March/April 2021
Vol. 34, No. 2

CRB

CONCRETE REPAIR BULLETIN

CONCRETE REPAIR IN EXTREME ENVIRONMENTS

ICRI
CONCRETE REPAIR
Restore | Repurpose | Renew

Protectosil®

Water Repellents, Corrosion Inhibitors, Graffiti Control & Crack Sealers

Protectosil®

Protectosil® CHEM-TRETE®
Protectosil® AQUA-TRETE®



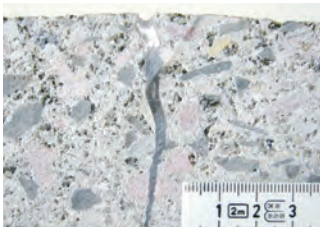
Protectosil®
Corrosion Inhibitors



Protectosil
ANTIGRAFFITI®



Protectosil®
MMA Crack Sealer HE



Protectosil® Water Repellents

- Penetration deep into the substrate
- Treated structure remains breathable
- UV resistant

Protectosil® Corrosion Inhibitors

- Extends the service life of the structure
- Easy and low-cost spray-on application
- Anti-spall or corrosion monitoring warranties available

Protectosil ANTIGRAFFITI®

- Repels graffiti and aids in removal
- Withstands repeated cleaning cycles
- Lower maintenance cost

Protectosil® MMA Crack Sealer HE

- Excellent crack penetration
- Cures within two hours
- Extends service life of concrete structures

Learn more about our comprehensive line of Protectosil® products including water repellents and anti-graffiti treatments.

Evonik Corporation
Building Protection
299 Jefferson Road
Parsippany, NJ 07054-0677
PHONE +1 800 828-0919
info.protectosil@evonik.com
evonik.com/protectosil

EVONIK
Leading Beyond Chemistry

Concrete Repair Bulletin
is published bimonthly by the:
International Concrete Repair Institute, Inc.
1000 Westgate Drive, Suite 252
St. Paul, MN 55114
www.icri.org

For information about this publication or about membership in ICRI, write to the above address, phone (651) 366-6095, fax (651) 290-2266, or email info@icri.org. The opinions expressed in *Concrete Repair Bulletin* articles are those of the authors and do not necessarily represent the position of the editors or of the International Concrete Repair Institute, Inc.

ISSN: 1055-2936

ON THE COVER: Extending Service Life of Höganäs County Water Tower. Examining damaged concrete and corroded reinforcement at the top of the reservoir. See page 22.

CRB
CONCRETE REPAIR BULLETIN

March/April 2021
Vol. 34, No. 2

FEATURES

DEPARTMENTS

NOTE FROM THE EDITOR

2021 is off to a good start and it is looking to be an improvement over last year. COVID-19 remains a concern around the world, but vaccines are available and the future is looking brighter. There's light at the end of the tunnel. Hopefully, by this Fall everyone will have had the opportunity to get a vaccine allowing us to meet in person at the Fall Convention.

The 2021 Spring Convention is set for April 21 and 22. Chapters are continuing to hold virtual meetings and are making plans to soon hold in-person meetings. Please continue to send your chapter events and updates to Dale Regnier.

This issue of the *Concrete Repair Bulletin* features technical articles about Curing Concrete in Extreme Conditions, Extending the Service Life of the Höganäs County Water Tower, Rehabilitating the Ituango Embankment Dam, and an article highlighting the new ICRI Guide Specification for Epoxy Injection, Guide No. 110.2-2020.

I hope you are all having a great start to 2021 and I look forward to seeing you at future ICRI conventions and chapter meetings!

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

DIFFERENCEMAKERS

I am excited to co-author this opening message with ICRI Executive Director Eric Hauth. Eric joined ICRI only 6 months before COVID-19 put a hard stop to in-person gatherings, so many of you have not had the opportunity to get to know him as well as I have. Eric's passion for our industry and his vision for ICRI's future is a major part of the stability we're creating for our organization, now and into the future. I'm excited to be working with him this year and hope each of you will get the opportunity to meet him at an in-person event later this year! –Elena Kessi


ELENA KESSI


ERIC HAUTH

As we write this article, it has been a full year since the start of the pandemic! We have all been through a lot and hopefully found ways to grow during this difficult time. We mourn for all those lost to this disease and celebrate all those who have sacrificed on the front lines.

One thing is for sure: Brighter days are ahead, and they will be even better knowing that we took the time to sharpen our tools and become even more resilient for whatever the future holds.

We want to assure our members .that ICRI has been working hard during these challenging times to become an even stronger organization for this exceptional industry. One of the most inspiring things about ICRI is that it is an organization made up of problem solvers—real difference makers. Each of you works hard for your customers, your teams, and your communities. And just like you, ICRI only thrives when it makes a real difference to the people and organizations we serve.

But what does it really mean for ICRI to be a *difference maker*?

For ICRI it means staying relevant and supporting our individual and company members. It means pushing forward with our technical products to make this great industry even better. It means finding new and better ways to deliver educational content to our members. It means creating new products that benefit our members. And it means doing more to showcase the important work of our members and volunteers.

Over the past year, ICRI has re-doubled our efforts to strengthen the institute and find new opportunities to make a difference to the individuals and company members we serve.

Throughout the year, ICRI:

- supports 38 chapters, including 2 student chapters.
- publishes 6 editions of the *Concrete Repair Bulletin*.
- provides exceptional networking opportunities through our 2 national conventions and 2 chapter roundtables.
- provides access to ICRI's 21 published technical guidelines, including 310.2R-2013 *Surface Preparation Guide* and CSP surface profile chips.
- produces technical guidelines and products, including 6 new guidelines currently working their way through ICRI committees.
- offers national and international peer recognition through our 7 distinct awards programs.
- runs 2 exceptional certification programs—the Concrete Surface Repair Technician (CSRT) and the Concrete Surface Moisture Testing Technician (CSMTT) programs.
- provides extensive volunteer opportunities to shape the future of the industry through ICRI's 12 technical committees and 13 administrative committees.

These offerings reflect the core values and purpose of ICRI. But we know we cannot just sit back and do what we have always done, especially during such a challenging time that forces us to be more resourceful and innovative. So, throughout the pandemic we have also been busy on several important fronts that will serve ICRI members well into the future.

Here are some of the highlights:

Virtual (Online) Education:

While the pandemic has many of us feeling a little "zoomed out," it is hard to deny that it accelerated a need to offer on-demand education for ICRI members, opening up new opportunities to position ICRI as the go-to source for industry education. If you haven't already done so, check out the large and growing list of on-demand webinars available on the ICRI Learning Center, available through the Education & Certification tab on the ICRI website.

Website Content & Navigation Overhaul:

The ICRI staff team and Marketing Committee worked together closely on an extensive overhaul of ICRI's website content and navigation structure to improve access to ICRI content and resources and the user experience.

Aligning Staff Responsibilities:
We have a great staff team supporting ICRI. Getting the right people in the right seats is critical to any successful organization, so we are grateful that Dale Regnier has returned to full time with ICRI as Program Director, enabling us to leverage his extensive knowledge and connections with ICRI members and better optimize ICRI's certification programs, chapter relations, and TAC activities.

New Strategic Plan and Operational Goals:
ICRI's Executive Committee has invested significant time laying out an updated strategic plan and operational goals to focus and guide our efforts in 2021 and beyond. Importantly, one of the goals is to implement a new product launch plan to make sure that ICRI has a consistent, comprehensive plan to promote future guidelines and other technical products. We're excited that the new Guide Specifications for Epoxy Injection (Committee 110)—featured in this edition of CRB—is the first new product launched using this plan!

New Investment Portfolio to Grow the Institute's Reserves:
For the first time in the institute's history, ICRI was able to move its money market reserve funds to an investment portfolio, professionally managed by a firm specializing in associations like ours. This move allows ICRI to take advantage of long-term market gains, strengthening our reserves through a well-diversified portfolio.

Enhancing ICRI's Focus on Diversity & Inclusion:
Last and certainly not least, we are excited about our new features to increase the focus on diversity and inclusion, championed by the Women in ICRI Committee. The January/February *CRB* put a spotlight on members of the committee, and this edition focuses on the 2021 International Women's Day topic "Choose to Challenge" (https://www.internationalwomensday.com). ICRI is an inclusive group and we will promote that spirit in this magazine.

We are so fortunate to be part of the concrete repair industry and grateful for the countless volunteers that make the work of ICRI possible. Together with our exceptional team of staff members, we have never been better prepared to be difference makers.

Thank you for your continued membership in and commitment to ICRI. We cannot wait to get back together in person—stronger than ever!

Sincerely,

Elena Kessi
2021 ICRI President

Eric Hauth
ICRI Executive Director

PRESIDENT'SMESSAGE

International Women's Day—March 8, 2021

A challenged world is an alert world. Individually, we're all responsible for our own thoughts and actions—all day, every day. We can choose to challenge and call out gender bias and inequity. We can choose to seek out and celebrate women's achievements. Collectively, we can all help create an inclusive world. From challenge comes change, so let's all choose to challenge.

#ChooseToChallenge

International Women's Day

ELENA KESSI

March 8 is becoming more widely known for celebrating International Women's Day. I remember seeing it all over social media last year and being encouraged by the positive messages I read. With the turmoil our society faced in 2020, I have spent quite a bit of time reflecting on diversity and biases in my own personal and professional life. When I think of my professional experiences, I consider myself to be very fortunate, because I chose to join an industry where despite the gender balance not being equal, I feel strongly that this industry today is extremely supportive and accepting of all people. I have worked closely with men since the start of my career and have always felt accepted and a valued member of the team. I recognize that this wasn't always the case. Many women before me fought to earn the same respect and acknowledgement that I have always felt, and for that I am forever grateful to them.

You may be asking yourself why I am writing about this in my ICRI President's message. Is this the right place to have these conversations? My answer is simple: ***absolutely***. My experience with my ICRI colleagues has been that of acceptance and support. And I want everyone to know that about ICRI.

When a small group of women came together and wanted to start the Women in ICRI Committee it was met with unanimous support from all ICRI leadership. In fact, then-President Ralph Jones attended and participated in all our formative meetings. I want to thank all the men and women in ICRI and our expanded industry for your continued support and collaboration—on the jobsite, at the office, and at ICRI.

The opening message of the CRB (pg. 2-3) talked about "Difference Makers" and how ICRI is paving the path forward. I'd like to celebrate and highlight the many WICRI difference makers across our National Committees and local Chapters.

ICRI's Spring 2021 Convention is being held virtually, April 21 – 22. The new condensed 2-day schedule is packed full of technical sessions, product demonstrations, and panel discussions featuring ICRI Difference Makers. It is a perfect opportunity to learn more about ICRI and get involved. I look forward to seeing you online at the convention!

Elena Kessi
2021 ICRI President

ICRI Trailblazers

Past President 2008
Monica Rourke, FICRI
Mapei Corporation, Manager, Waterproofing & Injection Systems - USA & Canada

Past President 2015
Katherine Blatz, FICRI
MBCC Group, Director, Global Virtual Design and Construction

WOMENINICRI

Difference Makers Serving their Local Chapters

Adrienne Larson
RM Chapter, Director
Wiss, Janney, Elstner Associates, Inc., Associate III

Alexandra Little, PE
DV Chapter, Director
O'Donnell & Naccarato, Inc., Senior Project Designer

Allison Lea
SCT Chapter, Vice President
Master Builders Solutions US, Strategic Account Manager

Annie K. Lo, AIA, LEED AP
NCA Chapter, Director
Walter P. Moore and Associates, Inc., Managing Director and Principal of Diagnostics

Ashly Ellison
FFC Chapter, President
Coastal Construction Products, Inc., Regional Accounts Lead

Caitlin Daniels
NE Chapter, Director
CBI Consulting, LLC, Marketing Director

Caitlin Maggiano
DV Chapter, Director
O&S Associates, Senior Project Manager & Office Director

Catherine Maloney
NE Chapter, Secretary
MMA Reps, Inc., Independent Manufacturer's Sales Representative

Christine Diosdado, PE (CA)
NCA Chapter, Vice President
Simpson Gumpertz & Heger, Associate Principal

Corey Spitzer
MNY Chapter, Secretary
John G. Waite Associates, Architects PLLC, Conservation Specialist

Courtney Green
CAR Chapter, President
University of North Carolina at Charlotte, Lecturer

Danielle Kennedy
BC Chapter, Officer
Read Jones Christoffersen Ltd., Design Engineer in Building Science and Restoration

Gloriana Arrieta Martinez, PhD, PE (PA)
MNY Chapter, Director
Simpson Gumpertz & Heger, Consulting Engineer

Heather Grazzini-Sims
MIN Chapter, Director
Carciofini Company, Vice President

Jessi Meyer, FICRI
MIN Chapter, Director and Past President
Cortec Corporation, VP Technical Sales and Product Management

Kandace Thompson
SCT Chapter, Secretary
Western Specialty Contractors, Project Manager

Karrie McMillan
FWC Chapter, Secretary
Florida Paints, Sales Representative

Kimberly Deibel, PE
MIN Chapter, Director
Braun Intertec Corporation, Structure Sciences Technical Manager

Laura Bolduc
CAR Chapter, Director
DKO Engineering, PLLC, President

Lisa Viker
MIN Chapter, Director
Vector Corrosion Technologies Inc., Business Development Manager

Marie Fallon
PITT Chapter, Director and Past President
A.R. Chambers and Son, Inc., General Manager

Marjorie Lynch, PE, FACI
MNY Chapter, Director and Past President
Jensen Hughes, Senior Engineer

Marthe Brock, CSI, CCPR
MIN Chapter, Director
Master Builders Solutions, Buildings and Restoration Specialist

Natalie Faber
RM Chapter, Vice-President
National Waterproofing Supply, Western Regional Sales Manager

Ryleigh Tatum
GS Chapter, Vice President
J.J. Morley Enterprises, Inc., Estimator

Sara Peters
NOH Chapter, Vice President
THP Limited, Inc., Principal

Sarah Horton
CHI Chapter, Director
Berglund Construction, Preservationist

Sonja Hinish
RM Chapter, Treasurer
BC&E, LLC, Senior Associate

Stacia Van Zetten, P.Eng.
TOR Chapter, Director
EXACT Technology, Chief Strategy Officer

Tina M. Tapinekis
MNY Chapter, Director
Surface Design Architect, PLLC, Senior Partner

TACTALK


MARK NELSON

TAC GOALS FOR 2021—RECOGNIZE TECHNICAL COMMITTEE LEADERS

One of our four TAC goals in 2021 is to properly recognize our ICRI Technical Committee Leaders. ICRI is a trade organization run by dedicated volunteers. Our mission is to improve the repair industry. Our success depends upon industry leaders volunteering their personal time to support our effort. In this article, I would like to personally recognize and thank those ICRI members who contribute their time to making our technical committees work.

ICRI's technical leaders are found throughout the organization. However, they are primarily located in leadership positions in our technical committees and in TAC (Technical Activities Committee). All of these leaders commit many hours to improving the repair industry by helping to create relevant and technically sound technical offerings.

ICRI TAC members serve three-year terms and are responsible for attending all of the TAC meetings as well as attending both of the ICRI national conventions. Also, all TAC members are responsible for supporting at least one technical committee. In addition to the time spent in these meetings, TAC members also take time to review all of the technical offerings that come out of the ICRI technical committees. In all, TAC members commit about 2-4 hours per month (24-48 hours per year) working on TAC-related activities.

