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CONCRETE REPAIR BULLETIN
September/October 2022
Vol. 35, No. 5

WEATHER—ITS IMPACT ON CONCRETE & CONSTRUCTION

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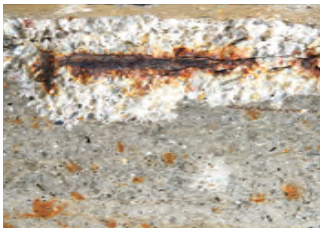


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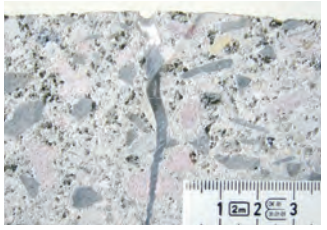

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ON THE COVER: Concrete rehabilitation of the historic 3rd Avenue bridge, Minneapolis, Minnesota (photograph by WJE). See page 18.

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FEATURES

DEPARTMENTS

NOTE FROM THE EDITOR

Fall is upon us and the construction season is in its final stretch in some parts of the U.S. and Canada. Hopefully, everyone had a safe and productive Summer. ICRI Chapters have had a busy summer of meetings, demo days, and golf outings. ICRI Certification programs are up and running throughout the country.

The 2022 ICRI Fall Convention is rapidly approaching—November 7-9 at the InterContinental Buckhead Atlanta. The theme is *Fire, Impact, Blast: Repairs after Extraordinary Events*.

This issue of the *Concrete Repair Bulletin* highlights weather and it's impact on concrete and construction. Articles include Cold Weather Concrete Practices, Concrete Rehabilitation of the 3rd Street Bridge in Minneapolis, a case study on precast concrete louver repairs, and an article about the need for expansion joints in a structure.

We continue to invite authors to submit articles for the *Concrete Repair Bulletin*. Topics and article guidelines are available through the Resources Tab on the ICRI website. Please be sure to let Dale Regnier know of your chapter's upcoming events and remember to check the ICRI website for the schedule of upcoming events.

I hope you continue to have a safe and productive 2022, and I look forward to seeing you at the Fall Convention!

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

PRESIDENT'S MESSAGE


JOHN MCDOUGALL


ERIC HAUTH

Dear ICRI Friends:

Ready for liftoff! As we head toward ICRI's 35th Anniversary year in 2023, we have never been better positioned for future growth and even more impact in the months ahead.

This year's State of the Institute showcases some of the "wins" and new initiatives that make ICRI a great investment of your membership dues.

With the world opening back up, this past fiscal year allowed ICRI to get back to live conventions. Our 2021 Fall Convention in Minneapolis and 2022 Spring Convention in Baltimore brought back the same great energy for which ICRI conventions are known. We were grateful to see registration levels comparable to ICRI's historical norm and overall high attendee satisfaction—successes that were due in large part to the extraordinary efforts of the Minnesota and Baltimore-Washington chapters.

ICRI chapters also hit the ground running again with new networking and educational events in communities across the continent. There is no ICRI without ICRI chapters and we couldn't be more impressed with their energy and commitment. We are excited to announce that new international affiliates in Mexico and Latin America are taking shape, creating opportunities to support concrete repair professionals in countries beyond the US and Canada.

The past fiscal year also saw significant staffing changes at ICRI with the hire of Dave Fuller as ICRI's Technical Director following the retirement of Ken Lozen. This is a crucial role for ICRI, and Dave has already made a significant impact by leading up several new initiatives, including a new committee chair training program and managing the development of ICRI's first technical app.

In addition, Dale Regnier, ICRI's Certifications Program Director, fully took over the reins of ICRI's two certification programs, getting us back to both live Concrete Slab Moisture Testing (CSMT) programs and Concrete Surface Repair Technician (CSRT) performance exams. Both programs have returned in a big way, with new offerings occurring throughout the US and Canada. We also spent valuable time—when we couldn't offer live programs—on strategies to better scale these programs in the future. These steps will allow ICRI to bring these and future education/certification programs to even more professionals across the industry.

For now, we invite you to spend a few minutes reviewing some of the important accomplishments of ICRI over the past fiscal year and opportunities for continued growth in this year's State of the Institute report (page 32).

As always, we welcome your input, comment, feedback, and ideas to make ICRI even stronger. Thank you for your dedication and membership in ICRI!

John McDougall, CCSRT
2022 ICRI President

Eric Hauth
ICRI Executive Director

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

Our Vision: ICRI will be the center for repair leadership supporting a profession built on science and craftsmanship, making the built world safer and longer lasting.

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TACTALK


MARK NELSON

ICRI TAC GOAL FOR 2022 – ORGANIZE TECHNICAL COMMITTEE WEB PAGES

The fourth ICRI Technical Activities Committee (TAC) goal for 2022 is to better organize the individual technical committee pages within the ICRI Causeway portal. This year we are working to standardize all of the technical committee processes that include how we publish and store our technical committee documents. All past technical committee minutes, agendas, ballots, and committee correspondence will be stored in logical, clearly-labeled files within the ICRI Causeway committee pages.

Technical committee chairs are responsible for many tasks including maintaining the records of all committee activities. Over the years, some technical committee chairs were more effective than others at maintaining and organizing those records. As a result, the transition process from one technical committee chair to the next was often an inefficient and inconsistent process. By providing the chairs with a clear record-keeping structure, the technical committee documents will be stored in a logical and easy-to-find location—making the transition process from chair to chair much more efficient.

Thank you to Matt Sherman, Dale Regnier and Dave Fuller for taking on this crucial project. Once unified, our technical committee page system will provide us with a structure that will benefit the organization for years to come.

TAC Member Appreciation


ASHISH DUBEY


PETER KOLF

At the end of this year, two members of TAC will be completing their service. Thank you to Ashish Dubey and Peter Kolf for serving on ICRI TAC for six years. Both Ashish and Peter performed many supporting roles on TAC and their efforts and wisdom were greatly appreciated. I'm sure both will continue to be active members on ICRI Technical Committees for years to come.

ICRI Technical Committee Chairs

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

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

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

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CERTIFICATIONUPDATE

by ICRI Program Director Dale Regnier

The ICRI Concrete Slab Moisture Testing (CSMT) Program is currently only available as a live program with in-person instructor segments. With the pandemic trending downward, ICRI has held six successful programs in 2022. The year started off at two strong Las Vegas events—World of Concrete and Surfaces—each attracting more than a dozen technicians seeking certification or re-certification.

ICRI then brought the CSMT program to the Flooring Contractors Association (FCICA) show in Tampa, Florida, and the National Wood Flooring Association (NWFA) show in Biloxi, Mississippi, certifying several technicians at each venue.

Terracon employees from all over Texas came to Houston for the ICRI Concrete Slab Moisture Testing Certification

Instructor Roland Vierra heads up the class at DFS Flooring in Sacramento

The DFS warehouse was perfect for the demonstration and workshop

DFS: The performance exam is where students demonstrate their understanding of the ASTMs used in the CSMT program

CSMT Instructor Roland Vierra (left), Program Director Dale Regnier (center) and General Manager of DFS Sacramento Mike Fahey (right)

In April, ICRI held a private CSMT program at Terracon, an engineering and consulting firm in Houston, Texas, for more than a dozen of its employees. It was here, as Program Director, I recorded my first perfect score on a written exam. The class was filled with technicians and field workers experienced in floor moisture—it was a pleasure bringing the class to Houston.

In July, the CSMT program was held in Sacramento, California, at the DFS Flooring facility. DFS was a fantastic host and brought several people to the class. ICRI certified 7 new technicians, 2 first re-certifications (after 5 years), and 2 second re-certifications (after 10 years). *(DFS photos are courtesy of Darci Rittenhouse.)*

ICRI would like to thank Wiss, Janney, Elstner Associates (WJE) for the use of its space in Northbrook, Illinois, for the August CSMT Program. WJE has previousy hosted CSMT programs in their expansive Northbrook facility. Its staff was helpful in the administration of the program and added a number of attendees to the class. The class went extraordinarily well with a dozen CSMTT certifications, including 5 recertifications.

If your company or chapter wishes to schedule a CSMT Program, please contact Dale Regnier, daler@icri.org, and provide contact information for the point person who will be in charge of coordinating the event, the proposed exam location, and potential date(s).

The WJE staff was helpful in administration of the class and added several attendees to the class. Pictured (left to right): Instructor Peter Craig, Ryan Landis, Mark Haddad, Jeff Plumridge, Mat Starczewski, Brookelynn Schmeck, and ICRI Program Director Dale Regnier.

Concrete Slab Moisture Testing (CSMT) Program

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Upcoming 2022 Program Location:

- Edmonton, Alberta, Canada—October 5–6
- Dallas/Ft. Worth, TX Area—October 25–26

Concrete Surface Repair Technician (CSRT) Program

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

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

Upcoming Live Performance Exam Location:

- Dallas, TX—December 7, 2022

(Live Performance Exams require an additional fee)

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

WOMEN IN ICRI

SPOTLIGHT— Liying Jiang

by Michelle Nobel

LIYING JIANG

Liying Jiang is a senior structural engineer at Structural Technologies. She currently serves on the Board of Directors for International Concrete Repair Institute (ICRI), and she is a voting member and chair of several technical committees/subcommittees of ICRI and the American Concrete Institute (ACI).

Liying specializes in cement/concrete technology, design of new concrete material/products, and development and production of precast architectural concrete. Liying is experienced in technical specifications, repair drawings, and construction administration of large-size concrete structure repair projects. She is also skilled in state-of-the-art concrete-related NDT technologies, such as Ground-Penetrating Radar (GPR), Impact Echo (IE), Impulse Response (IR), etc.

Liying grew up in Shanghai, China. She was attending McGill University in Montreal, Canada, when she met her husband, a structural engineer, and they fell in love. After Liying graduated, she moved to Alma, Quebec, Canada, and went to work for BPDL as a construction material specialist designing concrete mix proportions and architectural finishes. She moved to the Boston, Massachusetts area and went to work for Simpson Gumpertz & Heger, where she worked for thirteen and half years managing various projects. She did field investigations, structural evaluations, laboratory analysis, petrographic review of materials-related distress, and repair and rehabilitation of buildings, bridges, parking garages, swimming pools, stadiums, and other structures. She then went to work for Jensen Hughes for about a year and a half before working for Structural Technologies as a senior structural engineer.

Liying's passion is the gratification she gets in bringing structures back to their original beauty. She loves the challenges she faces every day and gets to work on unusual and different types of structures, the places they take her, and the friendships she makes along the way. As an Asian woman, she's learned to be comfortable with herself to overcome shyness and speak up. She's a trailblazer for all the young Asian women following in her footsteps and leading the way to a brighter future for all women.

About four years ago, Liying started running as a hobby. She ran her first marathon in April, a half marathon over the Memorial Day weekend, and is training to enter the Baystate Marathon in Boston in October. She and her husband are also avid bicyclists. They ride together as well.

I had the pleasure of getting to know Liying at an ICRI convention a few years ago. I've met many people over the years at ICRI that have become my friend. I see her leaving her mark, making many friends at ICRI, and in turn, ingraining her status in ICRI. I am honored and blessed to call Liying my friend.

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Cold Weather Concrete Repair Practices

by Matt Hansen

Whether concrete repairs are made with conventional concrete or prepackaged concrete repair mortars, cold weather, at the time of application, can have negative effects on the performance and durability of the repair materials. As a matter of fact, most concrete repair mortar manufacturers recommend that the majority of their products be installed at temperatures above 40°F (4°C). Ideally, this would be the case on all repair projects. However, due to critical placement schedules and unpredictable weather, there are times when concrete repairs must be placed in cold weather.

When this is the case, the recommendations of material manufacturers and of the American Concrete Institute ACI 306.1R *Guide to Cold Weather Concreting* should be followed. The American Concrete Institute (ACI) defines "cold weather" as existing "when the air temperature has fallen or is expected to fall below 40°F (4°C) during the protection period." The protection period is defined as "the amount of time recommended to prevent the concrete from being adversely affected by exposure to cold weather during construction."

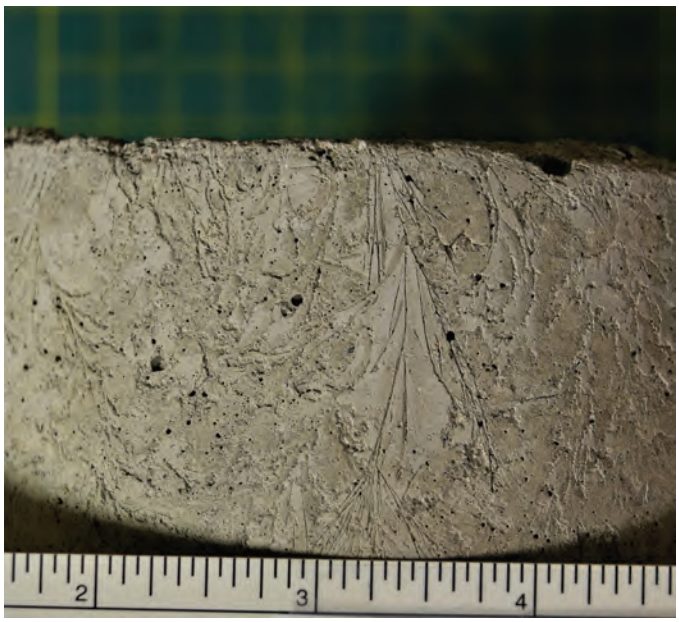

Fig. 1: Damage to cementitious paste caused by bladed ice crystals when freezing takes place at critical saturation levels.

Provided that they are properly produced, placed, and protected, concrete and concrete repair mortars can and will develop sufficient strength and durability to satisfy service requirements, even when placed in cold weather. The key to this is managing the risks.

RISKS OF FREEZING—"THE RACE IS ON"

Freezing is the number one risk when placing concrete and cementitious concrete repair mortars in cold weather conditions. Concrete and cementitious repair mortars that are allowed to freeze at "critical saturation levels" can be severely damaged by the formation of bladed ice crystals in the cement paste while it is still in its plastic state (Fig 1). Critical saturation is the moisture saturation level at which freezing will result in damage to the concrete or repair mortar, thereby reducing the strength and durability of the repair.

The degree of saturation and the risk of damage from freezing to concrete and cementitious repair mortars decrease as the material sets and the mixing water is used up in the cement hydration process. At a certain point after hydration, moisture levels are below "critical saturation levels" and the repair material is strong enough to resist damage from freezing.

