and avoidance of cracks in concrete. Despite available preventative measures, such as a sound subgrade, designs for low-shrinkage concrete that incorporate shrinkage-reducing or shrinkage-compensating admixtures, using concrete with lower water-to-cementitious ratios, adding macro or microfibers, proper curing, using evaporation retarders and performing joint cutting operations as soon as possible, concrete can still maintain its tendency to crack.

Narrow cracks, typically in the 0.01-0.06 inch (10-60 mm) width range, in concrete slabs are especially troubling when they occur on bridge and parking decks, elevated floor slabs and similar high-use horizontal slab surfaces. Cracking can allow for the penetration of water, sulfates, chlorides, and other harmful agents, accelerating surface spalling and the corrosion of steel reinforcement. This cycle of deterioration can shorten the service life of a concrete deck and require expensive repairs or full replacement of the deck in the future.

COMMON METHODS FOR TREATING CRACKS

Protective Coatings

One way to treat narrow cracks in concrete is to use film-forming acrylic waterproofing coatings. Many of these coatings are quite flexible and have crack-bridging properties. There are also additional benefits to using film-forming technologies to protect concrete in high-traffic areas. Traffic deck coatings based on epoxy or urethane polymers are commonly installed on bridge decks, parking decks, factory floors, and loading docks. Many of these systems incorporate an aggregate broadcast to provide skid resistance and have the added benefit of waterproofing the concrete. However, protective coatings are applied to the concrete surface, which means that exposure to weather, abrasion, or other damage will eventually lead to the deterioration of these materials. For this reason, many acrylic coatings (for example) are primarily used on vertical surfaces and horizontal decks for decorative purposes or exposure to lighter pedestrian traffic.

Water Repellents

Another method of treating narrow concrete cracks is to use penetrating water repellent sealers containing silane, siloxane, or a silane/siloxane blend. These sealers penetrate the crack and coat its sides to provide the substrate with a water-repellent barrier, but do not fill the cracks entirely or fully seal the concrete surface. Penetrating silane or siloxane sealers soak into the surface of the concrete where they chemically react to form a hydrophobic barrier within the pores that causes water and other liquids to bead off the surface (Fig. 1). By reducing the absorption of water, the surface becomes more resistant to cracking, spalling, pitting, freeze-thaw damage, mold and mildew growth, and efflorescence formation. These penetrating sealers will not change the appearance or color of the concrete and do not leave behind a visible surface film. When properly applied, silane and siloxane sealers can last for up to 7-10 years before resealing is needed.

Healer/Sealers

Another treatment for narrow cracks is to use a thin, chemically curing polymeric resin to fill the cracks. Penetrating by gravity alone, the resin fills the crack and seals out water, salts, and other damaging elements. This method of crack repair is intended to seal cracks that are “static” or “non-moving”, such as shrinkage and settlement cracks that have stabilized. This method can also be used to protect the entire concrete deck by applying a flood coat of the polymeric resin on the entire surface. This essentially seals the deck while sealing or “healing” the cracks. The term healer/sealer is often used to describe the polymeric resin applied in this process. Concrete healer/sealers have typically been based on chemically cured methyl methacrylate, high molecular weight methacrylate, urethane, or epoxy chemistry.

HEALER/SEALER MATERIAL PROPERTIES

Although concrete healer/sealers have been around for decades, their ability to fully fill, seal, and heal cracks often yielded mixed results. When healer/sealers were first developed, it was easy to look at the viscosity of the resin as the reason for these mixed outcomes. If the viscosity was too low, it could flow into the crack and out the bottom of the slab. If the viscosity was too high, it didn't penetrate far enough to fill the crack. When a new generation of healer/sealers were developed, other factors were considered, including the method used to achieve the desired viscosity, modulus of elasticity, and surface tension.

Viscosity Effects

Through laboratory testing and field trials, the best results were found when the crack healer/sealer material was found to be low viscosity. In formulating chemically curing polymeric sealers and coatings, the simplest way to lower the viscosity of a product is to increase solvent content. However, increased solvent typically means a higher volatile organic compound (VOC) content, increased hazards

in mixing and handling, and an impact on physical properties.

Formulators can adjust the molecular weight and molecular weight distribution of the healer/sealer, and this can have a profound effect on the viscosity of the finished product. Generally, the higher the molecular weight, the higher the viscosity. This is often not desirable for a crack healer/sealer.

Higher molecular weight also results in higher strength and durability of the final product. To solve this conundrum, the molecular weight distribution of the healer/sealer is adjusted, resulting in lower viscosity, without affecting the strength properties of the material. Adjusting the molecular weight distribution of a healer/sealer polymer can be compared to the gradation of aggregate in concrete and visualized by imagining a funnel with a large opening. If we pour just one size of aggregate into the funnel, it will flow through readily, but if we put in a full gradation of aggregate, it will clog the funnel and not flow. Similarly, a wide distribution of different-sized polymer chains results in a healer/sealer with higher viscosity and therefore less ability to flow and penetrate cracks. Newer generation healer/sealers are formulated with a narrower distribution of polymer sizes, which produces a more flowable material.

Impact of Modulus of Elasticity and Surface Tension

Modulus of elasticity is a measure of stiffness, with higher-modulus materials exhibiting less deformation under load compared to low-modulus materials. A low-modulus crack healer/sealer can provide better resistance to mechanical or thermal movement of the concrete deck. Because many treated cracks are found on bridge and parking decks, often subjected to this type of movement, a low modulus of elasticity product is optimal in many instances, as it will withstand a certain amount of movement and help prevent re-cracking.

In addition, low surface tension is an important factor in allowing the healer/sealer to penetrate the crack. Healer/sealer products are formulated using specially designed agents to reduce surface tension, which allows the resin to penetrate the concrete cracks more readily. A liquid with high surface tension contains molecules that are more attracted to each other than they are to the surface upon which they are applied. Also, the molecules at the surface of a high surface tension liquid have no molecules attracting them from above, so these surface molecules can only be attracted down and in. This attraction to itself, coupled with strong surface tension, causes the liquid to bead up instead of spreading out on the surface. Concrete healer/sealer formulators incorporate surface tension reducing additives called surfactants to ensure the healer/sealer spreads out onto the concrete surface instead of beading up and resisting flow and penetration.



Fig. 2: Pretreating cracks



Fig.3: Pouring low-viscosity material into crack



Fig. 4: Spreading material over deck slab

HEALER/SEALER APPLICATION

The healer/sealer application begins with proper surface preparation. The concrete surface must be structurally sound and free of grease, oil, curing compounds, soil, dust, and other contaminants. New concrete and masonry must be at least 28 days old. Surface laitance must be removed. Concrete surfaces must be roughened and made absorptive, preferably by mechanical means, and then thoroughly cleaned of all dust and debris.

If the surface was prepared by chemical means (acid etching), a water/baking soda or water/ammonia mixture, followed by a clean water rinse, must be used for cleaning to neutralize the substrate. The Concrete Surface Profile (CSP) should be CSP 2-5 in accordance with ICRI 310.2R,¹ published by the International Concrete Repair Institute (ICRI). Following surface preparation, the strength of the surface can be tested if quantitative results are required by project specifications. A tensile pull-off tester may be used in accordance with ASTM C1583,² with a required tensile pull-off strength commonly specified to be at least 250 psi (1.7 MPa).

The application of the materials includes pretreating large cracks if necessary, flood coating with the low-viscosity, low-modulus epoxy, distributing the epoxy onto the substrate, removing excess epoxy, broadcasting fine sand onto the wet epoxy, removing the excess sand when resin has cured, and opening the deck to traffic.

After properly mixing the material, cracks may be pretreated by gravity feeding the healer/sealer by hand directly on top of the crack (Fig. 2) or by ponding the material over cracks (Fig. 3), permitting it to sink in and seal the crack onto the properly prepared surface in a wave form and spread uniformly with a squeegee or a short nap roller to fill voids, cracks, and porous areas (Fig. 4).




