

# CRB

CONCRETE REPAIR BULLETIN

January/February 2020  
Vol. 33, No. 1

## VISION 2020 UPDATE

2020 ICRI PRESIDENT  
MARK D. LEMAY

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**ON THE COVER:** 2020 ICRI President Mark LeMay beside "The Brand Inspector" bronze, Texas and Southwestern Cattle Raisers Building, Fort Worth, Texas. Photo by Jim Brown.

# CRB

## CONCRETE REPAIR BULLETIN

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### NOTE FROM THE EDITOR



The new year has started for ICRI and everyone is preparing for a busy year. On the national level, 2020 will again start with the annual ICRI Kick-off Party at the Stratosphere in Las Vegas on February 3. The year will continue with the Spring Convention in Vancouver, British Columbia, Canada, and the Fall Convention in Minneapolis, Minnesota. Also during the year, chapters will host Concrete Slab Moisture Testing and Concrete Surface Repair Technician Certification Classes.

This year, we will continue to feature topics of interest to our members and industry in the *Concrete Repair Bulletin*. The magazine will be going through a few updates to keep up with the new ICRI Branding. This issue continues with the ACI 562 Repair Code series of articles. We will look at how our industry is positioned for the future, and a Q & A article featuring incoming ICRI President Mark LeMay.

I hope you will all have a successful and safe 2020 and I look forward to seeing you at this year's events!

Jerry Phenney, Editor, CRB  
MAPEI Corporation

# PRESIDENT'S MESSAGE



Greetings and  
Welcome to 2020!

2020 ICRI President Mark LeMay pictured at the Fort Worth Stockyards National Historic District. Photo by Jim Brown.

I am honored and humbled to serve ICRI membership as its 32<sup>nd</sup> President. Frankly, graduating from Notre Dame's School of Architecture in 1977, I would not have imagined that I would be in this position at any point in my career. Nevertheless, I have been extremely fortunate throughout my career to have been mentored by knowledgeable and talented individuals in the fields of architecture, construction, and, more recently, engineering. Early on, eschewing new design and construction, my jigsaw-puzzle background led me to the world of renovation and restoration, and I have never left. Joining ICRI in 2006, I found a tremendous group of like-minded individuals and companies who thrive on the challenges put before us by our built environment—both old and new. We are the doctors who diagnose the ills of our man-made structures, and we are the makers of materials and tools that our technicians and surgeons use to correct the deficiencies identified in our clients' concrete and masonry structures. As evidenced in our Project Awards program, we take great pride in our work by recognizing and celebrating our revived structures—restored, repurposed and renewed!

This issue of the *Concrete Repair Bulletin (CRB)* reviews the progress our industry has made toward the 13 goals set forth in Vision 2020, begun in 2004 and first published in June 2006 by the Strategic Development Council. (You can view a copy of the document at: [https://www.icri.org/resource/resmgr/strategicvision/vision2020-version1.0\\_\\_may20.pdf](https://www.icri.org/resource/resmgr/strategicvision/vision2020-version1.0__may20.pdf).) One major goal was to “create a repair/rehabilitation code...,” that was accomplished with the publication of ACI 562 in 2013—updated in 2016 and again in 2019. ICRI has played a significant role in this process by assisting with the creation of ACI

562MAN—“Guide to the Code for Assessment, Repair and Rehabilitation.” In addition, ICRI's Guide Specifications Committee accomplished Vision 2020's goal #4 to “develop performance-based guide specifications for specific and generic repair designs to improve specifications” with the creation of ICRI's editable “Guide Specifications for Structural Concrete Repair” (Guideline 110.1-2016), and “Guide Specifications for Externally Bonded FRP Fabric Systems for Strengthening Concrete Structures” (Guideline 330.2-2016).

ICRI's initiatives toward achieving the goals set forth by Vision 2020 were kick-started in 2014 by the board's approval of ICRI's Strategic Vision that established our mission around four pillars: Industry Leadership, Professional Development, Organizational Strength, and Organizational Credibility. Championed by my predecessor Chris Lippmann, who took the reins of the Strategic Implementation Committee in 2014, ICRI has embarked on an exciting ride to raise awareness of our industry, and provide the knowledge and tools “to improve the quality of repair, restoration, and protection/preservation of concrete and other material systems.”

Yes, these truly are exciting times to be a member of ICRI! If you attended any of the technical committee meetings at the recently completed (and wildly successful!) Fall Convention in Philadelphia, it is plain to see our organization has many new initiatives in the works, thanks in part to the ideas submitted by **you**, the members, via the Secretariat program. Established out of the growth of the Strategic Implementation Committee, our Secretariat “assures that ideas and issues are heard, disseminated and managed by the appropriate ICRI committees



and task groups.” You may ask, “How do we accomplish these new initiatives?” Adhering to the mantra that “many hands make light work,” **your** involvement in our Technical and Administrative Committees can make a difference! You are mistaken if you think (like I once did) that you have little to offer our committees. We all have different experiences with, and perspectives of, the repair industry that could provide valuable input to the products that we are producing for the betterment of the industry. I encourage each of you to pick a committee that piques your interest (for me, it was Coatings and Waterproofing), fill out the online application to become a consulting member of the committee, and participate in the meetings and conference calls that take place throughout the year! Don’t be shy—take the leap! You will find that contributing to a new document, webinar, or certification program is a tremendously rewarding experience!

During my year serving as your ICRI president, two of my goals will be to increase membership in our local chapters and convincing more members to participate in our national committees. Yes, this second item can be a bit intimidating at first, but I strongly encourage you to stick with it! Doing this has helped to elevate my career to the next level, provided me with access to fellow members from around the country with different experiences, and rewarded me with a great deal of knowledge gained!

Finally, I would be remiss if I did not express my sincerest thanks to:

- Beth Newbold for inviting me to be a voting member of the Chapters Committee;
- My fellow Region 7 Chapters for allowing me serve as their Regional Representative for four years;
- Katherine Blatz for immediately getting me plugged in to an active role on the Executive Committee;
- My predecessors (Michael, Katherine, Keith, Brian, Ralph and Chris) for their mentorship and friendship;
- My boss at JQ, Stephen Lucy, for his unwavering support of my involvement in ICRI;
- And my wife, Marcia, for her patience and understanding on all those nights and weekends spent with my fired-up laptop.

I am one lucky guy! 



Mark D. LeMay, AIA  
2020 ICRI President

## ICRI Mission and Strategic Plan Benefit Members and the Industry





MARK NELSON

This past September, I had the honor and opportunity to be named the new ICRI Technical Activities Committee (TAC) Chair. This position has a strong history of industry leaders starting with Peter Emmons and continuing with Jack Morrow, Robert Gaul, Rick Edelson, Kevin Michols, through past Chair Fred Goodwin. In order to continue this great tradition, I look

forward to working with a strong team of TAC members, technical committee chairs, and technical committee participants.

At the recent convention in Philadelphia, TAC established and documented four goals for directing ICRI technical activities for years to come. We called those goals our four pillars:

1. Increase visibility and openness of TAC;
2. Define and publish TAC member roles;
3. Promote alternative technical offerings (i.e. webinars and YouTube videos);

4. Create effective working relationships between TAC and other ICRI Administrative Committees.

Over the next four TAC Talk articles, I will cover each of those pillars in greater depth. However, one theme that will be included in every effort from the ICRI Technical Activities Committee will be inclusion. We look forward to getting more ICRI members involved in the technical process. We look forward to publishing all of the current technical committee openings in a clear and easy-to-find location on the ICRI website. We look forward to creating new types of technical offerings that can be used by all ICRI members. The ICRI Technical Activities Committee is moving forward to help the industry. We look forward to getting you involved in this evolution.

If you want to join a technical committee within ICRI, please feel free to contact me directly at [mnelson@nelsontesting.com](mailto:mnelson@nelsontesting.com).

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

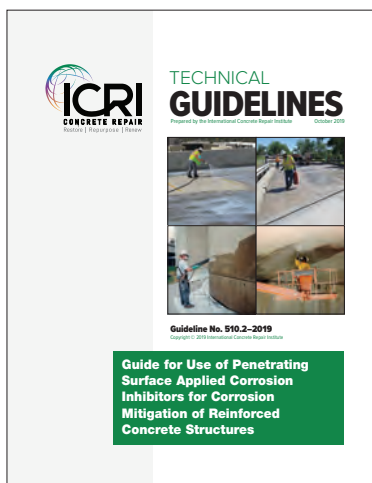
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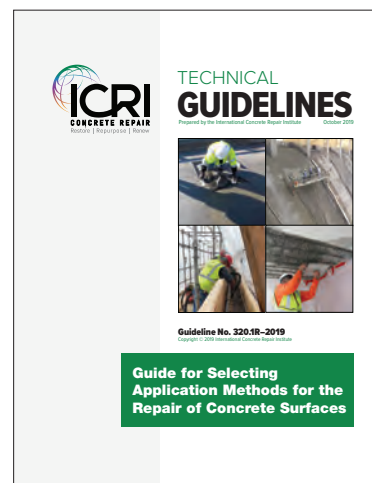


### UPDATED! Guideline 320.1R-2019

*Selecting Application Methods for the Repair of Concrete Surfaces*

Illustrates and describes the application methods commonly used for placement of concrete repair materials, along with material requirements, the best applications, and cautions and limitations for each. In addition, engineering considerations, surface preparation, constructability, environmental factors, quality assurance/control, and safety are addressed.

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These and all ICRI guidelines are available from the ICRI online store. AND...most ICRI guidelines are free to ICRI members as PDF downloads!

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# SECRETARIATUPDATE



RICK EDELSON

As I write this, I will be entering my last year serving as a member of the ICRI Secretariat. First and foremost, a hearty thank-you to Jeff Barnes for his diligent service as a Secretariat member. As one member finishes, a new member will be joining us, so stay tuned for the addition of our next member. For my final year, I will serve as Secretariat Chair and Tim Gillespie will serve as Coordination Committee Chair—who works under our direction.

Currently, out of a total of 70 Ideas submitted to the Secretariat since 2016, there are 32 remaining open as initiatives that are being followed by the Secretariat. Although many of the Initiatives have been outstanding, one of the latest is remarkable and will likely have a huge impact for our organization. ICRI will be establishing the Volunteer Opening Board—a place for committees and task groups to post their needs for volunteer assistance that will include details of the expected work for everyone to see.

For the last 30 years that I have been with ICRI, one question arises every single year, especially from our newest members: “Where can I participate?” or, stated another way, “What committee can I join that has an opening for my expertise?” Now it will be simple and direct for this to be answered. Most, if not all, ICRI committees need more volunteers to help. With the Volunteer Opening Board, every committee will have the opportunity to post openings with a description of the volunteer services needed. And, most



importantly, all of you will be able to find a place where you can participate.

Although full details have yet to be finalized, a link to the Volunteer Opening Board will likely be on the home page of the ICRI website.

The Secretariat was formed to facilitate the orderly implementation of ideas within the ICRI organization by receiving and processing ideas from its members, then monitoring the results through contact with the ICRI committees, task groups, and members. Ideas and issues are heard, disseminated, and managed by the appropriate ICRI committees and task groups. This exciting new idea came from our committees, staff, and members all saying the same thing: “How does an ICRI member know where to participate?” Let’s all take it from here.

**Rick Edelson** is a Secretariat and Past President of ICRI.



## Volunteer

### Why 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—and available to assist you to answer questions about how ICRI operates, and to help you be the most effective volunteer possible.

### Follow Your Interests

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

### Length of Commitment

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



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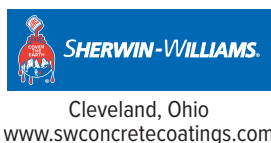


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# SUPPORTING MEMBERS

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



# Vision 2020: Past, Present, and Future

by David Whitmore

**V**ision 2020—a vision for the concrete repair, protection and strengthening industry—was established in 2006 after a series of industry workshops initiated by Peter Emmons, who was chair of ACI's Strategic Development Council (SDC) at the time. Vision 2020 is an industry-wide initiative which has received support and collaboration from 10 industry organizations as illustrated on the cover of the original Vision 2020 document<sup>1</sup> (Fig. 1).

The Vision 2020 mission was to “provide a strategic plan for improvements in the concrete repair industry, making the industry more efficient, effective, green, safe, and fun by year 2020.” As we begin 2020, it is worthwhile to look back at what has been accomplished, take an inventory of where we stand today, and discuss the future priorities for the repair industry.

Concrete deterioration affects all types of reinforced concrete structures. Proper repair techniques and corrosion protection methods can be used to rehabilitate and extend the service life of deteriorated structures (Fig. 2 and 3).



Fig. 2: Repair and galvanic encasement of deteriorated columns has been completed and scaffolding is being installed to facilitate repair and protection of the deteriorated pier caps



Fig. 3: Improper repair techniques can lead to continued corrosion and concrete delamination



Fig. 1: Vision 2020 document published in 2006

**Table 1: Vision 2020 Goals and Accomplishments**

Goal	Accomplished Tasks
1. Industry-Wide Cooperation	<ul style="list-style-type: none"> <li>Established Vision 2020 Repair and Protection Council</li> <li>Concrete Repair Manual<sup>2</sup>, fourth edition published</li> <li>Joint ICRI/PTI Document PTI DC80.3-12/ICRI 320.6-2012<sup>3</sup>, “Guide for Evaluation and Repair of Unbonded Post-Tensioned Concrete Structures”</li> <li>Joint ICRI and SWRI Document: Horizontal Waterproofing Manual</li> <li>Joint ICRI/SSPC/NACE Document ICRI 710.1- 2004<sup>4</sup>, “Guide for Design, Installation, and Maintenance of Protective Polymer Flooring Systems for Concrete” (updated document coming in 2020)</li> </ul>
2. Accelerated Industry Documents	<ul style="list-style-type: none"> <li>Vision 2020 supported and encouraged various ACI and ICRI committees to complete documents of relevance to the concrete repair industry</li> <li>Internet portal (fixconcrete.org) was established and maintained until concrete repair information became more widely available</li> </ul>
3. Create Repair Code	<ul style="list-style-type: none"> <li>ACI Committee 562 established and ACI 562-19<sup>5</sup>, “Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures and Commentary” published</li> <li>Joint ACI/ICRI Guide<sup>6</sup> to the ACI 562 concrete repair code published (updated guide coming in 2020 to complement ACI 562-19)</li> <li>ACI Subcommittee 562-E established to promote the ACI 562 concrete repair code and provide educational seminars and adoption efforts</li> </ul>
4. Create Repair Specifications	<ul style="list-style-type: none"> <li>ACI committee 563 established and ACI 563-18<sup>7</sup>, “Specifications for Repair of Concrete in Buildings” published</li> <li>ICRI Committee 110 established and ICRI 110.1-2016<sup>8</sup>, “Guide Specifications for Structural Concrete Repairs” published</li> <li>ICRI 330.2-2016<sup>9</sup>, “Guide Specifications for Externally Bonded FRP Fabric Systems for Strengthening Concrete Structures”</li> <li>ICRI 130.1R- 2009<sup>10</sup>, “Guide for Methods of Measurement and Contract Types for Concrete Repair Work”</li> </ul>
5. Improve Repair Materials	<ul style="list-style-type: none"> <li>ACI 546.3R-14<sup>11</sup>, “Guide to Materials Selection for Concrete Repair”</li> <li>ICRI 320.2R–2018<sup>12</sup>, “Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces”</li> <li>ICRI 320.3R–2012<sup>13</sup>, “Guide for Inorganic Repair Material Data Sheet Protocol”</li> <li>EN 1504 Products and Systems for the Protection and Repair of Concrete Structures and ISO 16311 Maintenance and Repair of Concrete Structures</li> <li>Validate Service Life Model <ul style="list-style-type: none"> <li>□ ACI Life-365 Software</li> <li>□ Stadium Model derived from Summa Model</li> </ul> </li> </ul>
6. Prevent Repair Construction Injuries	<ul style="list-style-type: none"> <li>ICRI Committee 120, Environmental Health and Safety, established</li> <li>ICRI 120.1–2009<sup>14</sup>, “Guidelines and Recommendations for Safety in the Concrete Repair Industry” published</li> <li>ICRI CRB column titled “Safety Solutions” established</li> <li>ICRI Committee 120 published white papers on silica, preserving hearing, and heat-related illness in the repair environment</li> </ul>
7. Predict Repair System Performance	<ul style="list-style-type: none"> <li>USBR project <ul style="list-style-type: none"> <li>□ Research funding of \$250,000 established</li> <li>□ Development of USBR M-82<sup>15</sup> “Standard Protocol to Evaluate the Performance of Corrosion Mitigation Technologies in Concrete Repairs” published</li> </ul> </li> <li>ACI Committee 365 Service Prediction documents</li> </ul>
8. Create Strategic Repair Research Council	<ul style="list-style-type: none"> <li>Strategic Repair Research Council (SRR) established by ACI SDC in 2012</li> <li>Operates under the ACI Research Foundation</li> <li>Collects and identifies repair-related research topics</li> </ul>
9. Increase Professionals, Recruitment, and Training	<ul style="list-style-type: none"> <li>Concrete Industry Management (CIM) Undergraduate Program</li> <li>CIM at four universities with scholarship program for attending ICRI and ACI conventions</li> <li>Universities encouraged to establish concrete repair related classes and post-graduate programs</li> <li>Compensation survey in the concrete repair industry completed by ICRI</li> </ul>
10. Improve Project Relationship, Contractual Agreement	<ul style="list-style-type: none"> <li>ICRI Committee 130, Procurement Methods and Relationship Arrangements established</li> <li>ICRI 130.1R– 2009, “Guide for Methods of Measurement and Contract Types for Concrete Repair Work” published</li> </ul>
11. Educate Owners	<ul style="list-style-type: none"> <li>ICRI Committee 160 (formerly 140), Life-Cycle and Sustainability established</li> </ul>
12. New Condition Assessment Technology	<ul style="list-style-type: none"> <li>Many guidelines developed for how to perform and use condition assessment, such as ACI 364.1R<sup>16</sup>; SEI/ASCE 11-99<sup>17</sup>; SEO/ASCE 30-00<sup>18</sup>, and TCRP Report 157<sup>19</sup></li> <li>Promotion of evaluation and health monitoring with theme of “Structural Health Monitoring System” at Spring 2011 ACI Conference in Houston, TX</li> </ul>
13. Develop Specific Repair System Needs	<ul style="list-style-type: none"> <li>Goal suspended</li> </ul>
14. Branding and Promotion of the Concrete Repair Industry	<ul style="list-style-type: none"> <li>Several breakout sessions have been completed to discuss the possibility of rebranding the concrete repair industry</li> </ul>
15. Achieving Durability and Sustainability of Concrete Repair	<ul style="list-style-type: none"> <li>The durability and performance of concrete repairs has been an underlying objective for many of the Vision 2020 goals</li> <li>Sustainability has been recognized as an important benefit of concrete repair which needs to be better understood and communicated</li> <li>Sustainability committees have been formed in ICRI and ACI</li> </ul>