ICRI Technical Committee Chairs serve two-year terms. The Technical Committee Chairs are responsible for organizing and running their committee meetings at the two national conventions along with any virtual meetings in between conventions. In addition, Technical Committee Chairs are responsible for everything related to running a technical committee including initiating ballots, attracting and organizing the members as well as setting the overall agenda and direction for that committee. Technical committee chairs commit 2-3 hours per month (24-36 hours per year) working on their technical committee activities.

We currently have 13 TAC members and 13 Technical Committee Chairs. Here are the names and companies of our TAC members.

ICRI TAC MEMBERS

- **Mark DeStefano**—*DeStefano Engineering Group*
- **Scott DiStefano**—*Sika Corporation*
- **Ashish Dubey**—*USG Corporation*
- **Paul Farrell**—*Carolina Restoration & Waterproofing*
- **Michel Jalbert**—*MAPEI Corporation*
- **Liying Jiang**—*Jensen Hughes*
- **Zelina Johnson**—*Klein and Hoffmann*
- **Peter Kolf**—*CTL Group*
- **Gerard Moulzolf** —*American Engineering Testing*
- **Jeff Ohler**—*Euclid Chemical*
- **Matthew Sherman**—*Simpson, Gumpertz & Heger*
- **Dan Wald**—*Master Builders Solutions*

ATTEND A TECHNICAL COMMITTEE MEETING

Every ICRI member has the opportunity to join and participate in ICRI technical committees. You can attend a meeting by simply asking the Technical Committee chair for an invitation to the next virtual meeting. Following is the list of ICRI Technical Committees and Chairs:

- **Committee 110—Guide Specifications**
  Chair: Liying Jiang, Jensen Hughes
- **Committee 120—Environmental Health and Safety**
  Chair: Paul Farrell, Carolina Restoration & Waterproofing
- **Committee 130—Procurement Methods and Relationship Arrangements**
  Chairs: Jeff Carlson, Consulting Engineers Group and Michael Saulnier, Pegasus Painting & Waterproofing
- **Committee 150—ACI 562 Guide Update**
  Chair: Rick Edelson, Edelson Consulting Group
- **Committee 160—Life Cycle and Sustainability**
  Chair: Vincent LaPointe, Simco Technologies
- **Committee 210—Evaluation**
  Chairs: Charles Mitchell, Smislova, Kehnemui & Associates and David Rodler, Smislova, Kehnemui & Associates
- **Committee 310—Surface Preparation**
  Chair: Peter Haveron, Texas Concrete Restoration
- **Committee 320—Concrete Repair Materials and Methods**
  Chair: Mark Kennedy, Simpson Strong-Tie Company
- **Committee 330—Strengthening and Stabilization**
  Chair: Tarek Alkhrdaji, Structural Technologies
- **Committee 410—Masonry**
  Chair: Jason Coleman, O'Donnell & Naccarato, Inc.
- **Committee 510—Corrosion**
  Chair: Jorge Costa, Durability, Inc.
- **Committee 710—Coatings and Waterproofing**
  Chair: Eric Muench, Sika Corporation

Thank you for all of the time and effort you put into your volunteer roles with the organization.

ATTEND A TECHNICAL COMMITTEE MEETING

You, too, can become a leader. The leaders above started by attending a technical committee meeting. Each ICRI member has the opportunity to join and participate in ICRI technical committees. You can attend a virtual meeting by simply contacting the Technical Committee chair for an invitation to the next meeting. Technical committee meetings at live conventions are open to everyone; just show up.

You can find the schedule for upcoming meeting dates on the ICRI website. As always, if you want to join an ICRI technical committee, please feel free to contact me directly at mnelson@nelsontesting.com.

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

PEDESTRIAN DECK COATING SYSTEMS

MIRAFLEX XL

Where to use:

- Over interior/exterior concrete surfaces
- Mixed-use, residential and commercial
- Waterproofing of existing topping slabs over sandwich membranes
- Vented and unvented metal pan deck slabs

Advantages:

- Vapor permeable - allows substrate to breath without blistering
- Wide array of slip resistant textures, colors and finishes
- Lower maintenance and life cycle costs vs. other flooring types
- VOC and LEED-compliant, low odor and fast cure time

MiraFlex XL is a cementitious, fabric- reinforced, waterproofing membrane system engineered for exterior pedestrian traffic applications.

MIRAFLEX II

Where to use:

- Interior/Exterior over occupied space
- Mixed-use, residential and commercial
- Over plywood and concrete substrates

Advantages:

- Monolithic, seamless protection – waterproofing membrane
- One-hour fire rated over plywood (ICC ESR 1714 listing)
- VOC and LEED-compliant, low odor and fast cure time
- Wide array of slip resistant textures, colors and finishes

MiraFlex II is a multi-layered pedestrian deck coating system consisting of a lath-reinforced cementitious underlayment, fluid-applied waterproofing membrane, and decorative finished deck surface. It can also serve as an under tile waterproofing membrane system.

Learn more at miracote.com

Headquarters: 800.692.3502
West Coast: 310.631.6594
Central: 210-888-0449
East Coast: 908.245.2808
miracote@cpcmail.net
miracote.com

MIRACOTE

SECRETARIAT UPDATE


JOHN McDOUGALL

There may be no better word to describe the last 12 months than *pivot*. On a weekly basis, we are tracking our actions, reviewing for effectiveness, and making course corrections to see ICRI work to better serve our membership and the industry. We are all doing this in our personal lives, remote learning with our families, and remote meetings with our work colleagues. It's an ever-evolving landscape and ICRI is facing the same challenges on a daily basis as we all are.

To better connect our membership to the future plans of ICRI, we have seen the Secretariat evolve again. With the world working remotely and everyone meeting virtually, we no longer are constrained to face-to-face meetings at conventions. The Secretariat will be 100% virtual, removing the time, travel cost, and meeting expense from the equation. This will allow for any member, anywhere, to participate and contribute without the disruption of flights and hotels. I see this as an opportunity for someone who may not have the time, corporate backing, or support to get involved at the highest level of ICRI and be a big part of the next "CSP replica chips" that continues to maintain ICRI as the leader in the concrete repair industry.

The Secretariat has also been realigned to better integrate the ICRI Board and Executive Committee. As President-Elect, I will chair the Secretariat and ICRI Vice President Pierre Hébert will be the Vice Chair. Both Pierre and I have served on the board and are well versed in how to navigate what can be a daunting process for reviews and approvals. By connecting with our administrative and technical committees, Technical Activities Committee (TAC), and Finance Committee, we will remove roadblocks to see good ideas blossom into great offerings for the industry.

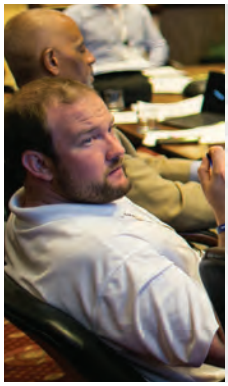
We have a solid pipeline of very good ideas and proposals being submitted and the Secretariat has been busy. I hope

to see it get busier and the process become more streamlined. We have made significant strides in the last 3 years to *de-regulate* the process of developing an idea into a product offering. By better connecting with TAC and the Marketing, Education, and Certification Committees, we have been able to see ideas become realities.

A few success stories that started as ideas that need to be celebrated are the establishment of the Women in ICRI Committee and the 40 Under 40 Awards Program. These started as ideas submitted through the Secretariat process, and with its guidance, have resulted in a standing committee and one of our most popular programs recognizing young professionals.

I hope you will take the time to submit your ideas and take the time to volunteer and get involved with ICRI today. ICRI has come a long way with the gracious support of countless volunteers. This is our association—your association—and let's work together to see the growth continue.

***John McDougall** is ICRI President-Elect, Secretariat Chair, CSRT certified, and Past President of the ICRI Carolinas Chapter.*



Volunteer

The success of the International Concrete Repair Institute and its work in the industry depends on a strong, active volunteer force. As a member of ICRI, you are invited to participate in the meetings and projects of any ICRI administrative or technical committee. All are volunteer-led and depend on your expert contributions.

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

Visit www.icri.org for more information.

You've got cracks. We've got you covered.

A complete line of structural epoxy repair products.

From viscosity, to cure time, to pot life, to temperature, to class — the Simpson Strong-Tie® family of crack repair products has a solution for almost every job. And we've got the dispensing tools and injection systems that help make application fast, easy and clean. Our epoxies are tested to the latest standards, so you can be sure that repairs are strong, and that your structures are safer.

To learn more about our versatile set of crack repair solutions, visit **go.strongtie.com/crackrepair** or call (800) 999-5099.

SIMPSON Strong-Tie®

SUPPORTING MEMBERS

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

3M
Saint Paul, Minnesota
www.3m.com

CSI CONTRACTING SPECIALISTS INCORPORATED
Attleboro, Massachusetts
www.contractingspecialists.com

HAMMER CONSTRUCTION
East Dundee, Illinois
www.hammer-construction.com

AMERICAN ENGINEERING TESTING, INC.
Saint Paul, Minnesota
www.amengtest.com

CORTEC CORPORATION
Environmentally Safe VpCI™/MCI® Technologies
Saint Paul, Minnesota
www.cortecvci.com

IMER GROUP
TOGETHER WE BUILD
Capitol Heights, Maryland
www.imerusa.com

AQUAFIN
Elkton, Maryland
www.aquafin.net

EUCLID CHEMICAL
Cleveland, Ohio
www.euclidchemical.com

IMR INNOVATIVE MASONRY RESTORATION, LLC
Prior Lake, Minnesota
www. imrestoration.com

BENGOA CONSTRUCTION
Hollywood, Florida
www.bengoaconstruction.com

EVONIK
POWER TO CREATE
Parsippany, New Jersey
www.protectosil.com

KRYTON
SMART CONCRETE®
Vancouver, British Columbia, Canada
www.kryton.com

C.A. LINDMAN INCORPORATED
Jessup, Maryland
www.calindman.com

FOXFIRE
CLEANERS + SEALERS + CORROSION CONTROL
San Antonio, Texas
www.foxfireusa.net

LymTal International, Inc.
248-373-8100
www.lymtal.com
Atlantic Beach, Florida
www.lymtal.com

ccl
Jessup, Maryland
www.cclint.com

FREYSSINET
SUSTAINABLE TECHNOLOGY
Sterling, Virginia
www.freyssinetusa.com

MAPEI®
Deerfield Beach, Florida
www.mapei.com

CP&R
saving the life of concrete®
Baltimore, Maryland
www.concretecpr.com

SUPPORTING MEMBERS

...your continued support greatly enhances programs both within ICRI and the concrete repair industry as a whole.

ICRI CONCRETE REPAIR
Restore | Repurpose | Renew

Shakopee, Minnesota
www.buildingsystems.basf.com

Aurora, Illinois
www.prospec.com

Pleasanton, California
www.strongtie.com

Rancho Dominguez, California
www.miracote.com

Columbia, Maryland
www.pullman-services.com

Cincinnati, Ohio
www.ssrg.com

Elmhurst, Illinois
www.nelsontesting.com

Florence, Alabama
www.hpsubfloors.com

Columbia, Maryland
www.structural.net

Dallas, Texas
www.neogard.com

Lawrenceville, Georgia
www.tecservices.com

Charlotte, North Carolina
www.terracon.com

NRG Consulting—Independent Contractor
Fort Myers, Florida

Shanghai
www.horseen.com/

Winnipeg, Manitoba, Canada
www.vector-corrosion.com

Lyndhurst, New Jersey
www.sikausa.com

Auburn, Washington
www.posttensioningsolutions.com

Norcross, Georgia
www.hdsupply.com

Lawrence, Kansas
www.prosoco.com

Houston, Texas
www.ssicm.com

Hampshire, Illinois
www.wrmeadows.com

Concrete Surface Repair Technician (CSRT) Program

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

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

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

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

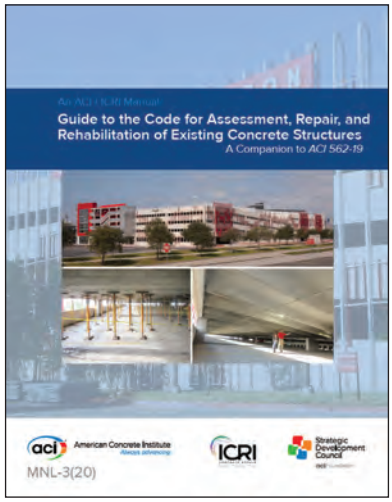
ICRI CONCRETE REPAIR CERTIFICATION

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

Contact:
Whitney Murray
Professional Development Manager
whitneym@icri.org

Now Available...

New ACI/ICRI Guide to the Code for Assessment, Repair, and Rehabilitation of Existing Concrete Structures



The American Concrete Institute (ACI) and International Concrete Repair Institute (ICRI) have published an updated "Guide to the Code for Assessment, Repair, and Rehabilitation of Existing Concrete Structures, A Companion to ACI 562-19." This guide provides the licensed design professional with the knowledge, skill, and judgment to interpret and properly use ACI 562-19, "Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures" and provides insight into the use and benefits of the code for contractors, material manufacturers, building owners, and building officials.

This updated guide features 3 main components:

1. Chapter guides for providing clarity and understanding of the relevant portions of ACI 562-19.
2. Appendix B provides an overview of the new standard ACI 563-18, "Specifications for Repair of Concrete in Buildings."
3. Project design examples illustrating the process of carrying out a concrete building assessment, repair, rehabilitation, or strengthening project from inception through completion.

New features of the updated guide include an appendix addressing specifications with examples and clear definition of the responsibilities and scope of the repair, rehabilitation, or strengthening. The guide also includes three new design examples and five updated design examples guiding the licensed design professional through the code provisions of actual concrete repair projects.

The new guide in printed format is available in the ICRI bookstore and as a bundle with the ACI 562-19 publication. ACI 563-18 is also available. Visit www.icri.org for details.

Got a complex job? Bring it.

COASTAL®
CONSTRUCTION PRODUCTS

The best products on the market, backed by the experience to help you get the job done.

We do more than just provide products – we offer solutions. Our team shares industry experience so you can feel confident knowing that your job can be completed on time and on budget.

CoastalOne.com **855.347.0866**

DOW® Service as strong as DOWSIL™ products. And that's hard to match.

Authorized Distributor DOWSIL™ silicones by DOW

Alabama | Arkansas | Florida | Georgia | Tennessee | Caribbean

Rehabilitating the Ituango Embankment Dam

by Robert Cordova and Richard First

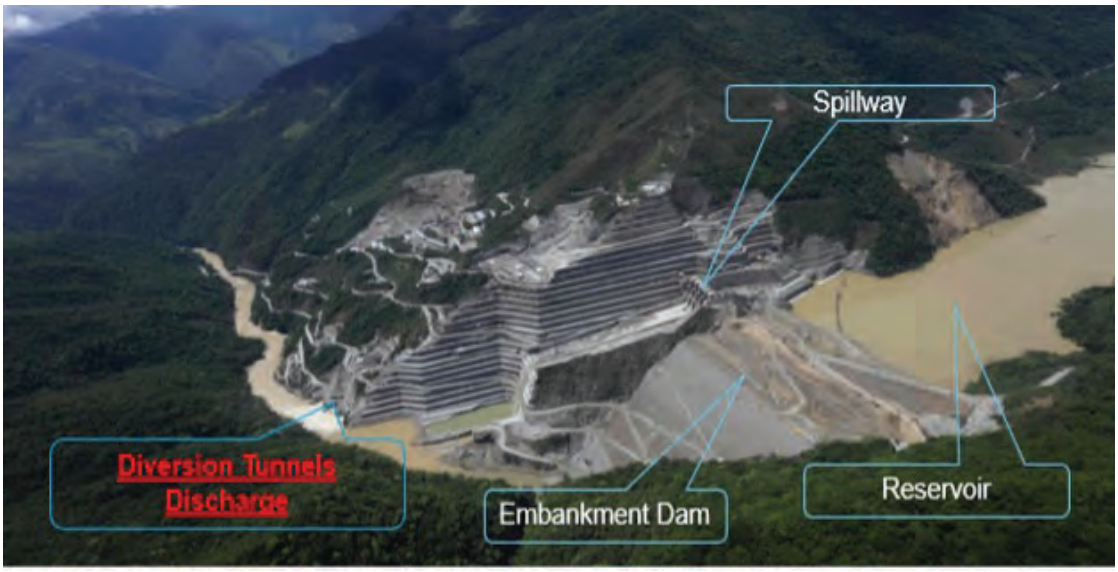


Fig. 1: The unfinished crest of the dam during the rainy season[6]

The Ituango Embankment Dam is currently under construction on the Cauca River near the town of Ituango, Colombia, South America. In 1983, a feasibility study was completed to address the energy needs of a growing and shifting population density of Colombia, as most of the population is in the northwestern region of the country and there exists a huge hydroelectric potential of the Cauca River.[1,2]

Unfortunately, the project was tabled for over two decades as a result of Colombia's economic crisis. In 2008, a design was finalized, and the project was awarded in 2011 to EPM (Colombia's giant multi-utility company) when they formed a joint venture with the Antioquia government, named Hydroituango.[1] Preliminary construction began that same year.