Fig. 5: Applying sand to material on deck slab



Fig. 6: Finished application on parking deck slab

Allow epoxy to penetrate the surface, re-applying to cracks and porous areas if necessary. Before the epoxy becomes tacky, excess epoxy that has not penetrated the surface can be removed with a squeegee. Broadcast clean, oven-dried silica sand (recommended 16/30 or 20/40 mesh) into the wet epoxy (Fig. 5) to provide a skid-resistant surface, or where subsequent toppings or coatings will be applied. Before opening to traffic, and when the healer/sealer has cured, remove any loose aggregate (Fig. 6).

SUMMARY

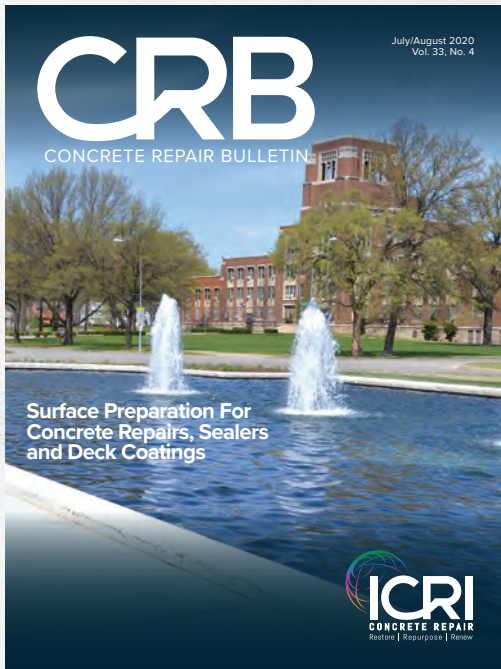
Despite current concrete technology to limit the size of or avoid cracks in concrete, cracking in concrete slabs is especially troubling when it occurs in bridges and parking decks, elevated floor slabs and similar high-use horizontal slab surfaces. Current methods for treating and healing narrow cracks include film-forming coatings; penetrating water repellent sealers; or filling the crack with a thin, chemically curing polymeric resin, engineered to ensure ideal viscosity, modulus of elasticity, and surface tension, for effectively treating narrow cracks in concrete. 

REFERENCES

1. ICRI 310.2R, *Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair*, International Concrete Repair Institute, St. Paul, MN, 2013.
2. ASTM C1583/C1583M-20, *Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method)*, ASTM International, West Conshohocken, PA, 2020.



Jennifer Crisman is the Director of Marketing Services at Euclid Chemical, a leading manufacturer of specialty concrete and masonry construction solutions. A 20-plus-year industry veteran, Crisman manages the marketing communications activities for Euclid's expansive line of admixtures, fiber reinforcement, concrete repair products, flooring materials and decorative concrete systems.



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INTRODUCTION TO ICRI TECHNICAL GUIDELINE NO. 210.4R-2021

GUIDE FOR NONDESTRUCTIVE EVALUATION (NDE) METHODS FOR CONDITION ASSESSMENT, REPAIR, AND PERFORMANCE MONITORING OF CONCRETE STRUCTURES

by Charles Mitchell

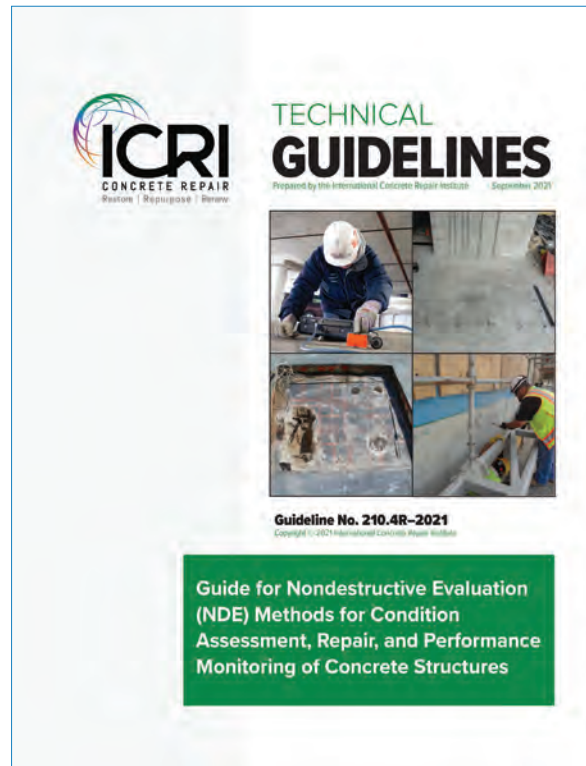


Fig. 1: Cover of ICRI Guideline No. 2104R-2021

ICRI Technical Guideline No. 210.4R-2021,¹ *Guide for Non-destructive Evaluation (NDE) Methods for Condition Assessment, Repair, and Performance Monitoring of Concrete Structures*, has been recently revised and updated (Fig. 1). The guideline, originally published in 2009, provides an overview of the various methods that can be employed in the non-destructive evaluation of concrete structures. The guide is intended to assist contractors, NDE service providers, owners, engineers, architects, and material suppliers in the selection of nondestructive evaluation (NDE) methods for evaluating the condition of concrete structures prior to repairs, and guidance in selecting appropriate NDE methods to provide quality control and assurance of repairs and long-term performance monitoring. The guide also provides assistance in understanding which specific properties/conditions related to the condition assessment, repair quality control, or performance

monitoring of a structure can be suitably evaluated using various NDE methods.

Sections of the guideline have been revised to provide new or updated information regarding nondestructive evaluation methods that reflect current recommended industry standards and guidelines. The guideline provides a roadmap and references linking various NDE methods to general applications; however, the guideline does not provide detailed information regarding the various NDE methods. Detailed information can be found in the reference standards and other documents that have already been published by various industry associations addressing each of the various methods.

As the guideline states, an essential component to proper maintenance and repair of a concrete structure is a thor-

ough understanding of the structure in terms of the cause, extent, and rate of progression of distress or deterioration. In order to attain this understanding, the repair professional must possess a combination of experience and a set of tools that can detect critical structural issues, such as distress or deterioration, that may not always be apparent, and are hidden from view. NDE methods offer the advantage of being able to diagnose internal concrete conditions, thereby enhancing repair design, quality assurance of concrete repairs, and performance monitoring of concrete repairs over the long term.

Important data can be obtained regarding the condition of a concrete structure and the nature, extent, and severity of internal distress or deterioration through the utilization of NDE methods. Without their respective applications in the assessment of specific structural members under distress, there could be the potential of compromising the feasibility and efficacy of repair. The concrete repair professional is obligated to recognize the strengths and limitations of each method to arrive at the proper NDE program for the specific structure under evaluation. The professional must also understand how to select the appropriate NDE method to determine the properties and conditions of concrete prior to repairs, for quality assurance (QA) and quality control (QC) during repairs, and for long-term performance monitoring of repaired structures.

The guideline provides an overview of the implementation of NDE methods, with recommendations for the following procedural considerations:

- Nondestructive Evaluation (NDE) Program;
- Condition Assessment with NDE Prior to Repairs;
- Repair Program Quality Control and Assurance with NDE;
- Performance Monitoring of Repairs with NDE; and
- Guideline Tables for Selection of NDE Methods.

NONDESTRUCTIVE EVALUATION (NDE) PROGRAM

Generally speaking, an NDE program should be planned based on observable surface damage conditions and a review of the available information regarding the design and construction of the structure, which may not always be available. Appropriate project objectives can then be determined and NDE methods selected for investigation of strength, structural concrete integrity, and other properties, as applicable. NDE methods selected for any preliminary assessment of a structure should determine qualitative information about the concrete conditions; in other words, if there are delaminations, voids, cracks, or spalling in the structure. These NDE methods are typically surface-based and include visual examination combined with acoustic impact (sounding) of the concrete surface. Subsequent quantitative information desired can then be derived using the suitable NDE method for more detailed assessments, which would include methods capable of determining internal strength, distress, and deterioration conditions of structural concrete and repair materials.