It should be noted, however, that very little if any hydration takes place in concrete and cementitious repair mortars once material temperatures fall below 40°F (4°C). In essence, once cementitious materials are placed in cold weather, "the race is on" to get their strengths up before the temperatures of the materials themselves fall below 40°F (4°C), where hydration and strength gain comes to a near standstill.

When placing concrete with a design strength of greater than 3,500 psi (24.5 MPa), it is generally accepted that once the concrete compressive strength has reached 500 psi (3.5 MPa), moisture levels in the concrete are below "critical saturation levels" and the concrete is strong enough to go through a single freeze without damage. For standard, concrete this takes about 48 hours at 50°F (10°C).

Concrete intended to provide low permeability or high resistance to chloride ingress should be protected from freezing until actual design strengths have been achieved.

On the other hand, many cementitious repair mortar manufacturers call for a compressive strength attainment of 1,000 psi (7 MPa) or above prior to allowing their materials to freeze.

The cement hydration process that takes place in concrete and cementitious repair mortars generates a certain degree of exothermic heat. This exothermic heat increases as the rate of set and the mass of placement increases. Thus, thicker placements such as full depth repairs will hold their exothermic heat for longer periods of time while thinner surface repairs will tend to lose their heat more quickly. Knowing these basic principles, multiple steps can be taken to help the concrete and repair mortars hit minimum required strengths prior to allowing them to freeze.

- **Heating ingredients prior to mixing:** By heating water, aggregates, and prepackaged materials prior to mixing, the concrete or concrete repair mortar can be placed at more normalized temperatures. This gives it a "head start" in the "race" to reach minimum required strengths before freezing. Recommended concrete temperatures at time of placement are shown in Table 1. Care should be taken not to overheat components as this can cause problems as well. Temperatures should not exceed those recommended by more than 20°F (11°C).

Section Size	Concrete Temperature as Placed
<12 in (300 mm)	55°F (13°C)
12 to 36 in (300 to 900 mm)	50°F (10°C)
36 to 72 in (900 to 1830 mm)	45°F (7°C)

Table 1: Recommended Cold Weather Concrete Temperatures as Placed. Temperatures should not exceed recommendations by more than 20°F (11°C).

- **Change concrete mix designs or repair mortar selection:** Concrete strength gain can often be sped up by consulting with the concrete producer. Removing supplementary cementitious materials from the mix, increasing cement contents, or even switching to Portland Type III High-Early Cement can help to speed up concrete strength gains in cold weather. Air entraining admixtures can also be added to protect concrete that will be going through multiple freeze-and-thaw cycles (air entrainment may not be appropriate for concrete that will be receiving a hard steel troweled finish). When using prepackaged cementitious repair mortars, manufacturers can be consulted for recommendations on alternate repair mortars that are designed for use at colder temperatures. For instance, some magnesium phosphate repair mortars can be placed at temperatures down to 0°F (-17°C).

- **Use non-chloride set accelerating admixtures in concrete:** Set accelerating admixtures meeting ASTM C494 Types C or E can be used to accelerate the set of the concrete and help it to reach minimum strengths prior to freezing. Some non-chloride set accelerating admixtures can even be dosed at levels that will actually lower the freezing point of the water in the concrete. Set accelerating admixtures containing chlorides should not be used when repairing concrete containing embedded metals. It should also be noted that, due to the complex formulation inherent in many prepackaged repair mortars, most manufacturers generally recommend against adding set accelerating admixtures to their products.

- **Insulated covers and forms:** Insulation, insulated blankets and heated blankets can be used to help trap the exothermic heat in the repair so that hydration contin-

Fig. 2: Heated mixing water


Fig. 3: Concrete placed at recommended temperature in cold weather conditions


Fig. 4: Insulated blankets help to trap exothermic heat so that hydration and strength gain continues

Fig. 5: Heated enclosures to create a temperature- controlled environment

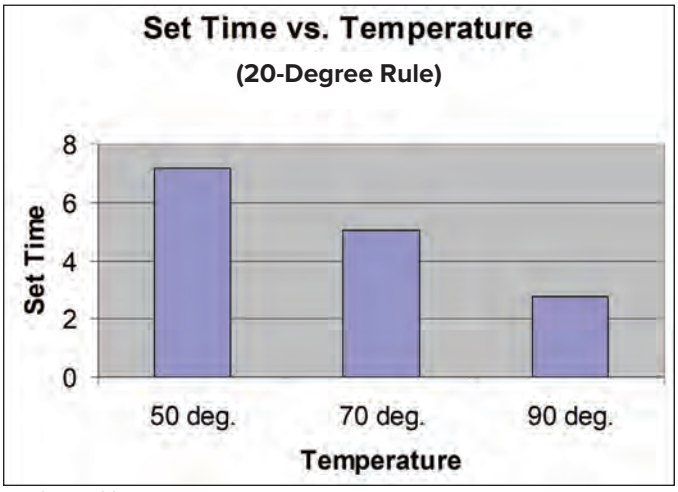

Fig. 6: The "20-degree rule"

Fig. 7: Warming substrate with heated blankets, coils, and insulation

ues, and the concrete or concrete repair mortar can reach minimum strengths prior to freezing. ACI 306.1R provides guidance on this subject. Corners and edges of repairs are usually the most vulnerable to freezing and require thicker insulation. Care should also be taken to not over-insulate the repair materials. This can trap too much heat and create other setting and durability issues.

- **Place concrete and repair mortars early in the day:** Avoid placing concrete repair materials late in the day when temperatures are on the decline. Instead, place repairs early in the day when temperatures are on the rise in order to take advantage of the warmest portions of the day.

- **Heated enclosures:** Heated enclosures can be used to create a temperature-controlled environment. They are generally needed for placing operations when the outside air temperatures are lower than -5°F (-20°C). Direct fired heaters that exhaust carbon dioxide (CO_2) into the enclosed atmosphere should be avoided as these gases can negatively react with freshly placed concrete and cementitious repair mortars, creating durability issues.

RISK OF DELAYED SETTING TIMES

Another cold weather risk for placement of concrete repairs is that of delayed setting times. As concrete and repair mortars cool in cold weather, hydration slows and set times are often delayed. Delayed set can lead to a variety of problems such as inadequate strength for removal of forms and supports, plastic shrinkage cracking, and problems with actual finishing of the concrete or repair mortar.

The "20-degree rule" is a rule of thumb that can be used to approximate the effect that temperature will have on concrete and concrete repair mortars. In general, setting time and strength gain data is established at approximately 70°F (21°C). The "20-degree rule" basically states that for every 20°F temp change up or down from that 70°F, set time is either increased (colder temps) or decreased (warmer temps) by 50% or one half (Fig. 6).

Cold surfaces can tend to draw the heat out of concrete and repair mortars, resulting in delayed set. For this reason, we should always avoid placing concrete and concrete repair mortars on frozen surfaces. In general, all surfaces coming into contact with concrete or repair mortars should be warmed to temperatures between 35°F and 90°F (2°C and 32°C). This may include forms and embedded reinforcing steel.

RISK FOR IMPROPER CURE

Cold weather does not negate the need for a proper cure on concrete and cementitious repair mortars. As a matter of fact, quite often the opposite is true. In cold weather, the top surface of the repair can dry out prior to full set, resulting in plastic shrinkage cracking. Surfaces should be cured with liquid curing compounds, plastic sheeting, in-

sulated blankets, or other methods that do not add water to the surface.

RISK OF THERMAL SHOCK

We can do everything correctly with regards to protecting the concrete or repair mortar from freezing, delayed set, and curing problems, only to encounter cracking due to thermal shock when repair materials are allowed to cool too rapidly. At the end of the protection period, insulation or other protection should be removed at intervals or just left in place, so that the surface temperature of the repair cools gradually over a 24-hour period. See Table 2.

Section Size	Maximum Allowable Gradual Temperature Drop in 24 Hours After Protection
<12 in (300 mm)	50°F (28°C)
12 to 36 in (300 to 900 mm)	40°F (22°C)
36 to 72 in (900 to 1830 mm)	30°F (17°C)

Table 2: Maximum allowable temperature drop in 24-hour period

CONCLUSION

Any time that cold weather is anticipated during concrete and concrete repair placement it would be best, if possible, to postpone the placement until more moderate temperatures are anticipated. Don't be afraid to have the difficult conversation with the owner, the engineer, or the contractor. There are times when conditions are such that cold weather placement is just not prudent. Postponement may be the best option.

However, if postponement isn't possible then it is critical that all parties come together and create a plan for managing the risks involved with cold weather placements.

- Establish protection plans for different temperature range scenarios. Don't get stuck planning for one temperature range, only to have temperatures change unexpectedly the day of the placement.
- Store prepackaged materials above ground and in temperature-controlled environments. Make sure that warm water is available on site for mixing. If placing concrete, work with the concrete producer to assure that they will be providing concrete at proper temperatures.
- Establish a plan for heating of existing substrates and forms that will be coming into contact with repair materials.
- Work with concrete producers, repair mortar manufacturers, and engineers on the project to assure that materials to be used are appropriate for cold weather conditions. One repair product or concrete mix design may not always be the answer in climates where temperatures can change daily or even hourly.
- Modify placement schedules so that concrete and concrete repair mortars are placed earlier in the day when temperatures are on the rise.
- Establish an approved curing method that does not add additional water to the concrete or concrete repair surface.
- Have plenty of insulation and insulation blankets on hand just in case they are needed.
- Establish a system for repair material temperatures during transportation, placement, throughout the protection period and during cooldown, after removal of the insulation.
- Establish agreed-upon testing procedures to monitor material strength gains. Due to their relatively small mass and lack of exothermic heat production, field cured cylinders are not appropriate for cold weather construction.
- Establish contingency plans for the unforeseeable problems that can occur, such as a broken down water heater.
- Exercise caution when removing forms and supports.

Finally, use the resources available to you through ICRI, ACI, NRMCA, PCA, and other associations to develop a plan to accommodate your cold weather concrete repair application. Through proper planning and managing of risks, your cold weather repair projects can be successful.

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Matt Hansen is a graduate of the University of Toledo, Ohio. He has more than 37 years of successful experience in design, sales, marketing, and technical services within the construction and concrete industry. He has been employed by the Euclid Chemical Company for over 24 years, and currently holds the position of National Business Development Manager. Matthew is a member of the American Concrete Institute committees ACI 362 Parking Structures, ACI 515 Protective Systems for Concrete, ACI 546 Repair of Concrete, ACI 563 Specifications for Repair of Structural Concrete in Buildings, and the International Concrete Repair Institute committees 110 Guide Specifications, 310 Surface Preparation, 320 Concrete Repair Materials and Methods and 510 Corrosion.

Concrete Rehabilitation Design for the Historic 3rd Avenue Bridge, Minneapolis, Minnesota

by Arne Johnson, Tanner Swenson, Dan Enser

Fig. 1: Engineers utilizing three under bridge inspection units for close-up bridge inspection and sounding during the Phase 1 bridge inspection (photograph by WJE).

Instantly recognizable in countless photographs of the downtown Minneapolis skyline, the 3rd Avenue Bridge over the Mississippi River is an iconic historic concrete arch bridge that recently celebrated its 100th birthday. Rehabilitation to address advanced concrete deterioration is ongoing and expected to be completed in early 2023. This article summarizes the investigation and rehabilitation design for the historic concrete elements, which was led by the authors on behalf of the Minnesota Department of Transportation (MnDOT). After project completion, a follow-up article will report how the rehabilitation went and the lessons that were learned during the construction phase.

HISTORY OF THE BRIDGE

The 3rd Avenue Bridge, originally designed and constructed in the early 1900s, is a classic example of the open spandrel concrete arch bridges that were common in that era. The 3rd Avenue Bridge stands out for its scale, its use of Melan reinforcing system and its S-curve geometry, which was necessary to avoid breaks in the limestone riverbed. The bridge, opened on Flag Day in 1918, is one of 24 bridges of prominent historic significance that MnDOT has selected for long term preservation, and it is included in MnDOT's Statewide Historic Bridge Management Plan. After the current effort is complete, the bridge will have undergone three major rehabilitations, with the first two in 1939 and 1980.

The bridge consists of seven original concrete arch spans in the river and approach spans on either end (non-original steel girders at the south end and prestressed concrete beams at the north end). Arch spans 1 through 5 consist of three arch ribs, while spans 6 and 7 consist of full-width

barrel arches, both of which support spandrel columns that in turn support the bridge deck. The bridge was constructed using the Melan reinforcing system, patented in 1892 by Austrian bridge engineer Joseph Melan.[1] In the Melan system, there are no conventional steel reinforcing bars in the arches. Rather, the concrete arches are reinforced with internal steel trusses composed of double-angle chords connected with riveted steel gusset plates and diagonal cross braces.

Although the bridge had been rehabilitated before, most recently with extensive concrete repairs and a full deck replacement circa 1980, the bridge by the early 2000s was again displaying significant concrete deterioration and structural deficiencies that needed to be addressed. The purpose of the current rehabilitation was to address the bridge condition, raise the NBI rating from 4 to at least 6, and achieve a target service life of at least 50 years after the repairs are completed.

CONDITION ASSESSMENT

As a first step in the rehabilitation of a historic concrete bridge, a well-conceived condition assessment is critical for success in achieving long-lasting repairs. Historic concrete has unique deterioration mechanisms that are considerably different than for modern concrete. Conditions can vary widely from area to area across the bridge due to the variability of the concrete resulting from early batching and placement methods, as well as multiple past repair projects. Deterioration conditions, which are often extensive, and historically significant features must be carefully documented for strategic repair and preservation of the structure. The objectives of the condition assessment are to characterize the construction and current condition of the structure, and, most importantly, to identify the deterioration mechanisms that are attacking the individual structure. Common deterioration mechanisms for historic concrete, including cyclic freeze-thaw damage, chloride-induced corrosion damage, and carbonation-induced corrosion damage, have been described elsewhere.[2, 3]

PHASE 1—BRIDGE INSPECTION

The condition assessment for the 3rd Avenue Bridge was performed in two phases. Phase 1 consisted of a close-up, element-level bridge inspection and sounding of 100% of the exposed surfaces (Figure 1). Distress conditions and condition states (according to MnDOT standards) were digitally mapped on scaled drawings using WJE's in-house iOS-based tablet software. Each inspector carried a tablet pre-populated with base sheets and custom drop-down fields that allow every condition to be digitally described and recorded. The data are accessible simultaneously by all the inspectors in the field as well as in the future by any individual with sign-in credentials. The software also has powerful post-processing capabilities including direct download into Excel or CAD, which immediately provides unlimited sorting and searching capabilities, as well as quantity calculations.