## WHAT HAS BEEN ACCOMPLISHED?

Thirteen goals were established in 2006 and an additional two goals were added in 2010. The 15 goals are listed in Table 1 along with a summary of accomplishments.

Many activities have been completed and significant progress has been made with respect to most goals (Fig. 4 and 5).

## THE PRESENT

With some of the goals successfully achieved, progress on outstanding goals has continued.

In 2017, two workshops were organized in conjunction with ICRI conferences to review and discuss the status of each of the Vision 2020 goals as well as to plan for the

future. Workshop attendees overwhelmingly suggested that during the remaining two years, Vision 2020 should focus on implementation of some of the existing key goals before continued adoption of new goals or objectives.

Two of the Vision 2020 goals which were identified as priorities for the concrete repair industry were Goal #3 (Create Concrete Repair Code) and Goal #4 (Create Concrete Repair Specifications). In addition to the focus on creating these documents, the groups felt it was important to encourage adoption and use of these documents and concepts. Based on this guidance, Vision 2020 has been focused on adoption and use of the Concrete Repair Code and Specifications over the last two years.

### Vision 2020 Goal #3: Create Concrete Repair Code

Although we have not achieved international and nationwide adoption of ACI 562-19 “Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures and Commentary” (Concrete Repair Code), the repair code has been adopted into the building code in Ohio, Hawaii, and a number of local jurisdictions. The repair code is under consideration in other states and I foresee the repair code will be adopted in more and more states over time.

We have also seen increased use and reference to the concrete repair code by owners and consultants in jurisdictions where use of the concrete repair code is not mandatory. As a concrete repair contractor, I have been involved in a number of projects where the concrete repair code has been referenced and specified in project specifications and documents.

Implementation and use of the Concrete Repair Code is good for our industry as it helps to ensure that proper investigation and repair is completed. This in turn will lead to more durable, longer life repairs which actually address the underlying cause of deterioration.

ACI 562 (Concrete Repair Code) is also now referenced in ACI 318-19<sup>22</sup> such that ACI 318 users are directed to ACI 562 if repairs are required. This is an important development and it will help to bring new construction and repair together. No longer is there an imaginary line between the repair of new and existing concrete structures.

Each of you can help this initiative by implementing the Concrete Repair Code principles in your projects and encouraging local code officials to adopt ACI 562.

### Vision 2020 Goal #4: Create Concrete Repair Specifications

In support of this goal, ACI committee 563 was established and tasked with the mandate to write mandatory language standard specifications, and ICRI Committee 110 was tasked to develop guide specifications, specific to concrete repair.



Fig. 4: Properly detailed concrete removal per ICRI 110.1/310.1R<sup>20</sup> and ACI 546<sup>21</sup>/563 with completion of concrete repairs per ACI 562 to improve durability and service life (Goals #2, #3 and #4)



Fig. 5: Use of proper personal protective equipment (PPE) and ergonomic tools improve worker health and safety by reducing exposure to silica and repetitive stress injuries (Goal #6)

ACI Committee 563 has recently published ACI 563-18, "Specifications for Repair of Concrete in Buildings." This document is now available and can be used to bring consistency to your concrete repair projects. ACI 563 is structured to work with ACI 562 as a companion document. As with the Concrete Repair Code, the current Vision 2020 focus and priority with regard to ACI 563 (Concrete Repair Specifications) is to encourage adoption and use of this new and useful document.

ICRI Committee 110 has also contributed to this goal by publishing ICRI 110.1-16, "Guide Specifications for Structural Concrete Repairs." In addition, ICRI Committee 330 has published ICRI 330.2-16, "Guide Specifications for Externally Bonded FRP Fabric Systems for Strengthening Concrete Structures." These specifications (prepared in Master Spec format) are intended to be used as a technical specification section in a complete project manual by outlining generally accepted industry standard requirements, optional requirements, and commentary. Currently, ICRI Committee 110 is working on guide specifications for epoxy injection of cracks and cementitious bonded concrete overlays.

## THE FUTURE: WHAT IS NEXT FOR VISION 2020?

As the time frame for Vision 2020 draws to a close, I believe it is time to review where we stand, reflect on what has been accomplished to date, and set new goals and priorities for our industry.

Many things have been accomplished and the concrete repair industry is in a better position than it was in 2006. Now is a good time to set our priorities for the future.

## Concrete

Concrete is the most widely used man-made building material in the world. It is an economical, long-lasting, low-maintenance material which can be cast and allowed to harden into almost any shape imaginable. Unlike other building materials, concrete does not rot, corrode, or decay and it does not burn. We continue to make and place about 1 cubic yard (0.8 cubic meters) of concrete per year for every man, woman, and child on earth. In the United States alone, over 70 billion cubic yards of concrete (54 billion cubic meters) have been placed since 1930. As reported by Shiu and Goodwin in 2014<sup>23</sup>, over 13 billion cubic yards (10 billion cubic meters) of this concrete is over 25 years old.

## Concrete Deterioration

Even though concrete is a low-maintenance, long-lasting material, it will slowly degrade with exposure to environmental forces such as freeze-thaw and chemicals. Reinforced concrete structures are also susceptible to corrosion of embedded steel and cracking or spalling of the concrete itself if the concrete becomes contaminated with aggressive ions such as chloride or if the pH of the concrete is neutralized.

Corrosion and degradation are two of the reasons why concrete may need maintenance or repair. Because the concrete structure will continue to be exposed to the environment, it is important that the repaired concrete structure, including the repairs themselves, are durable and long-lasting. This has been a key focus of Vision 2020 and we need to consider what else needs to be done in this area.

## Concrete Repair Industry Is Large and Growing

The concrete repair industry in the United States was estimated to be \$18 to \$21 billion per year by Emmons and Sordyl in 2006.<sup>24</sup> In 2017, the American Society of Civil Engineers (ASCE) in their infrastructure report card estimated that an investment of \$2.0 trillion was needed to close the 10-year deferred investment gap in the U.S. alone.<sup>25</sup>

There is no question that the concrete repair industry is large—but just how large is it, really? The range between \$18 billion and \$2 trillion is too large to be credible. A research statement has been submitted and funding has been requested from ACI's Strategic Development Council (SDC) to hire a third-party research group to study this important issue and to help document the importance of concrete repair to the overall concrete industry. This is an important initiative which should be supported by our industry.

The concrete repair industry is growing faster than the overall economy because there is a huge inventory of existing concrete structures and a large backlog of deferred maintenance and repairs. The overall grade in the infrastructure report card issued by ASCE has dropped from "C" in 1998 to "D+" in 2017, due in part to the large backlog in repair requirements.

## Preservation and Sustainability

Concrete is a durable, long-lasting material; with proper maintenance and repair, it can last for many decades or centuries.

Materials and energy are used to make fresh concrete and new concrete structures. Far less energy or materials are used to repair, reuse, or repurpose existing structures. As such, repair is a sustainable practice and should be preferred.

Preserving concrete structures is important and we need to promote this activity as the preservation of every 10,000 cubic yards (7,646 cubic meters) of concrete avoids the release of over 9,000 pounds (4,082 kg) of nitrous oxides and 5,500 tons (4,990 metric tons) of carbon dioxide (CO<sub>2</sub>). This is equivalent to the annual CO<sub>2</sub> emissions of about 1,250 people. Preservation of 10,000 cubic yards (7,646 cubic meters) of concrete also conserves over 19,000 tons (17,237 metric tons) of natural resources that would otherwise be used to produce the aggregate, cement, and



steel necessary to produce the replacement structure. It also saves enough potable water to fulfill the daily needs of 2,500 people, prevents over 20,000 tons (18,144 metric tons) of rubble from being sent to landfill and prevents the release of enough heat to boil 30 Olympic-sized swimming pools!<sup>26</sup>

In addition to the efforts of industry organizations and government agencies, individuals and individual companies have joined in this very important initiative. We have committed resources to educate the industry and the public at large about this important issue and the societal and environmental benefits of preserving concrete structures. The informational website WeSaveStructures.info<sup>27</sup> contains information on the benefits of preservation, links to industry resources and websites, and provides a free environmental impact calculator where you can input project details and determine the environmental impact of demolishing and replacing your concrete structure.

Sustainability will be the key issue for future generations. We are the sustainable side of the concrete industry and we need to make more people aware of this.

For example, the Historic Dry Canyon Bridge, built in 1921, spans Dry Canyon Creek on the Columbia River Highway in Oregon (Fig. 6). The bridge was rehabilitated to extend its service life by an additional 25 to 50 years by Oregon DOT instead of being demolished and replaced with a new structure. Rehabilitation utilized many repair and protection techniques completed in accordance with ICRI

guidelines. These included isolated concrete repairs as per ICRI 310.1R<sup>28</sup>, global corrosion protection (realkalization) as per ICRI 510.1<sup>29</sup> and application of an aesthetic and protective coating. On the project, 1,400 cubic yards (1,070 cubic meters) of concrete was maintained in service, over 2,800 tons (2,540 metric tons) of concrete rubble was not produced, and 700 tons (635 metric tons) of CO<sub>2</sub> emissions were not produced. Annual CO<sub>2</sub> emissions of 140 people were eliminated<sup>30</sup> (Goal #15). This is an example of one concrete structure that was saved. Together we can save thousands of structures and make the world a better place.

## PATH FORWARD

Vision 2020 has been a very useful and effective initiative and has already improved the concrete repair industry. Many industry organizations have been involved and have supported this initiative including significant input from ICRI members, committees, and staff. Many individuals have also dedicated countless hours to develop and lead this initiative over the years. In particular, I would like to thank the founder and previous Vision 2020 Champions, Peter Emmons, Kelly Page, and Nam Shiu, as well as Fred Goodwin, for their dedication and efforts to improve our industry.

Many initiatives have been developed and achieved since Vision 2020 was conceived. Even considering these substantial achievements, there is still much more to do.

ICRI has been instrumental in Vision 2020 and has been deeply involved with some of the Vision 2020 goals. As the voice of the concrete repair industry, I believe it is important for ICRI to continue to be involved in this initiative. In this regard, a Vision 2020 Update presentation and workshop for developing future goals for the concrete repair industry are planned for the ICRI 2020 Spring Convention.

In closing, as we begin 2020, I recommend that we take stock and build on what we have accomplished, recognize the challenges facing our industry, and work together to establish a set of new priorities that will help meet the demands of the future. 🗨

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Fig. 6: Historic Dry Canyon Bridge: before (top) and after (bottom) rehabilitation



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The International Concrete Repair Institute (ICRI) is the leading resource for education and information to improve the quality of repair, restoration, and protection of concrete.

# Accelerating Innovation and Acceptance in the Concrete Industry: An Update on ACI's Strategic Development Council

by Charles Hanskat



Fig. 1: SDC Technology Forum 45 in San Diego, CA (Spring 2019)

**I**n sharp comparison to most other “manufacturing” industries, the construction industry has experienced nearly flat productivity growth for decades. The construction industry is ripe for improvement. However, to move forward, we must address the strategic and technical barriers to productivity and long-term serviceability in our built environment. As new technologies arise that can potentially improve productivity, durability, and serviceability, or minimize its environmental impacts, how do those get introduced into the existing system?

Though in the concrete industry we have seen a wealth of new materials and processes, there is a distinct inertia in getting many of these accepted into our designs and construction processes. Part of this resistance lies in the fact that in using concrete, we expect to create structures that will last for 50 to 100 years or more. As designers and builders, we want to build structures that last. Thus, we want to evaluate these emerging technologies considering their contribution and impact not only on today's construction but also for creation of durable concrete structures.

Innovation can often help to reduce the negative trends affecting the concrete construction industry. We see a decreasing workforce, and lack of productivity gains. But before we can accept widespread adoption of a new technology to address these trends, we need to prove that the technology works, and that it works for the life of the structure. This may require demonstrating performance in research, pilot studies, passing criteria, or proven acceptance tests. It may require a change in how our long-established design standards address the technology. Thus, the adoption requires a significant investment of time and effort.

The typically risk-averse construction community needs a clear incentive to invest in an innovative concept. “A contractor must evaluate whether the innovation would result in higher profits, better performance, more durability, increased safety, or faster completion time”, states Eamonn Connolly, Director of Engineering, James McHugh Construction Co. “Even if innovation is necessary because standard solutions won't work, it's essential to consider other stakeholders' thresholds for risk.”

## ACI STRATEGIC DEVELOPMENT COUNCIL

The American Concrete Institute's (ACI) Strategic Development Council (SDC) was created over 20 years ago to gather a group of industry influencers to provide a strategic overview of the concrete industry and move it forward. We are not an ACI technical committee producing technical documents. We do not produce educational seminars or conduct certifications. Rather we were formed to bring together key companies, executives, and leaders in the concrete industry to consider how to best advance the concrete industry (Fig. 1).

"My involvement with industry technology forums has shown me that the ongoing research and full-scale product development being done right now is creating solutions to problems which only a few years ago seemed to have no clear answer at all," states Eric Peterson, Construction Manager, Webcor Concrete. According to John Hausfeld, Director of Quality, Baker Concrete Construction, "Innovations of the future will look different than they have in the past. We expect that the highest impact innovations will involve adoption of tools that improve the means and methods that we use to manage concrete construction projects."