When conducting the NDE to determine those quantitative data, correlation of the NDE results with invasive sampling (i.e., drilling/coring) and laboratory testing of samples is critical (Fig. 2).

To confirm the accuracy and interpretation of the NDE results, the calibration of the NDE method for a given concrete mix at a given age for strength determination is strongly recommended. Correlation and verification are generally required in concrete flaw detection since NDE methods are affected by many variables including quality and moisture content of the concrete, amount of reinforcing steel present in tested sections, and others. Typically, samples representing a range of NDE test results are extracted and examined to provide a correlation between test results and conditions exhibited in samples removed.

CONDITION ASSESSMENT WITH NDE PRIOR TO REPAIRS

A comprehensive condition assessment is essential to a successful concrete repair (Fig. 3). The applicable NDE method for a particular repair program can be misdirected, with invalid results, if a condition assessment is not performed, or is not detailed and specific. The absence of a condition assessment could lead to expenses incurred by all parties exceeding the project's budget and may lead to repairs that are both insufficient and compromised. NDE is a common approach to a condition assessment leading to an understanding of the source of the issue being investigated. With a working knowledge of the tools and techniques available, each issue can be examined, documented, and assessed. Some condition assessments can



Fig. 2: Obtaining core specimens to determine compressive strength of concrete

be completed entirely with NDE; however, invasive methods may also be necessary. Even if invasive methods are necessary, NDE will often lead to the most appropriate invasive test and help to identify where such tests should be located to confirm or correlate with apparently sound, questionable, or poor conditions. The recommended practice is to correlate NDE results with invasive test results.

REPAIR PROGRAM QUALITY CONTROL AND ASSURANCE WITH NDE

Quality control and quality assurance are necessary components of any structural concrete repair project. For



Fig. 3: Top surface delamination with exposed reinforcing steel in an elevated garage deck slab during a condition assessment



Fig. 4: Ground penetrating radar (GPR) to identify and verify locations of embedded reinforcing steel



Fig. 5: Conducting impact-echo tests on a reinforced concrete shear wall to detect honeycombing and voids

instance, the installation of a bonded overlay would necessitate the evaluation of the bond between the new material and the existing substrate. Nondestructive testing provides an array of methods that can be used to verify the soundness of the overlay repair techniques. There are several other NDE applications that are commonly employed, such as determining the extent of the non-shrink grouting of voids beneath slabs, or of CMU cells in a grouted masonry wall, which can be evaluated using ground penetrating radar (Fig. 4), thermography, impulse response, impact-echo (Fig. 5), radiography, or other techniques. The quality and extent of epoxy injection can be evaluated using stress wave techniques such as ultrasonic pulse velocity and tomography, ultrasonic pulse-echo, impact-echo, and spectral analysis of surface waves. In new construction, NDE can be utilized as a quality assurance tool with respect to impact-echo thickness testing of pavements and slabs, maturity testing of concrete for strength development, and crosshole sonic logging of drilled shaft foundations to confirm the concrete integrity in underwater concrete placement or deep foundations in unsuitable subgrade conditions.

PERFORMANCE MONITORING OF REPAIRS WITH NDE

Performance monitoring of repaired structures is gaining more attention as an NDE tool, although still underutilized. When used properly and evaluated correctly, the results of NDE can be utilized to establish a baseline condition, which can be compared to future test results to evaluate change in a structure. Technology allows remote wireless computer monitoring of structural performance of many structures, including vertical facilities and bridges. It can also be used to evaluate trends of deterioration or performance change in a structure to enable projection of mid-range and long-range repair needs. Examples of performance monitoring include visual inspection and delamination survey of a structural deck or bonded overlay periodically, half-cell and linear polarization/galvanostatic pulse techniques to monitor the extent and rate of reinforcing corrosion, acoustic triangularization to locate acoustic events such as the release of energy when a prestressing strand fails, and crack monitoring to evaluate whether the cracks are propagating and becoming worse with time.


GUIDELINE TABLES FOR SELECTION OF NDE METHODS

This guideline also offers a tabular listing of the concrete property/condition to be investigated and applicable NDE methods to employ. The following tables are included to assist the concrete repair professional in the correlation of the concrete condition or property of the concrete and the utility of a particular NDE method:

- NDE Methods for Concrete Strength Prediction;
- NDE Methods for Reinforcement/Metal Location, Cover Depth, Sizing, and Corrosion Condition Assessment;
- NDE Methods for Structural and General Concrete Condition Assessment; and

- NDE Methods for Foundation Condition, Integrity, and Length.

SUMMARY

The revised and updated Technical Guideline No. 210.4R-2021, Guide for Nondestructive Evaluation (NDE) Methods for Condition Assessment, Repair, and Performance Monitoring of Concrete Structures contains new information and images/illustrations to assist the repair professional in selecting the appropriate NDE methodology on concrete repair projects. Revisions were made to the format and content of the tables in this updated edition of the guideline, specifically, Table 7.2 NDE Methods for Reinforcement/Metal Location, Cover Depth, Sizing, and Corrosion Condition Assessment, as well as revisions to the appendix section on corrosion rate testing, including the linear polarization method, galvanostatic pulse method, and AC electrochemical impedance modeling. The updated guideline expounds upon the information in the previous version to assist the concrete repair professional in choosing the applicable NDE method to arrive at a comprehensive resolution for any repair project. 

REFERENCE

1. ICRI 210.4R, *Guide for Nondestructive Evaluation (NDE) Methods for Condition Assessment, Repair, and Performance Monitoring of Concrete Structures*, International Concrete Repair Institute, St. Paul, MN, 2021, 34 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 40 years, the last 14 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 a co-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, and a member of the American Welding Society (AWS).

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TECHNICAL GUIDELINES

Prepared by the International Concrete Repair Institute September 2021



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Guide for Nondestructive Evaluation (NDE) Methods for Condition Assessment, Repair, and Performance Monitoring of Concrete Structures

ICRI Guideline 210.4R-2021

Guide for Nondestructive Evaluation (NDE) Methods for Condition Assessment, Repair, and Performance Monitoring of Concrete Structures

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The International Surface Event (TISE)
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FEBRUARY 1-2, 2022

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FEBRUARY 17-18, 2022

Canadian Concrete Expo
Toronto, Canada
Website: www.canadianconcreteexpo.com

APRIL 4-6, 2022

2022 ICRI Spring Convention
Baltimore, MD
Website: www.icri.org

APRIL 12-14, 2022

National Wood Flooring Association Expo
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Website: www.nwfaexpo.org

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Events can be emailed to editor@icri.org.
Content for the March/April 2022 issue is due by February 1, 2022 and content for the May/June 2022 issue is due by April 1, 2022.

International Concrete Repair Institute

INDUSTRY NEWS

CIM ANNOUNCES DONATIONS FOR ANNUAL AUCTION AT WORLD OF CONCRETE

The Concrete Industry Management (CIM) program—a business intensive program that awards students with a four-year Bachelor of Science degree in Concrete Industry Management—is pleased to announce signature items for their annual auction at World of Concrete:

- a truck-mounted 38M concrete pump donated by Alliance Concrete Pumps, NORCAL Kenworth and Kenworth Truck Company.
- a 2022 Mack® Granite® donated by Mack Trucks and equipped with a McNeilus® FLEX Controls™ Standard Mixer donated by McNeilus
- a Somero Enterprises, Inc. S-485 Laser Screed®

The annual auction will be held Wednesday, Jan. 19, 2022 in the West Hall Room W106 of the Las Vegas Convention Center. For a full list of items, please visit www.concretedegree.com/auction.