PHASE 2—FIELD TESTING, MATERIAL SAMPLING, AND LAB TESTING

Based on the Phase 1 inspection, small study areas across the bridge were selected to represent the full range of conditions present. Phase 2 consisted of field testing and materials sampling at each study area, with the primary goal being to identify the severity and the mechanisms of deterioration occurring in the concrete for each element type. This is critical because the repairs will only be durable if they are designed to address the underlying deterioration mechanisms at each particular structure and element. The study areas were spatially distributed across the bridge to represent the range of conditions and material types present. At the 3rd Avenue Bridge, a total of 137 study areas were evaluated, and 81 concrete samples and 10 steel reinforcing steel samples were removed for testing in WJE's laboratories.

Field testing methods utilized on the 3rd Avenue Bridge included half-cell potential surveys, corrosion rate measurements, resistivity testing, carbonation testing, and ultrasonic thickness testing of steel truss members (Figure 2). Lab testing of material samples taken from the bridge included testing for mechanical properties of concrete and steel materials, chloride content analysis and chloride horizon profiling (particularly important for the deck and substructure elements below deck joints), and petrographic analyses of numerous cores to identify vulnerabilities specific to the concrete in this structure (i.e., freeze-thaw cracking, air content, carbonation depth, paste-aggregate characteristics, etc.). Service life projections were developed for each element type utilizing the test data that were collected, and this information was used to inform the development of rehabilitation alternatives and life cycle cost comparisons.

CONCRETE REHABILITATION DESIGN AND CONSTRUCTION

After analysis of the rehabilitation alternatives, MnDOT selected the alternative that would achieve a service life

Fig. 2: Engineers utilizing three under-bridge inspection units for close-up bridge inspection and sounding during the Phase 1 bridge inspection (photograph by WJE).

of at least 50 years, which became the design criteria for the concrete repairs. A 25-year service life alternative was also considered but was, in the end, judged to be almost as expensive, logistically complicated, and considerably less durable.

For each alternative, the age, previous exposure conditions, and current testing results for each bridge element were evaluated to determine which elements could be repaired and which would need to be replaced. For example, the pedestals under the spandrel columns were all original to the bridge, even where columns had been previously replaced, and deck expansion joints had been relocated in previous deck replacements. As such, pedestals located below previous as well as current expansion joints required greater quantities of replacement to achieve the desired service life.

Customized concrete repair details were developed following consideration of the various state-of-the-art methods for addressing the deterioration that had been identified during the condition assessment. Many aspects of the repair design could be discussed, but for brevity just five are highlighted below.

High Quality Surface Repairs for Historic Concrete

The details of the concrete repair design were developed and communicated through carefully prepared specifications and drawings to achieve historic sensitivity and high-quality, durable repairs. The guiding principle behind the repair design was to detail the repairs in ways that would address the root deterioration mechanisms identified in the structure. At the 3rd Avenue Bridge, the primary mechanisms were found to be chloride-induced corrosion and freeze-thaw damage, which are water-driven mechanisms. In simplified terms, the repairs will be durable if water is kept from penetrating, which means repairs that bond well, limit cracking, and limit separation at the repair perimeters. Based on the hands-on inspection of the bridge, concrete surface repairs were specified for all locations where delaminations, spalls, and previous repairs were present, and repair details were developed for each typical location. Unique details were provided to address the severe corrosion-related distress at the arch rib corners, longitudinal cracking at the tops and bottoms of the arch ribs, and areas where freezing-and-thawing damage was particularly deep. The specifications demanded high-quality concrete repair techniques, including perimeter saw cutting, removal to sound concrete using light chipping hammers, substrate preparation via sandblasting, sandblast cleaning and coating of exposed reinforcement, and anchorage using epoxy-grouted bars. The concrete repair specifications were designed to allow the contractor to choose form-and-pour, form-and-pump, or shotcrete methods with either prepackaged or ready mixed concrete for each type of repair. For each, a minimum as well as a maximum compressive strength was specified so that the properties of the repair materials would not be substantially different than those of the original concrete. The contractor chose to use predominantly prepacked wet-mix shotcrete for most repairs. In portions of the bridge most visible to the public, the new concrete repairs were specified with a form-board finish to match the original surface texture.

Fig. 3: Bridge inspector recording notes utilizing proprietary iOS-based tablet inspection software (photograph by WJE)

Accurately Estimating Concrete Repair Quantities

One of the biggest challenges in repairing historic concrete is accurately estimating and controlling the repair quantities. For the 3rd Avenue Bridge project, quantities were estimated by leveraging the inspection software described above to calculate the as-mapped areas that warranted a repair (Figure 3). Three factors were then applied to convert the as-mapped quantities into quantities for the repair plans: a squaring off factor (converting as-mapped areas to rectilinear shapes), a time delay factor, and an "other factor" intended to capture some of the typical unknowns in repairing aging concrete. In all, the total repair factor, sometimes called the growth factor, ranged from 1.8 to 2.2 for the various bridge elements. This is consistent with the authors' experience on similar previous projects.

To control the repair quantities during construction, it is critical to have fair, clear, and workable repair measurement and payment procedures. An entire plan sheet and various other details throughout the plans were devoted to carefully defining and illustrating the way in which the quantities would be measured and paid. Saw-cutting the repair perimeters before chipping and avoiding combining repairs more than approximately one foot apart help limit unnecessary quantity growth. The original concrete at the 3rd Avenue Bridge has particularly large aggregates, so the sawcut depth was deepened to avoid irregular breakouts along the sawcut edges during the concrete removal process. Engineers experienced in historic concrete repairs should participate in the field to mark the in-situ conditions that warrant a repair (because some conditions are not detrimental and may be more durable if left untreated), as well as to measure the repairs and track the quantities in real time.

Deep Concrete Repairs for Freeze-Thaw Damage

Freeze-thaw damage occurs when non-air-entrained concrete, which includes most concrete constructed before approximately 1950, is saturated with water and while saturated undergoes multiple freezing and thawing cycles. At the 3rd Avenue Bridge, this type of damage was often present below drain discharges or at arch springlines where water collects (Figure 4). Based on petrographic examination of core samples, most of the surface repairs were anticipated to be no more than 6 inches deep, but repair details were provided for depths up to 12 inches, which was the deepest damage observed in the core samples, except for at the pier bases. The contractor is required to excavate incrementally deeper until reaching sound substrate, and payment is on a unit price basis for either 6-inch, 8-inch, 10-inch, or 12-inch depth.

Even deeper freeze-thaw damage was present at the pier bases, near the waterline and below drain discharges. Maximum concrete erosion was up to 17 inches and freeze-thaw damage up to another 8 inches was present beyond that. Rather than removing all the freeze-thaw damaged concrete, the repair details required removal of a uniform 12 inches of concrete to reach what was defined as an "intact concrete substrate" (aggregates firmly embedded in solid paste but some freeze-thaw related cracking allowed), not necessarily a perfectly "sound concrete substrate." Deeper removals were performed in localized "pockets" to reach an intact surface. Longer epoxy-anchorages were installed deeper into the sound material beyond the removal depth, and a new grid of stainless-steel reinforcement was installed near the surface. New self-consolidating concrete was cast to for a new pier jacket that matches the ornate historic profile of the pier bases (Figure 5).

Mitigation of Future Freeze-Thaw Damage and Reinforcing Steel Corrosion (i.e., Extending Service Life)

Coating

The overarching goal for mitigating future freeze-thaw and corrosion-related deterioration mechanisms is to keep water out of the concrete. Coatings and sealers are widely used for this purpose, but film-forming coatings are often inappropriate for a historic structure according to preservation standards, unless the structure was coated historically. Research showed the 3rd Avenue Bridge had various surface treatments in its history, including complete coating in the 1980 rehabilitation. The original concrete is non-air-entrained and chloride contaminated, and therefore extremely vulnerable to future deterioration and loss of historic fabric if water penetrates. After thorough discussions between historians and technical experts, it was agreed that a high-performance, film-forming, water-resistant coating would be applied to all historic concrete surfaces. A relatively thin acrylic-based coating product (30 mils wet film thickness, 20 mils dry film thickness) was selected so as not to mask the original form-board lines. It can be removed, which is important for historic structures, and it enhances the appearance of the concrete by masking multiple generations of different colored patches.

Critical Zones

In addition, in critical zones at the arch spring lines, where water tends to collect and where cracking from thermal cycling is possible, the concrete surface repairs, except for arch undersides, are specified to be cast in place and wet cured to minimize shrinkage cracking. The repairs in these zones require an extended "cure out period" during which time almost all shrinkage cracks and bond line separations should develop. Next, the surfaces in these zones will be treated with two coats of silane to refusal, which will seal the narrow cracks and separations. Wider cracks will be routed and sealed and then pre-striped with an elastomeric patching compound before installation of the coating over the entire surface.

Fig. 4: Deep freeze-thaw deterioration near springline of arch rib below drain discharge (photograph by WJE)


Fig. 5: Concrete removals completed, reinforcing steel being placed, and new pier jacket concrete being formed and placed (photograph by WJE)

Targeted Cathodic Protection at Arch Corners

The deterioration in the arches was concentrated at the arch corners where exposure is the worst due to direct runoff and two-side exposure to moisture and freeze-thaw cycling. Corners that were distressed were repaired using a custom detail that included careful reinforcement to control cracking and ensure long-term bond as well as continuous cathodic protection anodes to protect portions of the Melan angles that were not exposed, cleaned, and coated (Figure 6a, Figure 6b). The design team collaborated with MnDOT's engineers regarding potential methods to mitigate future deterioration along the arch corners. After reviewing various approaches together with the owner, it was agreed that, to slow future corrosion damage at segments of the arch corners that were currently sound but known to be marginally chloride contaminated and hence vulnerable to future distress, a targeted cathodic protection approach would be implemented. In this approach, cathodic protection anodes would be installed only in areas found, based on testing, to have an elevated risk of corrosion activity. The anodes were specified to be field located based on half-cell potential testing performed during the construction phase in the corner areas between those marked for repair. Where readings indicated potential corrosion activity, anodes were installed in cored holes that were staggered on either side of the Melan angles (Figure 6c, Figure 7). Selected anode locations were wired to test stations for monitoring to verify their effectiveness upon installation and to track their effectiveness at this structure over time.

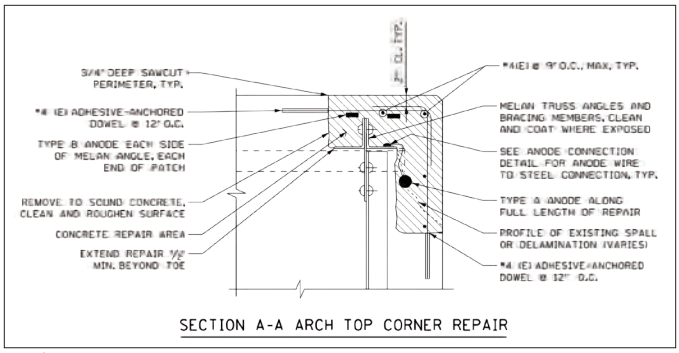

Fig. 6a: Typical detail for arch corner repair where concrete was unsound

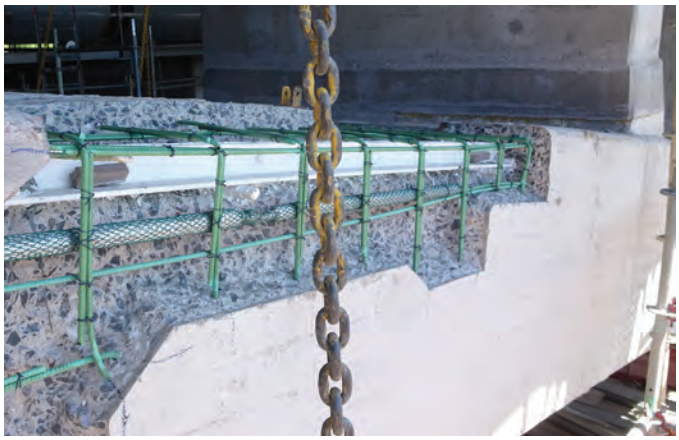

Fig. 6b: Arch corner repair prepared for concrete placement

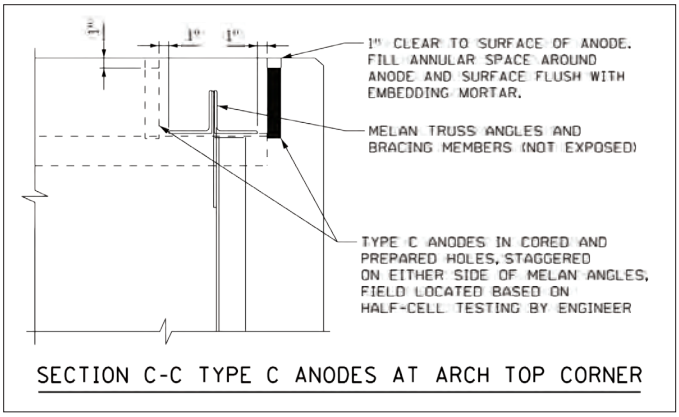

Fig. 6c: Typical detail for arch corner repair where concrete was sound but half-cell testing indicated potential for active corrosion

Matching Concrete Repairs to Original Concrete Texture and Color

Matching concrete repairs to the original concrete texture and color is an important step in the rehabilitation process for historic concrete bridges. For this project, the coating to be installed will result in a uniform color and surface texture, and no color matching was required by the historic agencies for the concrete repairs. For portions of the bridge most visible to the public, form board finish was

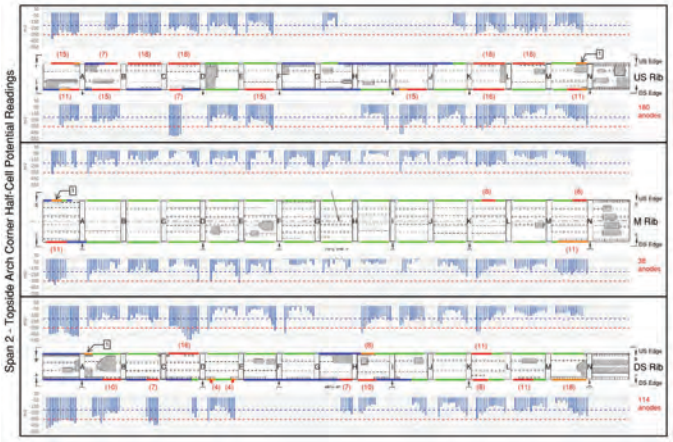

Fig. 7: Example data sheet showing the results of half-cell potential testing to locate the anodes in the zones of sound concrete between the corner repairs (see detail in Figure 6b) (image courtesy of WJE).