Over SDC's two decades of serving the concrete industry, we have identified and supported many key "industry critical" developments that shape our industry today, and in the future. A few of the key successes in our history are:

1. Alternative Cementitious Materials
2. Self-Consolidating Concrete
3. Performance-Based Design for Wind
4. Global Review of Concrete Durability and Service Life
5. Building Information Modeling
6. Volume-Induced Crack Reduction
7. High Strength Reinforcement
8. Vision 2020 (see David Whitmore's article this issue detailing with what we've accomplished and where we are heading with Vision 2020)

## NEW SDC VISION, MISSION, AND GOALS

Over the last two decades as we have grown as an organization, we also got bogged down in the administration and processes of identifying and nurturing the technologies. We had a Technology Management Committee (TMC), a Technology Transfer Advisory Group (TTAG), as well as several committees assigned to manage those technologies that we considered to be industry critical technologies (ICT). Though ACI now provides much greater staff support, the SDC Board decided that we needed to consider a reorganization to help streamline and focus our limited volunteer and staff resources on key strategic issues.

In a strategic planning session last year, the SDC Board adopted our new:

- **Vision**—Be the catalyst to optimize the use of concrete to serve societal needs.
- **Mission**—To provide strategic direction for advancement in the concrete industry.

We also decided that we would focus our efforts to provide Strategic Direction in the area of four goals. Admittedly these are broad, sometimes overlapping goals. However, we believe they are key to moving the industry forward:

- Improve the Durability of Concrete,
- Improve Design and Construction Process,
- Improve the Adoption of Innovation,
- Improve Concrete Contractor Productivity & Project Quality.

To streamline the structure and process, we discharged the TTAG committee, and most of the ICT-specific committees. The TMC is retained and we've established a new project management team for each goal comprised of one Board member and one member of TMC. This enhances our Board and TMC working together and helping keep both groups fully informed of where we are heading on each goal.

The new process (Fig. 2) charges the co-leader team for each goal with reviewing a "problem statement". This can be well defined with suggested action in place already, or very loosely thought out with needs for collaboration to create an action plan. SDC has an online submittal form posted on the SDC website ([www.concretesdc.org](http://www.concretesdc.org)) publicly available for anyone in the industry.

The co-leader team will conduct an initial evaluation of submitted problem statements or develop their own roadmap for needed activities. Factors to be considered are alignment with SDC goals, urgency, breadth and magnitude of impact, beneficiaries, significance and magnitude of technologies advantages, contribution to growth and competitiveness of the concrete industry.

The next step is identifying how to best move the initiative forward. There may be a request for TMC to issue a Request for Proposal (RFP) for research or provide a review of research proposals that were submitted with the initial problem statement. SDC may need to host a workshop to further define the need and enhance industry buy-in. The initiative could require a feasibility study or recommending a task group of industry experts to fast track a technical document for ACI; other standards developing groups, like ASTM International, formerly known as American Society for Testing and Materials (ASTM); or the International Concrete Repair Institute (ICRI).

The SDC co-leaders, and ultimately the Board, will then consider how to best support the initiative. When funding is requested, SDC will evaluate the priority of the initiative against other initiatives currently underway or planned soon. SDC has limited staff and financial resources and this process gives us a way to prioritize requests.

## CONCLUSION

SDC hosts Technology Forums twice a year. These forums are held separately from the ACI Conventions to allow our attendees to concentrate on the strategic benefits



# New Process

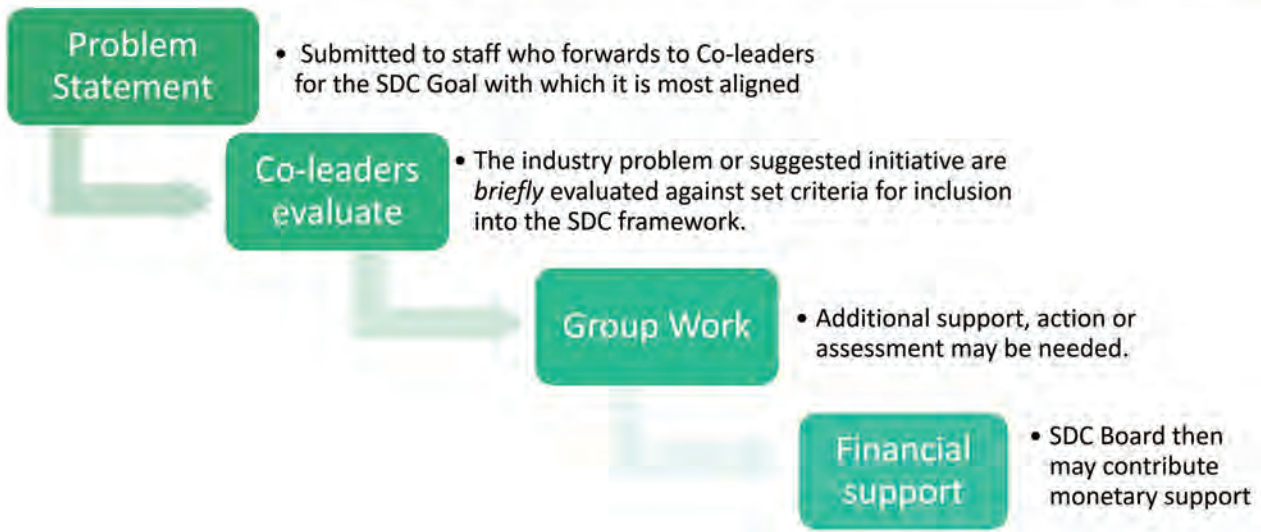


Fig. 2: New SDC Process for Evaluating Problem Statements and Initiatives

of new technologies to the industry. The forums provide a networking opportunity for our member companies, corporate executives and industry leaders. They also allow those companies or individuals with potential innovative technologies an opportunity to present their technology to the attendees. SDC's Spring Technology Forum will be held in Charleston, South Carolina, February 11-13, 2020. You can review the agenda of this forum (and several past forums) on the SDC website. The SDC forums and membership are

open to all (Fig. 3). Your attendance and active participation in the work of SDC is encouraged.

Our refreshed structure helps us to focus our limited resources on the most productive and beneficial initiatives. It gives us a method to focus on our key goals and establish priorities for assigning our resources that didn't exist in our previous structure. This is an exciting time for SDC as we develop our leadership teams and move initiatives forward with our new format. We have enjoyed major successes over the last two decades, but we look forward to making even more significant and strategic impacts on the concrete industry in the future. 🗨️



Fig. 3: Networking Opportunities at an SDC Forum



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# ACI 562-19: Looking Forward and Back

by Keith Kesner

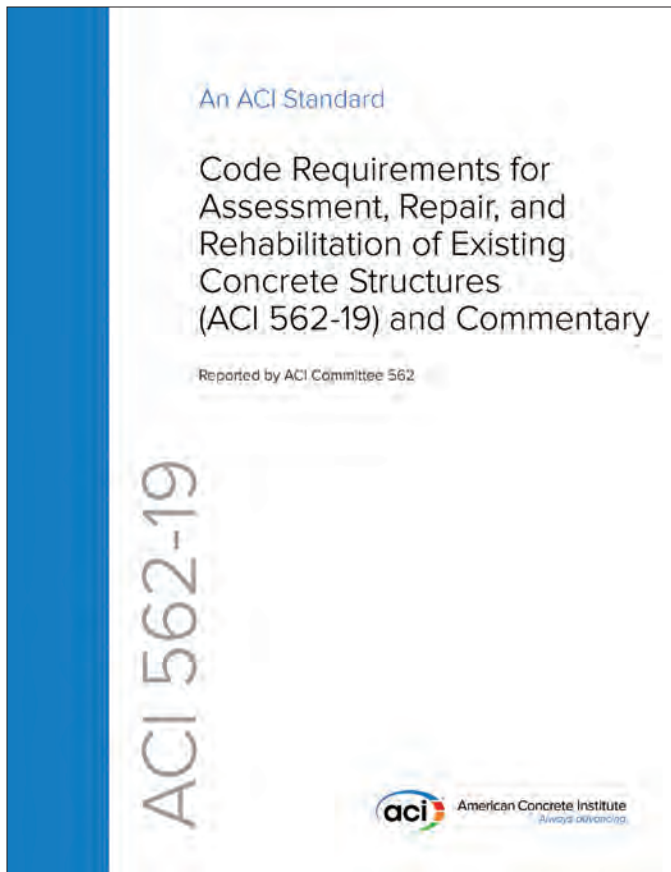


Fig. 1: ACI 562-19

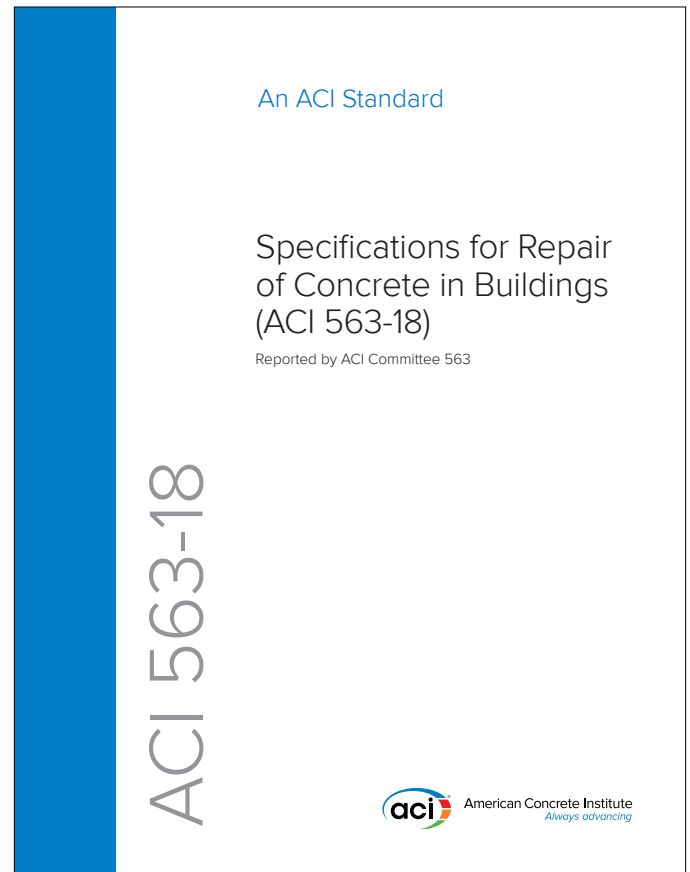


Fig. 2: ACI 563-18

The concept of a concrete repair code and specifications was proposed in Vision 2020<sup>1</sup> as a way to improve the performance of repaired concrete structures. In 2019, American Concrete Institute (ACI) Committee 562 completed work on an updated code for repair of existing concrete structures: Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures (ACI 562-19)<sup>2</sup> (Fig. 1). Combined with the publication of Specifications for Repair of Concrete in Buildings (ACI 563-18)<sup>3</sup> (Fig. 2), standard documents have been developed that will significantly improve the safety and durability of repaired concrete structures. The following sections discuss how the use of standards improves the performance of repaired structures, describes changes in ACI 562-19, and briefly discusses future directions for the ACI 562 code.

## HOW ACI STANDARDS IMPROVE CONCRETE REPAIR PERFORMANCE

The 2006 Vision 2020 Report established specific goals and timeframes to improve the performance of concrete repairs. Goals #3 and #4 of Vision 2020 were the development of a code and specifications for concrete repair (ACI established Committee 563 for standard specifications and ICRI established Committee 110 for guide specifications). The intent of the concrete repair code was to establish evaluation, design, and inspection practices that raise the performance level of repair and protection systems. A separate code document was needed because existing codes and standards developed for new construction were not directly applicable to existing structures.



ACI 562-19 was developed to work with the International Existing Building Code (IEBC).<sup>4</sup> The IEBC provides minimum requirements for repair of existing structures. The requirements are largely limited to delineating when a structure may require upgrades to satisfy current code requirements. The IEBC provides no insight on assessment of existing structures, unique considerations associated with repair of existing structures, or durability of repairs. A key goal of ACI 562 was to provide the repair community the content missing from the IEBC—specifically, a repair code that established minimum practices for assessment of existing structures, design of repairs that ensure life safety, and are durable within the desired service life of the repaired structure.

## CHANGES IN ACI 562-19

ACI 562-19 is the third version of the concrete repair code developed by ACI to be a performance-based document for the assessment and repair of existing concrete structures. Since the publication of the first edition in 2013, the ACI 562 committee has focused on improving the code provisions and increasing the technical depth of the document. Some of the changes in ACI 562-19 include improvements in the code requirements for external reinforcement, coordination of load testing requirements with ACI 318<sup>5</sup>, and clarification in how unsafe conditions are defined.

### External Reinforcement

Installation of external reinforcement, in the form of fiber reinforced polymers, external post-tensioning, external steel members (Fig. 3), or external steel plates are common strengthening methods. However, in contrast to internal reinforcement, external reinforcement may be exposed to fire or an elevated temperature in service. ACI 562 includes additional load combinations and code requirements that must be satisfied to ensure external reinforcement systems perform as intended. These provisions were updated in ACI 562-19 for consistency with other ACI standards and to improve the clarity of the provisions.

### Load Testing Requirements

In 2013, ACI 562 became the first code to adopt the ACI 437.2<sup>6</sup> standard for load testing of existing structures. The ACI 437.2 standard allows for either monotonic or cyclic testing protocols to evaluate existing structures. Working with representatives from ACI Committees 437 and ACI 318-C, the provisions in both ACI 318-19 and ACI 562-19 were modified to provide a consistent set of requirements for load testing of structures (Fig. 4).

### Unsafe and Potentially Dangerous Conditions

A key part of the assessment of any structure is the identification of unsafe and dangerous conditions. The first version of ACI 562 (ACI 562-13) used definitions of dangerous and unsafe that were directly adopted from the International Existing Building Code (IEBC). The definition of dangerous from ACI 562-13 is as follows:



Fig. 3: External steel reinforcement



Fig. 4: Load test in progress: cyclic loading (a) and monotonic pool loading (b) (Images courtesy of Pivot Engineers)

**dangerous**—any concrete building, structure, or portion thereof that meets any of the conditions described below shall be deemed dangerous:

1. The building or structure has collapsed, has partially collapsed, has moved off its foundation, or lacks the necessary support of the ground.
2. There exists a significant risk of collapse, detachment or dislodgement of any portion, member, appurtenance, or ornamentation of the concrete building or structure under service loads.

**Commentary:** *dangerous*—this definition is from the International Existing Building Code (IEBC 2012).

A key question arose from this definition: when does an existing member or structure have a “significant risk of collapse under service loads?” To address this question, a reliability approach was used to develop a demand-to-capacity ratio at which a member is at “significant risk of collapse under service loads.”<sup>7,8</sup> The resulting demand-to-capacity ratios provide a design professional a mechanism to determine when a structure may be unsafe and in need of shoring or other intervention. This demand-to-capacity ratio is also used to delineate when a structure will need to be strengthened to current code requirements or strengthened to the original design requirements. Figure 5 shows an example of an observed unsafe structural condition and the shoring used to temporarily address the condition.

### GUIDE TO ACI 562

To help design professionals, a guide to ACI 562 was jointly developed by ACI and the International Concrete Repair Institute (ICRI). The guide was developed to provide a “plain language” explanation of the code provisions and present worked example problems of typical repairs. The guide is currently being updated to reflect changes in ACI 562-19 and the use of ACI 563-18. New case studies are being developed to provide examples of strengthening of existing structures using section enlargement and other methods.

### FUTURE DIRECTIONS FOR ACI 562

All standards are regularly updated to reflect the latest technology, practice issues, and research results. This process allows the code committee to introduce new provisions and to improve the language of existing provisions. It is important to note that ACI 562 is a “young” standard, having been first published in 2013, compared to ACI 318 which was initially published in 1941. Accordingly, ACI 562 has “room to grow” as a standard, and improvements to the code will be developed in the new code cycle which started at the ACI 2019 Fall Convention.