EUCLID CHEMICAL ACQUIRES LIQUID CONCRETE ADMIXTURES MANUFACTURER

Euclid Chemical, a leading manufacturer of concrete and masonry construction products, has announced its recent acquisition of the business of Brett Admixtures, which has exclusively manufactured and commercially promoted Euclid solutions since 1998.

With headquarters and primary operational activity located in Albertville, Minn., Brett Admixtures also has facilities in Sioux Falls, S.D., Marengo, Iowa, and Fargo, N.D. Allowing for geographic growth, this infrastructure will yield manufacturing and distribution synergies for both businesses across their newly expanded operations footprint.

As part of the acquisition, Jim Gubbin, the acting vice president for Brett Admixtures, will assume responsibility for all operational, distribution and field services matters, while John Brett Jr., sales manager for the company, will lead Brett's proven team of admixture consultants and sales representatives as they join Euclid's operations and sales teams.

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Increte Stone-Crete architectural concrete formliners were customized to restore aged cast stone on the historical Newtown Turnpike Bridge. **Increte Stone Essence** replicated the original look of the stone, preserving the appearance of this unique 1930s era bridge. Euclid Chemical is honored to receive a 2021 ICRI Project Award of Merit for this restoration.

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ASSOCIATION NEWS

AMERICAN CONCRETE PUMPING ASSOCIATION (ACPA) ANNOUNCES 2021 SCHOLARSHIP RECIPIENTS

The American Concrete Pumping Association (ACPA) announces Leighton Landreth, Dominick Willman and Shelby Willy as co-recipients of the association's first annual Bob Weatherton Scholarship. Landreth attends Vernon College in Vernon, Texas, studying business administration. Willman is a senior at Ironwood Ridge High School in Oro Valley, Ariz., and Willy is pursuing an Architectural Engineering degree at the University of Oklahoma.

The scholarship is named in honor of the late "Big Bob" Weatherton of The Concrete Pump Store in California. Weatherton served on the ACPA Board of Directors for more than 40 years and is remembered as one of the industry's most avid champions.



Leighton Landreth became interested in pump trucks at a very early age, thanks to her family's history in the construction industry. Before she finished high

school, Landreth accepted an office position in the family's new pump company, Bigfoot Concrete Pumping. While attending Vernon College on an athletic scholarship, Landreth continues to work part-time for the family company and hopes to own her own business someday.



While at IRHS, Dominick Willman distinguished himself through his induction into the National Honor Society, lettering in academics, and memberships in the Key and History clubs.

Willman also contributes his time as a math tutor to other students and volunteer cook at the local homeless shelter.



At the University of Oklahoma, Shelby Willy is making a difference, thanks to her involvement in programs centered around outreach and community service—

Sooners Without Borders and Sooner Engineering Education. Shelby hopes to work for or own a nonprofit that creates

sustainable ways to provide basic needs to those less fortunate, foreign and local.

For more information about the ACPA, visit www.concretepumpers.com.

NORTH CAROLINA ADOPTS ACI CONCRETE REPAIR CODE

On September 14, 2021, the North Carolina Building Code Council (BCC) voted to accept ACI's proposal to amend the 2018 North Carolina Existing Building Code to reference ACI CODE-562 *Code Requirements for the Assessment, Repair and Rehabilitation of Existing Concrete Structures*, it was subsequently approved for adoption by the North Carolina Rules Review Commission on November 18, 2021. Effective January 1, 2022, North Carolina will become the fourth state to reference ACI CODE-562, joining Hawaii, Ohio, and Florida.

A leading authority and resource worldwide for individuals and organizations involved in concrete design, construction, and materials, ACI has long focused its efforts on knowledge development and dissemination. Through its mission, the Institute dedicates resources and efforts to advance the adoption of its consensus-based knowledge.

The North Carolina BCC and all individuals involved in the code development process are recognized for addressing the need to help ensure quality repairs of structural concrete and thus better provide for the safety, health, and general welfare of the citizens of North Carolina.

The code change establishes minimum requirements for the design, construction, repair, and rehabilitation of concrete structural elements in buildings for various levels of desired performance as deemed appropriate for the project. In addition to improved life safety, the requirements clearly define objectives and anticipated performance for the code official, owners, designers, contractors, and installers. For more information visit concrete.org/advocacy.

NATIONAL INSTITUTE OF BUILDING SCIENCES APPOINTS STEPHEN T. AYERS INTERIM CEO

The National Institute of Building Sciences Board of Directors is pleased to announce that The Honorable Stephen T. Ayers, FAIA, NAC, CCM, LEED AP, the 11th Architect of the Capitol and President of The Ayers Group, LLC, has accepted the position of Interim CEO of NIBS. Ayers' appointment follows the announced departure of CEO Lakisha A. Woods, CAE.



Ayers previously served as Chair of the NIBS Board from 2017 to 2018. He also served as Chair of the Construction Management Association of America and the Construction Users Roundtable.

On February 24, 2010, President Barack Obama nominated Ayers to serve as the 11th Architect of the Capitol. By May of that year, the United States Senate confirmed Ayers, and the President officially appointed him to a 10-year term as Architect of the Capitol.

Ayers was responsible for facilities maintenance and operation of the historic U.S. Capitol Building, the care and improvement of more than 570 acres of grounds and the operation and maintenance of 18.6 million square feet of buildings, including the House and Senate Congressional office buildings, Capitol Visitor Center, Library of Congress, U.S. Supreme Court Building, and other facilities.

Under his leadership, Ayers reduced carbon emissions, improved energy efficiency, and implemented sustainable design practices throughout the Capitol complex. He also was committed to supporting small businesses to help facilitate competition and support local communities and implemented several programs to award contracts to companies that reflect the nation's diversity.



The International Concrete Repair Institute is the leading resource for education and information to improve the quality of repair, restoration, and protection of concrete. Visit www.icri.org.

ASSOCIATION NEWS

CENTER OF EXCELLENCE FOR NONMETALLIC BUILDING MATERIALS ANNOUNCES NEW EXECUTIVE DIRECTOR

NEx: An ACI Center of Excellence for Nonmetallic Building Materials has hired Jerzy Zemajtis as Executive Director, replacing Dr. David A. Lange. He will oversee all NEx operations and initially focus on identifying and recruiting new members interested in advancing nonmetallic building materials.



Jerzy has over 30 years of experience in materials testing, structural design, repair and rehabilitation, corrosion condition assessment, and service life modeling of concrete structures. His work includes the development of testing programs for numerous major structures around the world and designs for composite and prestressed concrete bridges in the U.S., Canada, and Poland. Prior to joining NEx, Jerzy was a staff engineer for the American Concrete Institute and organized the first-ever ACI International Code Summit in 2021. He received his PhD in construction materials from Virginia Tech, Blacksburg, VA, and is a licensed professional engineer in Washington State, and the province of British Columbia, Canada.

In addition to new member recruitment, Jerzy will focus on establishing initiatives to grow awareness and technology adoption related to nonmetallic building materials. To learn more or to get involved with NEx, visit nonmetallic.org or contact info@nonmetallic.org.

BUILDING AND CONSTRUCTION INDUSTRY LEADERS ANNOUNCE PLANT CERTIFICATION FOR COMPOSITE PRODUCERS

The American Composites Manufacturers Association (ACMA), American Concrete Institute (ACI), and NEx: An ACI Center of Excellence for Nonmetallic Building Materials have signed a memorandum of understanding to develop and deploy a new plant certification program. The agreement sets the framework of an important partnership to establish a plant certification program for producers of fiber-reinforced polymer composite bars and tendons for use in concrete.

ACMA, ACI, and NEx each agree the program should comply with applicable ANSI, ISO, or AASHTO / NTPEP requirements for a plant certification program and should be developed under the auspices of a Standards Developing Organization. This new certification program aims to accelerate the adoption and use of fiber-reinforced polymer composite bars and tendons.