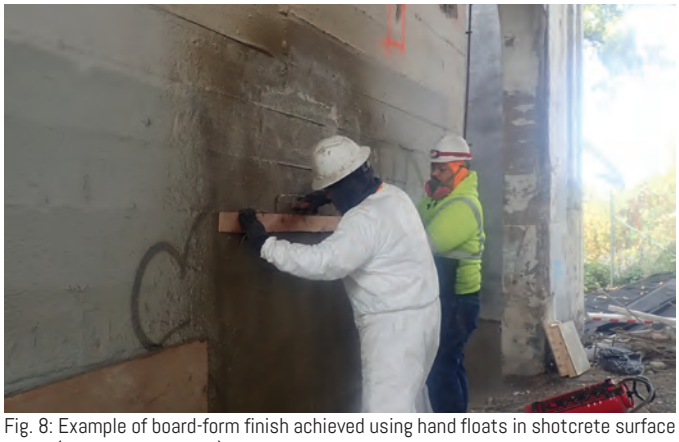

Fig. 8: Example of board-form finish achieved using hand floats in shotcrete surface repair (photograph by WJE).

required in the repairs. To create the board-form texture in the repair concrete, the contractor used form liners for the cast-in-place pier jackets and hand floated the board-form lines into the fresh shotcrete surface repairs to match adjacent areas of remaining original concrete (Figure 8). The project specifications required mockup-ups to be performed in three steps: shop samples, made in the shop and transported to site; field samples, made at the site next to point of placement; and trial repairs, made on the structure and left in place if accepted. This stepwise process provides confidence that the repairs will be historically appropriate and consistent with the specified quality requirements.

Fig. 9: Recent drone image showing status of the in-progress construction (photograph by WJE)

Construction is underway under a full bridge closure and an aggressive schedule (Figure 9). Once rehabilitation is complete, the lessons learned from execution of the concrete repairs will be shared.

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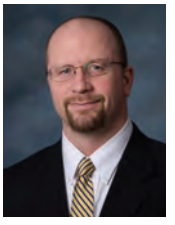
Arne Johnson is a Principal and structural engineer with over 30 years of experience at WJE, Northbrook, IL. He has expertise in structural inspection, condition assessment, field and laboratory testing, service life and durability evaluations, vibration monitoring, and repair/rehabilitation design, particularly for historic concrete structures. Notable historic concrete assessment and rehabilitation projects include the 3rd Avenue Bridge, Franklin Avenue Bridge, St. Paul Union Depot, Soldier Field, Wrigley Field, and Fenway Park. Arne received his BS in civil engineering from the University of Illinois at Urbana-Champaign and his MS in structural engineering from the University of California, Berkeley. He is a licensed professional engineer in multiple states.

Tanner Swenson is an associate level structural engineer with 7 years of experience at WJE, Minneapolis, MN. His experience includes condition assessment, field testing, and repair/rehabilitation of concrete structures, including the 3rd Avenue Bridge. Tanner received his BS in civil engineering and MS in structural engineering from the University of Minnesota. He is a licensed professional engineer in multiple states.



Dan Enser is an Associate Vice President with HNTB Corporation in Golden Valley, MN where he has worked for the last 27 years in design, construction, and management. Most recently he has been focused on bridge rehabilitation projects. He served as the design Project Manager for the rehabilitation of the historic 3rd Avenue Concrete Arch Bridge over the Mississippi River. Dan's previous experience includes managing the rehabilitation design and construction of the historic Franklin Avenue Concrete Arch Bridge over the Mississippi River under an accelerated 116-day closure. He has also managed several independent peer review projects, including the extradosed St. Croix River Crossing Bridge and the rehabilitation of truss Bridge 5900 (Winona TH-43) over the Mississippi River. He received his degree in civil engineering from the University of Minnesota.

Case Study: Precast Concrete Louver Repairs

by Christopher Kottra

Fig. 1: East elevation louvers

Fig. 2: South elevation louvers

BACKGROUND

The 474 North Lake Shore Drive Condominium Building is a 61-story concrete-framed structure completed in 1990. The façade consists of precast concrete panels with an exposed aggregate finish. A total of 492 precast concrete louvers fill openings in the façade panels at the bottom 15 floors of the north, south, and east elevations in lieu of windows (Fig. 1 and 2). These louvers allow natural ventilation of the garage.

The precast concrete louvers generally consist of six trapezoid-shaped horizontal rungs spaced evenly within the opening (Fig. 3). Some louvers along the lower floors on the east and south elevation consist of solid concrete panels that have rungs to replicate the appearance of other louvers (Fig. 4).

EVALUATION

Concrete deterioration was identified at the precast concrete louvers on the east elevation during a critical façade examination in 2008. Conventional partial- or full-depth concrete repairs were performed in 2009 at the louver rungs where deteriorated concrete was identified. Within a few years, adjacent portions of the louver rungs that had not been repaired previously were exhibiting similar deterioration (Fig 5). Some of the deterioration was likely attributed to ring anode effect (aka “Halo” effect). During a close-up review at portions of the façade in 2014, it was concluded that deterioration of the concrete louvers had continued and was progressing at a faster rate than other façade components. The deterioration was attributed to the following factors:

1. Low concrete cover over reinforcing steel on louver rungs;
2. Presence of near horizontal surfaces on louver rungs; and
3. Exposure to deicing salts, albeit in a peculiar way.

A heavily traveled elevated roadway runs parallel to the east elevation of the building. The road is salted during wintery conditions and snowplow trucks spray salt onto the east elevation louvers (Fig. 6). Exposure to these chlorides led to corrosion of reinforcing steel and concrete deterioration in some locations. Conventional concrete repairs performed in 2009 were effective initially. However, since deterioration continued, it became clear that alternative repair options were needed to improve performance and durability. Four “levels” of schematic repair options were developed in 2015 for the louvers on the north, east, and south elevations, which were as follows:

Level 1 Repairs

Perform conventional concrete repairs to address continued deterioration similar to what was performed in 2009 (See Fig. 7). The scope of work would also include routing and sealing of cracks and applying an architectural waterproofing coating. These repairs would only address localized areas of deterioration and would not necessarily protect the louvers from continued exposure to chlorides and the effects of

ring anode corrosion. Furthermore, the waterproofing coating considered for this repair would not be elastomeric and would not accommodate cracks that may appear in the future. As such, re-application would be required every 3 to 5 years.

Level 2 Repairs

Perform Level 1 repairs except apply a high-performance fluid-applied waterproofing membrane over exposed areas of sound concrete in lieu of the waterproofing coating considered for Level 1 Repairs. Fluid-applied membranes are more durable and have elastomeric properties that can bridge small cracks. Re-application would still be necessary every 8 to 10 years.

Level 3 Repairs

Level 3 Repairs initially consisted of over-cladding the existing louvers with prefabricated "caps" constructed of glass fiber reinforced concrete (GFRC). However, this option was removed from consideration due to concerns of dimensional consistency and aesthetic implications that would have prevented the "one-size-fits-all" intended benefit of the caps.

Level 4 Repairs

Remove rungs of concrete louvers leaving the concrete "frame" in place. Grind surfaces where rungs are removed flush with frame. Install prefabricated aluminum louvers consisting of frame covers and rungs (See Fig. 8). Replacing the concrete louvers with more du-

Fig. 3: Typical louver configuration

Fig. 4: Replica louver with solid panel

Fig. 5: Concrete deterioration adjacent to prior repairs

Fig. 6: Salt spray from adjacent elevated roadway

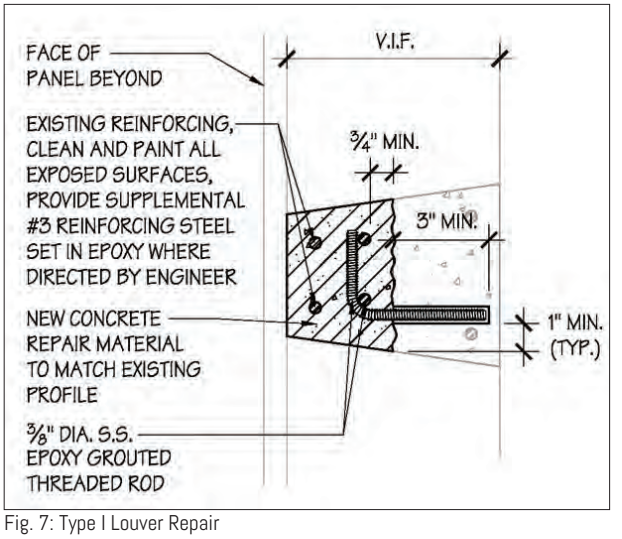


Fig. 7: Type I Louver Repair

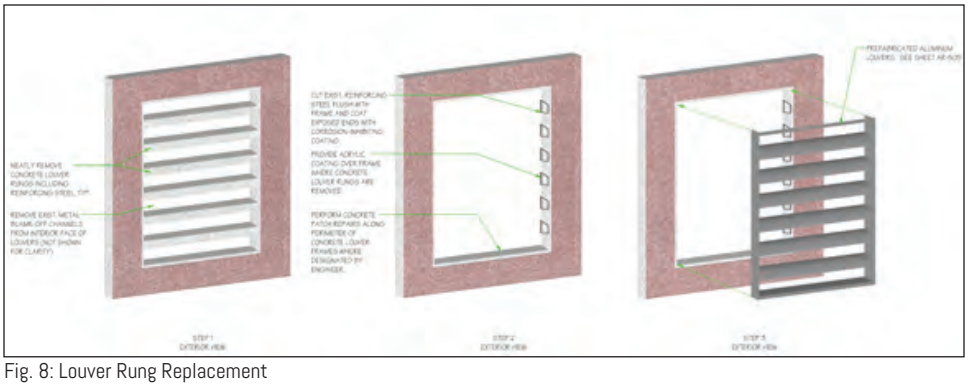


Fig. 8: Louver Rung Replacement

rable materials eliminated the need for periodic conventional concrete repairs. The need for future repairs and maintenance would also be drastically reduced.

Recommendations to the HOA were that the highest level of repairs should be considered for louvers with the highest exposure to chlorides. Conversely, louvers with less exposure to chlorides (i.e., most of the north and south elevations, and upper levels of the east elevation) are less likely to deteriorate to the extent observed at lower portions of the east elevation. As such, the lower-level repair options would be more financially appropriate for those locations. Considering cost and benefits, an effective combination of the Levels 1, 2, and 4 was recommended to the HOA.

REPAIR IMPLEMENTATION

The 15-story parking garage has 376 parking spaces dedicated to the residents of the building. There are also 258 commercial parking spaces that are owned and maintained separately from the HOA. Based on the agreement between the two entities, the commercial owner was partially responsible for maintenance of the garage façade. Extensive deliberation between the two parties regarding the appropriate approach to repairing the louvers delayed the project. The louvers were monitored and make-safe repairs were performed periodically until a large-scale repair project could be implemented (Fig. 9).

Elsewhere on the building, sealant between precast concrete façade panels was original to the building and nearing the end of its anticipated useful life. Although only localized sealant failure had been observed, the HOA had been budgeting for a proactive comprehensive sealant replacement project to be completed in 2018 and/or 2019.

The timelines for the louver repair project and comprehensive sealant repair project converged in 2018, and the twoprojects were combined into a single façade restoration project. Construction documents were completed in fall 2018 with the intention of starting the work in spring 2019. Several Chicago-area restoration contractors competitively bid on the project, and the project was awarded in January 2019. Work began in March 2019, and was completed in early December of the same year.

Some logistical challenges presented themselves early on. Lead time for obtaining the replacement aluminum louvers was going to be longer than originally anticipated. To combat this, the contractor initially mobilized swing stages to the north, south, and west elevations concurrently, but left the east elevation for later in the project schedule. Wall-mounted cellular antennae were anchored through one to two louvers on each elevation. The various cellular service providers were inconsistent in their requirements for temporary protection, temporary relocation, and/or temporary shutdown of their cellular equipment. As such, the restoration contractor had unanticipated challenges in coordinating those efforts.

The contractor had as many as eight swing stages operating at a time in an effort to maintain an aggressive schedule. To minimize downtime due to unfavorable weather conditions or material delays, the contractor established flexibility in what work would be performed each day (i.e., sealant, concrete, coating). During louver replacement on the east elevation, the contractor was able to stage workers on the inside of the garage and from the swing stages to improve efficiency (Fig. 10). Metal channels were anchored to the inside face of the precast façade panels, which were staggered from the concrete louvers to control air flow. Some of the channels had been exhibiting corrosion (Fig. 11). An allowance had been included in the original contract sum for replacing corroded channels. Because the channels would have to be removed where louvers were being replaced, the HOA elected to replace all the channels where louvers were being replaced rather than reinstall the existing channels.

Due to the high cost for accessing the façade, the HOA wanted to maximize the amount of work that could be done during this project to minimize the potential for repeating mobilization costs. With that in mind, the project also included unit price work such as concrete patch repairs matching the exposed aggregate finish, routing and

Fig. 9: Loose concrete removed periodically

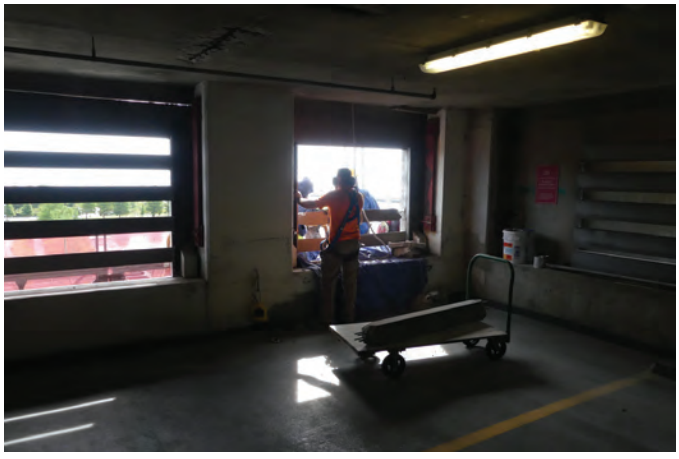


Fig. 10: Louver rung removal with workers on interior and exterior

sealing cracks, glazing gasket replacement, and replacing failed insulated glass units.