To provide design professionals with a path toward flexible solutions, the ACI 562 committee has focused on developing a performance-based standard that encourages evaluation of the damaged portion of the structure (repair area) and the surrounding structure. As a largely performance-based standard, ACI 562 contains provisions using “shall be considered” language in lieu of prescriptive requirements. The commentary in ACI 562 provides context on the items to be considered as a part of the design process. One task in the new code cycle will be to review the “shall be considered” language and to confirm that sufficient guidance is provided in the commentary for design professionals to execute the code intent.

Future changes to the code are also likely in the area of precast prestressed and post-tensioned structures. The presence of either bonded prestressing steel or



Fig. 5: Observed unsafe condition (a) and shoring used to temporarily address the condition (b)


unbonded post-tensioning needs to be considered both in the design of structural repairs and in the development of durable repair solutions. New subcommittees are currently examining if additional code provisions and commentary are needed for these types of structures.

ACI 562-19 was developed for repair of existing concrete structures beyond traditional building structures. Accordingly, the committee is also reviewing the code to determine mechanisms to expand use of the code for non-traditional building structures. The ACI 562 code was developed to be used with and adopted into the IEBC. To date, despite support of design professionals, building code officials, repair material manufacturers, and building owner groups, ACI 562 has not been adopted into the IEBC. Several states have adopted ACI 562-16 as a standard for repair of existing concrete structures. Adoption efforts are currently underway in numerous states and local jurisdictions. The ACI website provides information on support efforts for adoption of ACI standards at <https://www.concrete.org/publications/standards/standardsadoption.aspx>.

### SUMMARY

The long-term success of a concrete repair project is the result of identification and quantification of the damage present, development of repair plans and specifications that address the structural and durability needs, and implementation of the repairs consistent with the project specifications. Development and use of codes and standards will improve repair performance by establishing



minimum levels of practice, which will have the effect of raising the performance of the entire repair industry. 

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# Evolution of the ACI 562 Code—Part 8

## Basis of design report for concrete repair projects

by Marjorie M. Lynch

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### EXISTING CONCRETE STRUCTURES—LEARNING LESSONS AND ADVANCING SOLUTIONS

ACI Committee 562, Evaluation, Repair, and Rehabilitation of Concrete Buildings, strives to advance the practice of engineering and improve the repair and rehabilitation of existing concrete structures. ACI Subcommittee 562-E, Education, is dedicated to helping engineers, building officials, contractors, owners, inspectors, and others by conveying information in more detail than is possible solely through the ACI 562 Code and Commentary. To this end, and in the hope of improving these documents, members of ACI 562 are providing a series of articles under the main theme “Existing Concrete Structures—Learning Lessons and Advancing Solutions.”

Through this series, the committee members explain the rationale behind some of the changes in the ACI 562-16 Code as well as share example problems, ideas, concepts, and the thoughts discussed in ACI Committee 562 meetings. It is also anticipated the series will help the committee address questions from the engineering and construction sectors, solicit answers to problems, and review areas of needed research.

A key provision of ACI 562-16<sup>1</sup> is the preparation of a basis of design report by the Licensed Design Professional (LDP). The report summarizes assessment of the existing structure, describes structural repairs to be performed under the provisions of ACI 562-16, and serves as a written record of the evaluation and design phase of a structural concrete repair project.

### PURPOSE

The basis of design report provides an overview of the project for the building owner and, when required, the code official at the commencement of repair construction. The report outlines the engineer's fundamental reasoning, assumptions, and judgment used in developing the design documents—the construction drawings and specifications. The concept of a basis of design report in ACI 562-16 was developed from current requirements in the existing building code in the Commonwealth of Massachusetts,<sup>2</sup> and the experience of design firms that successfully use the report to convey information to owners. The basis of design report is not intended to replace a detailed project report and will provide similar information to that contained in general drawing notes. In many situations, an expanded “checklist” type report will satisfy the requirements of ACI 562-16.

Some jurisdictions currently require that a basis of design report be submitted to the local code official prior to issuance of a building permit. For example, the Commonwealth of Massachusetts requires that for any code-regulated rehabilitation programs, the building's systems be investigated and evaluated, including evaluation of design gravity loads, lateral load capacity, egress capacity, fire protection systems, fire resistive construction, interior environment, hazardous materials, and energy conservation. Massachusetts requires that the results of the investigation and assessment, along with any proposed compliance alternatives, be submitted to the building official in a written report form. The code official uses this report to determine if the repair project adequately addressed the existing condition of the building.

Per Section 1.5.3.1 of ACI 562-16, the basis of design report should include:

- a. description of the building, including age of construction, structural systems, identified original building code, and past and current uses;
- b. documentation of unsafe structural conditions in the work area of the structure determined in the assessment;

- c. documentation of substantial structural damage in the work area;
- d. members and systems of the work area requiring increase in capacity beyond the demand of the original building code;
- e. modifications such as additions, alterations, or changes in occupancy;
- f. conditions and details of the proposed rehabilitation work;
- g. past history of concrete repairs and rehabilitations;
- h. assessment criteria and findings;
- i. design-basis code criteria and basis of rehabilitation design;
- j. material selection parameters;
- k. shoring needs;
- l. quality assurance and quality control (QA/QC) requirements;
- m. types and frequency of future inspection; and
- n. types and frequency of future maintenance.

Depending on the project scope, some of the listed items may not be present and thus need not be included in the basis of design report. At a minimum, the basis of design report should address four topics:

- a description of the structure;
- the age and condition of the structure prior to the repair project;
- documentation of unsafe structural conditions and extent of structural damage; and
- findings of the assessment and recommendations for future maintenance/inspection after project completion.

While not always required, some projects may benefit by including a summary of major findings and recommendations that prefaces the main report. Additional information such as supporting data for the repair design—including laboratory tests, nondestructive testing, or load testing results—can be a part of an appendix.

## BACKGROUND INFORMATION

The typical basis of design report will start with a description of the existing structure that identifies the structural system and age of construction and lists the original building code, if possible. In many existing structures, as-built drawings are not available and the basis of design report, along with repair plans, will provide an owner with baseline information about the structure.

The original structural system for the building should be described clearly and simply: the type of framing, type of reinforcement, number of stories, and year of original

construction. Alterations and additions made since the original construction and a description of previous repair efforts should also be included in the background section. The cumulative effects of alterations on the building's structure structural system can be also covered in the report.

## ASSESSMENT FINDINGS

A crucial finding in any existing structure assessment is the extent and impact of damage on the capacity of the existing structure. ACI 562-16 requires the identification of unsafe structural conditions and substantial structural damage (refer to ACI 562-16 or the IEBC<sup>3</sup> for definitions) during the assessment. When these conditions are present, they must be identified in the basis of design report (refer to Fig. 1 for an example). When local ordinances require unsafe structural conditions and substantial structural damage to be reported to a code official, the basis of design report is a convenient mechanism to point out these conditions. The basis of design report should also identify any members requiring strengthening beyond the demand of the original building code.

## REPAIR DESIGN DESCRIPTION

The basis of design report describes what actions are recommended by the design professional to address deficiencies found in the structural evaluation and assessment. The repair work specified in the construction documents for the repair project should be described to provide a general overview. The repair description should identify the design-basis criteria for the repairs. A description of any areas requiring shoring during the repair period should also be included (Fig. 2 and 3).

A major goal of ACI 562-16 is to improve the long-term durability of both repairs and repaired structures.

Accordingly, the basis of design report should identify project-specific QA/QC measures to be implemented



Fig. 1: Shear cracks in a one-way joist system are examples of substantial structural damage (unsafe conditions) that must be identified in the basis of design report (photo courtesy of Keith Kesner, CVM Engineers, King of Prussia, PA)


during repairs, as well as code-required special inspections. Inclusion of these items in the basis of design report is intended to provide the owner information on how a durable repaired structure will be achieved.

## RECOMMENDATIONS FOR FUTURE MAINTENANCE/INSPECTION

A key concept in ACI 562-16 is a requirement that future maintenance and inspection procedures be documented by the LDP and provided to the owner. The intent of these provisions is not to create a maintenance code, or to

require maintenance of existing structures be performed, but to inform the owner of the necessary steps to maintain the structure after completion of repairs. A secondary goal of providing future maintenance/inspection requirements is to protect the LDP in the event of future problems related to a lack of maintenance in a repaired structure.

## SUMMARY

The basis of design report provides the owner and, when required, the building official a simple means of understanding the conditions that led to the repair project, why repairs are necessary, and what actions need to be taken to ensure the long-term performance of the structure. It is a tool that demonstrates that the design professional has created a code-compliant and appropriate repair program for the various stakeholders. The basis of design report is not intended to place an onerous requirement on the LDP, but rather to provide a simple means to convey to the owner (and possibly the code official) a description of the work being performed and how to maintain the structure in the future. 

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Fig. 2: Nonstructural elements may preclude the use of standard details. Shoring plans must be specific to the existing conditions (photo courtesy of Keith Kesner, CVM Engineers, King of Prussia, PA)

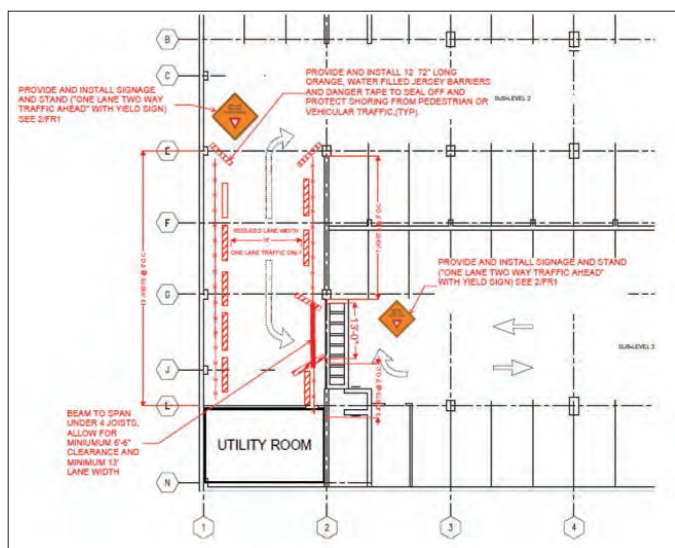


Fig. 3: Areas requiring shoring should be described in the basis of design report. In this example, the contractor is required to keep the structure (a parking garage) open and fully functional throughout the repair work. The contractor is also instructed to install special signage and protection for the shoring (location marked by lines with X marks), retain a licensed engineer to design the shoring, and submit sealed shoring drawings for owner review (image courtesy of Keith Kesner, CVM Engineers, King of Prussia, PA)



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# Evolution of the ACI 562 Code—Part 9

## Interface bond provisions in ACI 562-16

by Khaled Nahlawi and Jay H. Paul

*Reprinted from Concrete International November 2016 with permission of the American Concrete Institute.*

### EXISTING CONCRETE STRUCTURES—LEARNING LESSONS AND ADVANCING SOLUTIONS

ACI Committee 562, Evaluation, Repair, and Rehabilitation of Concrete Buildings, strives to advance the practice of engineering and improve the repair and rehabilitation of existing concrete structures. ACI Subcommittee 562-E, Education, is dedicated to helping engineers, building officials, contractors, owners, inspectors, and others by conveying information in more detail than is possible solely through the ACI 562 Code and Commentary. To this end, and in the hope of improving these documents, members of ACI 562 are providing a series of articles under the main theme “Existing Concrete Structures—Learning Lessons and Advancing Solutions.”

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**A**lthough ACI can trace its concrete design standard back to 1910,<sup>1</sup> more than a century elapsed before the organization issued its first concrete repair code, ACI 562-13.<sup>2</sup> The repair code, unlike other ACI standards, is primarily a performance-based document. It was developed to provide licensed design professionals (LDPs) with the minimum requirements for assessing and repairing or rehabilitating existing structural concrete buildings, members, systems, and, where applicable, nonbuilding structures. Prior to the development of the code, an LDP might set repair and rehabilitation requirements arbitrarily or based on the culture or past experiences of the LDP's firm. The new standard should result in improved consistency and overall performance in the industry and thus further protect lives and property.

The second version of the code was published in June 2016.<sup>3</sup> The most significant changes to ACI 562 include:

- Revisions to Chapters 1 and 4 to include specific criteria requirements for assessment and design of repair and rehabilitation for varying levels of damage, deterioration, or faulty construction;
- Revisions to allow the repair code to be used with the International Existing Building Code or as a stand-alone code (Appendix A); and

- Revisions to the interface bond provisions in Chapter 7.

To assist engineers in applying the new code, ACI and the International Concrete Repair Institute (ICRI) have collaborated and produced a guide for its use (refer to Reference 4). This article discusses the updated interface bond provisions, provides excerpts from the new guide, and includes an example to illustrate the application and significance of these new provisions.

### GUIDE TO THE ACI 562 CODE

The primary purpose of the new guide is to help LDPs gain more knowledge and skill in interpreting and properly using ACI 562-16. Although specifically developed for LDPs, the guide was also designed to provide insights into the use and benefits of ACI 562 for contractors, material manufacturers, building owners, and building officials. To achieve these goals, the guide is separated into two main components: chapter guides and project examples. The chapter guides explain the proper use of ACI 562, and the project examples illustrate the process of carrying out a concrete building evaluation, repair, rehabilitation, or strengthening project from inception through completion.

The chapter guides follow the general organization of ACI 562; section numbers in Chapters 1 to 11 and Appendix



A of the guide correspond to the provision numbers in ACI 562. The chapter guides include background and explanation of the various Code provisions with particular insight into how the chapters and sections of ACI 562 are applied to a repair project. Where applicable, flowcharts are provided to help users navigate the various provisions of the Code. References to project examples are provided where needed to illustrate how specific provisions within each chapter of ACI 562 are incorporated into the design process. In some instances, additional limited-scope examples are included to better illustrate a point that is not covered by the project examples.

To give readers a preview of the guide, some aspects relative to Chapter 7 of ACI 562 are discussed herein.

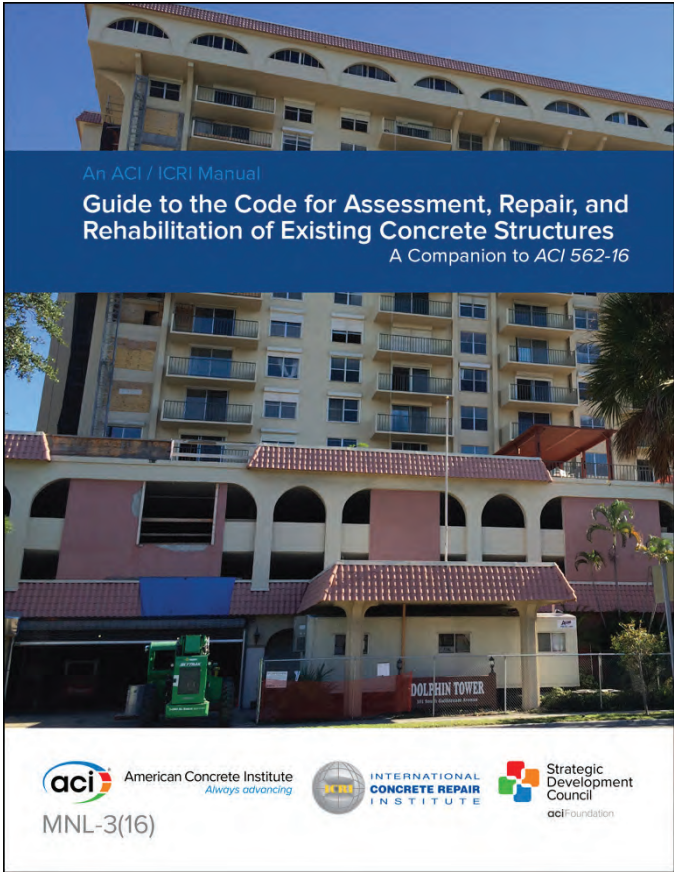
### SECTION 7.4—INTERFACE BOND

Section 7.4 was revised to emphasize the importance of proper bonding between the substrate and overlay.<sup>5</sup> Bond strength is influenced by the strength of the substrate concrete, strength of the repair material, quality of the substrate concrete surface preparation, construction procedures, characteristics of repair materials, and time-dependent factors such as shrinkage of concrete and variations in repair material properties with time. Section 7.4.3C of the Code commentary stresses the importance of substrate preparation and various methods used to test for bond integrity. Various methods to prepare concrete surfaces are discussed in ICRI 310.2R-2013<sup>6</sup> and ACI 546R-14<sup>7</sup> to achieve the desired performance of concrete repairs. The Code commentary also references ICRI 210.3R-2013,<sup>8</sup> which discusses bond strength in repairs and suggests minimum values depending on application criticality.