"This endeavor challenges our industry to certify manufacturers to standards which future nonmetallic building materials can abide by," said Jerzy Zemajtis, Executive Director, NEx: An ACI Center of Excellence for Nonmetallic Building Materials. "NEx, ACMA, and ACI are committed to improving the protection of the health, safety, and welfare of the public at large and to facilitate the needs of the market, and this agreement is a major step in that direction."

"The plant certification program will expand opportunities for composites and establish clear standards for producers across the composites manufacturing industry," added Cindy L. Squires,

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Esq., President and CEO, American Composites Manufacturers Association.

Learn more about ACMA's efforts in improving nonmetallic solutions at acmanet.org.

Visit concrete.org to learn more about ACI's resources on nonmetallics in concrete.

To learn more about how NEx is advancing nonmetallics and to get involved, visit nonmetallic.org.

INTERESTED IN SEEING YOUR NEWS IN THIS COLUMN?

Email your 150-200 word association news to editor@icri.org. Content for the March/April 2022 issue is due by February 1, 2022 and content for the May/June 2022 issue is due by April 1, 2022. ICRI reserves the right to edit all submissions.

INTERNATIONAL CONCRETE REPAIR INSTITUTE

ICRI CHAPTER NEWS

CHAPTER CALENDAR

ICRI Chapters are starting to host events again in 2022. Be sure to check with individual chapters by visiting their chapter pages to determine if they have made any plans after this *CRB* was published.

BALTIMORE-WASHINGTON

February 10, 2022
JOINT DINNER WITH ACI
Maggiano's Tyson's Corner
Tyson's Corner, VA

FLORIDA WEST COAST

January 13, 2022
AXE and ALE SOCIAL
Axe & Ale
St. Petersburg, FL

February 2, 2022

CHAPTER TECHNICAL MEETING
Topic: Shoring by Dansco Engineering
Red Mesa Cantina
St. Petersburg, FL

GEORGIA

January 6, 2022
2022 KICK-OFF BOARD MEETING
Bennett & Pless Offices
Atlanta, GA

INDIANA

January 13, 2022
TECH EVENT
Topic: Ford Building Restoration
The Anchor
Indianapolis, IN

March 10, 2022

TECH EVENT
Topic: Moisture in Concrete; Testing and Solutions
Location: TBA

METRO NEW YORK

January 20, 2022
WATERPROOFING AT FALLING WATER
Club 101
New York, NY

MICHIGAN

March 2022
ANNUAL DEMO DAY
Location: TBD

MINNESOTA

January 14, 2022
ANNUAL MEGA DEMO
Theme: Plaza Restoration
Cement Masons Local 633
New Brighton, MN

CHAPTER ACTIVITIES

QUEBEC INCREASES SCHOLARSHIP AWARDS IN 2021

The ICRI Quebec Chapter has just concluded its second year of the scholarship program for graduate students. In 2021 the Chapter received 20 applications, which is quite phenomenal considering that this is only the second year of the program. The program initially planned to offer only two scholarships, but the tremendous response encouraged the Board to adjust the program. After some deliberation, the chapter agreed to give a total of five scholarships to individuals working on some interesting projects.

2022 recipients receiving scholarships of \$1,500 each included Stéphanie Blanchard from Sherbrooke University. Under the supervision of Richard Gagné, this project involves the study of deconstructed sections of the old Champlain Bridge to allow a better understanding of the causes of its deterioration. Also receiving \$1,500 is Sophie-Isabelle Dionne-Jacques from Laval University. Under the supervision of Marc Jolin, this project focuses on the study of the rebound mechanisms of sprayed concrete by dry process.

Due to the overwhelming response, the chapter and judges decided to award three additional awards of \$1,000 each. These went first to Thi Hang Tran from Laval University. Under the supervision of Luca Sorelli, this project concerns the development of ecological UHPC. The second recipient is Fahime Sokhangou from Laval University. Under the supervision of Luca Sorelli, the project they are working on focuses on Structural Health Monitoring using UHPFRC. Then finally, the third award will go to Yosra Rmili from Sherbrooke University. Under the supervision of Ammar Yahia, this final project is studying the expansion of concrete and its effect on the formation of the boundary layer in pumping pipes.

Congratulations to all the awardees. Unequivocally, the local scholarship program is a great success that the Quebec Chapter wants to continue to improve.

INDIANA HOSTS HOLIDAY EVENT



The ICRI Indiana Chapter hosted their annual holiday party at the Rathskeller. They included a historic tour of the Anthonaem in addition to a delicious dinner and German beer. During the holiday party, ICRI Indiana presented the Indiana 9/11 Memorial with a donation which will be utilized for maintenance of the newly renovated Indiana 9/11 Memorial.

OKLAHOMA GATHERS ONCE AGAIN



On October 14, 2021, the Oklahoma chapter hosted a meet and greet at the Golf Suites of Tulsa, giving chapter members a chance to get together once again



ICRI has 39 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.

Chapters also provide an outstanding opportunity to meet and build relationships with repair specialists in your area. In addition to the technical meetings, chapters also host golf outings, social evenings, dinner cruises, and other networking events.

WWW.ICRI.ORG

CHAPTER ACTIVITIES

CAROLINAS GIVES BACK WITH SERVICE PROJECT

On October 19 and 20, 2021, ten member companies of the ICRI Carolinas Chapter met at a nondescript apartment complex in Charlotte, NC. The Rachel Street apartments are a 16-unit complex purchased in partnership with the Charlotte Rescue Mission (CRM). The CRM is a residential substance abuse treatment facility with separate campuses for men and women. The Rachel Street apartments were purchased to be used as transitional, assisted housing for graduates of the CRM program. This facility will be a springboard to transition men and women from the 120-day residential treatment program successfully back into society.

As these units are being renovated for their new use, a need was identified for some exterior concrete upgrades. Several of the entrance stoops were cracked and crumbling and in need of replacement, a few sections of sidewalks were missing, and the facility lacked pads to store trash cans instead of in the mud. Because they know concrete, ICRI Carolinas sprang into action.

On the first day of the three-day service project, 23 individuals from 8 companies showed up with equipment and tools to demo the concrete to be replaced, remove the sod in areas for new concrete, form everything up, and place compacted gravel and wire mesh in the areas to be poured. Then on the second day, 12 individuals from 5 member companies came to place and finish the concrete. They installed a total of 6 yards of concrete over about 350 square feet at 22 different locations. The pace was fast and furious as the volunteer group scrambled to get the 6 yards from the truck in wheelbarrows and a Georgia buggy and then to finish it as it began to set up. It was tough work but successful.

In the end the chapter helped to provide this important transitional-living project with the necessary infrastructure to be able to provide nice and functional housing for the tenants who are soon to move in. This was the largest service project our chapter has ever attempted. After becoming somewhat dormant during COVID without the ability to get together for our conferences, we thought this would be a great way to help spark our chapter back to life. The overwhelming response from the Chapter Members allowed not only all the work to get done, but a chance for everyone to be together and celebrate being members of such a wonderful organization.

The ICRI Carolinas Chapter service project committee members included: John Lambert from Stone Restoration; Bill Brickey with Terracon; Jeff Welty with High Rock; Mike Jarman from Coastal Construction Products; and Ben Pisello with Coastal Construction Products.