SUMMARY

Final project statistics included the following:

- 57 concrete louvers on east elevation were replaced with prefabricated aluminum louvers (Fig. 12);
- 46 louvers received a silicone elastomeric coating (Fig. 13);
- Remaining 389 louvers received an acrylic protective coating (Fig. 14);
- Approximately 60,000 linear feet (18,288 meters) or over 11 miles (18 km) of sealant was replaced (Fig. 15).

The original contract sum was $3,257,000 which included conservative quantity estimates for unit price work and a healthy contingency to address unanticipated conditions. Most of the façade components were in better condition than anticipated. As such, repair quantities were less than estimated for many of the unit price repairs. The final construction cost was approximately $2.8M and the entire project was completed in approximately 9 months.

The success of the project can largely be attributed to advance planning. The planning stages allowed for the following:

- Development of repair options for the Owner to select from;
- Association to build funds for the project;
- Proactive repairs (for the sealant work specifically);
- Collaborative effort among team members; and
- The project to finish under budget.

Fig. 11: Channels on interior of garage exhibiting corrosion

Fig. 12: Aluminum louver

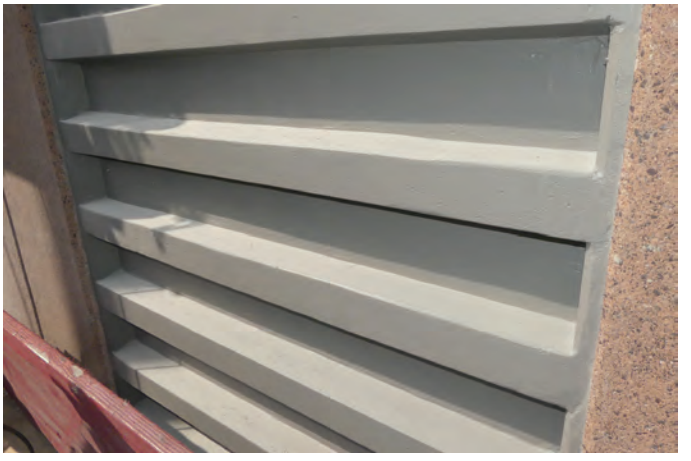


Fig. 13: Elastomeric coating

Fig. 14: Acrylic protective coating

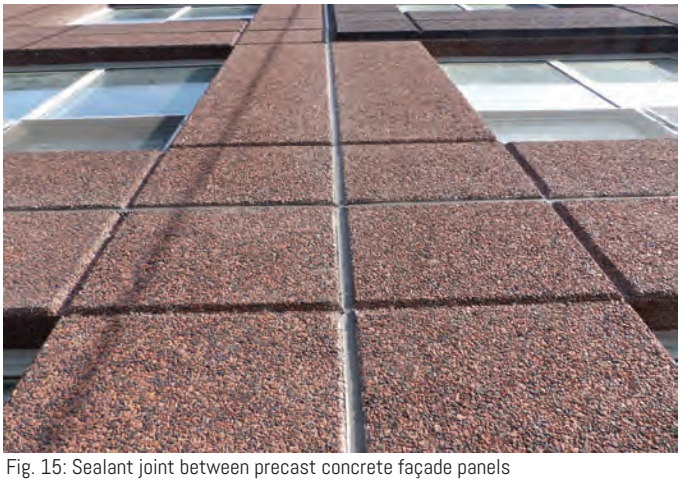


Fig. 15: Sealant joint between precast concrete façade panels

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Christopher Kottra, PE, REWC, is a Principal at Building Technology Consultants. Mr. Kottra has over 18 years of experience with evaluation, repair, structural design, and analysis of a variety of structures. Evaluation projects include parking garages, City of Chicago critical façade examinations, and miscellaneous building enclosure or structural deficiencies. He is a licensed Professional Engineer in the State of Illinois (PE), a Registered Exterior Wall Consultant (REWC), and a Certified Construction Contract Administrator (CCCA). Christopher is currently a member of ICRI, SWR Institute, BEC, and APRA. He is a past president of the Chicago Chapter of ICRI and is currently a member of ICRI Committee 410—Masonry.

Case Study: Precast Concrete Louver Repairs

OWNER
474 North Lake Shore Drive Condominium Association
Chicago, IL

DESIGN PROFESSIONAL
Building Technology Consultants, Inc. (BTC)
Arlington Heights, IL

CONTRACTOR
Mark 1 Restoration Company
Dolton, IL

MATERIAL MANUFACTURERS
Airolite
(aluminum louvers)
Schofield, WI

MasterBuilders, formerly BASF
(concrete repair mortars, urethane sealant, acrylic coating)
Shakopee, MN

Dow Silicones Corporation
(silicone sealant, elastomeric coating)
Auburn, MI

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Expansion Joints—Weather or Not

by Zachary Schafrath

In building construction, an expansion joint is a mid-structure separation designed to relieve stress on building materials caused by movement. Building movement at expansion joints is impacted by traffic loads, creep, structure settlement, and sway caused by wind and seismic events. Regular cycling, however, is primarily induced by thermal expansion and contraction caused by temperature changes.

Expansion joints are considered by many to be the most inconvenient yet critical application in a structure. The selection of an inappropriate system or an improper installation of an appropriate system will result in costly repair, replacement, and maintenance expenses. To conserve budget costs on a recent school project, the design team amended the project, eliminating the expansion joints. In the first year after the project's completion, the region experienced an abnormally cold winter followed by record-setting summer heat. As a result, excessive cracks formed in the floors, walls, and ceiling. The design team then had to bring in a consultant to assist with cutting in expansion joints in the floor, masonry walls, and roof. The cost to install the expansion joints at this point was multiple times the cost of the initial proposal. This was a perfect example of the adage "if you do not install an expansion joint, the project will add one for you."

While exploring expansion joint solutions for a project design, there are many factors to consider such as movement, moisture management, aesthetics, and pedestrian/vehicular egress. One of the most important aspects to consider is weather.

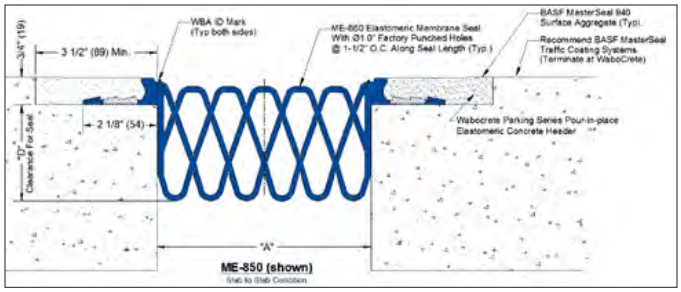


Fig. 1: Winged-Joint System

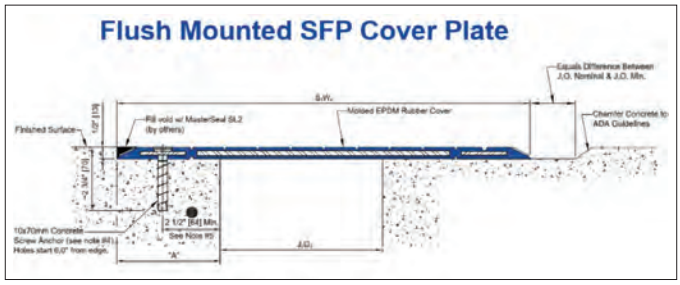


Fig. 2: Flush Mounted Cover Plate


Fig. 3: Compressed Foam

COLD WEATHER

Snow and snow removal play a major role in the options for an expansion joint. Imagine the top deck of a parking garage in Boston or Denver. This deck is exposed to the elements and over the winter months, snow gathers and requires removal. If salt is added to the deck, it is important for the deck to remain watertight so the salt does not mitigate into the concrete structure and corrode the reinforcement. This can be achieved by selecting a system that ties into the deck securely such as a winged-joint system with header material. (Fig. 1)

Snowplows pose a particular threat to expansion joint performance. Joints are susceptible to damage by plow blades. In this environment, a system that is flush with the deck surface may be more appropriate than a surface mounted system, which can be more susceptible to plow damage.

The weight of the intended snow removal equipment should also be considered when choosing a system. Heavy equipment driving across cover plates can cause significant damage if they are not properly sized. Having a snow maintenance program that addresses expansion joints will ensure the system functions properly year after year.

WARM WEATHER

Suppose now you are on a top deck in Arizona or Flori-

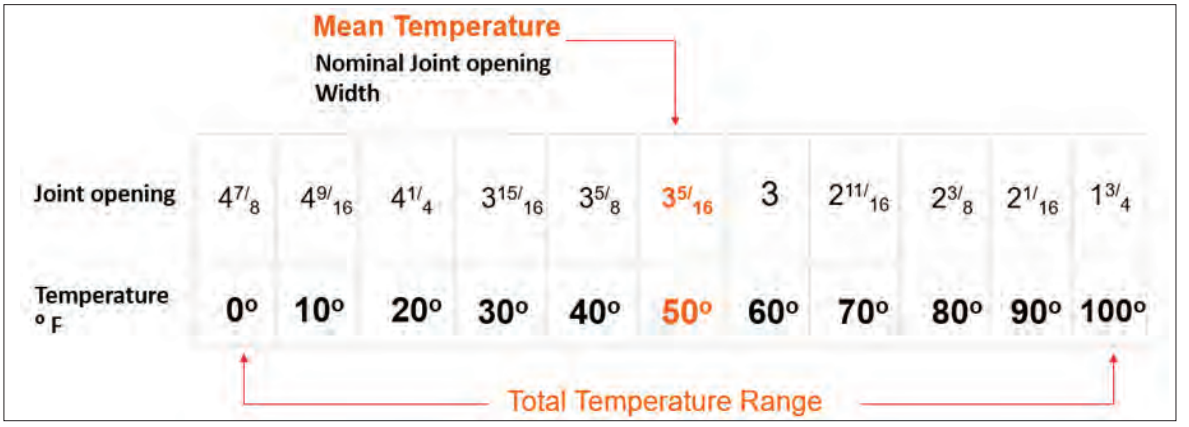


Table 1: Temperature Adjustment Table

da. The use of many infill expansion joint materials such as silicone-faced pre-compressed foam can get soft and spongy in extreme heat. Subsequently, these may not be firm enough for pedestrian traffic and can pose a safety hazard.

When installing pre-compressed foam (Fig. 3) in an area experiencing extremely high temperatures, it is best to use an acrylic-impregnated foam product as opposed to wax-impregnated product because the wax can deteriorate over time above 150 degrees surface temperature.

Another hazard of extreme heat is the coefficient of thermal expansion (materials expand and contract when exposed to temperature changes). This extreme heat causes metal to expand, resulting in cover plates buckling and warping. This creates damage and trip hazards if the spacing is not calculated appropriately. Specific products are available that are UV stable. These are best paired in locations with long exposure to direct sunlight.

THERMAL CHANGES

Every expansion joint behaves in a unique manner but in general a joint opening's width will shrink in hot weather and grow in cold weather due to the concrete slab expanding and contracting when exposed to these temperature changes. Often a dramatic change in joint opening width can be observed between morning and afternoon on the same day. An experienced expansion joint professional is familiar with identifying the nominal joint opening width or joint opening width at mean temperature. See Table 1.

All credible expansion joint manufacturers will publish the mid-range, minimum and maximum joint opening ranges for their product lines. These are critical to follow during the selection process.

Imagine a retrofit project in which the table above references the seasonal range of temperature and corresponding joint opening widths. The plan calls for an infill material that supports 50% inward and outward movement. The supplier asks for the nominal width of the opening. The contractor calls his foreman at 2 p.m. in late August who measures a 2" joint opening so the contractor orders a 2" nominal joint opening product (1"-3" range). What do you suppose will happen in February when the thermal movement relaxes the joint opening to 4"? You guessed it: The system will likely fail. In this scenario, an appropriate system would be a 3.5" nominal system with 50% inward and outward movement capabilities allowing expansion to 5.25" and contraction to 1.75". This example illustrates the importance of identifying the nominal joint opening width and the dramatic effects temperature can have on expansion joints.

CONCLUSION

Expansion joints are considered by many to be the most inconvenient yet critical application in a structure especially when weather is a factor. Cold/hot weather, dead loads, snowplows, and thermal changes can greatly impact a joint opening's movement. Partnering with a knowledgeable manufacturer and a factory trained applicator will eliminate confusion and ensure a positive project experience.

Zach Schafrath has 26 years of experience in construction. Growing up in NE Ohio, Zach began forming and pouring concrete as well as working in masonry. He has also worked as a construction Project Manager in the Stucco and EIFS sector. Zach has been an Account Manager for the Civil and Bridge division, and Project Manager for the Oil and Gas division for Hilti and has worked in Sales for Hilti and Huntsman Building Solutions. Zach is currently in his 3rd year at Watson Bowman Acme and is the National Account Manager for the Parking and Stadium division, responsible for the company's Factory Trained Applicator program.

Zach has a Bachelor's degree in Business-Finance from the University of Oregon and a Master's degree in Business-Industrial Engineering from Mississippi State University. Zach is a member of the California chapter of ICRI and currently resides in Rochester, NY with his wife Jennifer and two daughters Virginia and Margaret.

ICRI State of the Institute

by John McDougall, ICRI President, and Eric Hauth, ICRI Executive Director

INTRODUCTION AND OVERVIEW

2021-22 Strategic Goals Summary

At last year's ICRI Executive Committee strategic planning retreat, the group identified critical goals for the upcoming fiscal year, in addition to the many other activities of ICRI. We are very pleased to report that ICRI met or exceeded almost all the goals identified at that time. Notable accomplishments include:

- Held a profitable and successful Spring 2022 Convention
- Started routine education webinars (eight per year)
- Convened at least six CSMT programs
- Launched at least three new or updated technical guidelines
- Implemented a new SME model for certifications program support
- Initiated build of new ICRI technical app
- Initiated build of new CSMT online modules
- Completed extensive evaluation of membership model and pricing
- Launched new international chapter/affiliate model
- Conducted new post-Surfside response initiatives including panel discussion on ACI 562

Four key pillars anchor the work of ICRI: *Organization Strength. Industry Leadership. Organization Credibility. Professional Development.* We discuss in detail these strategic goals for the year and other activities of ICRI guided by each of our four pillars in the following report.