The LDP should determine the factored interface shear and tension stresses across the bonded interfaces between the repair materials and existing substrates. Then, the LDP should verify that the calculated horizontal shear strength is at least equal to the required bond strength or tensile strength of the concrete substrate, such that

$$v_u \leq \phi v_{ni} \qquad \text{(ACI 562-16, Eq. [7.4.1])}$$

Here,  $v_u$  is the calculated bond demand shear stress based on mechanics,  $\phi$  is the reduction factor obtained from ACI 562-16, Section 5.3.2, and  $v_{ni}$  is the measured bond stress determined using a valid test method such as ASTM C1583/C1583M.<sup>9</sup> The overlay should be tested for



“Guide to the Code for Assessment, Repair, and Rehabilitation of Existing Structures” is available at the ICRI Store at [www.icri.org](http://www.icri.org)

proper bonding as required by ACI 562-16, Sections 7.4.2 through 7.4.4, and as presented in Table 1.

According to ACI 562-16, Section 7.4.2, for bonded interfaces with  $v_u$  values of less than 30 psi (0.2 MPa), only qualitative bond-integrity testing is required. For bonded interfaces with  $v_u$  of more than 60 psi (0.4 MPa) (per Section 7.4.4), or a repaired section that is subjected to a sustained tension force, reinforcement must be provided between the substrate and overlay.

The guide to ACI 562-16 includes an expanded discussion of this topic along with two examples to illustrate the application and significance of these new provisions.

**Table 1:**  
**Testing requirements based on interface bond stress demand  $v_u$**  (Table 7.4.5 from Reference 4)

$v_u$	Section No. (ACI 562-16)	Testing requirements
Less than 30 psi (0.2 MPa)	7.4.2	Bond-integrity testing
Between 30 and 60 psi (0.2 and 0.4 MPa)	7.4.3	Quantitative bond strength testing
Greater than 60 psi (0.4 MPa)	7.4.4	Quantitative bond strength testing
Completely resisted by interface reinforcement	7.4.5	Quantitative bond strength testing not required



The following is such an example, taken from Chapter 7 of the guide, addressing the approach and requirements to determine bond strength of an overlay to an elevated slab in a parking structure.

**EXAMPLE 7.2—DETERMINING BOND STRENGTH OF OVERLAY TO AN ELEVATED SLAB**

**Background**

A nine-story parking structure located in the Midwest of the United States was constructed of 8 in. (200 mm) thick lightweight concrete flat slabs in 1971. The owner contracted with an engineering firm to evaluate the structure and design repairs. From the outset, the owner made it clear that inspection and repair activities should have minimal impact on operation of the structure (the revenue stream could not be interrupted).

The design concrete compressive strength was 3,750 psi (25 MPa) and the reinforcing steel was specified to be in accordance with ASTM A615 Grade 60 (yield strength of 60,000 psi [400 MPa]).<sup>10</sup> The top surfaces of the decks were sounded and visually inspected and were found to be badly deteriorated. The LDP estimated that the extent of deterioration on the top side ranged between 30% to 70%. Delamination and cracking was also evident on the bottom surfaces of the decks, but the deterioration was much less extensive than that on the top surfaces.



Fig. 1: Pulloff test on an overlay concrete (Fig. 7.2a from Reference 4)<sup>7</sup>

Cores extracted from several areas of the deck were tested for strength and chloride content. Tests revealed that the concrete compressive strength matched the design concrete compressive strength and that chloride was present, with excessive concentration levels near the top. Insufficient cover over the reinforcement was detected at various locations throughout the garage.

**PROCEDURE**

The LDP determined that the repair would consist of the removal of 3-1/2 in. (90 mm) of the top of the deck slabs and replacement with a bonded lightweight concrete overlay. There are several methods for concrete removal, including shotblasting, hydrodemolition, cutting, impact milling, pre-splitting, and abrading. Irrespective of the method used, it must be effective, safe, and economical, and it should produce minimum damage to the concrete substrates left in place (free of microcracks). The contractor and the LDP evaluated the different methods and it was decided to use hydrodemolition because it:

- Results in a rough, irregular surface profile that provides an excellent bond for all types of repair materials, creating a monolithic repair;
- Minimizes or eliminates surface microcracking;
- Exposes aggregates without fractures or damage and thus ensures they will interlock with the overlay;



Fig. 2: Removal of 3-1/2 in. of slab by hydrodemolition (Fig. 7.2b from Reference 4)

**Table 2:**  
**Results of pulloff tests of the mockup area** (Table 7.2a from Reference 4)

Test number	Test location	Test parameters		
		Bond force, lb (kN)	Bond strength, psi (MPa)	Separation location
A1	Level P8 floor slab mockup area A	900 (4.0)	126 (0.87)	Substrate concrete
A2		790 (3.5)	110 (0.76)	Surface of the substrate concrete
A3		790 (3.5)	110 (0.76)	Surface of the substrate concrete
B1	Level P8 floor slab mockup area B	1125 (5.0)	157 (1.08)	Substrate concrete
B2		1000 (4.5)	142 (0.98)	Surface of the substrate concrete
B3		1000 (4.5)	142 (0.98)	50% substrate concrete 50% surface of the substrate concrete

- Selectively removes lower strength and deteriorated concrete (delamination);
- Minimizes vibration in the surrounding structure; and
- Preserves and cleans reinforcing bars for reuse and minimizes the need for sandblasting.

Robotic equipment was used for this job to ensure uniform removal of concrete. But prior to the start of the production work, a mockup was installed and extensively tested to ensure the success of the recommended procedure.

**Table 3:**  
**Results of pulloff tests of the partially completed work** (after Table 7.2b in Reference 4)

Test number	Test area and location	Date of placement	Test parameters		
			Bond force, lb (kN)	Bond strength, psi (MPa)	Separation location
BT-1	Level P9 on column line 2 between column lines G and H	6-29-06	560 (2.5)	79 (0.54)	Substrate concrete
BT-2	Level P9 on column line 2 between column lines K and L	6-29-06	670 (3.0)	96 (0.66)	Substrate concrete
BT-3	Level P9 west of column line 2 between column lines N and P	7-08-06	225 (1.0)	32 (0.22)	75% interface between substrate concrete and overlay, 25% within substrate concrete
BT-4	Level P9 between column lines 8 and 9 and J and K	7-14-06	1350 (6.0)	190 (1.31)	Epoxy adhesive
BT-5	Level P9 between column lines 8 and 9 and F and G	7-14-06	1350 (6.0)	190 (1.31)	Substrate concrete

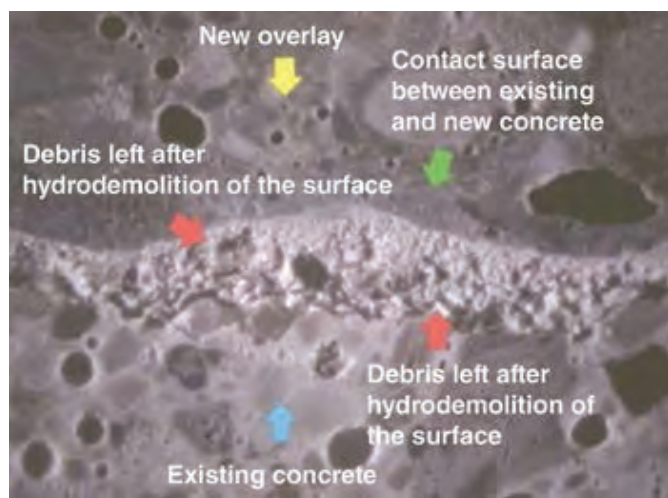


Fig. 3: Petrographic examination of the interface between the new overlay and the existing concrete slab (Fig. 7.2c in Reference 4)

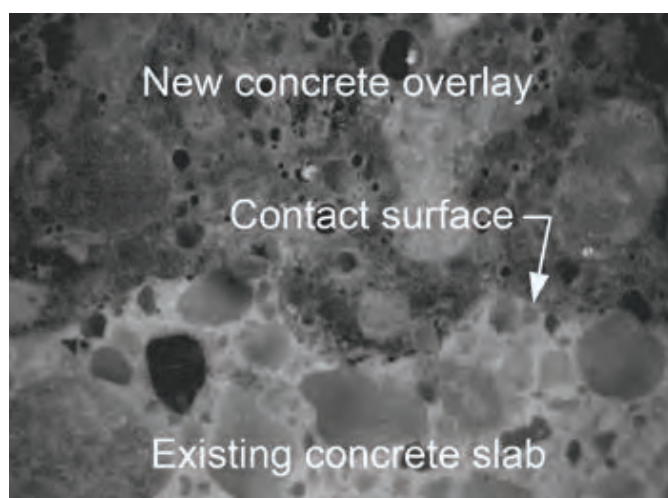


Fig. 4: Petrographic examination of the interface between the concrete substrate and the overlay (Fig. 7.2d in Reference 4)

**Table 4:**  
**Results of pulloff tests after the remedial actions** (Table 7.2c from Reference 4)

Test number	Test area and location	Date of concrete placement	Test parameters		
			Bond force, lb (kN)	Bond strength, psi (MPa)	Separation location
BT-16	Level P9, NWC	Not provided	1240 (5.5)	174 (1.2)	Interface zone
BT-17	Level P9, SWC	Not provided	560 (2.5)	79 (0.54)	Substrate concrete
BT-17A	Level P9, SWC, 9 ft N of core BT-17	Not provided	790 (3.5)	100 (0.69)	Interface zone
BT-17B	Level P9D, West, 3 ft N of core BT-17	Not provided	790 (3.5)	100 (0.69)	Interface zone
BT-18	Level P8D, West	Not provided	1450 (6.5)	206 (1.42)	Interface zone
BT-19	Level P8D, West, column 2 between N and P	Not provided	1350 (6.0)	190 (1.31)	Interface zone

Note: 1 ft = 0.3 m

The testing of the mockup slab included:

- Tensile bond tests of the overlay concrete to the substrate by pulloff (Fig. 1); and
- Petrographic examinations of cores.

A total of six tests were performed (Table 2). The test results exceeded 100 psi (0.69 MPa), a minimum value stated in ACI 562-16, Section 7.4.2C, and ICRI 210.3, and the difference between maximum and minimum test results was 47 psi or 30%.

Once the LDP was satisfied with the test results and the process was confirmed, the contractor proceeded with the implementation of the repair work, starting with removal of the upper surface of the slab (Fig. 2).

The LDP requested extensive testing of the repair work throughout the duration of the project. The testing for the overlay concrete was similar to the testing for new cast-in-place concrete. Pulloff testing in accordance with ASTM C1583/C1583M was performed to confirm the adequacy of the bond of the overlay to the substrate concrete. The results of the pulloff tests are presented in Table 3.

The test results varied between 32 psi and 190 psi (0.22 MPa and 1.31 MPa). The difference of 158 psi (1.09 MPa) or 83% indicates large scatter and is unacceptable. The LDP ordered petrographic examination of some of the samples. The test results revealed that the contractor did not remove all debris and loose material from the substrate surface area, thus creating a weak bond between the substrate and overlay (Fig. 3).

Corrective actions were implemented to improve the bond strength:

- The contractor improved the methods used to clean the surface of the substrate and to remove residue resulting from hydrodemolition; and
- Inspectors examined the substrate surface more closely to determine suitability to receive the bonded overlay.

The pulloff testing after the corrective measures indicated more consistent results (Table 4). Tensile bond values were at least 100 psi (0.69 MPa), with the exception of one test result.


The LDP ordered another set of petrographic evaluations of some of the samples. The examinations indicated that the overlay was well consolidated and there was good bond at the contact surface with the substrate (Fig. 4).

## CONCLUSIONS

To ensure any project is successful, the construction phase of the work should be performed with high-quality workmanship and materials that satisfy the intent of the construction documents. The described project (Example 7.2) was in large part successful because the owner, contractor, and engineers worked together. While this repair was very challenging because it was necessary to keep the garage open with a maximum number of spaces while the repairs were made, the project was completed on time and within budget.

## MAINTENANCE PROGRAM

Repair work may fail prematurely if a well-established maintenance program is not implemented. Therefore, ACI 562-16, Chapter 1, General Requirements, and Chapter 8, Durability, require that the LDP provides the owner with a maintenance program for the individual repairs. Properly executed and monitored, a maintenance program will extend the life span of repair work and minimize the total cost of ownership. The maintenance program for the example parking structure could be divided into three categories:<sup>11</sup>

- Routine maintenance—this includes repairing leaking joint sealant, clearing plugged drain lines, repairing small areas of spalled or delaminated concrete, replacing expansion joint seals, and washing down the parking decks twice a year. Keeping the structure clear of deicing salts and other debris can significantly improve the life span of the repair work;
- Preventive maintenance—this includes reapplication of surface sealers, traffic membranes, joint sealants, and expansion joints. Preventive maintenance usually does not entail the major disruptions associated with structural repairs; and
- Replacement—this includes replacement of structural and operational items at the end of their service lives. Lighting, elevator equipment, plumbing fixtures, and parking access and control equipment must be maintained to ensure that customers are safe and keep coming back. 

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**Khaled Nahlawi** is a Senior Engineer at ACI. He has extensive experience in design of new structures as well as design and management of retrofit and repair projects. He was the project engineer on the first U.S. application of post-tensioning strengthening to an unreinforced masonry structure after the Loma Prieta Earthquake.

He serves as the Secretary on the ACI TAC Repair and Rehabilitation Committee. He received his BS in civil engineering from Damascus University, Damascus, Syria; his MS in construction engineering and management; and his PhD in structural engineering from the University of Michigan, Ann Arbor, MI.



**Jay H. Paul, FACI**, is Senior Principal at Klein and Hoffman, Inc., Chicago, IL. He has more than 40 years of experience in the evaluation, design, and repair of environmental structures, parking facilities, building façades, roofs, and foundations. He is the Secretary of ACI Committee 563, Specifications for Repair of Structural Concrete in Buildings. He serves on the ACI TAC Repair and Rehabilitation Committee and ACI Committees 364, Rehabilitation; 546, Repair of Concrete; and 562, Evaluation, Repair, and Rehabilitation of Concrete Buildings. He received his BS and MS in architectural engineering from the University of Illinois at Urbana-Champaign, Urbana, IL.

## The International Concrete Repair Institute Offers...

### ACI 562-16 Repair Code & Guide Training Videos



Improve your knowledge of ACI-562-16 Repair Code and the ACI/ICRI Guide to the Repair Code. The presentations were recorded during a Special Technical Session on the ACI 562 Repair Code and Joint ACI/ICRI Guide to the Repair Code.

#### Topics Covered:

- ACI 562 Repair Code, by Keith Kesner
- A Repair Technician's Guide to the ACI 562 Repair Code, by Rick Edelson
- Guide Design Example: Parking Garage Repair, by Pat Martin
- Guide Design Example: Adaptive Reuse of Historic Depot, by Kip Gatto
- Guide Design Example: Precast/Prestressed Double-Tee Repair, by Carl "Chuck" Larosche

Videos available at [www.icri.org](http://www.icri.org).  
Free to ICRI members.



# Q&A WITH MARK LEMAY

**W**e recently sat down with new ICRI President Mark LeMay (featured on the cover of this *Concrete Repair Bulletin* issue) and asked him about ICRI and his thoughts on its future.



MARK LEMAY

## As ICRI President, what are your top priorities for ICRI in 2020?

I have a few:

1. Increase our company memberships, and our overall membership numbers. My firm belief is this: If you are serious about being in the concrete repair business, you and your company need to be a member of this organization.
2. Take a hard look at the benefits offered to our Supporting Members and to our Company Members. We raised dues last year, and I think we owe it our members to make sure the value proposition we are offering is commensurate with the dues structure.
3. Maintain the balance of providing quality educational content and products (especially webinars) while being a welcoming and enjoyable organization to be a part of.