Chapter Members gather to give back



Form work before the pour



The work continues



Chapter Members were glad to be able to get together again



Finishing a pour on day 2



Preparing to wheel in the concrete



More form work

ICRI CHAPTER NEWS

CHAPTER ACTIVITIES

FLORIDA WEST COAST CLAY SHOOT



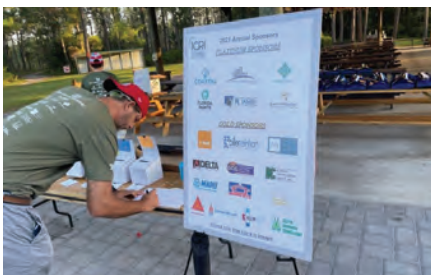
The scene is set for the best shooters around to win a trophy



Gift bags ready for the attendees



Close to Halloween gives a license for a Trick or Treat theme



No event is possible without the help of the many sponsors



Raffle tickets for a special prize



Guests arrive at the Tampa Bay Sporting Clays venue



October 22, 2021 turned out to be a perfect day for a shooting event



Guests were able to shoot from several different vantage points



Lunch was brought in for the shooters from M-N-M BBQ



The chapter celebrated several winners



The group prepares for the final raffle of the day



Attendees enjoyed an afternoon of networking as well



The chapter welcomed more than 80 members and guests for a fun and exciting afternoon

CHAPTER ACTIVITIES

BALTIMORE-WASHINGTON HOSTS FALL SEMINAR

On December 2, 2021, the Baltimore-Washington Chapter held its annual Fall Technical Seminar. Organized by Program Committee Chair, Tom Ouska, the program included presentations on corrosion & concrete deterioration, non-destructive evaluation (NDE) equipment, new water-based technologies for concrete restoration, updates to ICRI's 240.4R guideline, and a forensic engineering case study from the Florida International University pedestrian bridge collapse. Olson Engineering also provided hands-on demonstrations of various NDE equipment. More than 70 members registered and attended the event which was graciously hosted at the Concrete Protection & Restoration (CP&R) Offices in Baltimore, MD.

QUEBEC HOSTS WEBINAR SERIES

The ICRI Quebec Chapter hosted a webinar series this past Fall. The series consisted of three separate webinars. The first webinar was held on October 21, 2021, when the chapter welcomed Johana Chavez Lares as a guest presenter. Her presentation was geared towards Cathodic protection using sacrificial anodes in reinforced concrete structures and included her guidelines on how to select the right anode.

The second webinar was held on November 18, 2021, and the chapter welcomed Scott Muzenski from FHWA as a guest presenter. His presentation was a follow-up to one the chapter presented last year. The November presentation was titled: "Thixotropic UHPC overlays : Recent research on bond and structural strength performanc." The final webinar in this series was hosted on December 2, 2021, and featured April Snyder from RJ Lee Group as the guest presenter. She presented on Petrographic solutions to concrete material evaluations. As the Quebec Chapter rarely hosted this kind of online webinar series, this format allowed the chapter to reach out to new people and create more awareness around ICRI and the local chapter.

NORTH TEXAS WELCOMES DAVE FULLER: COMPANY TRAINING PROGRAMS

The North Texas Chapter held their November Membership Meeting virtually on Thursday, November 11. Following discussion of chapter business, the chapter welcomed Dave Fuller, ICRI Technical Manager. Mr. Fuller's presentation focused on creating effective company training programs, which is a key component in the success of companies in the concrete repair industry due to its unique technical challenges. The important steps in the basic training process included establishing company goals and strategies, preparing training events, and realizing behavioral changes as a result of the training. Mr. Fuller presented challenges and opportunities associated with adult learning and principles that will help with knowledge retention for adults and focused on the important of hands-on experiences and on-the-job learning. Finally, the importance of evaluating the impact of the training program was reviewed, ranging from gauging the reaction of participants to evaluating improvements in work quality and financial benefits. The North Texas Chapter thanks Dave Fuller for attending our meeting and sharing his knowledge on training programs with the group!

CAROLINAS HOSTS MEGA DEMO

The 2021 Mega Demo hosted by the ICRI Carolinas Chapter was held on November 3-4 in Raleigh, NC. The two-day event featured four technical and educational presentations on Wednesday at the StateView Hotel and demonstrations conducted by representatives from eight different member companies on Thursday. The demos were conducted in the cattle barn at the NC State University livestock education unit. The venue gives our demonstrators plenty of room to spread out and allows attendees to be hands-on and up-close for each demonstration. The MEGA DEMO was also the first time the chapter has been able to gather indoors for a meeting since 2019. The Board was also pleased to recognize our outgoing President, Courtney Green, for her contributions to the chapter and to also thank Steve Moore who rotates off the board after eight consecutive years of service to our chapter.



Chapter members prepare for the 2021 Mega Demo



Attendees gather for the Mega Demo



Demonstration number one



Demonstration number two



Demonstration number three

CHAPTER ACTIVITIES

NORTH TEXAS HOSTS ANNUAL GOLF CLASSIC

A record number of golfers showed up to celebrate the North Texas Chapter's 20th Annual Jesse Points Memorial Golf Classic on October 1 at Waterchase Golf Club in east Fort Worth. Intermittent showers did not dampen the enthusiasm nor deter the excellent play by several teams. In the end, the Western Specialty Contractors' team of Bob Scheeler, Bob Tober, Parker Mink, and Bryan Staffell eked out a one stroke victory with a score of 58. Second Place went to the Master Builders Solutions' team of Patrick Jorski, Andy Bautz, Don Moore, and James Monroe. Ram Tool's team of Albert Gray, Matt Willmann, Kevin Heitz, and Kris McConnell garnered Third Place honors with a score of 60.

A scorecard playoff had to be held among four teams scoring 70 to determine the "Dead-Ass Last" (i.e., "Most Honest") team. On the 10th handicapped hole, the Aquatex Waterproofing team of Brad Tolson, Jacob Johnson, Jose Verreal, and Shane Leath will get bragging rights for the year as the D.A.L./Most Honest team on the course.

Aquatex team member Jacob Johnson also took home Long Drive honors on hole #18.

Closest to the pin winners included Tim O'Brien (#2), Chase Gilley (#7), Thomas Alonzo (#12), Alex Selby (#14), and Mark LeMay (#16).

Proceeds from the tournament help to fund the North Texas Chapter's Scholarship fund.

The tournament is named after NTX Charter Member Jesse Points, who chaired every Chapter golf tournament from 1999 until his death in June 2017.



Golfers gather for dinner after play



1st Place team (L-R) Parker Mink, NTX President, Eddie DeHaro, Bob Scheeler, Bryan Staffell (not pictured, Bob Tober)



2nd Place team (L-R) Andy Bautz, Patrick Jorski, James Monroe, and Don Moore



3rd Place team with NTX President Eddie DeHaro



"Most Honest" team from Aquatex Waterproofing



Jesse Points (R) with Bob Scheeler at the 2016 NTX Golf Tournament

"As someone relatively new to the concrete restoration industry, one of the very first things I did after starting my new job was join my local ICRI chapter. It immediately gave me access to best-in-class training documents (especially the ICRI Guidelines). ICRI also offered informational videos and a peer network that accelerated my knowledge and confidence out of the gate. I highly recommend membership to anyone new thinking about entering the field."

Jeff Konkle
MAK Construction Products Group

CHAPTERS COMMITTEE CHAIR'S LETTER



MICHELLE NOBEL
Chapters Chair

Welcome to 2022! I'm so excited for 2022, and with the New Year comes new beginnings. In the astute words of Buddha, *"No matter how hard the past is, you can always begin again."* So, let's build on our successes from the past year and strive for an even better 2022!

It's time to make sure you've sent in your officer and director updates and your chapter plans for 2022. It's also time to start thinking about the Chapter Awards again. We have skipped the past few years due to COVID restrictions making meeting difficult for most chapters. Remember, planning ahead and scheduling meetings for 2022 will ensure you have a full calendar of events on which to base your awards forms at the end of the year. It's always thrilling to see who's going to win the coveted "Chapter of the Year" Award.

After an incredibly successful 2021 Fall Convention in Minneapolis, we're heading to the East Coast for the 2022 ICRI Spring Convention in Baltimore. It'll be at the beautiful Baltimore Marriott Waterfront from April 4-6, 2022. Make your plans now because you don't want to miss out!