SPECIFICATIONS

Being the largest hydropower plant in Colombia, the dam would ultimately reach the height of 740 ft (225 m) with a reservoir length of 49 miles (79 km), creating a huge reservoir capacity of 95 billion ft^3 (2.7 billion m^3) in which only 34,600 million ft^3 (980 million m^3) would be considered useful capacity. To maintain the reservoir levels, the dam will have a spillway with four radial gates to control the flow of over 776,900 ft^3 (22,000 m^3) per second. The dam's power plant will have a nominal hydraulic head of 646 ft (197 m) and will actuate 8 Francis turbines, each generating 307 MW for a total of 2.4 GW of power and ultimately generating 17% of Colombia's energy demand.[1,3]

DIVERSION TUNNELS

Two twin tunnels, 26 ft (8 m) in diameter, would originally be designed to divert the Cauca River around the construction site as the dam was being built. These tunnels were initially designed to have control gates which provided a mechanism to close the tunnels once the final elevation of the dam was constructed. Being 20 months behind schedule in the initial phase of the construction, it was decided to redesign the tunnels without the control gates to save time and get back on schedule. In lieu of the control gates on the twin tunnels, a third tunnel was constructed, similar in size with control gates, simultaneously with the construction of the dam. This tunnel will be referred to as an auxiliary tunnel (ADT), also referred to as the galleria, or the GAD.[4]

FAILURE OF THE TUNNELS

In 2018, the crest of the dam, which stabilizes the dam between the two abutments, had not yet been completed (Fig. 1). It was approximately 16 ft (5 m) short of the targeted elevation of 740 ft (225 m). However, in anticipation of completing the dam, the twin tunnels were plugged with concrete stoppers. This would leave the auxiliary tunnel

to operate alone while the last 16 ft (5 m) was constructed.[5] Upon completion of the crest, the spillway and the radial gates would then control the reservoir levels.

Unfortunately, Colombia's very long rainy season caused many catastrophic events. As torrential downpours continued, landslides along the banks of the river caused the lone auxiliary tunnel to become restricted. This created a serious problem when the reservoir began to fill at a very high speed. Workers vigorously attempted to unclog the GAD and open one of the twin tunnels.[4] Eventually, both the GAD and one of the twin tunnels would become unrestricted; however, this was short-lived because the debris blocked the twin tunnel and the head pressure of the reservoir caused the GAD to partially collapse restricting the water again (Fig. 2). Partial collapse of the GAD resulted in sinkholes on the mountainside[7] (Fig. 3).

At this point, the water was trapped in the reservoir and caused the head pressure to grow, creating fear of a breach or even worse, the overtopping of the dam. As such, the government had no choice but to declare a state of emergency.[6] With the tunnels restricted, it was decided to divert the water through the partially finished machine room (Powerhouse).[4] This caused flash flooding downstream, devastating these communities and displacing tens of thousands who made their home along the river.[3,6]

Fig. 2: Schematic illustrating internal collapse of the GAD tunnel as a result of growing pressure within the soil[7]

Fig. 3: Sinkhole on the mountainside[7]

PROPOSED ENGINEERING SOLUTION

To repair the collapsed tunnels, a solution was engineered to inject a series of micropiles of a cementitious, underwater grout to "wall off" the entrance and exit of the tunnels to create pre-stoppers. The grout would be required to withstand very high flow rates (Fig. 4).

An underwater injection resin was used on both the inlet and outlet of the tunnel to completely seal the inlet and stop the remaining water flow (Fig. 5). The debris between the pre-stoppers was then excavated and filled with a permanent concrete stopper (Fig. 6).

UNDERWATER GROUT

Specified grout requirements were as follows:

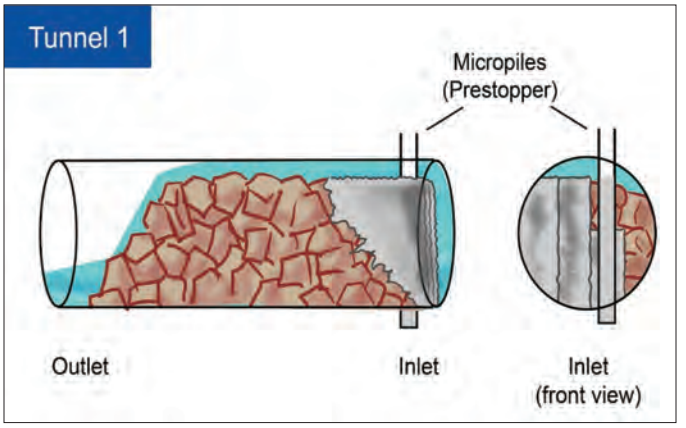


Fig. 4: Schematic of proposed micropile solution

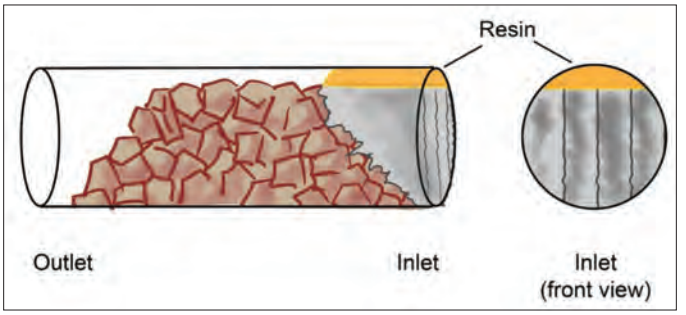


Fig. 5: An underwater injection resin is used to seal the gap between the micropiles and the top of the tunnel

Fig. 6: Once the pre-stoppers are constructed, the debris within the tunnel can be excavated and a permanent concrete backfill can be installed

- Pumpable over 130 ft (40 m);
- 1 hour of working time at temperatures ≥ 86°F (30°C);
- Moderate compressive strength of 7250 psi (50 MPa); and
- Anti-washout properties to withstand a very high flow rate ≥ 90 gal (340 L) per minute.

It should be noted that existing underwater grouts only withstand washout in static water.

Proof of Concept

A novel grout was developed to attain the specified properties. A small-scale mockup was fabricated in the laboratory to emulate the conditions the grout would experience during placement. The apparatus included a water inlet and outlet and the core was filled with coarse aggregate to mimic the debris in the tunnel (Fig. 7). The specially developed underwater grout was then pumped through PVC tubes and retracted in a tremie-like action filling between the aggregate, until the aggregate was fully incapsulated. Figure 8 shows a well consolidated core sample removed from the proof-of-concept experiment. The grout exhibited minimal washout; however, the water flow did not properly emulate the anticipated water flow in the actual tunnel. After a few formulation adjustments, the engineers requested that a larger-scale field trial be performed in Bogota, Colombia.

Field Trial

The experimental underwater grout was scaled up and produced for local field trials in Bogota, Columbia (Fig. 9). This larger-scale field trial encompassed further considerations beyond the proof of concept experiment conducted in the lab. First, the proposed mixing and pumping equipment for the project was used. A water meter (Fig. 10) was used to gauge the water pressure of the pumps that were used to generate a flow of approximately 90 gal (340 L) per minute. The apparatus also used multiple inlet pipes to approximate a uniform water flow throughout the setup.

Empty drums were also positioned on scales to collect and weigh the outlet water flow (Fig. 11). This enabled measurement of the efflux density and determined the material lost by using a mud balance. Initial results from the trial calculated a washout of approximately 50%. Such material loss was not acceptable, though a core sample from the hardened material indicated excellent consolidation of the embedded debris (Fig. 12). While many ideas were brought forth to reduce the material loss, it was ultimately decided to simply reduce the water content of the grout. A second trial offered improved results—only 30% material loss. This result was deemed a success and a material order was placed for full-scale grouting to be completed at the site of the dam. Over 1,240 bulk bags at 3,285 lb each (1,490 kg) were produced and shipped from the US to Colombia for the first attempts.

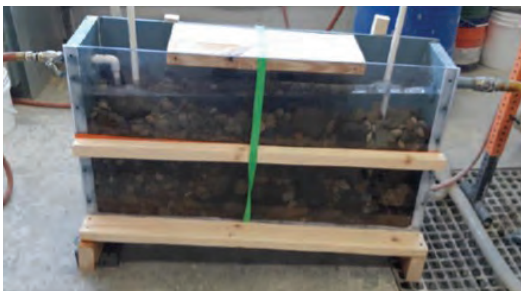


Fig. 7: A small-scale mockup was performed in the laboratory with flowing water to demonstrate proof of concept

Fig. 8: Core taken from the proof of concept demonstration exhibits excellent consolidation

Fig. 9: Large-scale mockup in Bogota, Colombia

Fig. 10: Water meter used to capture the extreme water flow during the large-scale mockup in Bogota

Fig. 11: Overflow from the large-scale mockup was captured and weighed to determine the amount of washout

Fig. 12: The core taken from the field trial demonstrated excellent consolidation

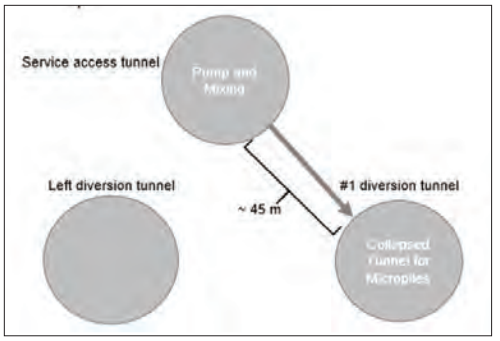


Fig. 13: Cross-section of the twin tunnels and the service tunnel where they would mix /pump the underwater grout into Diversion Tunnel 1


Fig. 14: Large mixer used to mix 1545 lb (700 kg) batches


Fig. 15: The Ituango Dam spillway became operational in 2019[4]

COMPLETING THE REPAIRS, ITUANGO DAM (DIVERSION TUNNEL 1)

The logistical setup for the project is approximated in Figure 13. The grout, mixing, and pumping equipment were installed in a secondary access tunnel approximately 150 ft (45 m) from the tunnel to be "injected." Boring equipment was used to bore through the mountainside to access the collapsed tunnel. The in-situ temperatures ranged from 77-86°F (25-30°C).

Once the grout mixing was calibrated for the on-site equipment and ambient conditions, 1545 lb (700 kg) batches were used for the injection process, mixing up to four batches per hour (Fig. 14). Approximately 1,240 bulk bags of the underwater grout and 881,850 lbs (400 metric tons) of resin were used to permanently seal Diversion Tunnel 1. In conjunction with sealing this diversion tunnel in October 2020, the crest of the dam was completed in 2019 (Fig. 15) and with the GAD currently being repaired, the project is now on schedule to be completed by 2022.

REFERENCES

1. Ituango Hydroelectric Power Project, Colombia, *Power Technology*, November 14, 2012, www.power-technology.com/projects/ituango-hydroelectric-power-colombia/.
2. Colombia Hydro Utility to Build 2,688-MW Pescadero Ituango, *Hydro Review*, December 7, 2007, https://www.hydroreview.com/world-regions/colombia-hydro-utility-to-build-2688-mw-pescadero-ituango/.
3. Risk of Dam Collapse Hangs in Colombia, *Geoengineer.org*, July 5, 2018, www.geoengineer.org/news/risk-of-dam-collapse-hangs-in-colombia#.
4. Brox, D., Hydro Diversion Tunnel Failure Review, *Tunnel Talk*, October 8, 2020, www.tunneltalk.com/Colombia-08Oct2020-Collapse-of-the-Ituango-hydropower-project-collapse-in-review.php.
5. Brox, D., Hydropower Watercourse Failures—Risks and Causes, *Tunnel Talk*, March 2020, www.tunneltalk.com/TunnelTECH-Mar2020-Hydro-waterway-collapses-causes-and-recommendations.php.
6. Bloom, E., *City Paper*, Working to Tap a Catastrophe at Colombia's Hydro Ituango Dam, June 8, 2018, https://thecitypaperbogota.com/news/working-to-tap-a-catastrophe-at-colombias-hidroituango-dam/19899.
7. Root Cause Analysis—Skava. Ituango Project Contingency, SKAVA Consulting, March 4, 2019, www.youtube.com/watch?v=uLcN7xS4K4w.

Robert Cordova, Senior Technical Product Specialist, has 30+ years of industry experience, 23 years with Master Builders Solutions. Since starting his career with Master Builders Solutions in 1997, Robert has held positions in quality management, plant management and research and development, supporting construction systems, and powder and coating product lines. He is a member of the International Concrete Repair Institute (ICRI).

Rick First, Senior Technical Product Specialist Lead, is a Technical Team Lead with more than 25 years of experience in the construction industry. Rick began his career with Master Builders as an R&D Scientist in 1994 where he worked in the areas of concrete petrography and cement-admixture interactions. Currently, Rick supports the flooring, repair, and grout product lines. He provides field support and coordinates both internal and external product training. Rick is a member of the International Concrete Repair Institute (ICRI) and the ICRI Northern Ohio Chapter.

Curing Concrete in Extreme Conditions

by Marthe Brock

Curing concrete in any environment can be a hassle and certainly has cost associated with it. Curing in extreme conditions can be significantly more complicated and costly, which can cause contractors to skip it or not do it properly. Why does that matter? There are countless articles and studies on the importance of proper curing of concrete. According to ACI 302.1R[1], "after proper placement and finishing of suitable quality concrete, curing is the single most important factor in achieving a high-quality slab."

The first purpose of curing is to retain moisture in the slab for as long as possible to allow for maximum hydration of the cement particles; equally important is slowing down, minimizing the volume change or shrinkage that occurs as concrete dries. The secondary purpose of curing is to provide a more durable and aesthetic surface which ideally would include fewer cracks and no dusting. Dusting (the result of a thin, weak surface layer, called laitance, which is composed of water, cement, and fine particles) can be a huge problem when placing concrete in extreme conditions. Temporary heat used during winter construction will affect the cure of concrete by pulling the moisture out of the air, causing the concrete to dry too quickly which can result in dusting or cracking. Similarly, if it is hot, sunny, and windy, the concrete is likely to dry too quickly, which can cause plastic-shrinkage cracking. ACI 302.1R states that these types of cracks occur "when the rate of drying at the surface is more rapid than the upward movement of bleed water."

Another important benefit of proper curing is strength development. ACI 308R[2] Figure 1.4 illustrates the increased compressive strength gain that occurs over time and the benefit that maintaining moisture provides (Fig. 1). At the end of the day, holding moisture in the slab is the most important performance criteria for curing.