ORGANIZATION STRENGTH

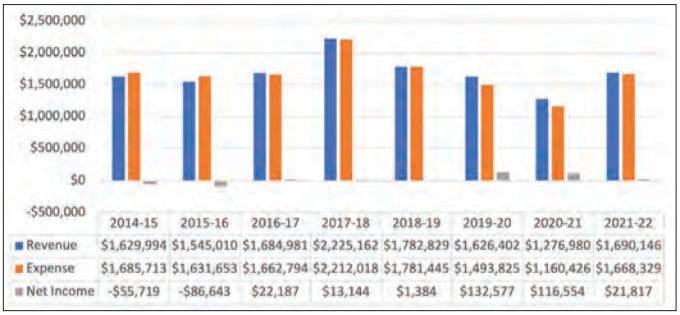
ICRI will have the resources, staff, and structures to fully support its strategic priorities.

Overall Financial Performance

Despite more than two years of significant headwinds caused by the COVID-19 pandemic and economic uncertainty, ICRI was able to finish the 2021-22 fiscal year slightly ahead of budget. As shown in Chart 1, we finished the year with a modest positive net income figure of $21,817. This figure represents a significant growth in the overall budget from the previous year—the heart of the pandemic downturn—and a return to normal budget levels.

It should be emphasized that ICRI weathered two of the most difficult years in our history without an increase in membership dues or dipping into the institute's reserves—an accomplishment that many associations would envy. We owe a huge debt of gratitude to our many supporting members, company members, and individual members for their consistent and sustained commitment to ICRI during this challenging period. This commitment, reflected in ICRI's strong retention and spirt of volunteerism, make this a truly remarkable organization.

Chart 1: Revenue, Expense & Net Income Trend



	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Revenue	$1,629,994	$1,545,010	$1,684,981	$2,225,162	$1,782,829	$1,626,402	$1,276,980	$1,690,146
Expense	$1,685,713	$1,631,653	$1,662,794	$2,212,018	$1,781,445	$1,493,825	$1,160,426	$1,668,329
Net Income	-$55,719	-$86,643	$22,187	$13,144	$1,384	$132,577	$116,554	$21,817

Major Program Drivers

Chart 2, developed for ICRI's new organizational dashboard, provides a useful shorthand of the performance of non-convention program drivers—ICRI's two certification programs, publications/product sales revenue, and revenue from *Concrete Repair Bulletin (CRB)* ad sales. *CRB* advertising revenue continued its turnaround, thanks to our generous sponsors and the work of the Ewald Consulting sales team.

Similarly, the Concrete Surface Repair Technician (CSRT) program continued to show new progress, with increases in newly certified professionals, more interest in the online education modules and the re-launch of live performance exams.

As a completely in-person training program held back by the pandemic, the Concrete Slab Moisture Testing (CSMT) program continued to lag budget, as the world began to open back up. However, as detailed in the certifications section later in this report, this program is rapidly returning to pre-pandemic levels with new programs taking place throughout the country. Please see the Certifications section on page 36 for details

Chart 2: Major Program Drivers

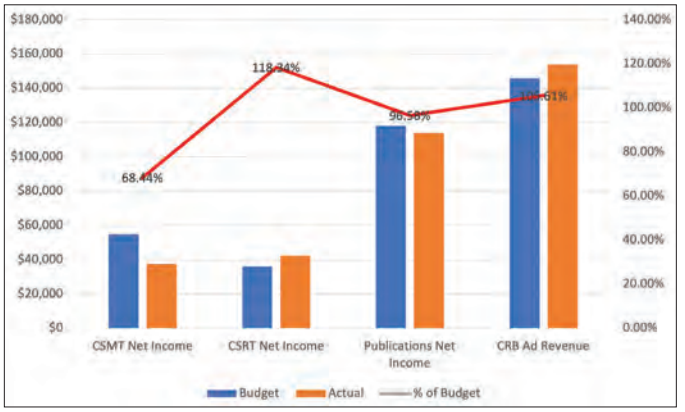
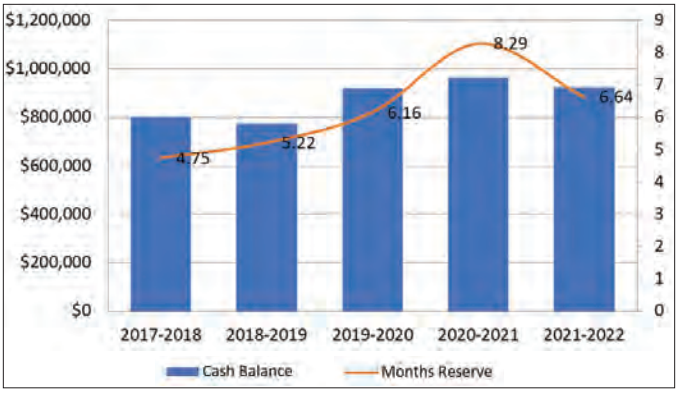


Chart 3: ICRI Reserves (ASAE Benchmark = 6-12 months)



Reserves

Not surprisingly, economic uncertainty following the pandemic has had a slightly negative impact on ICRI's reserve funds. After seeing significant gains in late 2021, rising inflation, volatility and fears of recession have resulted in several months of overall negative market performance. ICRI's conservative investment philosophy, however, has blunted the impact.

As of early July 2022, ICRI's reserve fund balance stands at approximately $620,000. This figure equals roughly 35 percent of ICRI's FY 21-22 operating budget; however, combined with cash balances on hand, ICRI remains above our minimum target to hold funds equal to at least 50 percent of budget. As noted above, ICRI has weathered the storms of the past two years without drawing on this reserve fund—ensuring a stable foundation for future financial growth.

ICRI Membership

As a membership organization first and foremost, the goal of attracting, engaging, and retaining members is central to the mission of ICRI. With ICRI's unique focus on concrete repair and the scale of the repair industry, we've set an ambitious goal to grow our membership by 50 percent in five years. It's a big goal, but we truly believe that the value of membership in this organization is a story that we can do an even better job of telling.

This past year, we made some progress towards this goal (Chart 4). We ended the fiscal year with a total of 2,091 members, versus 1,999 members at this time last year, representing a year-over-year growth of 4.6 percent. It is important to note that membership numbers fluctuate each month given the rolling renewals of our members. Nevertheless, we are encouraged to see upward growth even with the pandemic and recent economic volatility.

Whether you're here to network, advance the quality of repair through technical committee work, or gain new insights and education, ICRI is the place to be for repair professionals.

Chart 4: June 2022 Membership Report

Membership Breakdown	21-Apr	21-May	21-June
Overall Membership	2135	2089	2091
United States	1840	1797	1794
Canada	209	206	204
International	86	86	90
Company Membership	390	379	378
Supporting Membership	43	42	40
Individual Members	1017	1004	998
Educators	36	36	36
Government Members	21	21	20
Retired Members	25	23	22
Student Members	46	48	50
Honorary Members	5	5	5
Additional Company Members	301	289	299
Additional Supporting Members	251	244	240
Company Representative Member	390	379	378
Company Representative Member	43	42	40

Chart 5: ICRI Company Membership Composition

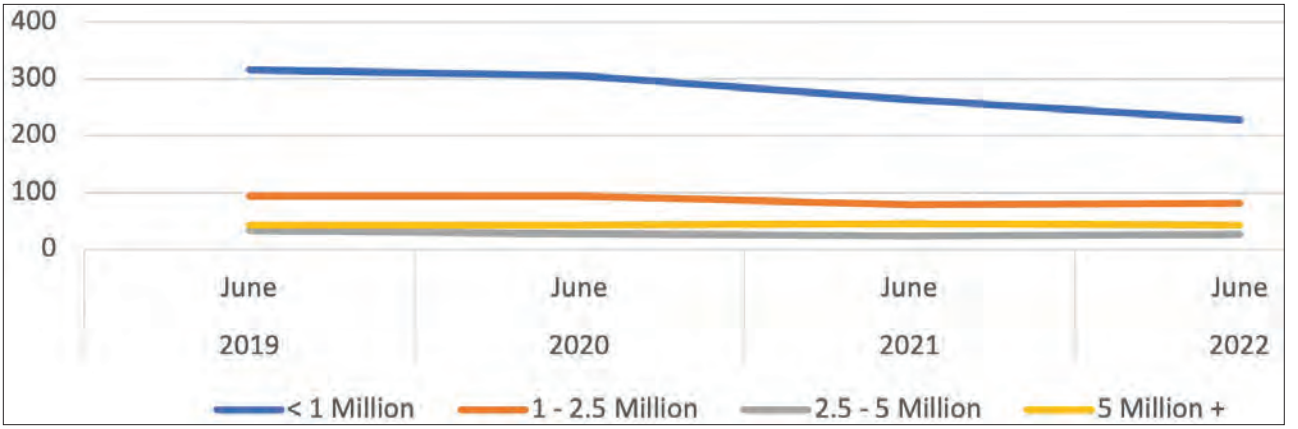
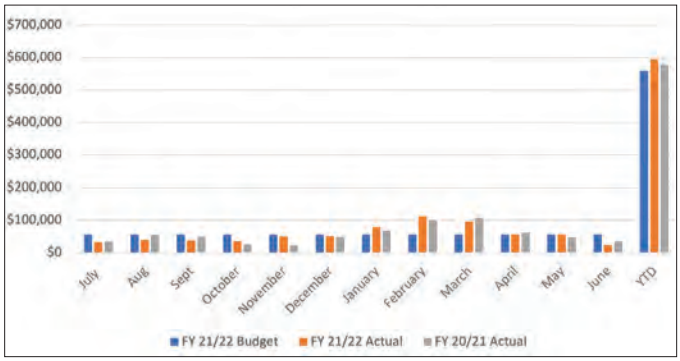


Chart 5 shows the breakdown of ICRI company memberships. The decrease in the number of small company members (<$1 million in revenue) is an ongoing trend. This and other factors led to a new initiative in the second half of the fiscal year to conduct a detailed analysis of our membership and pricing model. We contracted with an expert consultant in the field and identified some insights that will guide our membership structure in the future. In the current fiscal year, we intend to implement recommendations that will simplify our model, signal to members a clearer value proposition and establish a stronger foundation for future growth.

Chart 6 reflects the financial side of ICRI's membership—the single biggest contributor to ICRI's bottom line. We are pleased to report that we ended the fiscal year with membership dues exceeding our budget projection and the previous year's total, indicating a slight upward trend. That said, we know there is much work ahead to attract new members and add even more value to current members. That is our top priority for the months ahead.

Chart 6: Membership Net Income by Month/Year



INDUSTRY LEADERSHIP

ICRI will be a state-of-the-art, trusted, and reliable source of delivering best industry practices and professional networks in the repair industry.

ICRI Chapters & International Affiliates

Our 39 chapters are the heart and soul of ICRI. Thankfully, they have been back in full swing with in-person events. The past year also saw a slight increase in overall chapter membership, from 2,188 to 2,378, a growth of 8.7 percent over last year.

Technical Activities

Technical activities are central to ICRI's mission to "improve the quality of repair, restoration, and protection/preservation of concrete and other material systems." Over the past year, ICRI volunteer committees and staff have been hard at work developing new guidelines and technical products.

Technical Products

ICRI launched the following technical products in the past fiscal year, designed to advance the quality of repair across the industry.

- 110.3-2021—*Guide Specifications for Cementitious Bonded Overlay*
- 210.4R-2021—*Guide for Nondestructive Evaluation Methods for Condition Assessment, Repair, and Performance Monitoring of Concrete Structures*
- 210.3R-2022—*Guide for Using In-Situ Tensile Pull-off Tests to Evaluate Bond of Concrete Surface Materials*
- *Concrete Repair Terminology (CRT)*, updated 2022

Technical Committees Chair Training

Last year, the Technical Activities Committee (TAC) identified a need to support ICRI's technical committees through training that will enable committees to run more efficient and effective meetings, leading to improved and more timely technical products for ICRI. ICRI's Technical Director, Dave Fuller, took on the important task of developing and implementing this new initiative. The work includes:

- Forming a new task group to define the training
- Completing a full-scale evaluation of technical committee leadership during the 2022 Spring Convention
- Incorporating the results to create a program for launch at the 2022 Fall Convention, which will include a "mock committee meeting" demonstrating best practices.

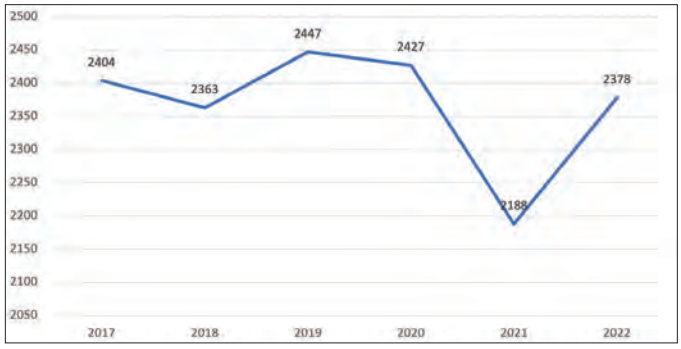
Florida West Coast Chapter Hosts Volunteer Day

◄ Tom White (foreground) uses paint sprayer on the house with Thomas Garguilo of SIKA (background) cutting in

▼ Some of the Chapter volunteers taking a short break with just two of the painted houses in the background

(Photos: CRB, July/August 2021)

Chart 7: Chapter Membership Trends



- We are excited to see this training come to fruition this Fall and become a regular component of committee onboarding and practice.

ACI 562 Repair Code Adoption Efforts

ICRI continued to support ACI's 562 code adoption efforts throughout the U.S. and played a significant role in promoting 562 acceptance by the International Existing Building Code (IEBC).

Specifically:

- ICRI maintained coordination of ICRI code adoption efforts through ACI 562 Code Coordination Committee and ACI
- Provided chapter and national support in Washington, Viginia, Arizona, South Carolina, and Massachusetts
- Hosted a webinar roundtable discussion on October 4 that attracted over 500 registrants
- Provided ICRI testimony at National IEBC hearings in Rochester, New York.

ICRI intends to continue these efforts and launch additional, targeted educational and certification initiatives to prepare ICRI members for future 562 implementation.

Technical Tools

ICRI's push to innovate is perfectly illustrated by staff and Committee 210's work over the past fiscal year. The committee spearheaded an exciting effort to launch ICRI's first digital, field-based app focused on assessing rebar cleanliness. We passed a critical milestone by signing an MOU with Exact Technology (Toronto, Canada) to build this app.

Our goal is to launch a beta version of the app available for attendees at our 2022 Fall Convention in Atlanta and gain usability feedback from that target audience. Attending the Fall Convention is a great way to get in on the ground floor and help us improve the app before our anticipated full launch at World of Concrete 2023.