## What would you say to a prospective new member about the benefits of joining ICRI?

I would tell (and have told) a prospective new member: If you like doing repair, and are serious about learning and being

immersed in the world of repair with other dedicated individuals, and you don't mind having some fun along the way, this is the organization for you! Give us a chance!

## What advice would you give a new ICRI member to make the most of their membership?

**Do not** be afraid to get involved in at least one aspect of the organization that interests you, be it technical or administrative. Yes, it may be intimidating at first (it was for me!), and you may not think you have anything to offer, but we all have different perspectives, and knowledge bases, and experiences that can be of great value to our organization. Stick with it! Make friends! **Get involved!**

## It's December 31, 2020—looking back over the past year, of what ICRI accomplishment are you most proud?

Providing six educational webinars for our members would be great!


## On a personal level, what's your favorite hobby?

Anyone who knows me knows that I am an avid golfer—not a good golfer, just one who enjoys getting out on the links with my kids or with friends. I have been fortunate to play all three courses at Kapalua on Maui, the TPC course in Tampa, and, recently, Colonial Country Club in my beloved hometown of Fort Worth.

## What book have you read recently that you'd recommend and why?

I must admit that I have not read many books lately – I read mostly magazines. All of the books I have read recently have been from my 7-year-old granddaughter's "library," with her sitting in my lap. Not many things are better than that! This is one of my favorites:



So, I recommend that, when the workday is done, sit your kids or your grandkids on your lap, and read to them. 

# Get Certified...

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## Concrete Surface Repair Technician (CSRT)

*"The ICRI CSRT program has assembled a vast amount of information... an individual can learn best practices that typically take five to ten years to accumulate. Whether you are new to concrete repair or experienced... this program has something for everyone."*

Jacob Borgerson, CSRT-Grade 1, Wiss, Janney, Elstner Associates, Inc.



Learn more at [www.icri.org](http://www.icri.org)

**Contact:**  
Steven Bruns, PE  
ICRI Certification Manager  
[stevenb@icri.org](mailto:stevenb@icri.org)

INTERNATIONAL CONCRETE REPAIR INSTITUTE



# CONCRETE REPAIR CALENDAR

## JANUARY 29 & 30, 2020

**ICRI Certification: Concrete Slab Moisture Technician at TISE West (Surfaces)**  
Las Vegas, NV  
Website: [www.intlsurfaceevent.com](http://www.intlsurfaceevent.com)

## FEBRUARY 3-7, 2020

**World of Concrete 2020**  
Las Vegas, NV  
Website: [www.WorldofConcrete.com](http://www.WorldofConcrete.com)

## FEBRUARY 5 & 6, 2020

**ICRI Certification: Concrete Slab Moisture Technician at World of Concrete**  
Las Vegas, NV  
Website: [www.WorldofConcrete.com](http://www.WorldofConcrete.com)

## MARCH 23-25, 2020

**2020 ICRI Spring Convention Repairs in New Construction**  
Vancouver, BC, Canada  
Website: [www.icri.org](http://www.icri.org)

## MARCH 29-APRIL 2, 2020

**The ACI Concrete Convention and Exposition - Spring 2020**  
Chicago, IL  
Website: [www.aciconvention.org](http://www.aciconvention.org)

## OCTOBER 5-7, 2020

**2020 ICRI Fall Convention**  
Minneapolis, MN  
Website: [www.icri.org](http://www.icri.org)

## OCTOBER 25-29, 2020

**The ACI Concrete Convention and Exposition - Fall 2020**  
Raleigh, NC  
Website: [www.aciconvention.org](http://www.aciconvention.org)

## INTERESTED IN SEEING YOUR EVENT LISTED HERE?

Events can be emailed to [editor@icri.org](mailto:editor@icri.org).  
Content for the March/April 2020 issue is due by February 1, 2020 and content for the May/June 2020 issue is due by April 1, 2020.



## CORRECTION

November/December 2019  
*Concrete Repair Bulletin*  
On page 47 of the November/December 2019 *Concrete Repair Bulletin (CRB)*, Sound of the Sea II Condominiums Award of Merit Winner's entry information was listed incorrectly. The project was

submitted by SKA Consulting Engineers, Inc., Greensboro, North Carolina, and the correct project team box should read:



### OWNER

**Sound of the Sea Condominium II Association, Inc.**  
c/o Crystal Coast Management Consultants  
Emerald Isle, NC

### PROJECT ENGINEER/DESIGNER

**SKA Consulting Engineers**  
Greensboro, NC

### REPAIR CONTRACTOR

**Carolina Restoration and Waterproofing, Inc.**  
Creedmoor, NC

### SUBCONTRACTOR

**Southern Cathodic Protection**  
Atlanta, GA

### MATERIALS SUPPLIER/MANUFACTURER

**Corrpro Companies, Inc.**

Medina OH

**Sika Corporation**

Lyndhurst, NJ

ICRI sincerely apologizes for this error.



## ARTICLE ADDITION

September/October 2019  
*Concrete Repair Bulletin*  
The author of the cover article, *Waterproofing with Style: Nissan Stadium Upper Deck and Upper Concourse Waterproofing and Repair Case Study*, has submitted the addition of the following project team box to recognize those involved:

### OWNER

**Metropolitan Government of Nashville and Davidson County**  
Nashville, TN

### ENGINEER

**SKA Consulting Engineers, Inc.**  
Greensboro, NC

### GENERAL CONTRACTOR/CONSTRUCTION MANAGER

**PBG Builders, Inc.**  
Goodlettsville, TN

### SUBCONTRACTORS

*Concrete Repair / Waterproofing*  
**Carolina Restoration & Waterproofing, Inc.**  
Creedmoor, NC

### Floor Coating

**Specialty Coatings, Inc.**  
Nashville, TN

### Metal Work

**Nash Erection and Welding**  
Goodlettsville, TN

**Triple Steel, LLC**  
Laverne, TN

### MANUFACTURERS/SUPPLIERS

**EMSEAL Joint Systems, Ltd.**  
Westborough, MA

**Dow Chemical Company, The**  
Midland, MI

**Hilti Corporation**  
Schaan, Liechtenstein

**Sherwin-Williams**  
Cleveland, OH

**Sika Corporation**  
Lyndhurst, NJ

**Smyrna Ready Mix Concrete**  
Nashville, TN

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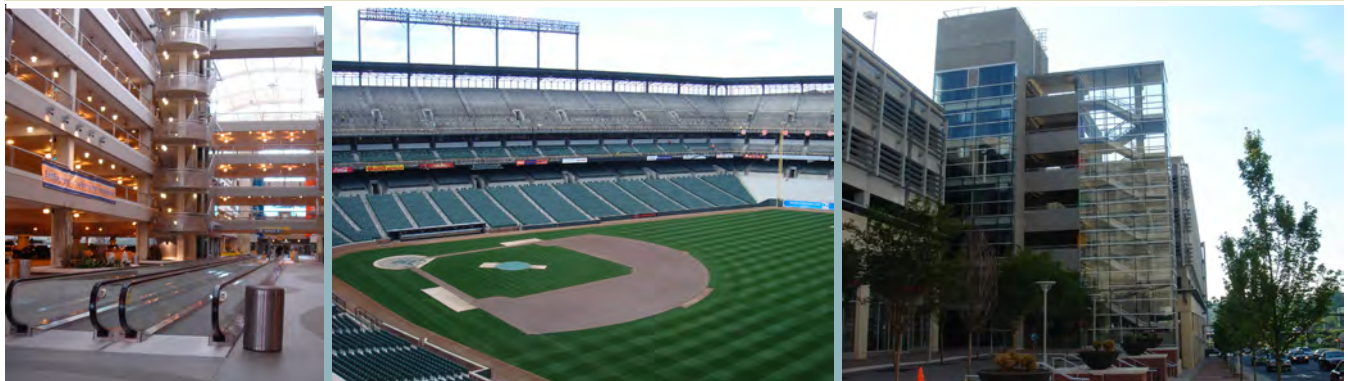


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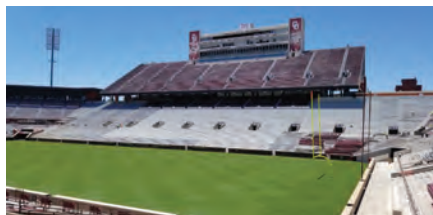
## INDUSTRY NEWS

### AWARD-WINNING STADIUM RENOVATION BY CHAMBERLIN ROOFING & WATERPROOFING

Chamberlin Roofing & Waterproofing is honored to have received an Associated Builders & Contractors (ABC) Oklahoma Excellence in Construction Eagle Award for their work on the Gaylord Family Oklahoma Memorial Stadium in Norman, Oklahoma.

Chamberlin repaired and replaced 4,000 linear feet of expansion joints to rectify water intrusion issues OU's stadium had been experiencing for years. Facing a compressed timeline, storage and access challenges plus an operational stadium, the project was completed with zero safety incidents in time for the first game of the season.

Judges selected the winning entries based on the following criteria: attractiveness of design, complexity, workmanship, innovation, unusual challenges or problems overcome and more. Placing first at the local Oklahoma chapter qualifies Chamberlin to compete for a national ABC Excellence in Construction Eagle or Pyramid award.



For more information visit <https://www.chamberlinltd.com/articles/gaylord-family-oklahoma-memorial-stadium/>

### CIM ANNOUNCES DONATION BY MACK TRUCKS AND MCNEILUS FOR ANNUAL AUCTION AT WORLD OF CONCRETE

The Concrete Industry Management (CIM) program—a business intensive program that awards students with a four-year Bachelor of Science degree in Concrete Industry Management—is pleased to announce that the signature item for their annual auction at World of Concrete is a Mack® Granite® Boost-A-Load mixer donated by Mack Trucks, Inc. and equipped with a McNeilus® FLEX Controls™ Bridge-master® Mixer.

"Mack Trucks and McNeilus have stepped up by making a significant donation to

support the CIM Auction," said Ben Robuck, CIM Auction Committee Chairman. "This mixer truck will help ensure a successful CIM Auction at the 2020 World of Concrete. We are very appreciative of the support from Mack Trucks and McNeilus. It speaks volumes to their commitment to the concrete industry and the importance these leading companies place on the CIM program."



"McNeilus is proud to continue our support of the CIM program and invest in future leaders that will advance the industry," commented Robert Monchamp, Vice President and General Manager of McNeilus Mixers and London Machinery.

"The Concrete Industry Management program is creating strong leaders and employees in the concrete industry, which is a very important market segment for Mack Trucks," said Tim Wrinkle, Mack Construction Product Manager. "We are proud to once again support the CIM with a donation of a Mack Granite model to the auction."

The annual auction will be held Wednesday, Feb. 5 in the North Hall of the Las Vegas Convention Center. The silent auction will be held from 11 a.m. to 12:45 p.m. and the live auction begins at 1 p.m. Once again this year, Internet bidding will be available on the Ritchie Bros. website, [www.rbauCTION.com](http://www.rbauCTION.com). To participate in electronic auction bidding, bidders must register a week in advance. Those participating in the auction at World of Concrete can register on-site. For a full list of items, please visit [www.concretedegree.com/auction](http://www.concretedegree.com/auction)

### INTERESTED IN SEEING YOUR NEWS IN THIS COLUMN?

Email your 150-200 word industry news to [editor@icri.org](mailto:editor@icri.org). Content for the March/April 2020 issue is due by February 1, 2020 and content for the May/June 2020 issue is due by April 1, 2020. ICRI reserves the right to edit all submissions.



# ASSOCIATIONNEWS

## AMERICAN CONCRETE INSTITUTE ANNOUNCES WINNERS OF FRP COMPOSITES STUDENT COMPETITION

The American Concrete Institute announces the winners of its Fiber-Reinforced Polymer (FRP) Composites Student Competition, held recently at the Concrete Convention and Exposition in Cincinnati, OH, USA.

The competition objectives were for students to design, construct, and test a concrete structure reinforced with fiber-reinforced polymer (FRP) to achieve the optimal load-to-cost ratio, predict the ultimate load, and predict the load that will result in a piston deflection of 3.5 mm (0.14 in.).

### Structure Type 1 Category

- 1st place: Universidad Central Del Ecuador (Ecuador)
- 2nd place: Southern Illinois University Edwardsville (USA)
- 3rd place: Bannari Amman Institute of Technology (India)

### Structure Type 2 Category

- 1st place: Universidad San Francisco de Quito (Ecuador)
- 2nd place: North Carolina State University (USA)
- 3rd place: University of Minnesota Duluth (USA)

Registration for the Fiber-Reinforced Concrete (FRC) Bowling Ball Competition will open on November 1, 2019. The competition will take place during The Concrete Convention and Exposition at the Hyatt Regency O'Hare in Rosemont, IL, USA, on March 29, 2020.

ACI's nationally recognized student competitions give students the opportunity to participate in interesting and educational concrete projects. For more information on ACI's Student Competitions, please visit [concrete.org](http://concrete.org).

## CSDA RELEASES UPDATED RESOURCES FOR SPECIFIERS

The Concrete Sawing & Drilling Association (CSDA) is pleased to announce the

release of two revised standards and a best practice to help architects, engineers, general contractors, government officials—virtually anyone involved with the specifying of concrete cutting, polishing, ground penetrating radar (GPR) imaging and selective demolition work.

Two standards, both of which provide guidelines and valuable information on concrete renovation disciplines, were revised and released by the CSDA Standards & Specifications Committee. These Standards are CSDA-WS-106 Wire Sawing and CSDA-DB-112 Diamond Blades. A Best Practice, CSDA-BP-019 Robotic Demolition was also revised and released.

All three of these documents can be found in the CSDA Resource Guide, along with over 40 other Standards, Specifications, Best Practices, Tolerances and White Papers. Each one has been carefully written, reviewed and approved by experts in the field and all are subject to regular updates by the association's Standards & Specifications Committee. CSDA gives

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specifiers the chance to download the guide in its entirety or as individual documents at [www.csda.org/specifications](http://www.csda.org/specifications).

## AMERICAN CONCRETE PUMPING ASSOCIATION (ACPA) RELEASES SAFETY BULLETIN FOR DOUBLE-ENDED HOSES

The American Concrete Pumping Association (ACPA) announces a new safety bulletin, Safe Practices for the Intended Use of Concrete Delivery and End Hoses. The bulletin addresses the proper methods for using concrete delivery hoses with two ends. Concrete delivery hoses with two ends have different purposes from concrete delivery hoses with one end.

"It's important for concrete contractors and concrete pumpers to understand when and where to use each type, as double-ended concrete delivery hoses increase the potential for serious personal injury when used as an end hose," says ACPA Executive Director Christi Collins. "The ACPA's new safety bulletin responds to a need in the industry for education about the hazards of using double-ended concrete delivery hoses."

Continually updating safety resources is part of ACPA's mission to foster and promote a positive safety culture within the concrete pumping industry. The new safety bulletin complements the association's extensive safety library and is available for free download on the association's website Safety/Training page: [https://www.concretepumpers.com/sites/concretepumpers.com/files/attachments/sb\\_endhoses.pdf](https://www.concretepumpers.com/sites/concretepumpers.com/files/attachments/sb_endhoses.pdf)

For more information visit [www.concretepumpers.com](http://www.concretepumpers.com).

## ACI CONCRETE CONVENTION, ROSEMONT/CHICAGO, IL

*Highlights Include Student Competitions, International Lunch, and 40+ Technical Sessions*

Known globally as the world's gathering place for advancing concrete, ACI will host its popular convention in Rosemont/Chicago, IL, USA, March 29-April 2, 2020. With a streamlined name – the ACI Concrete Convention – and an updated and energized identity, the event will showcase the convening power of the Institute, the diversity of our community, and the knowl-

edge sharing that occurs between experts, professionals, and students.



The convention will feature 40+ technical and educational sessions to provide attendees with the latest research, case studies, best practices, and the opportunity to earn Professional Development Hours (PDHs).