We're also planning a Spring ICRI Roundtable. Whether we hold it virtually or live, it's guaranteed to be engaging and informative. Details about these events are coming soon, so keep an eye out for email updates.

The Women in ICRI Committee Meeting is looking for other women to join our illustrious group. Please, don't hesitate to join this group of women working in the concrete repair industry. We highlight the accomplishments of women from all around the world. If you would like to join the Women in ICRI group, please reach out to Tara Toren-Rudisill at TToren-rudisill@ThorntonTomasetti.com, Monica Rourke at MRourke@mapei.com, or me at mnobel@mapei.com.

Did you know that your chapter can receive rebates for referring people to either ICRI Certification program? Host a CSMT or CSRT Live Performance Exam at your chapter, or refer people to one on the schedule and you'll receive rebates if the participant identifies your chapter as the promotional source. How easy is that?!

In the rebate program, chapters receive a rebate of 15 percent of the paid member/nonmember registration fees for all participants who register for the CSMT/CSRT programs solely due to the chapter's marketing and promotion.

For the chapter to receive the rebate, the participant (during registration) must indicate that they heard about the CSMT/CSRT program from the chapter as the promotional source and then identify the specific chapter name in the appropriate drop-down menu.

The rebates apply to all ICRI CSMT/CSRT program courses and categories that the chapter promotes and gets registrants to identify the chapter as the promotional source (excludes registration fees for CSMT classes where registration is handled by others, like World of Concrete, TISE-Surfaces, and partner events). If a private partner program includes open registration and the chapter is asked to promote to fill the class, the chapter does receive the rebate if the participant identifies the chapter as the promotional source.

So, host a CSMT/CRST event and receive rebates for your chapter! It's educational and a fundraiser at the same time!

Dates to mark on your calendar:

- World of Concrete 2022—January 17-20, 2022 in Las Vegas, Nevada
- 2022 ICRI Spring Convention—April 4-6, 2022 in Baltimore, Maryland

Remember to email Dale Regnier at daler@ewald.com your ICRI chapter meetings and events so he can post them on the ICRI website and the *Concrete Repair Bulletin*.

Do you know what's happening in the area where you're traveling? Check out the ICRI calendar to find out! You can make new friends and see what other chapters do for their events. It's a win-win!

Here's a link to the calendar on the ICRI website for more information: https://www.icri.org/events/event_list.asp

The ICRI staff, the Executive Committee, your Regional Director, and the leaders of your local ICRI chapters are here to help. ICRI is here to help you and support you in everything you do. In the eloquent words of William Shakespeare, *"I count myself in nothing else so happy as in a soul remembering my good friends."*

Remember to be safe, be kind, and I will see my good friends in Baltimore!

Sincerely,

Michelle Nobel
2022 ICRI Chapters Committee Chair
MAPEI Corporation



NEW!

Guide Specifications for

CEMENTITIOUS BONDED OVERLAY



Now available at www.icri.org

This guide specification aids the Design Professional in the preparation of technical specifications for inclusion directly into a project manual for the construction of cementitious bonded overlays that are in line with the state-of-the-art materials and methods used in the concrete repair industry. The document provides an outline for developing the three parts of the specification through suggested text, references, and commentary for evaluating alternatives. This specification section must be used with ICRI 110.1, Guide Specifications for Structural Concrete Repairs.

PEOPLE ON THE MOVE

CONCRETE EXPERT, MARY VANCURA, PhD, PE, JOINS AMERICAN ENGINEERING TESTING



American Engineering Testing (AET) is pleased to announce the addition of concrete expert, Mary Vancura, PhD, PE as a Principal Engineer in the Building Technology group. Mary has been in the Civil Engineering field for 17 years and has a wealth of knowledge and expertise in construction materials testing, and experience on design-build projects. She is a PE in 20 states and is active in the Minnesota Concrete Council, American Concrete Institute, and the Transportation Research Board.

Mary will use her diverse background in civil, environmental, structural, pavement, and construction engineering to support endeavors with the building technology, concrete, and construction groups. In her role, she will promote smart sustainability of concrete use in construction through performance specifications, attention to concrete service life, and education on utilization of the newest technologies to reduce Portland cement content in concrete mixtures.

Mary will be an integral member of growing the Building Technology department by planning for the expansion of services, mentoring current staff, and growing the team. She also has a love for working with her clients, and she will continue to develop and maintain client relationships as part of her role.

CTL GROUP INTRODUCES NEW SR. MATERIALS CONSULTANT, JONATHAN RIDENOUR



Jonathan Ridenour has over 15 years of experience in welding engineering, materials selection, metallurgical processing, forensic analysis, and managing the fabrication, construction and commissioning of oil, gas, and petrochemical projects.

His areas of technical expertise include welding, fabrication, and commissioning; laboratory test methods, and fracture mechanics of metals; forensic failure analysis; nondestructive inspection tech-

niques; evaluation and mitigation of corrosion; casting and forging.

Prior to joining CTLGroup, Mr. Ridenour held positions as an Engineering Group Manager for an offshore installation contractor, independent contractor representing various oil & gas companies, and welding engineer for a pipeline welding company.

Mr. Ridenour's representative experience includes: Welding Engineering and Materials Failure Analysis

CTL GROUP INTRODUCES NEW MATERIALS TECHNOLOGY ASSOCIATE, SUNDAR CHITHIRAPUTHIRAN



Sundar Chithiraputhiran has over 13 years of professional experience in the building materials and construction industry with a focus on research, development, and commercialization of products and technical consulting. He has developed and commercialized products for road repair, flooring, and structural applications. Additionally, he has provided solutions and insight across a wide range of engineering challenges — performing root cause analysis, material characterization, and performance evaluation. His subject matter expertise includes, but is not limited to, cement, concrete, gypsum, and supplementary cementitious materials (fly ash, slag, metakaolin, etc.).

Prior to joining CTLGroup, Mr. Chithiraputhiran held positions as a Senior Researcher for a leading building materials manufacturing company in their research and development center. He also has the experience of working as a Project Engineer on a heavy construction project for 2 years.

Mr. Chithiraputhiran has a Master's degree in Civil, Environmental and Sustainable Engineering from Arizona State University and is currently pursuing his PhD in Civil and Materials Engineering part-time at University of Illinois Chicago (UIC).

Mr. Chithiraputhiran's key achievements include: developed & commercialized five new sustainable products; co-Inventor on three patents; and multiple peer reviewed journal publications with 200+ citations.

PRODUCT INNOVATION

CORTEC® LABORATORIES OFFERS ACCREDITED ASTM G180 TESTING FOR CORROSION INHIBITING ADMIXTURES

It is increasingly clear that steps must be taken to enhance the durability of concrete structures. Engineers today are designing new structures expected to last over a century, while owners of existing structures that are reaching the end of their designed service life are looking for ways to maintain them for further use. Corrosion of metal reinforcement is a critical risk factor for durability of structures, and as such, the development and selection of corrosion inhibiting admixtures is a consideration to take seriously. Cortec® Laboratories can assist stakeholders in the all-important screening process by performing accredited testing to ensure admixtures measure up to widely accepted industry standards for the selection and qualification of corrosion inhibiting admixtures. One such test is G180, a corrosion inhibition test measurement option under ASTM C1582, Standard Specification for Admixtures to Inhibit Chloride-Induced Corrosion of Reinforcing Steel in Concrete.



While Cortec® Laboratories is ready to test any admixture, MCI®-2005 is one of special note that passes ASTM G180 testing and is ideal for new construction. MCI®-2005 is an organic corrosion inhibitor that contains a blend of amine salts of carboxylic acids. Unlike calcium nitrite admixtures, which have a set accelerating effect that can send workers scrambling or cause early setup problems, MCI®-2005 slightly delays set time, making the concrete easier to work with and reducing the heat of hydration. Other advantages are that MCI®-2005 contains 67% USDA certified biobased content and is certified to meet ANSI/NSF Standard 61 for use in large potable water structures.