Following successful launch of this app, ICRI plans to initiate the build of our second digital field-based app based on ICRI's industry-standard CSP® surface profile chips. Although this work is pending, substantial pre-work has already taken place throughout the past fiscal year.

ICRI Fall and Spring Conventions

This past fiscal year finally saw ICRI getting back to live conventions—2021 Fall in Minneapolis and Spring 2022 in Baltimore. Both were big successes with a return to the energy for which ICRI conventions are known!

As seen in Chart 8, convention registrations for Minneapolis and Baltimore returned to levels close to pre-pandemic levels—an incredible show of interest and support by ICRI members after two years of virtual activities.

Financially, both live conventions in the past fiscal year (Fall 2021 and Spring 2022) proved successful, with positive net income from both. As seen in Chart 9, convention net income since early 2020 reflects the impact of COVID-19, with a sharp decline followed by an eventual return to normal. We fully anticipate this positive trend to continue into the Fall 2022 convention in Atlanta and beyond.

▲ Baltimore Spring 2022

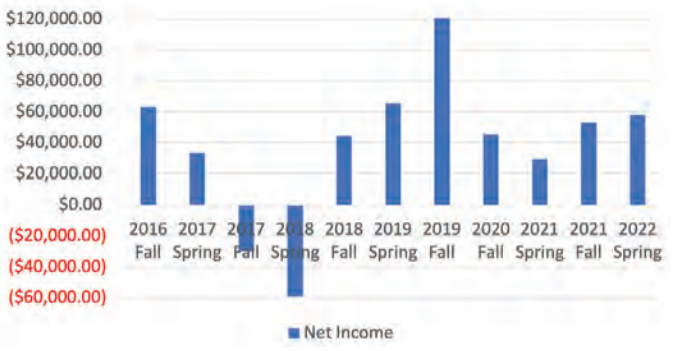
◀ Minnneapolis Fall 2021

Chart 8: Convention Registrations for Past 5 Years

Year	Season	City	Attendance
2022	Spring	Baltimore	294
2021	Fall	Minneapolis	196
2021	Spring	Virtual	207
2020	Fall	Virtual	285
2020	Spring	Virtual	150*
2019	Fall	Philadelphia	460
2019	Spring	Jacksonville	273
2018	Fall	Omaha	280
2018	Spring	San Francisco	252
2017	Fall	New Orleans	232
2017	Spring	Montreal	312

* The cancellation of ICRI's Spring 2020 Convention due to the pandemic shutdown required a rapid turnaround to a virtual event, with expected loss of regular convention attendance.

Chart 9: Convention Net Income



ORGANIZATION CREDIBILITY

ICRI will be a well-connected organization backed by a recognized and respected brand locally, nationally, and internationally.

ICRI continues to invest considerable time and energy enhancing its website, improving the user experience and access to critical content.

The ICRI website is performing well with steady year-over-year traffic to the website. The largest segment of users come to the ICRI website from organic searches (37,179 users), indicating that the continued work done throughout the year on Search Engine Optimization (SEO) and meta tags is helping drive relevant traffic to the ICRI website without spending advertising dollars.

As we continue to focus ICRI marketing, membership, and education efforts we expect to see traffic continue to improve. Many reputable sites are referring to ICRI, which increases credibility

and builds brand awareness. Table 10 shows the top three non-search, non-ICRI owned channel referrals that drew the most users to ICRI's website.

Chart 10: Top ICRI Website Referral Sources

Source	Users	Sessions
concretenetwork.com	143	156
Graco.com	125	138
Wagnermeters.com	122	139

Social media referrals increased compared to the previous report for LinkedIn and Facebook while Twitter traffic fell across the board in FY 21-22. LinkedIn was the biggest winner for ICRI in FY 21-22 driving 1,995 sessions (+15.99%) and 1,387 users to the website (+10.78%). Facebook was responsible for 723 sessions (+8.72%) and 664 users to the website (+11.97%). Overall, there was a 12.83% increase in sessions via social referral.

Additional Marketing Successes

Continuation and Refinement of the Project Launch Plan Process

Building on the success of FY 20-21 Product Launch Plan, the Marketing Committee refined the Product Launch Plan Process. The goal of this process is to ensure that ICRI products are widely distributed to the right audience at the right time. The ICRI marketing and communications team took this guidance and built a comprehensive product launch process that can be adapted to any new ICRI product. In FY 21-22, ICRI refined the process, including more tie-in to education projects and existing ICRI audiences.

Products that went through the process in this year include:

- ICRI Guide 110.3-2021 *Guide Specifications for Cementitious Bonded Overlay*
- ICRI Technical Guideline 210.4R-2021 *Guide for Nondestructive Evaluation (NDE) Methods for Condition Assessment, Repair, and Performance Monitoring of Concrete Structures*
- Concrete Repair Solutions Center

This more disciplined product launch approach will be applied going forward to all major technical products developed by ICRI, helping to ensure widespread adoption of ICRI best practices and recognition of the incredible ICRI volunteers that make these products possible.

ICRI 35th Anniversary Planning

The ICRI Marketing Committee identified a wonderful upcoming opportunity to promote the history of ICRI and the future of the organization, the 35th Anniversary. The Marketing Committee has two groups working to capitalize on the prestigious anniversary—a Video Task Force and a 35th Anniversary Working Group.

PROFESSIONAL DEVELOPMENT

ICRI will develop and deliver programs, products, and services that provide knowledge, build skills, and validate expertise.

Webinars

Webinar Process Developed and Finalized

Launching consistent and frequent educational webinars has long been a goal of ICRI. To accomplish that goal in accordance with the quality standards of the organization, ICRI's Education Committee and staff developed and implemented a new internal process for appropriate review and approval of ICRI hosted webinars. With that process in place, this past fiscal year finally saw the implementation of new technical webinars on a consistent basis and a goal from now on to offer at least eight ICRI webinars each year.

This new cadence of webinars got underway in June at the end of the fiscal year, with the launch of a summer series focused on protecting concrete.

- Webinar 1: *Understanding Concrete Surface Preparation* – 123 Registrants
- Webinar 2: *Specifying Clear Water Repellent* – 52 Registrants
- Webinar 3: *Understanding Traffic Membranes* – 72 Registrants
- Webinar 4: *Troubleshooting Protective Coatings* – TBD

These webinars also revealed that a consistently high number of registrations (>50% for the initial two webinars) are not ICRI members. Therefore, ICRI has also initiated campaigns focused on these attendees to encourage their membership in ICRI.

Certification Programs

ICRI's two national certification programs—CSMT and CSRT—were dealt an obvious setback by COVID-19. However, as restrictions lifted, ICRI didn't miss a beat—scheduling new live offerings for both programs. In addition, ICRI's Certifications Program Director, Dale Regnier, undertook an effort to offer virtual recertifications, allowing individuals to take advantage of this opportunity remotely.

As a result, both programs began to resume normal operations, with new programs around the country and more being scheduled on a regular basis.

In December, we held a successful CSRT live performance exam (LPE) for employees of RTC Waterproofing in Carrollton, Texas—the first LPE since 2018! The LPE is the final step in the process for students to achieve full CSRT certification.

In March 2022, ICRI offered an onsite LPE exam for employees of Vector Construction in Decatur, Illinois. That program was followed later in the spring by another program at its Edmonton, Alberta location.

Group shot of the new Certified CSRTs at Vector Construction, Edmonton, Alberta, Canada

On the CSMT front, staff and ICRI subject matter experts led by Peter Craig have conducted a number of education and LPE testing that includes successful programs at World of Concrete, The International Surfaces Event, the Flooring Contractors Association, the National Wood Flooring Association and at Terracon.

Chart 11 and 12, show the overall numerical impact of these efforts and total participation since program inception.

These programs represent one of ICRI's biggest areas of opportunity and growth. With the continued adoption of ACI 562, CSRT provides an essential concrete 101 for professionals in the field and a great refresher for seasoned professionals.

CSMT has for years has been the gold standard training program for slab moisture testing with significant untapped growth. Therefore, we will maintain our focus in the coming months on growing our capacity to promote and deliver these programs to even more professionals in the field.

Self-Directed Educational Programs

As noted in the introduction on page 32, ICRI also invested time during the past several months in new strategies to scale these programs. Notably, we are now enlisting paid expert SMEs to augment staff capacity in the deployment of CSRT live performance exams.

ICRI has also launched a new initiative to add virtual/online education modules for the CSMT program for the first time in this program's history. The goal is to create high-quality e-learning modules on ICRI's learning management system in the coming months. To accomplish that goal, ICRI recently completed two days of professional video footage of ICRI past president and CSMT program founder Peter Craig, performing CSMT testing to use for e-learning and promotional purposes. We hope to launch these new online modules at WOC 2023.

Last and certainly not least, ICRI's Certification Committee has spent considerable time building content for a future self-directed fiber reinforced polymer (FRP) education/certification program. This work has also leveraged the expertise of ICRI's 310 committee to finalize the content. Next steps include working with an e-learning consultant to finalize the program design and construct learning modules for ICRI's learning management system for likely launch in 2023.

SUMMARY AND CONCLUSION

We hope this report of ICRI's FY 2021-22 initiatives gives our members a stronger insight into the many activities underway at ICRI to advance our industry and support our members. These activities would not be possible without the incredible commitment and collaboration of our members, volunteers, and staff.

Chart 11: CSMT Program Dashboard

Newly Certified	Recertified	Total FY21-22 Impact	Number of Programs	Total Current Certifed Since Inception
89	33	122	9	514

Chart 12: CSRT Program Dashboard

Net New Certifications	Net New in Certification Program	Total Certified Since Inception	Total in Certification Program
39	87	149	398
Net New Completed Education	**Net New in Education Program**	**Total Completed Education Program**	**Total in Education Program**
19	54	123	188

Peter Craig, on location at AET in Saint Paul, MN filming for CSMT educational modules

As noted, we firmly believe that this organization should grow by 50 percent over the next 5 years reaching even more professionals and making an even larger positive impact for this industry. To achieve that goal, we will need your continued support and involvement. If you're not already involved on an ICRI national committee or with your local chapter, get involved! It will propel your network and career.

For now, we wish you safety and great success and we look forward to seeing you at a future ICRI event!

CONCRETEREPAIRCALENDAR

OCTOBER 4, 2022
ICRI Webinar: *How ACI CODE 562-19 Impacts Stakeholders in the Concrete Repair Industry*
Website: www.icri.org

OCTOBER 23-27, 2022
ACI Concrete Convention
Dallas, TX
Website: www.concrete.org

OCTOBER 25-26, 2022
ICRI Concrete Slab Moisture Testing
Dallas/Ft. Worth, TX Area
Website: www.icri.org

NOVEMBER 7-9, 2022
2022 ICRI Fall Convention
Atlanta, GA
Website: www.icri.org

DECEMBER 7, 2022
ICRI Concrete Surface Repair Technician Live Performance Exam
Dallas, TX
Website: www.icri.org

JANUARY 16-19, 2023
World of Concrete
Las Vegas, NV
Website: www.worldofconcrete.com

JANUARY 31—FEBRUARY 2, 2023
The International Surfaces Event
Las Vegas, NV
Website: www.intlsurfaceevent.com

APRIL 2-6, 2023
ACI Concrete Convention
San Francisco, CA
Website: www.concrete.org

APRIL 17-19, 2023
2022 ICRI Spring Convention
Vancouver, BC, Canada
Website: www.icri.org

INTERESTED IN SEEING YOUR CONCRETE INDUSTRY EVENT OR NEWS LISTED HERE?

Events and News can be emailed to editor@icri.org. Content for the November/December 2022 issue is due by October 1, 2022, and content for the January/February 2022 issue is due by December 1, 2022.

ICRI CONCRETE REPAIR
Restore | Repurpose | Renew

PEOPLEON THEMOVE

JENNA BLANKENSHIP JOINS THE CHEMQUEST GROUP AS DIRECTOR OF MARKETING

The ChemQuest Group—a global consulting firm focused on tailored technology acceleration, market intelligence and business strategy for the specialty chemicals and materials industry—has appointed Jenna Blankenship as Director of Marketing.

Blankenship has over a decade of experience in marketing and communications for the specialty materials industry. She joins The ChemQuest Group from Emerald Kalama Chemical LLC, a company of the LANXESS group, where she served as Communications Lead.

In recent years, Blankenship's focus has been the development of market communications to support the adoption of safer, more sustainable, higher performing chemistries and formulations for consumer products, such as cosmetics, cleaners, fragrance, paints and adhesives. She has also contributed communications expertise to industry associations working to shape the future of these markets and educate end consumers and stakeholders, such as the Household and Commercial Products Association and the Fragrance Creators Association.

In her new role as Director of Marketing, Blankenship will develop and execute The ChemQuest Group's overall marketing communication strategy, in conjunction with the executive team, to support business strategy. This includes activities related to content development, branding, events, media relations and digital marketing. She will also support the development of market intelligence and digital assets, such as the new ChemQuest website and TraQr™ interactive dashboard and forecasting tool.

INDUSTRY NEWS

CONSTRUCTION MATERIALS INDUSTRY FACES OPPORTUNITIES AND CHALLENGES

The Texas Aggregates & Concrete Association (TACA) annual meeting in June highlighted presentations helping companies navigate a complex economic, political and post-pandemic environment.

Michele Stanley, National Stone, Sand & Gravel Association's (NSSGA's) Vice President, Government and Regulatory Affairs noted that there are many opportunities for the Texas aggregates industry and new funding by the Infrastructure Investment and Jobs Act (IIJA) is one of them.

States will have about a 30 percent increase in funding for highway and transportation programs through the $1.2 trillion IIJA, which includes $550 billion in new infrastructure spending above baseline levels. Over the next five years, Texas will receive $31.23 billion in federal highway and transit funds, $1.2 billion for airports and access to $125 billion in competitive grants.

The IIJA will bring enormous opportunities to the Texas aggregates industry. The bill promises vital investment in roads, bridges, trains, broadband access, drinking water and much more. The industry will continue to work closely with regulators, legislators, local communities and all stakeholders to provide the materials Texas needs to achieve its enormous growth.

Rob Mineo, Director, FMI Capital Advisors, added that Texas is an attractive place for population growth meaning a strong demand for construction materials. Despite inflation, increasing interest rates, a looming recession, supply chain disruptions, labor shortages, etc., the construction materials industry is well positioned to weather a potential macro-economic downturn.

INTERESTED IN SEEING YOUR NEWS IN THIS COLUMN?