The International Lunch will present: "High-Performing Buildings with Sustainable Concrete," a presentation by special guest Erleen Hatfield. The presentation will discuss the use of concrete in sustainable construction, including the new Atlanta stadium, academic buildings, and high-rise construction. Sustainable and meaningful best practices in concrete construction will be shared. Additionally, the role of technology (BIM) in design will be presented and how it can be beneficial to project stakeholders and sustainability goals.

Other convention highlights include:

- Fiber-Reinforced Bowling Ball Student Competition
- Student Lunch with guest speaker, David Lange, ACI Past President
- An industry exhibition showcasing more than 40 exhibitors

ACI will also be conducting Certification exams including:

- Concrete Construction Special Inspector Certification Exam
- Concrete Quality Technical Manager Certification Exam
- Concrete Transportation Construction Inspector Certification Exam
- Post-Installed Anchor Installation Inspector Certification Exam

Throughout the convention, ACI will hold over 300 committee meetings, 40+ technical sessions, an industry trade exhibition, networking events, and more. Registration is open online, and discounted rates are offered until February 23, 2020. To learn more about the ACI Convention and to register please visit [aciconvention.org](http://aciconvention.org).

## TACA PARTNERS WITH TMRA ON ITS AWARD-WINNING TEACHER WORKSHOP PROGRAM

Starting in 2020, the Texas Aggregates & Concrete Association (TACA) will partner with the Texas Mining and Reclamation Association (TMRA) on its award-winning Teacher Workshop program. Through this program, Texas teachers learn science-based information on the availability, importance and development of the state's natural resources.

TACA will augment the industrial minerals workshops by updating and expanding the curriculum to provide more relevant and accurate information on the work of TACA members. Both TACA Producer companies and Allied members will participate. In addition to the industrial minerals workshops, TMRA offers workshops on the lignite and uranium industries.

To date, more than 1.5 million students have heard the true story of Texas mining and reclamation, with more than 1,500 teachers attending since 1991 and each teacher reaching approximately 130-150 students annually. The program is recognized by the Governor's Conference on Math, Science and Technology, certified by the Texas Environmental Education Advisory Council and is a professional development provider of the State Board of Education Certification.

"This is an excellent opportunity for our two associations to work together to help educate teachers about the vital natural resources, including sand, gravel and crushed stone, that help build our state's infrastructure," said David Perkins, president of TACA.

For more information on the program, please visit the TMRA Teacher Workshop page.

## INTERESTED IN SEEING YOUR NEWS IN THIS COLUMN?

Email your 150-200 word association news to [editor@icri.org](mailto:editor@icri.org). Content for the March/April 2020 issue is due by February 1, 2020 and content for the May/June 2020 issue is due by April 1, 2020. ICRI reserves the right to edit all submissions.

# ICRI CHAPTER NEWS

## CHAPTER CALENDAR

### CENTRAL OHIO

January 16, 2020

#### CHAPTER MEETING

Topic: Precast PG Presentation  
Bowling Palace Columbus Square  
Columbus, OH

### CONNECTICUT

January 8, 2020

#### CHAPTER MEETING

Topic: US Capital Dome History  
Best Wester Plus  
North Haven, CT

February 12, 2020

#### CHAPTER MEETING

Best Wester Plus  
North Haven, CT

### DELAWARE VALLEY

January 16, 2020

#### CHAPTER WINTER SOCIAL

Axe Throwing at Bury the Hatchet  
King of Prussia, PA

### GREAT PLAINS

January 16, 2020

#### BREAKFAST TECHNICAL TALK

Joint Meeting with ACI Kansas  
Topic: Epoxy and Chemical Anchoring  
Argosy Hotel & Casino  
Riverside, MO

### MINNESOTA

January 9, 2020

#### MINNESOTA MEGA DEMO

Topic: Post Tensioned System Repair  
Local 633 Training Center  
New Brighton, MN

### NEW ENGLAND

January 8, 2020

#### JOINT MEETING WITH CSI

Topic: Dynamic Wall Systems  
University of Massachusetts Club  
Boston, MA

### NORTHERN OHIO

February 12, 2020

#### CHAPTER SOCIAL/OUTING

Top Golf Cleveland  
Independence, OH



## CHAPTER NEWS DEADLINES



MARCH/APRIL 2020

Deadline: January 10, 2020

MAY/JUNE 2020

Deadline: March 10, 2020

Send your Chapter News by the deadlines  
to Director of Chapter Relations Dale  
Regnier, at [daler@icri.org](mailto:daler@icri.org)

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## CHAPTER ACTIVITIES

### NORTH TEXAS KNOWS FRMC

An enthusiastic crowd gathered at the Las Colinas Conference Center in Irving, Texas for the North Texas Chapter's final meeting of 2019. Following the bountiful fajita lunch buffet, the chapter welcomed Keith Bohren and Chad Eades from Simpson Strong-Tie to present a program on fabric-reinforced cementitious matrix (FRCM).

What is FRCM? In short, it combines a sprayable mortar with a carbon-fiber grid to create a thin-walled, reinforced concrete repair that also strengthens the member to which it is applied. Keith provided background and technical information for the process. He explained that the system is similar to the more well-known epoxy-based fiber reinforced polymer (FRP) systems with the exception that FRCM is cement-based. The advantages of FRCM include: it matches the properties of the host concrete; is more heat resistant than the epoxy-based systems; the system is breathable; and is less labor intensive because it repairs and strengthens the concrete member in a single installation process. Best uses for FRCM include large vertical and overhead surfaces to repair defects, to provide blast-resistance seismic upgrades, and to increase load capacities for existing structural members. Four-hour fire ratings are achievable, along with 30%-40% increases in structural capacity. The installation sequence includes removal of all unsound concrete, cleaning and coating any exposed steel reinforcing, and

injecting cracks. A surface profile of CSP 6 to 9 is recommended and the host concrete must be saturated surface dry (SSD). Mortar is spray-applied to fill any voids and a layer of mortar is applied to the concrete surface. The carbon fiber grid is added and embedded into the wet mortar using a trowel or wood float. A second layer of mortar is applied over the grid, screeded, finished, and wet cured for 3-5 days.

Chad provided "lessons learned" featuring the earthquake-damaged Napa County Courthouse project where the FRCM system was applied to both the interior and exterior walls of the masonry structure. This project was recognized with a 2019 ICRI Award of Excellence and was a 2019 ICRI Project of the Year finalist.



North Texas Chapter President Stephen Grelle, PE, (left) thanks presenters Keith Bohren (center) and Chad Eades (right)

### GREAT PLAINS PROVIDES LOCAL EVENT WITH GREAT SPEAKERS

The Great Plains Chapter sponsored a continuing education presentation at the Johnson County Contractor Licensing Fall Conference on the ACI 562 Repair code.

Though the original speaker had a scheduling conflict, the chapter was able to bring in one of his colleagues, Robert Howell, who is also an ACI staff engineer. In addition, ACI presented information on ACI 318.

Both classes scheduled during the Johnson County Contractor Licensing Conference were booked to capacity with all 80 slots completely reserved with contractors, code officials and some engineers from the Kansas City Metro area.

The conference typically attracts close to a thousand attendees over the 5-day event with each session being given to between 50 and 80 attendees.



The session on the ACI 562 Repair Code presented by the Great Plains chapter was very well attended



North Texas guest speaker Chad Eades fields questions on FRCM



(left) The Johnson County Contractor Licensing Conference is five full days of education for folks in the Kansas City area

(right) The Great Plains Chapter presented Robert Howell with a new Carhartt Laptop Backpack that was embroidered with the updated ICRI Great Plains logo to thank him for his time and presentation





## CHAPTER ACTIVITIES

### CHICAGO OFFERS UP A YEAR IN PICTURES



The Chicago Chapter hosted a dinner and presentation on the historic Edgewater Beach Apartments Renovation in March



The Chicago Chapter hosted its annual golf outing and scholarship fundraising event in June with a full contingent of foursomes and plenty of sponsors.



A dinner after the golf that was well attended



George Mulholland, Stephen Schmidt, and Will Kroncke take in the Chicago skyline at the August Summer Mixer



There is no better place to be in August than a Chicago rooftop patio for relaxation and networking with peers

### MINNESOTA HOSTS CSRT EXAM

The Minnesota Chapter sponsored a live performance exam for the ICRI Concrete Surface Repair Technician (CSRT) Tier 2 certification program. The event was held after the chapter's Fall Technical Session where presenter Josh Jones spoke about various surface preparation methods.



The Minnesota Chapter provided many learning opportunities for participants its Fall technical session in conjunction with live, hands-on, performance exams for the ICRI CSRT Tier 2 Certification Program.

Hosting the CSRT event after the technical session offered a unique chance for the chapter to provide additional learning opportunities for participants at the same location.

The event was hosted at the Local 633 Cement Masons & Plasterers Training Center. The training center does an amazing job to help facilitate learning opportunities to both ICRI and the industry. To date, this is the largest live performance session to have been completed for the CSRT program.



The Chicago Chapter participated in the Skyline Council of Landmarks Illinois Young Professionals and Emerging Leaders Summer Mixer in August. ICRI Chicago Board member Will Kroncke (pictured here) addressed the crowd of 150 to explain the benefits of ICRI membership



ICRI members Jim Fadellin (left) and Zelina Johnson (front, center) with their guests, find the rooftop to be the best way to enjoy a Chicago Cubs game at Wrigley Field



The Chicago Chapter presented an informative event with WiRE (Women in Restoration and Engineering) in September



September 2019: The Chicago Chapter hosted members and guests at a Chicago Cubs Rooftop Summer Social



The WiRE event was highlighted by a roundtable discussion that offered insight into topics of interest for the restoration and engineering field

# ICRI CHAPTER NEWS

## CHAPTERS COMMITTEE CHAIR'S LETTER



MICHELLE NOBEL  
Chapters Chair

Now that the holidays are over, it's time to get back to work. I hope everyone enjoyed their time off with family and friends and are looking to the new year as a chance at renewed life and new possibilities. After all the celebrating and resolutions are done, we need to remember the good things in our lives and grateful for which we are blessed.

In the enlightened words of Socrates, "The secret of change is to focus all of your energy, not on fighting the old, but on building the new."

So, let's build the new year with success and happiness. It's 2020. Let's make the year as clear as the vision!

The 2019 ICRI Fall Convention was an absolute success! Kudos to the Delaware Valley Chapter and all who contributed their time and energy to make a record-setting ICRI convention! Convention attendance surpassed all expectations with 476 people attending the amazing event. The scavenger hunt, Women in ICRI reception and the night at the Franklin Institute were absolutely astounding! I can't wait to see what the British Columbia Chapter has in store for us!

Are you signed up to go to the ICRI Kick-Off Party at the Stratosphere in Las Vegas? It's February 3, 2020 from 6:00 to 9:00 pm. Every year ICRI has a fabulous party in Las Vegas to kick off World of Concrete. ICRI also offers a \$25 exhibits-only admission (online registration only) with discounted seminars to World of Concrete, February 4-7, 2020 in Las Vegas, Nevada. It's the industry's largest annual education, exhibition, and certification event. Go to [ICRI.org](http://ICRI.org) to find out all the details for this incredible show.

The next ICRI Chapter Roundtable will be in Tampa, Florida, February 27-28, 2020.

In attendance will be the ICRI President Mark LeMay, myself as the ICRI Chapters Committee Chair, ICRI Executive Director Eric Hauth, ICRI Technical Director Ken Lozen, Chapter Relations Director Dale Regnier, and representatives from Regions 1 and 2. The chapters attending this event are from the Carolinas, Central Florida, Florida First Coast, Florida West Coast, Georgia, Gulf South, Southeast Florida, South West Florida, and Virginia. We may also get to welcome ICRI's newest chapter, Oklahoma! I'm so excited to welcome them to the ICRI family.

At the ICRI Chapter Roundtable, we share many great ideas on how to improve the chapters, as well as how to gain and retain new members and leaders. Dale Regnier and I always come away with new ideas and great input from all who attend the roundtables. If you're interested in coming to one of the roundtables, reach out to Dale or myself. It's definitely worth the trip!

Remember, ICRI supports chapters with:

- chapter web pages
- monthly chapter update
- dues collection/monthly rebate check/deposit
- membership record keeping
- coverage in *Concrete Repair Bulletin*
- staff support—any question, any time
- discounts on publications
- bulk CRB / publications
- template for a chapter program tracking sheet —date, topic, speaker, company, attendance
- template for a chapter calendar

Please take advantage of these resources. They are provided to help chapters learn and grow.

Remember to sign your delegates up for ICRI conventions. It's one of the best benefits of being an ICRI member and it helps add points toward ICRI Chapter Awards. And, you know you want to find out what chapter wins the Chapter of the Year Award! The paperwork for the 2019 Chapter Awards needs to be sent in by February 15, 2020.

Dates to mark on your calendar:

### 2020 ICRI Kick-Of Party

February 3, 2020  
The Stratosphere  
Las Vegas, Nevada

### World of Concrete 2020

February 3-7, 2020  
Las Vegas, Nevada

### ICRI Chapter Roundtable (Regions 1 & 2)

February 27-28, 2020  
Tampa, Florida

### ACI Concrete Convention

March 29 - April 2, 2020  
Chicago, Illinois

### 2020 ICRI Spring Convention

March 23-25, 2020  
Vancouver, British Columbia, Canada

### 2020 ICRI Fall Convention

October 5-7, 2020  
Minneapolis, Minnesota

### ACI Concrete Convention

March 25-29, 2020  
Raleigh, North Carolina

For ICRI Chapter and other events, visit <http://www.icri.org>.

Remember to submit your chapter events and information by using the "[Submit a Chapter Update](#)" link, found on your chapter's national webpage, so your events and information can be listed on the ICRI national website. At ICRI, we want members to support each other and their chapters. You never know from where your next lead for a project will come from. It's the relationships that you build that help build your own success. We need everyone to get people interested in ICRI and, with your help, we'll all make ICRI a success!

Please, always remember to be kind, travel safe, and I'll see everyone in Tampa for the ICRI Chapter Roundtable!

Sincerely,  
Michelle Nobel  
Chapters Committee Chair

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**For the latest ICRI Chapter information, visit [www.icri.org](http://www.icri.org)**



# PRODUCT INNOVATION

## THREE MORE PROSOCO COATINGS ARE QUALIFIED FOR LEED V4

Three PROSOCO products—Interior Masonry Dustproofer, Siloxane WB Concentrate, and BMC II—now contribute to LEED v4 low-emitting materials credits after independent testing by Berkeley Analytical.

This development is PROSOCO's response to demand within the LEED commercial and interior design community, according to Dwayne Fuhlhage, Sustainability Director for PROSOCO.

Designers have been asking for LEED v4-ready products that protect and maintain CMU and precast concrete, and refinish interior, exposed brick and concrete—a popular trend in retrofits.

Design professionals are looking for products that help them achieve the IEQ Low Emitting Materials credit. Siloxane WB Concentrate solves a problem by protecting interior parking decks from water and salt. Existing building retrofits created demand for a product like Interior Masonry Dustproofer to stabilize chalky, exposed brick interiors.

Likewise, BMC II has been a specified solution for decades on projects needing tough protection from a coating, such as the U.S. Capitol and countless other buildings with exposed CMU, masonry and concrete.

The qualification of BMC II products for LEED v4 low-emitting materials credits is another example of PROSOCO's ability to purposefully and nimbly direct research and product development resources to timely demands in the industry.

Through independent testing with Berkeley Analytical, these products conform with the California Department of Public Health (CDPH) Standard Method V1.2. They also qualify for project teams using WELL, Collaborative for High Performance Schools (CHPS), and green building codes such as CALGreen, ASHRAE Standard 189.1, and the International Green Construction Code (IgCC).

With these additional products becoming certified, PROSOCO now offers 21 LEED v4-ready products with the SCS Indoor Advantage Gold certification.

## UNLEASH THE CORROSION INHIBITING POWER OF MCI WATER REPELLENTS

A common best practice to make new or existing concrete structures last longer is to periodically apply a concrete sealer that protects against the intrusion of chlorides, carbonation, and rain.