When incorporated into concrete, MCI®-2005 forms a protective molecular layer on embedded metals to inhibit corrosion. In new construction, this is quantified by

an increase in critical chloride threshold and subsequent reduction in corrosion rates once corrosion initiates. When used with repair mortars and grouts, MCI®-2005 not only protects rebar within the patch, but it is also able to migrate into undisturbed concrete adjacent to the repair to protect reinforcement already in place.

Whether looking to test MCI®-2005 or another admixture for an upcoming project, stakeholders can learn more about how ASTM G180 testing is done by viewing the video recently made by Cortec® Laboratories. Contact your local MCI® rep to learn more or arrange testing: <https://www.cortecmci.com/contact-us/>.

GEOSTABILIZATION INTERNATIONAL EXPANDS CAPABILITIES IN RAIL WITH CUTTING-EDGE TECHNOLOGY

Railways are critical for efficient and cost-effective movement of commodities across long distances. But they are only as productive as they are operable – making it crucial for track maintenance downtime to be minimal and repairs sustainable. With the innovative RailJET® Subgrade Stabilization System, GeoStabilization International® is optimizing productivity through reduced cyclical track bed maintenance and costs, including limited hi-rail access only areas with dense high tonnage train traffic.



Explicitly intended for railroad soft-subgrade soils stabilization, the RailJET® uses a modified jet grouting process to improve subgrade integrity below mainline track, super-elevated curves, bridge approaches, rail yards and specialty track work such as switches and crossovers. The hydrodynamic mix-in-place technique produces a soil-cement column – ranging from eight to 16 inches in diameter – to reinforce the soil both in bearing and shear. The mix-in-place system allows for grout to be delivered on demand with no waste or spoil mess to clean up during or after treatment.

Traditional maintenance and repair methods typically require access way construction along the track or equipment to be rail loaded on flat cars and transported to the jobsite, offloaded and prepped for operation. Once the work is complete, access ways need to be removed or the equipment is reloaded to demobilize. These processes are logistically challenging, costly and can significantly increase a project's overall duration – especially when working in limited-access areas.

The Hi-Rail mounted equipment is a self-contained system, making it ideal for limited-access areas and where track windows are tight, as no additional railroad provided equipment is needed. Being self-contained also allows for quick deployment on and off the track, reduced repair costs and increased jobsite flexibility. The RailJET provides a stable platform for railroad loading, increasing infrastructure longevity, reducing long-term maintenance costs, and providing protection from the potential dangers and damage of soft subgrade geohazards. For more information, please visit www.geostabilization.com

INTERESTED IN SEEING YOUR NEWS IN THESE COLUMNS?

Email your 150-200 word news to editor@icri.org. Content for the March/April 2022 issue is due by February 1, 2022, and content for the May/June 2022 issue is due by April 1, 2022. One (1) high resolution headshot/product photo may be included. ICRI reserves the right to edit all submissions.



ICRI is the center for repair leadership, supporting a profession built on science and craftsmanship—making the built world safer and last longer. For the best in product manufacturers and industry professionals, visit www.icri.org.

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NEW MEMBERS

SUPPORTING MEMBER

Stone Mountain Access Systems, Inc.

Hillside, Illinois
United States
Halena Allen

COMPANY MEMBERS

Fairway Architectural Railing

Hamilton Township, New Jersey
United States
Rob Blackman

Gardon Construction Ltd

Winnipeg, Manitoba
Canada
Joe Benjamin

JY Direct, LLC

West Chester, Pennsylvania
United States
Jeffrey Yoder

PBA Design Group, Inc.

Tampa, Florida
United States
Howard Piper

Premier Building Restoration, Inc.

Erdenheim, Pennsylvania
United States
Kelly Woods

SGS, Inc.

Riverdale, Maryland
United States
David Schwartz

United Building Envelope Restoration

Manassas Park, Virginia
United States
Thane Timbers

ADDITIONAL INDIVIDUALS FROM SUPPORTING MEMBER COMPANIES

Fernanda de Figueiredo

Concrete Protection & Restoration Inc.
Oakland Park, Florida
United States

ADDITIONAL INDIVIDUALS FROM COMPANY MEMBERS

Juan Arredondo

Mapei
Arlington, Texas
United States

Chris Baker

JQ Engineering
Dallas, Texas
United States

Tyler Bishop

Western Specialty Contractors
Glendale Heights, Illinois
United States

Tommy Brennan

U.S. Concrete Products
Timonium, Maryland
United States

Dan Caron

Blinderman Construction
Chicago, Illinois
United States

Audrey Chapman

Aquafin, Inc.
Elkton, Maryland
United States

Michael Ferro

Concrete Protection & Restoration Inc.
Oakland Park, Florida
United States

Nathan Johnson

JQ Engineering, LLP
Dallas, Texas
United States

Shirley Stern

Hempel
Conroe, Texas
United States

Gary Syslo

Walker Consultants
Chicago, Illinois
United States

Sarah Whitmore

Vector Corrosion Technologies
Winnipeg, Manitoba
Canada

INDIVIDUAL MEMBERS

Abdelgadir Adam

Potomac, Maryland
United States

William Ayers

Hicksville, New York
United States

Byron Beamer

Seabrook, Texas
United States

Ryan Bellissimo

Beachwood, Ohio
United States

Jeff Borys

Clarendon Hills, Illinois
United States

Steven Burkett

Tampa, Florida
United States

Randy Curtiss

Norfolk, Virginia
United States

Yves Deschenes

Ste-Anne-des-Plaines, Quebec
Canada

Vicky Fanberg

Dayton, Ohio
United States

William Fennell

Walnut Creek, California
United States

L.A. Green

Richmond, Virginia
United States

Bob Howell

Rochester Hills, Michigan
United States

We are
focused on
the industry's
future and
your success.



ICRI is the center for concrete repair and restoration leadership, supporting a profession built on science and craftsmanship—making the built world safer and longer lasting.

- 1** Developing an industry of professionals through networking and best practices
- 2** Expanding certification programs and services to educate and build skills
- 3** Building strategic partnerships to strengthen the relevance of ICRI and the concrete restoration industry
- 4** Serving the needs of members and customers with staff, volunteers, and our chapter network

NETWORKING · EDUCATION · INFORMATION · CERTIFICATION
CONVENTIONS · COMMITTEES · INDUSTRY GUIDELINES

Join Today @ www.icri.org

NEW MEMBERS

Munesh Kumar

Te Atatu South, Auckland
New Zealand

Jesus Lopez

San Juan, Puerto Rico
United States

Nariman Mahboub

Mississauga, Ontario
Canada

Chogaibou Maiga

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Mali

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ICRI'S ANNUAL PROJECT AWARDS

Sika is honored to be a part of a total 9 projects that have been awarded at ICRI's annual award ceremony. Sika submitted a total 5 award winning projects along with 4 projects submitted by other companies where Sika was listed as the material supplier.

Sika Submitted:

1. PG&G Powerhouse Science Center (Project of the Year Finalist)
2. Terminal Tower (Project of the Year Finalist)
3. St. Joseph's Church Restoration (Award of Excellence)
4. The Leamington (Award of Excellence)
5. Alt Meyer Building Restoration (Award of Merit)

Customer Submitted (Sika as Material Supplier):

6. The Assembly: Jumpstarting the Historic Ford Assembly Building (Submitted by: Wiss, Janney, Elstner, Associate; Project of the Year Winner)
7. Repair and Protection of a 1950s-era Wastewater Digester Tank Structure: Gold Bar Digester No. 3 (Submitted by: RJC Engineers; Award of Excellence)
8. The Don Cesar - Entrance Ramp & Bridge Repair (Submitted by: Tadjer-Cohen-Edelson Associates, Inc.; Award of Excellence)
9. Prill Tower Repair Extends Service Life (Submitted by: PULLMAN; Award of Merit)



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