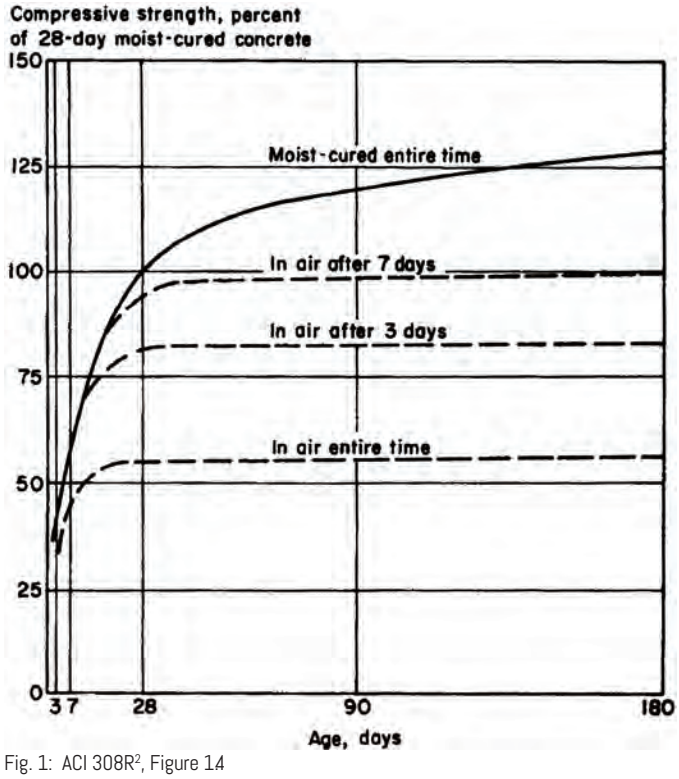


Fig. 1: ACI 308R[2], Figure 1.4

CURING SPECIFICATIONS

There are two widely accepted curing specifications in the industry today: ASTM C309[3] and ASTM C1315[4]. Both standards were updated in 2019; however, the updates were minimal at best. ASTM C309 was originally approved in 1953, and at the time, it was a performance-based specification, meaning it simply stated minimum water loss requirements. Over time, it has evolved to become more specific, in that it describes Type and Class of resin. The current performance benchmark in ASTM C309 is "water loss not more than 0.11 lb/sf (0.55 kg/m^2) and the reflectance minimum is not less than 60% for the Type 2 resin base."

In the early 1970s, it was decided to add the concept of "membrane forming" to the ASTM C309 specification. Therefore, if a liquid did not form a film, it no longer met the specification even if it met the water loss requirements. While this served the industry for decades, there is a grassroots effort to change the specification. There are many reasons to update the specification but one of the primary challenges has always been that most flooring materials do not stick to curing compounds, especially as products have decreased in solvent content.

The other key curing specification is ASTM C1315. It was originally approved in 1995 and is designed to include curing compounds as sealers. C1315 is more comprehensive because it includes the benchmark for yellowing. The

performance criteria in C1315 "is water loss not more than 0.08 lb/sf (0.40 kg/m^2) in 72 hours. The reflectance minimum is not less than 65%." Another difference between C309 and C1315 is the latter includes benchmarks for acid and alkali resistance and non-interference with adhesives. The primary limitation to both specifications is they do not consider alternate curing methods.

CONCRETE CURING METHODS

There are four basic methods for concrete curing. They are water, coverings, liquid membrane forming chemicals, and moisture retention chemicals. Each method has advantages and disadvantages, and different costs associated with it.

Water

Let's look at the first option of water, which happens to have a very low material cost but a high labor cost. There have been many studies, including one that concluded "For optimum long-term strength and durability, moist-cured specimens performed best."[5] Certainly, soaking the entire slab in lime water (ponding) is ideal but it is not realistic in the field. There is a more subtle benefit to water cure when curing in extreme heat; water takes down the heat of hydration which can really help minimize plastic shrinkage cracks. Clearly, there are significant limitations to water cure. For example, you need a consistent water source, and someone must be on site to ensure the surface does not dry. Also, in extreme conditions like winter, water is not an option because of freezing.

There are 3 basic ways to water cure; in addition to ponding discussed above, the second way is to mist spray or fog the slab with water. This method is very effective and again, material cost is low. As you can imagine, the cost is based on the labor to have someone babysit the slab. Not only do you have to keep the surface wet, it is necessary to move the sprinkler or fogger around to ensure the whole slab is maintaining an even amount of moisture. Because this is laborious and does not generate additional revenue, the industry developed a third way which combines wet cure with coverings.

Coverings

For decades, burlap and polyethylene film (poly) were the most common coverings used (Fig. 2); they are readily available, inexpensive, and easy. The benefit of poly over burlap is light reflection or absorption. If it is cold outside, black poly is used to retain heat; if it's hot, then white poly should be used to reflect light and heat. Poly lost favor in the market because it leaves marks on the concrete, especially if the poly "tents up," meaning there is an air pocket between the poly and the surface, and the concrete can discolor in that location. Color variation can also occur where the poly laps or at the seams, which is not aesthetically pleasing. As such, the industry worked to develop a better option by combining poly and burlap to make burlene.

The advantage of burlene was the burlap laid flatter on the concrete making it less likely to leave marks but it also held the bleed water at the surface longer because the burlap is absorptive. There are new super absorptive coverings that include a perforated vapor barrier applied to one side to help dissipate the heat of hydration, maintain moisture, and provide protection. These products maintain a 100% relative humidity condition on the slab, which is great if the temperature is above freezing.

During the 1970s energy crisis, the cost of temporary heat was so high that new construction would stop when temperatures dropped below 32°F (0°C) for extended periods of time. This stoppage of work created room for innovation to extend the construction season. As a result, insulated curing blankets were invented (Fig. 3).

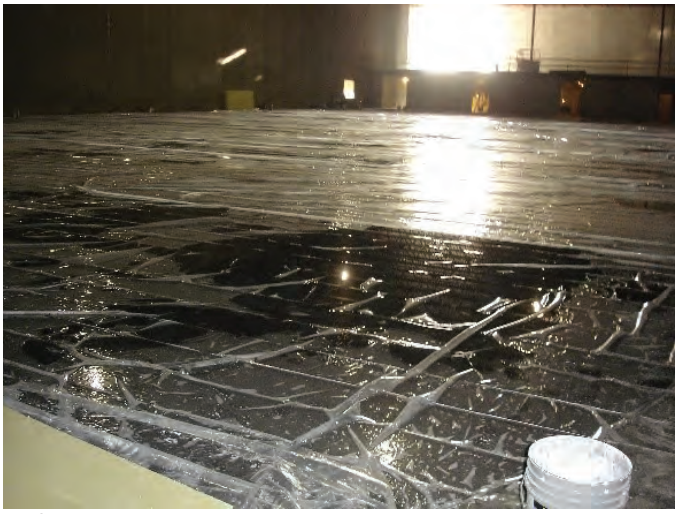


Fig. 2: Polyethylene film on green concrete

4038447

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Whereas, THERE HAS BEEN PRESENTED TO THE Commissioner of Patents and Trademarks A PETITION PRAYING FOR THE GRANT OF LETTERS PATENT FOR AN ALLEGED NEW AND USEFUL INVENTION THE TITLE AND DESCRIPTION OF WHICH ARE CONTAINED IN THE SPECIFICATIONS OF WHICH A COPY IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PATENT AND TRADEMARK OFFICE IN THE CLAIMANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE THE SAID CLAIMANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A PATENT UNDER THE LAW.

NOW, THEREFORE THESE Letters Patent ARE TO GRANT UNTO THE SAID CLAIMANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID CLAIMANT(S) FOR THE TERM OF SEVENTEEN YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF ISSUE FEES AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM MAKING, USING OR SELLING THE SAID INVENTION THROUGHOUT THE UNITED STATES.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent and Trademark Office to be affixed at the City of Washington this twenty-sixth day of July in the year of our Lord one thousand nine hundred and seventy-seven, and of the Independence of the United States of America the two hundredth and second.

Fig. 3: Insulated concrete curing blanket patent (photo courtesy of Wayne C. Brock)

Most Insulated curing blankets include layers of micro foam wrapped in reinforced poly with grommets around the perimeter. The micro foam is lightweight and does not absorb water easily. Being lightweight was important to the contractors because the blankets are moved around a lot, so they needed to be portable. Another blanket property is the grommets; contractors are able to connect the blankets so the protection is continuous. Also, connecting the blankets together makes them heavy enough so they do not blow off the concrete. Contractors can leave them in place for 28 days or longer, protecting the concrete from freezing and allowing for an extended curing process.

Liquid Film Forming Materials

Once ASTM C309 was updated to require a film forming material, the industry was looking for the best, most economical option. There were many variations initially, but high-quality acrylic resin (16-18% solids) blended with solvent, sprayed well, and provided a durable film. The amount of solids have increased over time for two reasons; the VOC laws require it, and "the percent of solids appears to be a good indicator of how well the compound will influence strength development and retain moisture."[5] As the VOC laws have changed, manufacturers were forced to decrease solvent or replace it with water. A water-based cure sounds great, but in reality they are not perfect. Water-based products do not bite into the concrete as well. We also discovered that solvent-based adhesives, say for carpet or vinyl composition tile (VCT), don't stick as well to water-based products and vis versa. Not only are there multiple options for carriers, there are a variety of resin types as well. Many of the products available today are a blend of polymers in order to achieve a quality film that is easy to apply. Resin quality matters for curing compounds but it is even more important when it is also performing as a sealer. Depending on the percent of solids, the final film thickness can be as little as 0.004 in (4 mils). Once you put traffic on the film, it will start to abrade, requiring reapplication or maintenance. Owners want to minimize maintenance, so they found another option.

The study[5] mentioned earlier found that the second-best curing method was white pigmented cures. The light reflectance and overall durability of the film is extremely good, which is why these products are commonly used for curing. Unfortunately, white pigmented cures tend to look very blotchy when applied and removing them is not easy.

The easiest product available today is dissipating cures. It's a brilliant idea: spray a film down and watch it magically disappear in 30 days. Contractors love dissipating cures because they are easy to apply and don't need to be removed. However, in my experience, dissipating cures don't magically disappear; they break down with UV exposure and traffic but so do most cures. One argument for using dissipating cures is the slab requires less prep when going over the concrete. While this is certainly true, if the floor is receiving a polymer coating, most companies require the surface to be shot blasted which would remove any curing compound on the market today. Not having to remove a film saves time and money—so based on that, the industry came up with another new/old idea.

Moisture Retention

Silicate-based sealers are a case of what is old is now new again. The first silicate was available in the early 1900s in the United States; it was a magnesium fluorosilicate known as Lapidolith. It was used to densify the surface, making the concrete less dusty and more durable. By forming a dense "crust" on the surface, water is retained in the slab, meeting the basic water retention requirements. Historically, the perceived benefit of silicates was that they chemically react with the free lime or calcium hydroxide in the concrete and become a permanent part of the concrete matrix. However, calcium hydroxide is the by-product of the hydration process and does not become available right away. So, a combination of curing techniques is required, which is a hassle. Also, waiting does not work with the fast pace of construction today. As is common in the construction industry, the need for speed drove innovation.

The new silicates work by bonding with the silica in the concrete, which is available right away, so waiting is no longer necessary. They also become a permanent part of the matrix, making them very low maintenance. Another benefit is they can be buffed into the slab, resulting in a sheen on the surface. It's like polishing agates in a tumbling basket; the more you polish/abrade concrete, the shinier and more aesthetically pleasing the concrete becomes. One word of caution when applying silicates (Fig. 4): they need to dwell on the surface so they can chemically react; however, if you over apply them or let them dry on the surface, a hard crystal-like material will form which is very difficult to remove (Fig. 5).

There are 3 main types of silicates used on the market today: sodium, potassium, and lithium-based silicates. Lithium-based products have really gained traction over the last several years for a variety of reasons; they contain zero VOCs, they generally are not a bond breaker, they

Fig. 4: Silicate application

Fig. 5: Dried crystalline from over application of silicate

Fig. 6: Low pressure spray application of curing compound

Fig. 7: Tire marks (rubber burn) on sealed concrete

help control moisture vapor transmission, and help control alkalinity—which is very important if you plan to cover your concrete with adhesively applied VCT or carpet. Not all adhesives are fully compatible with silicates—it is always a good idea to check with the manufacturer or do a field mock-up if feasible.

Silicates are now being tested in the industry and marketed as functionally equivalent to a 28-day water cure with a moisture retention number that exceeds ASTM C309, even though they don't form a film. In fact, there is a grassroots effort to change the way we quantify these products. ASTM C39[6], *Compressive Strength of Cylindrical Concrete Specimens*, contains the water cure method of curing and is being used as the basis of performance in lieu of the current standards. The committee that is working on this change plans to develop a new category that would include penetrating liquids that provide proper moisture control and good aesthetics.

FINAL CONCRETE FINISH

More than ever, the finish look of concrete is important. When applying acrylic cures, technique is critical. A low-pressure sprayer applies the coating most evenly and looks the best (Fig. 6). It's important to agitate the material during application because the solids tend to settle to the bottom. If a thick coat of acrylic cure is roller applied in an attempt to really seal up the concrete surface, it creates a terrible blotchy or mottled surface that is not aesthetically pleasing. As covered earlier, the total film thickness is around 0.004 in (4 mils) per coat. Traffic and UV will break down acrylics—it just takes time. Most owners don't want to wait so mechanical abrasion like shotblasting or chemical removal using citrus-based cleaners or chemical strippers are used. I always say, "thin to win" when it comes to sealers. If you want to seal your concrete well, multiple thin layers are the way to go.

Ambient temperature during the application is also important. If it is too cold, water-based products can appear hazy on the surface or freeze during the drying process. The time it takes to completely dry depends on the product and the ambient conditions. The ideal conditions are 65 to 85°F (18 to 29°C) with a 50% relative humidity. In these conditions, cures can receive light foot traffic after 3 hours. The cure should dry overnight before putting regular traffic on the surface—it takes a full 7 days for maximum hardness. Increased humidity slows the drying process.

Note that cures can highlight imperfections in the concrete and if the sealer is left to puddle in low spots on the concrete, it will darken the surface and leave a shiny residue. Also, acrylic-based products tend to rubber burn when vehicles turn in a tight radius—rubber from the tires can mark the surface (Fig. 7). Special consideration must be taken when applying cures in any condition.

CONCLUSION

There is no panacea when it comes to curing. The good news is there are many options. Some are simple and inexpensive. Others are more complicated but provide more predictable results. Curing is critical and should never be skipped.

REFERENCES

1. ACI Committee 302, *Guide for Concrete Floor and Slab Construction* (ACI 302.1R – 96), American Concrete Institute, Farmington Hills, MI, 1996.

2. ACI Committee 308, *Guide to Curing Concrete* (ACI 308R – 01), American Concrete Institute, Farmington Hills, MI, 2001.

3. ASTM C309, *Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete*, ASTM International, West Conshohocken, PA, 2019.

4. ASTM C1315, *Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete*, ASTM International, West Conshohocken, PA, 2019.

5. Whiting, Nancy, and Snyder, PhD., P.E, Mark, *A Study of the Effectiveness of Portland Cement Concrete Curing Compounds*, 2003.

6. ASTM C39, *Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens*, ASTM International, West Conshohocken, PA, 2020.