An even more powerful option—with no extra labor required—is to apply a Cortec MCI concrete sealer enhanced with Migrating Corrosion Inhibitors. These water repellents contain MCI molecules that penetrate the concrete pore structure and form a corrosion inhibiting molecular layer on embedded metal reinforcement. This dual (and sometimes triple) protection



## PAINTING CONCRETE? SSPC HAS YOU COVERED!


### Concrete Coating Application Specialist (CCAS)


SSPC's new Concrete Coating Application Specialist course is designed to teach coating applicators the skills they will need to successfully complete a concrete coating project and how to maintain vital infrastructure.

Check [www.sspc.org](http://www.sspc.org) for more information.

### Want to host this course?

Contact: Sara Badami

 [badami@sspc.org](mailto:badami@sspc.org)

 412-281-2331 ext. 2208

### Concrete Coating Inspector (CCI)

Concrete is one of the most widely used man-made products in the world, and often coatings are used to protect it. Inspectors have a crucial job on concrete projects to make sure surface preparation and coating application meet the unique needs of these surfaces. SSPC's CCI provides the foundation for quality concrete inspection work.

Check [www.sspc.org](http://www.sspc.org) for more information.





### View SSPC's Concrete Specific Products

SSPC looks to provide the concrete coatings industry with up-to-date standards and information.

Check [www.sspc.org](http://www.sspc.org) for prices and more information on our concrete specific products.



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# PRODUCT INNOVATION

is convenient to achieve by applying just one product.

Read our recent press release to learn about different MCI water repellent technologies for various project and budget needs: [https://www.cortecvci.com/whats\\_new/announcements/MCI-Water-Repellants-PR-2019-11.pdf](https://www.cortecvci.com/whats_new/announcements/MCI-Water-Repellants-PR-2019-11.pdf)

## A DEEP-REACHING SOLUTION FOR REBAR CORROSION FROM MCI CORTEC

Corrosion of embedded rebar is an ongoing challenge for concrete structures. Fortunately, MCI-2020 Gel delivers a robust dose of Migrating Corrosion Inhibitor Technology directly to the depth of reinforcement when proper surface prep cannot be achieved.

Once inside the concrete, the inhibitor can move laterally through the concrete, depositing a protective MCI molecular layer on embedded reinforcement to act as a barrier to corrosive elements.

Unlike some of its competitors, MCI-2020 Gel does not contain secondary amines or nitrites, which together can form carcinogenic nitrosamines.

Read our recent press release to find out if MCI-2020 Gel is right for your project and to hear past success stories! [https://www.cortecvci.com/whats\\_new/announcements/MCI2020\\_Gel%20\\_PR.pdf](https://www.cortecvci.com/whats_new/announcements/MCI2020_Gel%20_PR.pdf).

## ALTERNATIVE TO SANDBLASTING RUST FROM CORTEC

Abrasive grinding and sandblasting are common ways to restore rusty metal surfaces and prepare them for painting.

A much easier and very effective alternative is to coat the rust with CorrVerter, a water-based rust passivating primer from Cortec Corporation.

CorrVerter can be used in countless applications and is especially helpful when dealing with rust in areas where it is difficult to achieve good surface prep.

Read our recent press release to see specific examples of how CorrVerter has been used to deal with real-life rust problems:

[https://www.cortecvci.com/whats\\_new/announcements/CorrVerter-PR-2019-12.pdf](https://www.cortecvci.com/whats_new/announcements/CorrVerter-PR-2019-12.pdf).

## ELASTOCHEM LAUNCHES CANADA'S FIRST POLYURETHANE, TWO-COMPONENT, SPRAY-APPLIED WATERPROOFING MEMBRANE FOR BELOW-GRADE FOUNDATIONS

*Ontario-based Elastochem receives CCMC certification for Hygrothane, a spray-applied waterproofing membrane for below-grade concrete foundation walls*

Elastochem Specialty Chemicals Inc., a leading Canadian manufacturer of spray polyurethane materials, announced on Thursday the certification of Hygrothane, Canada's first spray-applied, two-component, polyurethane-based waterproofing membrane. Hygrothane is a complete, polyurea-based membrane system that is applied at high pressure. When cured, it forms a seamless, monolithic waterproofing membrane on below-grade concrete foundation walls. The durable and flexible formula is made with 100% solids, can be applied at below-freezing temperatures and contains no VOCs.

Foundation waterproofing can be an extremely time-consuming and challenging procedure. Traditional systems, such as peel and stick and sheet membranes pose the risk of inconsistent seams that may lead to subsequent water build-up. Other drawbacks include the need for additional coatings that require further application and curing time. Meanwhile, other liquid-applied formulas are primarily water-based, which means that they face limitations at below-freezing weather conditions.

Hygrothane solves these problems by offering a smooth, one-step application that eliminates the use of primers, long curing times, and delays. It performs in below-freezing temperatures, which makes it ideal for all-season construction and challenging northern locations. The spray-applied liquid cures to form a solid membrane, eliminating seams or joints, which addresses the most common areas where waterproofing tends to fail. The buildable formula can be applied on irregular surfaces and is ideal for applica-

tions where complete coverage with a sheet membrane is unlikely. Foundations sprayed with Hygrothane can be backfilled in under one hour post-application.

## DYNAMIC TACTILE COMPOSITE DUO: DETECTABLE WARNING SYSTEMS' ADA COMPLIANT AlertCast® & AlertTile® TACTILE WARNING PRODUCTS DELIVER A MYRIAD OF CONSTRUCTION AND SAFETY SOLUTIONS VIA ADVANCED COMPOSITES.

Now a part of the proprietary product family of Mar-Bal, Inc. (Mar-Bal: Chagrin Falls, OH), Detectable Warning Systems™ (DWS) is progressively launching their AlertCast® and AlertTile® detectable warning products. The innovative ADA compliant products are engineered for visually impaired or handicapped pedestrians—offering advanced rigid composite material solutions with 'tactile cues' for either cast-in-place or surface applied construction and safety applications.

Known as 'The One-Source Solutions Provider', privately held Mar-Bal has three state-of-the-art U.S. manufacturing plants in Ohio, Virginia, and Missouri—producing everything entirely turn-key. The economical DWS products also feature ease-of-installation, consistent delivery, and unparalleled customer service.

Contractors, distributors, states, and municipalities all benefit from each product's advanced engineering and commitment to innovation, as well as the benefits of composites for multiple markets including: Health Care- Disability, Rail-Transport, Architecture, Infrastructure, Universities/Education, etc.

**AlertCast® Profile:** Considered "The industry's best replaceable detectable warning", it is a premium glass-reinforced thermoset, cast-in-place, rigid composite engineered for superior impact resistance, slip resistance, wear resistance and long-term durability. Its exclusive lightweight design incorporates a panel of superior slip-resistant truncated domes designed to comply with ADA standards. Should the need arise, the tiles are also replaceable.

Notably, it features the patented PENE-TRATOR® anchoring system—a simple

# PRODUCT INNOVATION

place-and-press wet concrete installation system with minimal aggregate displacement and maximum holding capabilities.

**AlertTile® Profile:** A glass-reinforced thermoset composite engineered for superior impact resistance, slip resistance, wear resistance, and long-term durability for retrofit applications. The exclusive design of AlertTile incorporates a thin, slightly flexible profile with a perimeter beveled edge to provide a safe pedestrian transition.

The surface applied rigid composite (30,000 psi compressive strength) features truncated domes designed to comply with ADA standards. AlertTile is flexible enough to conform to ramp irregularities, and also utilizes its own unique anchoring system.

For more information on Mar-Bal's line of DWS products please visit: [www.detectable-warning.com](http://www.detectable-warning.com).

## NITEGLOW® TWO-STAGE SAFETY NOSING WITH GLOW-IN-THE-DARK TECHNOLOGY

*Photoluminescent Anti-Slip Stair Nosing is Ideal for Exit Pathways*

(Wooster, OH) – Wooster Products will feature NITEGLOW® treads with high quality photoluminescent in The Precast Show booth #1652. This two-stage anti-slip stair nosing is ideal for exit path markings, steps and leading edge of landings when finding pathways in the dark is a necessity. NITEGLOW® meets NYC Local Law 26, 2015 IBC, and 2015 IFC code compliance and is well suited for either new construction or retrofit interior stair applications. Heat treated corrosion resistant aluminum substrate and a nearly diamond-hard aluminum oxide filler assures long tread life under heavy pedestrian traffic. Bright, long lasting photoluminescent epoxy filler is free of hazardous and radioactive substances, extends uniformly throughout the filler. A high content of aluminum oxide abrasive provides traction and long service life, and is replaceable. Available in lengths to order, to a maximum of 8'0". Clean architectural lines ensure aesthetic appeal.

NITEGLOW® two-stage safety nosing includes a replaceable anti-slip abrasive-filled top insert, and a mill finish extruded

aluminum base, with sure-hold anchor. Optional wood insert keeps aluminum base clean during initial construction. Protective tape also available.

Anti-slip filler includes approximately 60% virgin grain aluminum oxide abrasive which is available in contrasting colors. Photoluminescent epoxy binder is a fully cured resilient epoxy with a filler ratio of 16% minimum for enhanced cleanability.




Wooster Products is the industry leader in anti-slip stair treads and walkway products. They have been manufacturing anti-slip products for new construction, renovation and OEM applications since 1921 from their

Wooster, OH facility. Long respected for quality and innovation, their products include cast iron (Ferrogrit®, cast aluminum (Alumigrit®), extruded aluminum (Spectra, Supergrit®, Stairmaster®, and Flexmaster®), pressure sensitive adhesive tape (Flex-Tred®), and coatings (WP-70, Walk-A-Sured®, and Safe-Stride®), as well as photoluminescent (glow-in-the-dark) nosings and treads (NITEGLOW®). For additional information visit [www.WoosterProducts.com](http://www.WoosterProducts.com).

## INTERESTED IN SEEING YOUR NEW PRODUCT IN THIS COLUMN?

Email your 150-200 word product information to [editor@icri.org](mailto:editor@icri.org). Content for the March/April 2020 issue is due by February 1, 2020 and content for the May/June 2020 issue is due by April 1, 2020. One (1) high resolution product photo may be included. ICRI reserves the right to edit all submissions.

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# NEW MEMBERS

## COMPANY MEMBERS

### **Acronom Masonry, Inc.**

Northborough, Massachusetts  
United States  
*Nick Bonugli*

### **East Coast Rigging & Contracting Co., Inc.**

Laurel, Maryland  
United States  
*Mark Kerner*

### **Erickson Structural Consulting Engineers, PC**

Vancouver, Washington  
United States  
*Brandon Erickson*

### **H Y Consultancy**

Fujairah, IFZA  
United Arab Emirates  
*Hossam Youssef*

### **Hein Brothers LLC**

Fort Myers, Florida  
United States  
*Eric Hein*

### **IC Coatings**

Orange Beach, Alabama  
United States  
*David Keenum*

### **Innovative Waterproofing Solutions**

Chesterfield, Michigan  
United States  
*John D'Annunzio*

### **MCW Restoration Services, LLC**

Pompano Beach, Florida  
United States  
*Cindy Raffio*

### **Miller & Co Concrete Solutions, Inc.**

Chilliwack, British Columbia  
Canada  
*Kelvin Miller*

### **MTN, Inc.**

Englewood, Colorado  
United States  
*Mike Steel*

### **RAM Construction Services of Minnesota, LLC**

Blaine, Minnesota  
United States  
*Mark Wachter*

## ADDITIONAL INDIVIDUALS FROM MEMBER COMPANIES

### **Natalie Buckley**

Walter P Moore & Associates, Inc.  
Kansas City, Missouri  
United States

### **Anthony Butler**

AquaFin, Inc.  
Elkton, Maryland  
United States

### **Michael Cole**

PULLMAN  
Kansas City, Missouri  
United States

### **Yanick Croteau**

Sherwin-Williams  
Montreal, Quebec  
Canada

### **Robert Frazier**

Wiss, Janney, Elstner Associates, Inc.  
Seattle, Washington  
United States

### **Ryan Hall**

Sika Corporation USA  
Lyndhurst, New Jersey  
United States

### **Maxwell McCarthy**

Evonik Corporation  
Piscataway, New Jersey  
United States

### **Terry Nye**

Lithko Restoration Technologies  
Blacklick, Ohio  
United States

### **Mike Pien**

Sika Corporation USA  
Woodbury, Minnesota  
United States

### **Joel Ross**

East Coast Rigging & Contracting Co., Inc.  
Jensen Beach, Florida  
United States

### **Milos Stanojevic**

SK&A Group  
Potomac, Maryland  
United States

## ADDITIONAL INDIVIDUALS FROM SUPPORTING MEMBER COMPANIES

### **Brian Bice**

Schönox HPS North America, Inc.  
Seattle, Washington  
United States

### **Kevin Hall**

The Euclid Chemical Company  
Cleveland, Ohio  
United States

### **Heath Morrall**

The Euclid Chemical Company  
Poplar Grove, Illinois  
United States

### **Nate Renzella**

Commercial Sealants & Waterproofing  
Hendersonville, Tennessee  
United States

### **Luke Valentine**

Engineering and Technical Consultants, Inc  
Columbia, Maryland  
United States

## INDIVIDUAL MEMBERS

### **Ryan Andrepont**

Denver, Colorado  
United States

### **Timothy Austin**

Pana, Illinois  
United States

### **Dee Dee Barwig**

Lombard, Illinois  
United States

### **Anthony Bentivegna**

Chicago, Illinois  
United States

### **Piotr Bilski**

Chicago, Illinois  
United States

### **Jacek Boloz**

Lombard, Illinois  
United States

### **Patrick Brothers**

Trail, British Columbia  
Canada

## NEW MEMBERS

**Jon Carden**

San Leandro, California  
United States

**Kevin Carrigan**

Blue Bell, Pennsylvania  
United States

**Brian Cheshire**

Irondale, Alabama  
United States

**Tyson Chester**

Cle Elum, Washington  
United States

**Amador Contreras**

Bridgeview, Illinois  
United States

**Brian Deska**

Alexandria, Virginia  
United States

**Mike Devlin**

Denver, Colorado  
United States

**Jonathon Dyson**

Lane Cove West, New South Wales  
Australia

**Carlos Fernandez Lillo**

Arlington, Virginia  
United States

**Sid Flatt**

Baton Rouge, Louisiana  
United States

**Garth Geer**

Denver, Colorado  
United States

**Jacob Girard**

Saint-Leonard, Quebec  
Canada

**Eric Hammarberg**

New York, New York  
United States

**Charles Hammond**

Austin, Texas  
United States

**Ken Hanks**

Austin, Texas  
United States

**Christopher Heipp**

Batavia, Illinois  
United States

**Sarah Horton**

Chicago, Illinois  
United States

**SunHee Hwang**

Blue Bell, Pennsylvania  
United States

**Domenico Iermieri**

Mississauga, Ontario  
Canada

**Casey Jones**

Dallas, Texas  
United States

**Gillian K**

St. Catharines, Ontario  
Canada

**Danielle Kennedy**

Vancouver, British Columbia  
Canada

**Charles Kielblock**

Cloverdale, Indiana  
United States

**Hyesun Lim**

Blue Bell, Pennsylvania  
United States

**Michael Loper**

Madeira Beach, Florida  
United States

**Jim Markatos**

Regina, Saskatchewan  
Canada

**Andy McKerrow**

Indianapolis, Indiana  
United States

**Karrie McMillan**

Winter Garden, Florida  
United States



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## NEW MEMBERS

### Jason McWilliams

Denver, Colorado  
United States

### Jose Morla Catalan

San Juan, Puerto Rico  
United States

### Eric Muench

Lyndhurst, New Jersey  
United States

### John Murphy

Ontario, California  
United States

### Michael Parker

Greensboro, North Carolina  
United States

### Shawn Quinn Jr.

Lester, Pennsylvania  
United States

### Jordan Rappin

Blue Bell, Pennsylvania  
United States

### Martin Robichaud

Sorel-Tracy, Quebec  
Canada

### James Rowson

Surrey, British Columbia  
Canada

### Justin Salgado

Schererville, Indiana  
United States

### Lubomir Sestak

Dubravica, Europa  
Slovak Republic

### Kate Sol

Lakewood, New Jersey  
United States

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