Marthe Brock, CSI, CCPR, is Buildings and Restoration Specialist for Master Builders Solutions in Minnesota. She has been an active member of the local construction industry since 1988. Brock is a past President for the Minneapolis/St. Paul Chapter of CSI and has been a CSI Certified Construction Product Representative for more than 20 years. She is also an active member of the ICRI Minnesota Chapter, serving on the Communication Committee and was recently appointed to the national ICRI Nominating Committee. Brock has a BA from the University of Minnesota.

Extending Service Life of Höganäs County Water Tower

by Julie Holmquist, Ivana Liposcak, and Nils Davant

Fig. 1: First inspection from sky lift


Fig. 2: Examining damaged concrete and corroded reinforcement at the top of the reservoir

In 1978, the Höganäs County water tower was built 380 meters (1247 ft) away from the sea near Lersbergsskogen, Sweden. In 2018, 10 years short of its 50-year expected service life, pieces of concrete had already begun to fall off the lower drip edge of the water reservoir. The county decided to conduct an investigation to determine the extent of the problem.[1] They found chloride-induced corrosion, compounded in some places by deep carbonation, and decided to perform a repair with a 20-year expected service life, incorporating a surface-applied migrating corrosion inhibitor to mitigate damage from corrosion that had not yet appeared.

IDENTIFYING THE PROBLEM

The water tower consists of a concrete reservoir positioned on top of seven pillars. The center pillar houses stairs, water pipes, electricity, and an elevator. The other six reinforced concrete pillars are U-shaped and positioned around the edge of the water tower. Six pilasters are built into the water tower directly above each pillar. Two of these pilasters serve as tension heels that anchor the 14 tension cables running through rings in the concrete walls of the reservoir.

Site investigation included a visual inspection, hammer sounding tests, concrete sampling, as well as measuring concrete cover and carbonation depth (Fig. 1 and 2). Workers discovered cracking and many spalled areas, exposing corroded rebar. Much of the damage was at the top of the pillars and along the drip edge at the bottom of the reservoir. Splintering concrete was also found in the tensioning heel pilasters, suggesting corrosion occurring beneath the surface of the 130 mm (5.1 in) thick concrete caps.

Investigators were surprised by the high levels of chloride content found on the drip edge and at the tops of the pillars, although this provided a good explanation for the damage they found. The chloride threshold (the point at which chloride concentration begins to induce corrosion) for the concrete was estimated to be 0.4% by weight of cement, and chloride content was found to be as high as 3.38% by weight of cement in one of the sampling sites at the top of the pillars. Chlorides in excess of 0.4% by weight of cement were also found in the lower part of the clamping heel and the drip edge reservoir. Concrete cover ranged from 0-77 mm (0-3 in) with an average of 40 mm (1.6 in). The carbonation front was typically shallow, but in one pillar, where they found a previous repair that had loosened, carbonation was 36 mm (1.4 in) deep, nearing the rebar depth of 43 mm (1.7 in). Figure 3 from the report records their findings at various test sites.

Investigators were not expecting to find such high levels of chloride in the structure given its location (380 m [1,247 ft] from the sea). Structures 50 m (164 ft) from the sea call for special dimensioning for airborne chlorides under stan-

dard EN 206[2], but the chloride levels on the tower were higher than what would be expected for a structure more than 50 m (164 ft) from the sea. They speculated that the chloride levels were high because they may have been in partially protected areas where the rain could not wash them away, or because chlorides may have been present in the original concrete.

IMPLEMENTING A SOLUTION

A barrier was placed around the bottom of the water tower to protect pedestrians from falling pieces of concrete. The overall assessment was that there was a considerable amount of minor damage that would eventually lead to serious impact to structural integrity if left unrepaired. While the corrosion along the drip edge of the reservoir did not affect bearing capacity, falling concrete is a hazard to those walking underneath. Moreover, damage to the vertical reinforcement on the outer pillars and damage to the tension cable fastenings (which called for further investigation) could cause problems with bearing capacity. The report concluded that nothing more than a minor repair could be done to the pre-stressed structure without requiring demolition and replacement. With the elevated chlorides found, it was imperative to act before the situation became too serious.

The report laid out three options. The first, with a life expectancy of 20 years, called for removing loose and damaged concrete, cleaning the reinforcement and replacing as necessary, then applying frost-resistant repair concrete or shotcrete, as well as a topically applied treatment to mitigate further corrosion.

The second and third options had life expectancies of 50 and 100 years, respectively, but were more invasive and extensive. Option two involved removing all concrete from the pillars and lower edge of the water tower, cleaning and replacing reinforcement as needed, and recasting the pillars with frost-resistant concrete. The third option was to tear down the old water tower and build a new one.

Option one was ultimately chosen in conjunction with the use of a surface-applied migrating corrosion inhibitor to mitigate ongoing corrosion. Repair on the 3,000 m^2 (32,292 ft^2) surface area proceeded according to standard EN 1504-10.[3] This involved water-blasting to remove dam-

Test	Construction Part	Covers [mm (in)]	Chloride ions / cement [weight %]	Carbonation depth [mm (in)]	Remarks
1.1	Under heel	41 (1.6)	0.12	12 (0.5)	Split concrete + crack
1.1.5	Drip edge reservoir	0-44 (0-0.2)	Side reservoir 0.15	4-10 (0.2-0.4)	Many surface rebar in the area
1.2	Pillars, at top	41 (1.6)	*1.32*	15 (0.6)	Crack
1.3	Pillar, half the height	42 (1.7)	0.11	2 (0.1)	OK
2.3	Pillar, half the height	36 (1.4)	0.11	4 (0.2)	OK
2.5	Exterior wall, upper ring next to heel	34 (1.3)	0.08	4 (0.2)	OK
3.1	Reservoir, outside	10 (0.4)	*1.0*	5 (0.2)	Split concrete
3.2	Pillars, at top	42 (1.7)	*1.12*	17 (0.7)	OK
3.3	Pillar, half the height	38 (1.5)	0.35	24 (0.9)	OK
3.4	Clamping heel, lower part	30 (1.2)	*0.51*	6 (0.2)	Split concrete, heel
3.5	Exterior wall, upper ring next to heel	38 (1.5)	0.13	3 (0.1)	OK
4.1	Pillars, at top	48 (1.9)	*0.44*	4 (0.2)	OK, next to damage 4.1.3
4.1.1	Drip edge reservoir	18 (0.7)	Not measured	3 (0.1)	Split concrete, reinforcement close to the surface drip edge
4.1.2	Pillars, at top	16 (0.6)	*3.38*	5 (0.2)	Split concrete
4.1.3	Drip edge reservoir		*0.54*	2 (0.1)	Superficial reinforcement in case of damage, reinforcement joint
4.1.4	Pillars, half the height	43 (1.7)	Not measured	36 (1.4)	Loose repair
4.5	Exterior wall, upper ring next to heel	15 (0.6)	0.16	8 (0.3)	OK, but heel damage
5.5	Exterior wall, upper ring next to heel	17 (0.7)	0.09	4 (0.2)	Crack
5.6	Inside wall, upper ring next to heel	24 (0.9)	0.08	3 (0.1)	Crack
7.0	Center pillar	45 (1.8)	0.08	3 (0.1)	OK

Fig. 3: Concrete cover, carbonation depth, and chloride content measured at various test points (italics show chloride concentration exceeding the threshold)[1]


Fig. 4: Scaffolding being erected


Fig. 5: Close-up of visible cracks after sandblasting the existing paint off


Fig. 6: Splintering concrete and exposed rebar in damaged area

aged concrete without harming sound concrete. The next step was to clean or replace corroded reinforcement (refer to Figures 4 through 6 for photographs during repairs). Then, the clean, dry concrete surfaces were treated with the surface-applied migrating corrosion inhibitor at 3.68 m^2 /L (150 ft^2 /gal). The corrosion inhibitor was first applied by spray and then worked into the concrete with a brush for better penetration. In areas needing repairs, an adhesion-improving cement slurry was applied to reinforcement prior to repair mortar to achieve a minimum bond strength of 1.5 N/mm^2 (218 psi). Application of repair mortar was next (Fig. 7 and 8), followed by an anti-carbonation coating and protective paint (Fig. 9) applied to the entire structure.

The key advantage of using a surface-applied migrating corrosion inhibitor is that it can penetrate into the existing concrete to reduce the rates of ongo-


Fig. 7: Repaired area


Fig. 8: Repairs on one of the upper pilasters of the reservoir

Fig. 9: After washing all surfaces, protective paint was sprayed onto the entire structure

ing corrosion and slow the start of new corrosion on unexposed, embedded reinforcement. Migrating corrosion inhibitors form a protective molecular layer on the rebar surface. They are considered ambiodic, or "mixed," inhibitors, forming a barrier at both the anodic and cathodic sites of a corrosion cell. The surface applied corrosion inhibitor utilized on the project has been shown to penetrate 5-8 cm (2-3 in) into sound concrete.[4] An evaluation by the General Building Research Corporation of Japan also found that specimens treated with this migrating corrosion inhibitor saw corrosion rates reduced by one-half to one-sixth compared with untreated specimens in the same test (Fig. 10).[5]

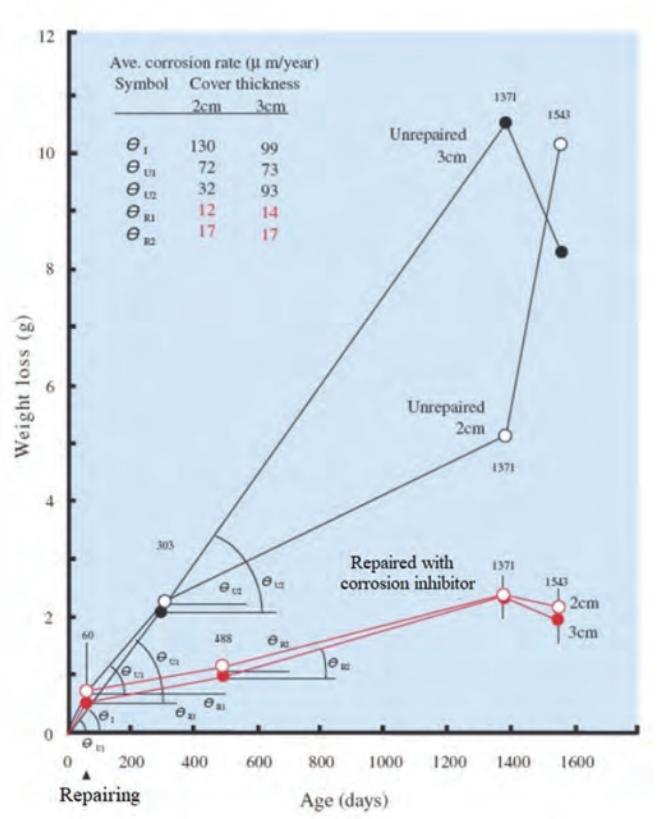


Fig. 10: Results from long-term testing of surface-applied migrating corrosion inhibitor (same material used in water tower repair)

REFERENCES

1. Herlin, Alexander, *Undersökning av vattentorn i Höganäs kommun*, RISE Research Institutes of Sweden AB, Göteborg, Sweden, December 4, 2018.

2. EN 206:2013+A1:2016, *Concrete – Specification, performance, production and conformity*, Swedish Standards Institute (SIS), Stockholm, Sweden, November 10, 2016.

3. EN 1504-10:2004, *Products and systems for the protection and repair of concrete structures, Part 10: Site application of products and systems and quality control of the works*, Swedish Standards Institute (SIS), Stockholm, Sweden, January 1, 2016.

4. Lindsey, John, P.E. and Sander, Jason, E.I., *Re: Report of Corrosion Inhibitor Testing*, W.O. #18426.001, H.C. Nutting Company, Cincinnati, Ohio, January 12, 2004.

5. Nagayama, Dr. Masaru and Shimozawa, Mr. Kazuyuki, *Long Term Corrosion Testing-2020* (November 1994-April 1999), General Building Research Corporation of Japan, April 1999.

Höganäs County Water Tower Repair

OWNER
Höganäs County
Lersbergsskogen, Höganäs County, Sweden

ENGINEER
Nils Davant, NCI AB

ARCHITECT
Sverker Tingdal

CONTRACTOR
Skandinavisk Industriuyveckling AB

MATERIALS SUPPLIER
NCI AB (National Concrete Innovations AB)

Julie Holmquist is the Marketing Content Writer at Cortec Corporation. She has spent five years in the field of corrosion control. In addition to regular weekly publications on the topic, she has written dozens of feature articles on corrosion mitigation for a broad range of industries including construction, oil and gas, manufacturing, and electronics. She holds a B.A. degree from the University of Northwestern, Saint Paul, MN.

Ivana Liposcak is MCI Technical Sales Manager at Cortec Corporation with a demonstrated history of working in the gas, petroleum, drilling, and construction industries. She graduated as a Civil and Material Science Engineer from the Faculty of Civil Engineering, University of Zagreb, Croatia. In the last 17 years, she has been working and specializing in geotechnical and concrete corrosion engineering.

Nils Davant is a building engineer with 30 years of experience and specializes in concrete repair. Besides consulting assignments, Nils teaches classes that offer competency on how to use concrete as a material and how to restore old concrete structures. He holds a Bachelor's degree from Stockholm Technical Institute, STI.

An Introduction to ICRI's New Guide No. 110.2-2020 *Guide Specifications for Epoxy Injection*

by Liying Jiang and Horace Willis

Epoxy injection is a cost-effective method of repairing non-moving cracks in concrete structural elements, such as walls, slabs, and columns, and restoring or supplementing pre-cracked capacity. Epoxy resins are typically used for the sealing and structural repair of cracks in concrete. A successful long-term repair depends on the proper application, as well as on addressing the cause of cracking itself.

Although epoxy injection is a popular choice that has been around for decades, the lack of accessible information still leads to poorly planned project specifications and poorly executed construction practices.

ICRI has published the new Guide No. 110.2,[1] *Guide Specifications for Epoxy Injection* (Fig. 1) that provides guidance for specifying epoxy injection materials and methods that incorporate state-of-the-art practices used in the concrete repair industry and are essential to an effective repair program.

The epoxy injection guide specifications are intended to assist Design Professionals in the preparation of technical specifications and can be easily included into construction contracts that involve epoxy injection as part of the repair program.

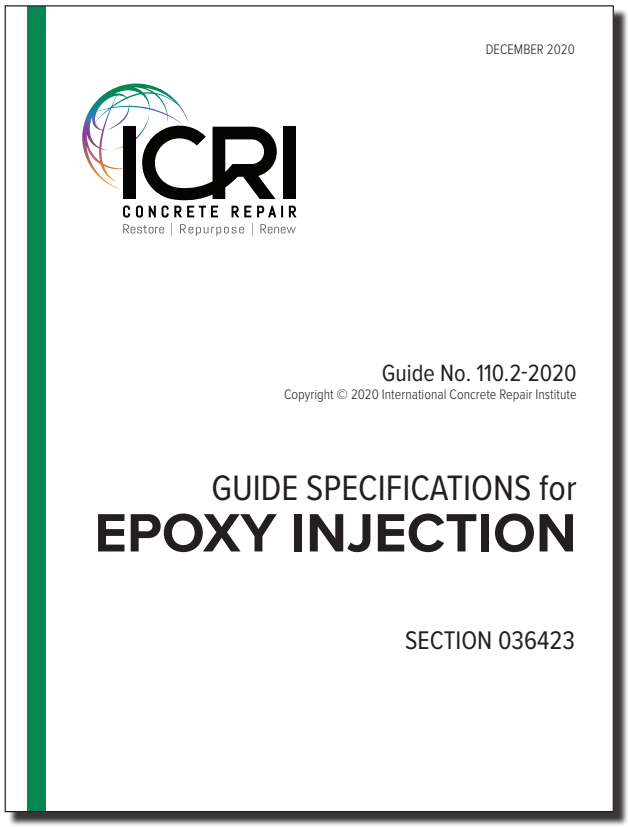


Fig. 1: ICRI's new Guide No. 110.2-2020

FORMAT

The guide specification's intended use is as a technical specification section in a complete and coordinated project manual that includes the applicable Division 01 General Requirements Sections such as Bidding Requirements, Unit Price, Quality Requirements, and other relevant Division 01 Sections which are cross-referenced in the epoxy injection crack repair technical specification section.

Design Professionals may use ICRI 130.1R,[2] *Guide for Methods of Measurements and Contract Types for Concrete Repair Work* as reference material to specify a method for quantifying and qualifying the pay basis for epoxy injection crack repairs.

Division 02 Existing Conditions, other technical specifications, and a set of construction drawings with details and requirements specific to the epoxy injection work are typical sections that would need to be included in the project manual. Sections that address other types of substrate repairs, such as spalled concrete surface preparation and repairs, are not included but are cross-referenced herein and should be added to the project manual as needed. It should be noted that ICRI also provides guidelines and guide specifications for other types of concrete and masonry related repairs.

The primary focus of the guide specifications is to provide an outline for developing the three parts of the specification through suggested text, references and commentary for evaluating alternatives. The document follows the 3-Part MasterSpec and other industry standard specification formats as follows:

PART 1 – GENERAL
PART 2 – PRODUCTS
PART 3 – EXECUTION

Figure 2 shows the Table of Contents for the guide specifications document. Three text colors have been used throughout the document to distinguish the purpose of the text. Black text is specification text, indicating to the specification user the essential requirements that are generally accepted as industry standards. Blue text indicates optional requirements or situations where the specification user must make a choice between multiple options based on the needs of the project. Blue text must be accepted or modified and changed to black text prior to issuing the document to avoid confusion regarding multiple alternatives or suggestive language. Red text indicates commentary to the specification and serves to explain and clarify the technical requirements of the specification section. To facilitate the use of the guide specifications, ICRI provides a Word-formatted document in addition to the color-coded hard copy or PDF-format documents, wherein the red text is formatted using "hidden text" within the Word document, that permits it to be turned on or off during viewing and printing.

USING THE GUIDE SPECIFICATION

The following sections highlight some of the more unique features of Epoxy Injection Crack Repair and offer practical examples of using the ICRI guide specification to create a specification section that can be integrated into the overall project manual to meet the needs of the project.

PART 1—GENERAL

Article 1.5 SUBMITTALS of the guide specifications provide a list of items (including product data, shop drawings, qualifications, quality control test results, injection equipment and procedures, SDS for all products used, construction schedule, and product data for materials containing volatile organic compounds [VOC]) required to be submitted by the contractor. The majority of the submittal items are typical for most repair construction projects. Because epoxy injection is a procedure that is designed and detailed by a Design Professional with the required strength to restore the capacity of the cracked concrete and sufficient flowability of the resin for the anticipated depth and width of the cracks, technical data sheets need to be submitted to include not only the materials (epoxy injection resin and cap seal) but also the related equipment (equipment for metering, mixing, and injecting as well as injection ports).

Fig. 2: Table of Contents for the guide specification document

The guide specifications provide guidance not only on the general procedure of the mock-ups (as described in Paragraph 1.6D) but also the critical quality control requirements for daily production including Paragraph 1.6E outlining the injection equipment pressure check test, Paragraph 1.6F defining tests for proper mix ratios, Paragraph 1.6G for requesting proof of ratio and pressure check, Paragraph 1.6H describing gel time and setting tests, and Paragraph 1.6I for obtaining verification cores. All these quality control requirements are essential to the success of the structural crack repair.

PART 2—PRODUCTS

Article 2.1 of the guide specifications outlines the requirements for the equipment for metering, mixing, and injecting, including that the injection equipment shall have the capability of discharging the mixed adhesive at a required pressure and maintaining that pressure. The required pressure itself is blue text, as it needs to be either accepted or modified by the Design Professional based on the specific project criteria, site condition, the injection material selected, as well as typical crack width and depth.

Article 2.5 of the guide specifications includes packaged repair material that is to be used to fill the core hole where core samples were extracted for crack filling verification. The compressive strength of the core hole repair material is blue text, as it needs to be accepted or modified by the Design Professional to ensure its compatibility to the existing concrete.

Fig. 3: Epoxy injection of wall cracks (photo courtesy of Simpson Gumpertz & Heger, Inc.)

Fig. 4: Epoxy injection of a floor slab crack (photo courtesy of Simpson Gumpertz & Heger, Inc.)

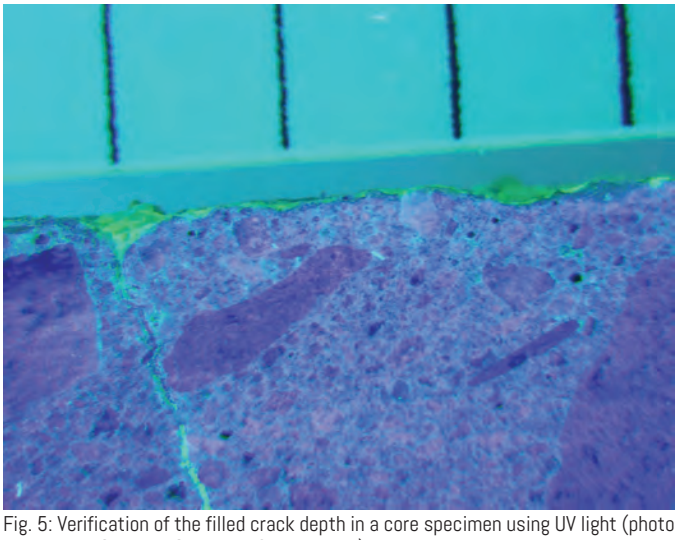


Fig. 5: Verification of the filled crack depth in a core specimen using UV light (photo courtesy of Simpson Gumpertz & Heger, Inc.)

PART 3 – EXECUTION

Article 3.1 of the guide specifications covers damage detection and includes the following red commentary text preceding the article to guide the Design Professional in editing the guide specification:

Article 3.1 requires notification of the Design Professional by the Contractor when layout of crack repair areas will be conducted, and requires that the Contractor perform the layout, and arrange for review and acceptance by the Design Professional. This procedure could be modified by the specifier if the Design Professional will perform the layout. If it is specified that the Design Professional perform the layout, it is important that the Design Professional be in a position to be responsive to requests for layout to avoid delays.

Other examination requirements could be added to this section such as specific requirements for... [Consider adding reference to ICRI Guideline 210.1R,[3] *Guide for Verifying Field Performance of Epoxy Injection of Concrete Cracks*.]

Defining the party that is responsible for marking cracks that need to be repaired and the party that is responsible for inspecting/verifying the crack locations and extents are critical. This is to ensure all structural cracks that are within the scope of the work are repaired as well as to manage the repair costs within the project budget.

Articles 3.2 through 3.6 of the guide specifications outline the step-by-step procedures for surface preparation, crack repair, field quality control, cleaning, and pay basis. Refer to Figures 3, 4 and 5 for views of epoxy injection of cracks in a wall and floor slab as well as verification of crack filling in a core specimen.

FUTURE WORK

ICRI Committee 110 Guide Specifications continues developing guide specifications to aid Design Professionals in the preparation of technical specifications, for inclusion directly into a project manual for the repair of structural concrete and related items using materials and methods that are in line with the state-of-the-art practices, materials, and methods used in the concrete repair industry. Committee 110 is currently developing guide specifications for cementitious bonded overlays and masonry repairs.

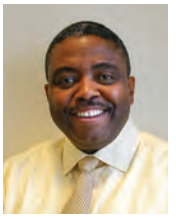
REFERENCES

1. ICRI 110.2, *Guide Specifications for Epoxy Injection*, International Concrete Repair Institute, St. Paul, MN, 2020, 19 pp.

2. ICRI 130.1R, *Guide for Methods of Measurement and Contract Types for Concrete Repair Work*, International Concrete Repair Institute, St. Paul, MN, 2009, 16 pp.

3. ICRI 210.1R, *Guide for Verifying Field Performance of Epoxy Injection of Concrete Cracks*, International Concrete Repair Institute, St. Paul, MN, 2016, 12 pp.

Liying Jiang, PE is a Senior Civil Engineer with Jensen Hughes and is a registered Professional Engineer in Massachusetts. She has over 13 years of professional experience in the construction and engineering field performing evaluations of existing structures, assessing and evaluating concrete materials, designing repair and rehabilitation measures, and developing management strategies for structures affected by alkali-silica reaction (ASR), corrosion, and other materials-related distresses, in addition to 2 years of experience in the precast industry. Liying is experienced in technical specifications, repair drawings, and construction administration of large-size concrete structure repair projects. She is also skilled in state-of-the-art concrete-related NDT technologies, such as Ground-Penetrating Radar (GPR), Impact Echo (IE), and Impulse Response (IR). Liying currently serves on the Board of Directors of the International Concrete Repair Institute (ICRI), is Chair of ICRI Committee 110, and is a voting member of several technical committees/subcommittees of ICRI and American Concrete Institute (ACI).



Horace Willis is a Senior Associate with SK&A for over 34 years. He provides leadership and oversight for a staff of project engineers and CAD designers within the firm's Structural Repair and Restoration Division. Horace is Vice-Chair of ICRI Committee 110. He pioneered the development of SK&A's envelope consulting services with the introduction of industry standard software and analytical tools, such as WUFI, to improve consulting services deliverables. In his current capacity, Horace has conducted numerous structural and façade evaluations; feasibility studies related to the expansion of existing parking structures; and building envelope evaluations and appraisals, including recommendations for repair opinions.

CONCRETE REPAIRCALENDAR

MARCH 28-APRIL 1, 2021
ACI Concrete Virtual Convention
Website: **www.concrete.org**

APRIL 21-22, 2021
2021 ICRI Virtual Spring Convention
Website: **www.icri.org**

JUNE 7-10, 2021
2021 World of Concrete, Las Vegas, NV
Website: **www.worldofconcrete.com**

INTERESTED IN SEEING YOUR CONCRETE INDUSTRY EVENT LISTED HERE?

Events can be emailed to editor@icri.org. Content for the May/June 2021 issue is due by April 1, 2021 and content for the July/August 2021 issue is due by June 1, 2021.

INDUSTRYNEWS

NIBS CONVENES BIM EXECUTIVE ROUNDTABLE ON CONSTRUCTION INDUSTRY DIGITAL TRANSFORMATION

The Building Information Management (BIM) Executive Roundtable included partners from the U.S. Department of State, U.S. Army Corps of Engineers, U.S. Department of Veterans Affairs, U.S. General Services Administration and U.S. Federal Highway Administration, along with private sector partners from Google, Microsoft, Amazon Web Services, Autodesk, Bentley, Epic, ESRI, HDR, Kieran-Timberlake and WSP.

There have been varied levels of adoption across delivery and management processes as well as education and training. The U.S. faces continued challenges with data interoperability.

While NIBS has created a U.S. National BIM Standard, it primarily has been developed through volunteer efforts with valuable content, but little coordination toward a comprehensive standard.

The Road to a National Building Information Management Program

To address this, NIBS is leading the creation of a National BIM Program. The goal is a solution at a national scale to enable digital process standards that will streamline business, accelerate the effectiveness of the supply chain, provide predictable processes, improve project outcomes, drive efficiency, and foster innovation.

Adam Matthews, Head of the International Stream of the Centre for Digital Built Britain, spoke to the UK's innovation-focused BIM program that is seen as a model for what can be done here. The program came at cost of about 5 million pounds. It has led to 33 percent lower costs through a reduction in the initial cost of construction and the whole life cost of built assets and 50 percent faster delivery.

Taking the First Step

Construction comprises 13 percent of the global economy. And while the U.S. already plays a tremendous leadership role in delivering innovative technology and design and construction services to a global marketplace, we lack the same leadership to tackle industry productivity and efficiency problems to benefit asset owners.

For more information about the NIBS Building Information Management Council and its mission to help the North American real property industry become more efficient, visit nibs.org/bimc.

CONCRETE INDUSTRY MANAGEMENT PROGRAM SEEKS DONATIONS FOR 2021 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 seeking donations for their 2021 CIM Auction to be held at World of Concrete. The auction is scheduled for Wednesday, June 9, 2021 at the Las Vegas Convention Center. The silent auction will be held from 11 am to 1 pm and the live auction begins at 1 pm.

The proceeds from the 2021 CIM Auction will benefit the CIM National Steering Committee (NSC) and support the current CIM programs at Middle Tennessee State University, New Jersey Institute of Technology, Texas State University and California State University—Chico, the Executive MBA program, as well as help fund scholarships. Industry support is needed more than ever with the addition of South Dakota State University, which will be joining the CIM family of schools beginning fall 2021.

The CIM Auction organizers are hoping for another record event in 2021—the 2020 auction was the best ever, raising a record-breaking $1.2 million in gross revenue.

Previous auction items have included concrete mixer trucks, cement, skid steers, concrete saws, drills, mixers, vibrators, scaffolding, safety equipment, screeds, fiber transport systems, dust collectors, NDT equipment, decorative concrete tools, water meters, pumps, generators, training sessions, reference books, advertisements, laptop computers, mobile computers, sports memorabilia, sports travel packages, golf packages, and vacation travel packages.

Those interested in making a donation should contact CIM Auction Committee Chairman Ben Robuck at ben.robuck@cemex.com or (404) 456-6867.

To learn more about the program, visit www.concretedegree.com.

INTERESTED IN SEEING YOUR NEWS IN THIS COLUMN?

Email your 150-200 word industry news to editor@icri.org. Content for the May/June 2021 issue is due by April 1, 2021 and content for the July/August 2021 issue is due by June 1, 2021. ICRI reserves the right to edit all submissions.

CHAPTER ACTIVITIES

DELAWARE VALLEY HOSTS VIRTUAL MEETING ON HISTORIC REPAIR

The Delaware Valley Chapter recently hosted a virtual event, "Historic Concrete Repair," with a presentation by Paul E Gaudette, Principal from Wiss, Janney, Elstner Associates Inc. More than 40 chapter members and guests attended the event and received a meal via GrubHub coordinated by the Chapter. The Chapter has worked to provide attendees with a code so they can order a meal, a great way to simulate the traditional live event where a meal is served. The presentation addressed technical challenges encountered as part of the repair of historic concrete illustrated by case studies. Paul discussed character-defining features such as exposed aggregate and board form finishes as well as designing appropriate conservation and repair measures for successful implementation.

The Delaware Valley Chapter hosted its second virtual event of the year, "Making Concrete Structures Last over 100 Years," on February 23, 2021. Please see the Chapter website for any information on upcoming webinars or events.

Guest speaker from the Delaware Valley Chapter's recent virtual meeting was Paul Gaudette, Principal from Wiss, Janney, Elstner Associates, Inc., who presented on Historic Concrete Repair

CENTRAL FLORIDA HOSTS HOLIDAY DINNER

On December 17, 2020, the Central Florida Chapter hosted a Holiday Dinner in Sanford, Florida. The chapter welcomed 22 attendees that included many of the local contractors, distributors, engineers, and manufacturers. The group abided by CDC guidelines and proper social distancing. They sat on the screened patio outside with heating lamps keeping them warm (even in Florida). The chapter members were able to enjoy good food and great company. At the end of the night, each party took home a poinsettia. It was a wonderful way for the chapter and the members to say good-bye to 2020 and look forward to a brand-new year!

The Central Florida Chapter celebrated the season with a Holiday Social enjoying great food and the company of friends and colleagues from the area

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

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 CALENDAR

Many ICRI chapters have had to cancel or postpone events due to the ongoing pandemic. You can check with individual chapters by visiting their chapter pages to determine if there are any exceptions, as this is a fluid situation that may have changed after this publication went to print.

BRITISH COLUMBIA
March 11, 2021
VIRTUAL TECHNICAL SESSION
Speaker: Bill Horne, NDT Corporation
Topic: NDT Methods Used for Condition Assessment of Reinforced Concrete Structures

BALTIMORE-WASHINGTON
May 13, 2021
SPRING GOLF TOURAMENT
Location: TBD

CENTRAL FLORIDA
April 15, 2021
CLAY SHOOT EVENT
Location: TBD

GEORGIA
March 25, 2021
VIRTUAL LUNCH AND LEARN
Topic TBD

April 22, 2021
VIRTUAL LUNCH AND LEARN
Topic TBD

METRO NEW YORK
April 14, 2021
VIRTUAL ANNUAL SYMPOSIUM
Topic TBD

May 27, 2021
VIRTUAL WEBINAR
Topic: Rising from the Dead

NORTH TEXAS
April 15, 2021
APRIL MEMBERSHIP MEETING
Topic TBD

PITTSBURGH
April 10, 2021
VIRTUAL WEBINAR
Topic: Drones and the Construction Community

ROCKY MOUNTAIN
March 2, 2021
VIRTUAL MEMBERSHIP MEETING

CHAPTER NEWS DEADLINES

MAY/JUNE 2021
Deadline: March 10, 2021

JULY/AUGUST 2021
Deadline: May 10, 2021

SEPTEMBER/OCTOBER 2021
Deadline: July 10, 2021

Send your Chapter News by the deadlines to Director of Chapter Relations Dale Regnier at daler@icri.org.

CHAPTERS COMMITTEE CHAIR'S LETTER

MICHELLE NOBEL
Chapters Chair

We started the new year with a bang here in Florida!! The Tampa "Champa" Bay Buccaneers won the Super Bowl! Los Angeles has the reigning world champs in baseball with the Dodgers and in basketball with the Lakers. However, it's difficult to top the collective success of Tampa Bay. Our town has been nicknamed "Champa" Bay, Titletown, or Tompa Bay (because of Tom Brady). The Tampa Bay Bucs won the Super Bowl, the Tampa Bay Lightning won the Stanley Cup, and the Tampa Bay Rays were runner-ups in the World Series. The Tampa Bay Rowdies soccer club also won a chance to play in the USL Championship Final, but it was canceled due to a coronavirus outbreak. These teams have shown what they're made of—all the while playing through challenges posed by the coronavirus pandemic.

Jon Cooper, head coach of the Tampa Bay Lightning said, ***"Successful sports teams, and especially championship runs, bring communities together. It brings unity to your city, and pride."***

I think we could all use a little unity right now; it distracts from the pandemic and civil unrest in our country. We're not fighting with each other when we're all rooting for the same team. It was nice to see everyone join in and enjoy the winning moments. It was a magical time during such a difficult period. They will be moments to look back on and smile when there have been so few this past year.

Thanks to all of you, the first virtual ICRI Chapter Rountable was a huge success! We will plan another virtual roundtable with details coming soon. It's an incredible resource for the chapters to join in and learn what fellow chapters are doing, especially in this pandemic. Even though we're all tired of the online meetings, it's been a fantastic resource for everyone, and there are things that you can do to have fun with them as well. Connecting with your members is beneficial to your chapter. So stay as connected as you can, even if it's another Zoom or Microsoft Teams call.

The 2021 ICRI Virtual Spring Convention is right around the corner on April 21-22, 2021. I hope you're all planning to attend. We are hoping to do an in-person ICRI Convention in the Fall. More information will be coming out as things unfold with the pandemic. A lot of companies are still not able to travel, and we don't know what the travel restrictions will be in the coming months. I pray I get to see you all soon! Everyone at ICRI headquarters has worked hard to make the virtual conventions an experience that we all learn from and enjoy. The sessions will be online and accessible through the ICRI Learning Center so you can watch them on demand. Register now for the 2021 ICRI Spring Convention!

The Women in ICRI Committee is always looking for women involved in our industry. We're different women from different backgrounds, places, and experiences, with one thing in common, we're all women. Please join our committee and make your voice heard among these amazing and inspiring women!

Please join us around the world on March 8, 2021, for International Women's Day. Remember to post a picture of yourself with your hand up and the hashtags: #ChooseToChallenge #IWD2021

If you would like to join the Women in ICRI group, reach out to Tara Toren-Rudisill, TTorenrudisill@ThorntonTomasetti.com, Monica Rourke, MRourke@mapei.com, or me at mnobel@mapei.com.

I'm reminding everyone that ICRI continues to support the ACI 562 Repair Code adoption efforts on both the national and chapter levels. Recently, the ACI 562 Repair Code was adopted in Florida and became effective the end of 2020. Thanks to the efforts of the Central Florida Chapter for providing a support letter and testimony from David Poulter, Central Florida Chapter Director, and First Florida Chapter Treasurer, for support of the code change proposal. Also, the Carolinas Chapter provided a letter of support, and John McDougall, ICRI President-Elect, provided testimony to the NC Building Council for the proposed code change in North Carolina. The NC Building Council is recommending approval to the existing NC Building Committee later this year. Furthermore, the Virginia and Oklahoma Chapters are pursuing code adoption efforts in their states. Efforts are also occurring in Pennsylvania and South Carolina. Please stay tuned for more local support opportunities.

For information on the Concrete Surface Repair Technician (CSRT) training program visit: https://www.icri.org/page/csrt-overview

Mark your calendar for World of Concrete, June 7-10, 2021, in Las Vegas, Nevada.

For other chapter events, like what other ICRI Chapters are doing, visit: https://www.icri.org/events/event_list.asp.

I announced in my last article that I would be stepping down as the ICRI Chair of Chapters. Since then, I have decided to stay on as the ICRI Chair of Chapters and serve as your Region 1 Director. I look forward to the next three years, serving and growing as your Region 1 Director and ICRI Chair of Chapters.

Be on the lookout for announcements from ICRI National. If you ever have any questions, reach out to the staff at ICRI Headquarters, the Executive Committee, or any of the leaders of ICRI for help. We always welcome new volunteers for a new and different perspective. In the words of Walt Disney, that ring so true, ***"You can design and create, and build the most wonderful place in the world. But it takes people to make the dream a reality."*** Let's make the ICRI dream a reality until we meet in-person again!

Please stay well, stay safe, be kind, and hopefully, I will see you all in the Fall!

Sincerely,

Michelle Nobel
2021 ICRI Chapters Committee Chair
MAPEI Corporation

ASSOCIATIONNEWS

ACI FOUNDATION ESTABLISHES ROBERT F. MAST MEMORIAL FELLOWSHIP

The ACI Foundation has established the Robert F. Mast Memorial Fellowship. This new fellowship, created through a very generous legacy donation, honors ACI Past President Robert F. Mast, who died July 16, 2020. The significant contribution will fund the award for decades and will aim to remain financially meaningful to students throughout the life of the award.

An honorary member of the American Concrete Institute, Mast was a member of several ACI committees, including ACI committee 318, Structural Concrete Building Code, and served on two of the ACI Foundation's program councils. In 1959 Mast joined brothers Arthur and Tom Anderson and Hal Birkeland's engineering firm as a junior engineer, eventually becoming a partner in 1963 to form Anderson, Birkeland, Anderson, and Mast, or ABAM Engineers. In the late 1980s, ABAM became BergerABAM, headquartered in Federal Way, Wash. In addition to his service to ACI, Mast was a long-time member of the Prestressed Concrete Institute and was elected to the National Academy of Engineering in 1989.

The new Robert F. Mast Memorial Fellowship will be awarded annually to a graduate student studying structural engineering with an emphasis on reinforced concrete design or precast/prestressed concrete design, with preference given to students who have previously completed an undergraduate degree in architectural engineering, architecture, or similar program. The new fellowship award will be administered by the ACI Foundation and will be open for applicants in mid-2021 for the ACI Foundation's 2022-2023 awards cycle.

The ACI Foundation offers fellowship and scholarship opportunities to students whose studies relate to the concrete industry. To learn more about the ACI Foundation and its councils, visit ACIFoundation.org.

INTERNATIONAL CONCRETE REPAIR INSTITUTE

US SLAG CEMENT SHIPMENTS INCREASE MORE THAN 11% IN 2020

Slag cement shipments continue to rise, with 2020 seeing a 11.7 percent increase over 2019 totals. This is the fifth consecutive year of double-digit percentage growth in shipment totals across the U.S. The Slag Cement Association (SCA) attributes the continual rise in shipments in part to slag cement's measurable benefits in concrete, including better workability and finishability, reducing thermal stress, higher compressive and flexural strengths, and improved resistance to aggressive chemicals.

"The continual rise in shipment totals serves as a testament of slag cement being used in broad applications to produce quality concrete," said Ed Griffith, President, Slag Cement Association. "The SCA is the leading source of knowledge for slag cement, providing resources of the inherent benefits that slag cement provides to the industry."

Reducing the carbon impact of concrete continues to be an important factor in construction material choice. Slag cement is a recovered material from the iron production process and because of this, reduces the environmental impact of concrete mixtures by decreasing carbon footprint, embodied energy, and the use of non-renewable materials. Additionally, slag cement is very effective in reducing permeability and increasing the durability of concrete. To learn more about the durability benefits and various applications of slag cement, visit www.slagcement.org to view technical information sheets, case studies, webinars, and more.

The SCA communicates the performance and environmental benefits of slag cement through the invaluable support and participation of its member companies. Ash Grove, a CRH company, recently joined SCA in 2021. SCA member companies also include Argos; Cemex; LafargeHolcim; Lehigh Hanson; Ozinga; Skyway Cement Company; and St Marys Cement, Votorantim Cimentos.

.

SCA ANNOUNCES SLAG CEMENT WEBINAR SERIES—SPRING 2021

The Slag Cement Association (SCA) is pleased to announce a second series of slag cement webinars presented by industry experts. These free webinars are a great opportunity to learn about the different benefits that slag cement offers when used in concrete construction. The webinars will commence at the beginning of March.

The Slag Cement Webinar Series—Spring 2021 will include:

- ***Avoiding Scaling in Concrete with Slag Cement***, presented by Henry Prenger, LafargeHolcim, March 4, 1 p.m. EST;
- ***Geotechnical Applications with Slag Cement***, Gordon McLellan, Lehigh Hanson, March 18, 1 p.m. EDT;
- ***Slag Cement Award Ceremony 2020 Winners***, Drew Burns, Executive Director, SCA, April 15, 1 p.m. EDT; and
- ***Slag Cement Research Awards Presentations***, April 29, 1 p.m. EDT.

The SCA encourages participants to preregister for each webinar. Registration links are included with the webinar descriptions below. For those who can't attend the live webinar the recordings will be archived on the SCA website to view on demand at www.slagcement.org/videos.

The SCA is looking forward to hosting the Slag Cement Webinar Series – Spring 2021. These webinars directly align with SCA's mission: "To serve as the leading source of knowledge for slag cement and slag blended cements through promotion, education, and technology development. To communicate the performance and environmental benefits of these cementitious materials through the support and participation of member companies." In addition, the SCA has more digital resources to showcase slag cement used in durable concrete construction throughout the United States at www.slagcement.org/videos.

AMERICAN CONCRETE INSTITUTE RELEASES 2021 ACI COLLECTION OF CONCRETE CODES, SPECIFICATIONS, AND PRACTICES

The American Concrete Institute has released the 2021 ACI Collection of Concrete Codes, Specifications, and Practices.

The ACI Collection is the most comprehensive and largest single source of information on concrete design, construction, materials, and repair, with nearly 50 codes and specifications and more than 200 practices – including all guides and reports.

The ACI Collection features ACI 318 "Building Code Requirements for Structural Concrete," ACI 301 "Specifications for Structural Concrete," and ACI 562 "Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures and Commentary." Additional categories in the ACI Collection include concrete materials, properties,

design, construction, reinforcement, specialized application, repair, structural analysis, and innovation, plus popular topics such as slabs, formwork, and masonry.

The ACI Collection is available as a convenient online subscription, a USB drive, and a nine-volume set of books. Specifically developed for individual users, the online subscription to the ACI Collection is the most convenient format, is always up-to-date, and includes access to every new ACI document as soon as it is published. Additionally, the online subscription includes access to current and historical versions of ACI's codes and specifications, along with versions in both inch-pound and S.I. units.

Special online access for multiple users, entire offices, and large multi-national companies, is also available.

To subscribe or order, visit concrete.org/store.

INTERESTED IN SEEING YOUR NEWS IN THIS COLUMN?

Email your 150-200 word association news to editor@icri.org. Content for the May/June 2021 issue is due by April 1, 2021 and content for the July/August 2021 issue is due by June 1, 2021. ICRI reserves the right to edit all submissions.

PEOPLE ON THE MOVE

NIBS PRESIDENT & CEO LAKISHA A. WOODS, CAE, ELECTED TO VICE CHAIR OF U.S. GREEN BUILDING COUNCIL

Woods joined the board in August 2019, marking the first time the National Institute of Building Sciences joined the USGBC board of directors

National Institute of Building Sciences President and CEO Lakisha A. Woods, CAE, has been re-elected to a three-year term with the U.S. Green Building Council board of directors. Woods will serve as vice chair.

"I'm honored to continue service with the USGBC board of directors," Woods says. "This is a great opportunity to represent the public interest to advance building science and technology to improve the built environment. Healthy buildings lead to safer, more resilient and sustainable communities."

Dr. Aaron Bernstein, Interim Director with the Center for Climate, Health and the Global Environment at the Harvard T.H. School of Public Health also was re-elected. Bernstein will serve as chair. Newly-elected board members include Anyeley Hallová, Founder of Adre; Dr. Ruth Thomas-Squance, Director of Field Building at the Build Healthy Places Network; and Dr. Marwa Zaatari, Partner with Dzine Partners and Co-Chair of the enVerid Systems Advisory Board. These newly-elected board members will join continuing board members, Daniel McQuade, Managing Director with Global Infrastructure Solutions, and Karen Weigert, Executive Vice President of Business Strategy, Finance and Regional Operations at Slipstream.

The U.S. Green Building Council is committed to a prosperous and sustainable future through cost-efficient and energy-saving green buildings. For more information, visit nibs.org.

MICROSOFT DIRECTOR OF TRANSFORMATION SERVICES SALLA ECKHARDT TO CHAIR NIBS BIM COUNCIL STEERING COMMITTEE

The National Institute of Building Sciences has announced that Salla Eckhardt, Director of Transformation Services with Microsoft, will serve as chair of the National BIM Program Steering Committee.

"There's a lot of work ahead," said Lakisha A. Woods, CAE, President and CEO of NIBS. "The program's next steps include establishing a governance structure to broadly engage diverse stakeholders through targeted workstreams and developing a business model for the initial three to five years of the U.S. National BIM Program. Salla's leadership will steer the program toward a comprehensive plan to serve all sectors of the industry."

The U.S. National BIM Program kicked off in early February with a BIM Executive Roundtable to discuss the need for a coordinated program to advance collaboration and innovation in the building industry. The goal is a solution at a national scale to enable digital process standards that will streamline business, accelerate the effectiveness of the supply chain, provide predictable processes, improve project outcomes, drive efficiency and foster innovation.

The roundtable included partners from the U.S. Department of State, U.S. Army Corps of Engineers, U.S. Department of Veterans Affairs, U.S. General Services Administration and U.S. Federal Highway Administration, along with private sector partners from Google, Microsoft, Amazon Web Services, Autodesk, Bentley, Epic, ESRI, HDR, Kieran-Timberlake and more.

Eckhardt said she hopes to bridge industry innovators to create a U.S. National BIM Program that will unite the industry.

"We need a standard that supports the entire digital building lifecycle from BIM-ready planning to BIM-based design and digital construction all the way to BIM as a component in built environment digital twins," Eckhardt said.

For more information about the NIBS Building Information Management Council and its mission to help the North American real property industry become more efficient, visit nibs.org/bimc.

INTERESTED IN SEEING YOUR NEWS IN THIS COLUMN?

Email your 150-200 word news to editor@icri.org. Content for the May/June 2021 issue is due by April 1, 2021 and content for the July/August 2021 issue is due by June 1, 2021. One (1) high resolution headshot/individual may be included. ICRI reserves the right to edit all submissions.

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

ICRI
CONCRETE REPAIR
Restore | Repurpose | Renew

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

PRODUCTINNOVATION

BOSCH POWER TOOLS UNVEILS HIGHLY-ANTICIPATED PROFACTOR LINEUP, BRINGING UNPARALLELED PERFORMANCE TO HIGH-POWERED CORDLESS TOOLS

Bosch Power Tools, a global leader for power tools and power tool accessories, today announced the release of its PROFACTOR high-powered cordless tools, powered by its exclusive CORE18V battery platform and equipped with Bosch BITURBO Brushless™ technology. Delivering power that outperforms its corded counterparts, PROFACTOR cordless tools give professionals the freedom to take on the most demanding applications on one battery platform.

At the heart of this new high-powered cordless system is Bosch's best battery technology—the CORE18V battery platform. It features advanced cell technology, cutting edge design and Bosch-exclusive COOLPACK™ 2.0 technology. With a design including copper end plates, welded cell connectors and power rails, the batteries provide reduced resistance and greater efficiency, allowing tools to draw higher currents from the battery. With the PROFACTOR-optimized CORE18V 8.0 Ah and the new PROFACTOR Exclusive CORE18V 12.0 Ah batteries, professionals can power the full PROFACTOR tool lineup from a single platform, eliminating the need for multiple battery platforms on the jobsite.

PROFACTOR tools feature Bosch BITURBO Brushless™ technology, which pairs a high-performance brushless motor and drive train system with powerful magnets and optimized in-tool electronics to take full advantage of the additional power generated by the CORE18V 8.0 Ah and 12.0 Ah PROFACTOR batteries.

Various kitted executions are also available for pre-order. For more information on the PROFACTOR lineup visit boschtools.com/profactor.

CLT GROUP—RECOVERY FROM EXTREME WINTER WEATHER

Buildings and infrastructure can be pushed to performance limits when extreme winter weather occurs. Snow and ice buildup can lead to collapses and leakage, and subfreezing temperatures can cause mechanical system failures and power disruptions. This is particularly true when frigid temperatures and rare winter storms extend deep into the southern parts of the U.S. where such conditions are not commonly considered in design, resulting in unprecedented losses.

CTLGroup engineers, architects, and scientists are uniquely positioned to assist with recovery from extreme winter events. We have extensive experience investigating all types of buildings, structures, components, and materials, including industrial facilities, pipelines, tunnels, bridges, as well as foundations and retaining structures.

Our forensic services include damage documentation and condition assessment, non-destructive evaluation and field testing, laboratory analysis of materials and components, root cause analysis, and development of repair recommendations. We serve as technical advisors for owners and insurance professionals alike to support quick loss recovery, and are able to evaluate vulnerabilities and provide recommendations to reduce risk and improve resiliency in the future.

To learn more about CTLGroup's services visit www.CTLGroup.com/Contact.

QUIKRETE® HOW-TO VIDEOS SUPPORT HOME IMPROVEMENT DURING COVID

With people spending significantly more time at home as a result of COVID-19, home improvement activity hit unexpected levels in 2020. Whether it was making small concrete repairs or pouring large concrete patios, people across the country turned to QUIKRETE® as their concrete resource based on nearly 37 million views of its how-to project videos. Accessed on the QUIKRETE website, YouTube channel and other social media channels, this robust library of videos provides detailed instructions for completing a wide variety of projects including the construction of decks and fences, installation of mailboxes and basketball goals, and other post-setting applications without mixing concrete, which was the most popular video last year.

QUIKRETE® Top 2020 Project Videos

1. How to Set Posts in Concrete without Mixing
2. How to Pour & Finish Concrete
3. How to Resurface Concrete with Re-Cap
4. How to Build Deck Footings
5. How to Build Concrete Lawn Borders

For more information about QUIKRETE, visitwww.QUIKRETE.com.

CORTEC®MCI®EMPOWERS CONCRETE REPAIRS TO LAST LONGER

The need for concrete repairs is unfortunately a fact of life, the root cause usually being corroded reinforcement that cracks and pushes away the concrete cover. In order to make repairs last as long as possible, it is important to protect against future corrosion by incorporating effective corrosion inhibiting technologies into the new concrete, grout, or repair mortars being utilized on the project. Cortec®MCI®offers long-lasting corrosion protection and extension in service life of structures. Two excellent ways to incorporate this technology are with MCI®-2006 NS and MCI®Mini Grenades.

MCI®-2006 NS and MCI®Mini Grenades contain Migrating Corrosion Inhibitors that extend the service life of concrete repairs by adsorbing as a protective molecular layer on embedded steel reinforcement. MCI®Technology delays time to corrosion and reduces corrosion rates once started. As an ambiodic, or "mixed," inhibitor, MCI®protects against both anodic and cathodic corrosion reactions. In repairs, this helps minimize the risk of the ring anode effect in which newly patched areas could spark a chain reaction of corrosion damage in adjacent concrete.

MCI®-2006 NS and MCI®Mini Grenades are highly versatile and provide an unobtrusive way to inhibit corrosion and maximize the effectiveness of concrete repairs.

Contact Cortec®today for more information and to order your supply of Migrating Corrosion Inhibitor™additives for concrete grout and repair mortars: https://www.cortecmci.com/contact-us/

INTERESTED IN SEEING YOUR NEW PRODUCT IN THIS COLUMN?

Email your 150-200 word news to editor@icri.org. Content for the May/June 2021 issue is due by April 1, 2021 and content for the July/August 2021 issue is due by June 1, 2021. One (1) high resolution product photo may be included. ICRI reserves the right to edit all submissions.

NEWMEMBERS

SUPPORTING MEMBER COMPANIES

Nelson Testing Laboratories
Elmhurst, Illinois
United States
Mark Nelson

COMPANY MEMBERS

Florida Structural Group Inc.
Fort Myers, Florida
United States
Brian Peachey

GeoTree Solutions
Houston, Texas
United States
John Hepfinger

ICP Building Solutions Group
Andover, Massachusetts
United States
Cole Stanton

LippCo Construction Products
Perkasie, Pennsylvania
United States
Chris Lippmann

LMC Construction, Inc
Bensenville, Illinois
United States
Luke Ciula

Restruction Corporation
Tempe, Colorado
United States
Jessica Milnes

Sintecno
Koropi, Attica
Greece
Apostolos Kountouris

ADDITIONAL INDIVIDUALS FROM SUPPORTING MEMBER COMPANIES

Jake Burgess
Nelson Testing Laboratories
Elmhurst, Illinois
United States

Krystyna Gable
Procon & Associates, Inc.
Little River, South Carolina
United States

Jeff Hoffart
Logan Contractors Supply Inc
Omaha, Nebraska
United States

Margie Tyler
W. R. Meadows, Inc.
Hampshire, Illinois
United States

ADDITIONAL INDIVIDUALS FROM COMPANY MEMBERS

Baker Berg
Coastal Construction Products
Jacksonville, Florida
United States

Paul Brasileiro
Fyfe

Dennis Brunnett
Simpson Strong-Tie
Spencer, Massachusetts
United States

Travis Buse
ProSpec - H.B. Fuller Construction Products
Aurora, Illinois
United States

Matt Callero
Tom White Painting & Restoration
Pinellas Park, Florida
United States

Evelyn Carreno
William Hach & Associates Inc
Wood Dale, Illinois
United States

Jordan Carrette
Crosier Kilgour & Partners Ltd.
Winnipeg, Manitoba
Canada

Bryan Evans
Braun Intertec Corporation
Lenexa, Kansas
United States

John Ford
Fyfe

Francisco Garcia
John Rohrer Contracting
Kansas City, Kansas
United States

Thomas Garguilo
Sika
Lakeland, Florida
United States

Tim Joliffe
William Hach & Associates Inc
Wood Dale, Illinois
United States

Luis Mireles
William Hach & Associates Inc
Wood Dale, Illinois
United States

K.C. Moorman
Jacor Contracting, Inc.
Kansas City, Missouri
United States

Michael Ock
Freyssinet, Inc.
Bowdon, Georgia
United States

John Porter
Simpson Gumpertz & Heger Inc
Waltham, Massachusetts
United States

Mark Postin
Fibrwrap Corporation

Dylan Reynolds
Restoration Systems, Inc.
Chaska, Minnesota
United States

Jorge Rodriguez
William Hach & Associates Inc
Wood Dale, Illinois
United States

Zach Schaefer
William Hach & Associates Inc
Wood Dale, Illinois
United States

Michael Walker
Western Specialty Contractors
Mabelvale, Arkansas
United States

INDIVIDUAL MEMBERS

Zatusy Syamam Ahamad
Puchong, Selangor
Malaysia

NEWMEMBERS

Ricardo Arrechea
Houston, Texas
United States

Daria Baranoff
Castle Rock, Colorado
United States

Cory Boillot
Parker, Colorado
United States

James Cicalo
New York, New York
United States

Brian Connolly
Myrtle Beach, South Carolina
United States

Ryan Cooke
Leawood, Kansas
United States

Jim Corbett
Elmhurst, Illinois
United States

Kevin Duffy
Arlington, Massachusetts
United States

Mike Eglin
Cleveland, Ohio
United States

Brian Faber
Denver, Colorado
United States

Carlos Garza Garza
Austin, Texas
United States

Chevan Goonetilleke
Castro Valley, California
United States

Simon Guerrero
Grand Prairie, Texas
United States

Chris Henselmeier
Indianapolis, Indiana
United States

Tom Herriage
Centennial, Colorado
United States

Brian Hodge
Townsend, Delaware
United States

Matthew Jensen
Memphis, Tennessee
United States

Christopher Leaton
Spring Hill, Kansas
United States

Michael Lenk
Hudson, Florida
United States

Cory Littlejohn
St Louis, Missouri
United States

Tony Marchiafava
Minneapolis, Minnesota
United States

Paul Matz
Munster, Indiana
United States

Mike McCrary
Plainfield, Indiana
United States

Will Mickiewicz
Chesterfield, Virginia
United States

Hernando Montoya
Tampa, Florida
United States

Benjamin Pape
Omaha, Nebraska
United States

Patrick Power
Quebec, Quebec
Canada

Dane Redinger
Dublin, Ohio
United States

Ray Reed
Fenelton, Pennsylvania
United States

Aaron Rickel
Richmond, Virginia
United States

Mark Rieder
Pittsburgh, Pennsylvania
United States

Mike Sample
Spring, Texas
United States

Daniel Schuman
Chicago, Illinois
United States

Vassil Tchakarov
Spring, Texas
United States

Justin Utterback
Alpharetta, Georgia
United States

Eric Wymer
Mendota Heights, Minnesota
United States

STUDENT/APPRENTICE MEMBERS

Emre Insel
University of Ottawa
Kanata, Ontario
Canada

Chuanjing Li
University of Ottawa
Ottawa, Ontario
Canada

Emilio Quintana
Georgia Tech
Atlanta, Georgia
United States

INDEX OF ADVERTISERS

ICRI CONCRETE REPAIR
Restore | Repurpose | Renew

INTERNATIONAL CONCRETE REPAIR INSTITUTE
1000 Westgate Drive, Suite 252
St. Paul, Minnesota 55114
P: 651-366-6095
E: info@icri.org
W: www.icri.org

Your **single-source provider** for restoration, strengthening and corrosion protection

MAPEI offers a full range of products for concrete restoration, waterproofing and structural strengthening. Globally, MAPEI's system solutions have been utilized for such structures as bridges, highways, parking garages, stadiums and high-rises.

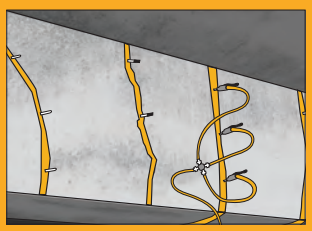
Visit **www.mapei.us** for details on all MAPEI products.

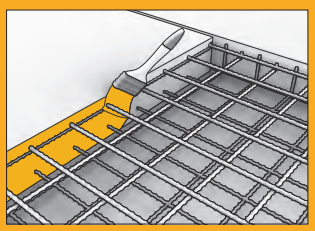
MAPEI USA

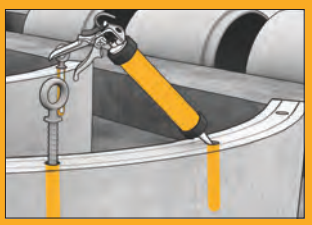
MAPEI®
ADHESIVES · SEALANTS · CHEMICAL PRODUCTS FOR BUILDING

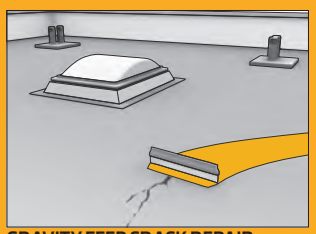
SIKADUR EPOXY RESINS

THE #1 TRUSTED CHOICE FOR EPOXY IN CONSTRUCTION

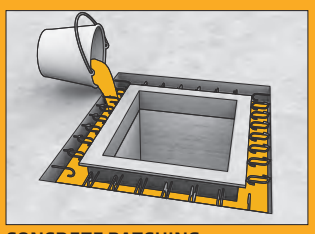

CRACK INJECTION


BONDING AGENT

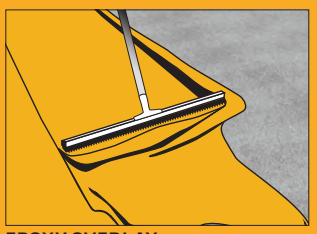

ANCHORAGES


GRAVITY FEED CRACK REPAIR


GROUTING REBAR / ROD


CONCRETE PATCHING


BASE PLATE GROUTING


EPOXY OVERLAY

Sikadur 31 SBA Sikadur Combiflex SG Sikadur 31 Hi-Mod Gel LPL
Sikadur 22 Lo-Mod Sikadur Combiflex Sikadur 51 NS
Sikadur 22 Lo-Mod Sikadur 33 Sikadur 42 Grout-Pak
Sikadur Injection Gel Sikadur Balcony System Sikadur Crack Fix
Sikadur 30 Sikadur 301 Sikadur 51 SL Sikadur 330 US
Sikadur® Sikadur 52
Sikadur 55 SLV Sikadur 43 Patch-Pak
Sikadur 35 Hi-Mod LV LPL Sikadur 35 Hi-Mod LV
Sikadur 32 Hi-Mod Sikadur 42 Grout-Pak PT Sikadur 31 Hi-Mod Gel
Sikadur Hex 300/306 Sikadur 32 Hi-Mod LPL Sikadur 22 Lo-Mod FS Sikadur 35 Hi-Mod LV
Sikadur 300 Sikadur Epoxy Broadcast Overlay System

SIKA CORPORATION
201 Polito Avenue | Lyndhurst, NJ 07071 | 800.933.SIKA | usa.sika.com

BUILDING TRUST