Email your 150-200 word industry news to editor@icri.org. Content for the November/December 2022 issue is due by October 1, 2022, and content for the January/February 2022 issue is due by December 1, 2022. ICRI reserves the right to edit all submissions.

REGISTRATION OPENS FOR ACI CONCRETE CONVENTION IN DALLAS, TX

Registration is open for the Fall ACI Concrete Convention in Dallas, Texas, USA. Engineers, contractors, researchers, manufacturers, and material representatives will convene on October 23-27, 2022, to collaborate on concrete codes, specifications, and practices. Technical and educational sessions will provide attendees with the latest research, case studies, best practices, and the opportunity to earn Professional Development Hours (PDHs). Select programming will also be available on-demand to attendees who choose to attend virtually.

The ACI Concrete Convention is an opportunity to showcase companies, projects, current events, research, and offers numerous networking events where you can expect to meet with many of the concrete industry's professionals. Attendees may also visit the exhibit hall to learn more about the many products and services offered by exhibitors.

Over 200 industry-leading speakers will present live at the convention, providing substantial opportunity for attendees to advance their concrete knowledge.

Visit www.concrete.org for more information.

CONCRETE INDUSTRY MANAGEMENT PROGRAM'S NATIONAL STEERING COMMITTEE ANNOUNCES NEW BOARD

The National Steering Committee (NSC) for 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—recently announced its new board members beginning July 1.

The new NSC officers include:

- Executive Director—Rex Cottle
- Chairman—Karl H. Watson, President and Chief Executive Officer, 7W Capital
- Vice Chairman—Steven Cox, Vice President—Customer Success, Command Alkon
- Secretary/Treasurer—Nicole R. Maher, Chief Operating Officer, National Ready Mixed Concrete Association (NRMCA)
- Immediate Past Chairman—Mike Schneider, Vice President, Chief People Officer (CPO), Baker Concrete Construction, Inc.

NSC Executive Director Rex Cottle said, "For the last 25 years, the leadership of the concrete industry has embraced and supported the mission of the NSC for CIM of 'advancing the concrete industry by degrees'. Those industry leaders who serve on our board of directors are a testament to their commitment to the continued success of CIM."

Visit www.concretedegree.com for more information.

ACI FOUNDATION NOW ACCEPTING FELLOWSHIP AND SCHOLARSHIP APPLICATIONS

ACI Foundation scholarships are offered to graduate and undergraduate students pursuing a concrete-related degree or program. International students are eligible to apply for all scholarships that are not region specific as defined by the sponsor. Each ACI Foundation scholarship includes an educational stipend of $5,000 USD; and recogni-

tion in *Concrete International* and on the ACI Foundation's website and social media.

The deadline for this application period is November 1, 2022, at 11:59 p.m. EDT. Mandatory internships would occur during the summer of 2023 and the full award cycle covers the 2023 fall semester through the 2024 spring semester. Additional application details are available at acifoundation.org/scholarships.

NEX AND EXXONMOBIL TO COLLABORATE ON ADVANCING NONMETALLIC BUILDING MATERIALS

NEx: An ACI Center of Excellence for Nonmetallic Building Materials is eager to announce ExxonMobil Upstream Integrated Solutions Company and ExxonMobil Chemical Company—a division of ExxonMobil Corporation (hereinafter ExxonMobil) as a Gold Supporting Member. ACI and ExxonMobil organizations will work together to help drive NEx's mission to collaborate globally on the use of nonmetallic building materials to drive research, education, awareness, and adoption.

Over their 135-year history, ExxonMobil has become one of the world's premier energy and chemical companies. ExxonMobil has a commitment parallel to NEx's initiatives as they work to advance and adopt innovative technologies to ensure nonmetallic building materials are as sustainable as they are of high quality.

Through a generous donation as a Gold Supporting Member, ExxonMobil will have a hands-on role in carrying out the core functions of NEx including: Standards and Specifications; Technical Committee Acceleration; Professional Development; Plant Audit/Certification; Research and Development; Advocacy and Technical Support, and more. Funding from Sustaining and Supporting Members for all NEx initiatives is critical to helping the Center achieve its mission.

To learn more about NEx , visit nonmetallic.org.

ACI FOUNDATION'S ANNUAL REQUEST FOR CONCRETE RESEARCH PROPOSALS NOW OPEN

The ACI Foundation's Concrete Research Council seeks to advance the concrete industry through the funding of concrete research projects that further the knowledge and sustainability of concrete materials, construction, and structures.

Proposal and funding parameters include:

- Topics are encouraged from all areas of concrete research.
- Up to $50,000 may be approved per project for direct costs.
- The ACI Foundation limits research organization indirect costs to 15%.
- An ACI Technical Committee must endorse the research concept and participate in an advisory role to the principal investigator.
- An individual researcher can serve as the principal investigator or co-principal investigator on only one submitted proposal.
- Industry partnering, and project cost sharing are strongly encouraged.
- December 1, 2022, submission deadline.

Principal investigators shall follow the requirements in the published RFP Application Guide, including the requirement to contact ACI Technical Committee Chairs by September 1, 2022, to request endorsement of the proposed research.

Selection of awarded projects will occur during the spring ACI Concrete Convention and notifications to principal investigators will occur in the following weeks.

For more information or to apply visit ACIFoundation.org.

SCA ANNOUNCES SLAG CEMENT UNIVERSITY

The Slag Cement Association (SCA) has launched Slag Cement University.

Designed for university professors and students, Slag Cement University is a resource and central repository of educational resources on slag cement use in concrete construction. SCA designed the content with the intent of making it easy for educators to incorporate content into existing civil, construction or materials engineering and construction management college degrees.

This offering will serve to enhance concrete materials instruction with new and exciting slag cement information, projects and tools for use in university courses.

Content was curated and developed by SCA members and staff to provide an overview of the applications, uses, and benefits of slag cement use. Content includes:

- Technical Information Sheets providing an overview of various applications and topics regarding slag cement use in concrete.

- Presentations and Pre-Recorded Webinars provide a well-rounded look at the various applications when using slag cement in concrete.
- SCA-developed Sustainability Tools-industry-wide environmental product declaration (EPD) and a companion carbon reduction calculator for concrete mixtures that incorporate slag cement.

There is also an 80-question exam that provides a testing method for universities to easily measure knowledge related to slag cement. For more information visit www.slagcement.org.

ACI HIRES INDUSTRY EXPERT TO ASSIST CENTERS OF EXCELLENCE

The American Concrete Institute (ACI) has hired Dean A. Frank to develop programs to assist in supporting the use of nonmetallic reinforcement and reducing carbon emissions in the concrete construction industry. Frank will initially be working primarily with NEU: An ACI Center of Excellence for Carbon Neutral Concrete, assisting in the development of assessment, validation, and certification programs as identified by NEU.

Frank joins ACI Staff as a Program Developer and brings extensive experience in sustainability, International Standards Organization (ISO) standards, and certification development of personnel, products, and manufacturing plants. Prior to joining ACI, Frank gained a comprehensive working knowledge of resilience and sustainability as an employee at Wiss, Janney, Elstner Associates Inc., the National Precast Concrete Association, Precast/Prestressed Concrete Institute, and through his consulting company. He also has experience in working in with ISO standards governing the operations of certifying bodies and is a licensed P.E. in Indiana and Colorado.

For more information on ACI Certification, NEU: An ACI Center of Excellence for Carbon Neutral Concrete, or NEx: An ACI Center of Excellence for Nonmetallic Building Materials, please visit ACICertification.org, neuconcrete.org, or nonmetallic.org, respectively.

AMERICAN CONCRETE INSTITUTE PUBLISHES UPDATED GUIDE

The American Concrete Institute has released an updated version of ACI PRC-211.1-22: Selecting Proportions for Normal-Density and High-Density Concrete—Guide. This guide to concrete proportioning provides background information on, and a procedure for, selecting and adjusting concrete mixture proportions. The update is a significant and timely major revision of the guide.

ACI Committee 211–Proportioning Concrete Mixtures has revised the entire guide to include the latest information on supplementary cementitious materials, chemical admixtures, particle packing, and more. Various examples incorporating binary and ternary mixes are provided as well as key mixture proportioning parameters, such as paste-to-void volume factor and cement efficiency factors. ACI PRC-211.1-22 is a convenient one-stop reference that provides novice users with the information needed to perform the outlined procedures.

For more information visit concrete.org.

ICRI**CHAPTER**NEWS

CHAPTER CALENDAR

ICRI Chapters are hosting events in 2022. Check with individual chapters by visiting their chapter pages to determine if they have made any plans after this publication went to print. You can also contact a Chapter Leader from any chapter to ask if they have added an event.

BALTIMORE-WASHINGTON
September 8, 2022
THIRD QUARTER DINNER MEETING
Maggiano's Tysons Corner
Tysons Corner, VA

October 6, 2022
ANNUAL GOLF TOURNAMENT
Waverly Woods Golf Course
Marriottsville, MD

CAROLINAS
October 5-7, 2022
CHAPTER FALL CONFERENCE
Embassy Suites Conference Center
Greenville, SC

CHICAGO
September 22, 2022
CHAPTER DINNER MEETING
Westwood Tavern
Schaumburg, IL

November 17, 2022
CHAPTER DINNER MEETING
Erie Café
Chicago, IL

CINCINNATI
September 21, 2022
CHAPTER GOLF OUTING
Winton Woods, Mill Creek Course
Forest Park, OH

DELAWARE VALLEY
September 9, 2022
ANNUAL CORNHOLE TOURNAMENT
Location: TBD

October 17, 2022
CHAPTER GOLF OUTING
Radly Run Country Club
West Chester, PA

FLORIDA FIRST COAST
August/September 2022
SHORING PRESENTATION
University of North Florida
Jacksonville, FL

October 2022
DEMO DAY
University of North Florida
Jacksonville, FL

November 1, 2022
ANNUAL SPORTING CLAYS EVENT
Jacksonville Sporting Clays
Jacksonville, FL

GREAT PLAINS
September 13, 2022
CHAPTER GOLF TOURNAMENT
Shoal Creek Golf Couse
Kansas City, MO

GULF SOUTH
October 6, 2022
FALL LUNCH MEETING
AGC of Alabama Headquarters
Irondale, AL

INDIANA
September 8, 2022
GOLF OUTING
Plumb Creek Golf Club
Carmel, IN

December 1, 2022
CHAPTER HOLIDAY PARTY
Indiana War Memorial
Indianapolis, IN

MID-SOUTH
September 29-30, 2022
CHAPTER TECHNICAL EVENT
Full Day with Four Presentations
Arlington Hotel
Hot Springs National Park, AR

METRO NEW YORK
September 22, 2022
ANNUAL FALL GOLF CLASSIC XIX
Cedar Hill Golf & Country Club
Livingston, NJ

October 20, 2022
3rd ANNUAL FISP PANEL
Club 101
New York, NY

NEW ENGLAND
September 14, 2022
CHAPTER GOLF OUTING
Shaker Hills Country Club
Harvard, MA

November 1, 2022
TECHNICAL PRESENTATION
Topic: Petrography
Location: TBD

December 6, 2022
CHAPTER HOLIDAY SOCIAL
Location: TBD

NORTHERN OHIO
October 3, 2022
CHAPTER GOLF OUTING & CLAMBAKE
Bunker Hill Golf Course
Medina, OH

VIRGINIA
September 15, 2022
ANNUAL FALL SYMPOSIUM
Colonial Heritage
Williamsburg, VA

October 20, 2022
FALL DEMO DAY
Richmond Primoid Warehouse
Richmond, VA

ICRI**CHAPTER**NEWS

Join your local chapter! Visit www.icri.org

CHAPTER ACTIVITIES

GULF SOUTH HOST JOINT MEETING WITH AMPP

ICRI Gulf South Chapter hosted a joint lunch meeting with the Birmingham Chapter of the Association for Materials Performance and Protection (AMPP). Michael Damiano, AMPP, spoke on AMPP's resources for evaluation, repair, and inspection of concrete structures. About 45 attendees escaped the July heat in the comfort of AGC of Alabama headquarters in Irondale, Alabama.

More than 45 members and guests gathered for the Gulf South meeting with AMPP in July

DELAWARE VALLEY HOSTS CLAY SHOOT

On Friday, June 10, 2022, the Delaware Valley Chapter hosted more than 40 members and guests at its annual Sporting Clay Shoot. Shooters of all ability levels challenged themselves and colleagues at Lehigh Valley Sporting Clays in Coplay, PA. The weather was perfect and the event was a great opportunity for teambuilding and networking. The chapter was especially grateful to the 14 different member companies who stepped up to sponsor the event.

The overall team win went to Squad 1 consisting of Scott Waltman and Roman Prus of Pullman Services, Jason H. of Autonomic Materials, Inc., and Stephen J. Crilly of Soudal USA.

The "Most Honest" award went to Ken DeStefano, PE, of Joseph B. Callaghan, Inc. with a score of (you'll have to ask him). The top overall score of 78 (out of 100 shots) was earned by Roman Prus of Pullman Services! Thank you and congratulations to all the winners!

Smiles in the sunshine as members and guests gather for the afternoon shoot. ICRI Past President Chris Lippmann (left) looks especially happy to be enjoying the day outside

The winning team from Squad 1 stops for a photo op

Roman Prus (front) receiving his prize for top overall score

FLORIDA WEST COAST TECHNICAL SESSION FOCUSES ON SPECIALTY SERVICES

On June 1, 2022, at the Red Mesa Cantina in St. Petersburg, Florida, the Florida West Coast Chapter hosted a technical presentation entitled *Problems and Solutions in Construction Specialty Services*. The program was presented by representatives from Consel, Inc., including Todd Reynolds and Michael L Barczak. They discussed some recent specialty construction projects they have been involved in and the solutions utilized to address the issues presented by those projects.

The presenters discussed issues encountered, special conditions present, and the methods and different materials used in chemical and/or grout injections to address issues such as active water leaks at cracks in concrete walls and slabs of buildings and tunnels; stabilizing soils below a launch pad at Kennedy space station to allow the use of newer, larger equipment like Artemis/Orion Moon Rocket; structural repairs related to concrete structural elements with honeycombing; and finally tunnel boring and water intrusion/flooding of the retrieval pit. A very unique presentation and informative for all those in attendance.

◀ICRI Florida West Coast Chapter President Gary Wasser, introducing the program

Presenter Michael L Barczak beginning the team's presentation ▶

ICRI**CHAPTER**NEWS

CHAPTER ACTIVITIES

FLORIDA WEST COAST HOSTS ANNUAL SOCIAL

The Florida West Coast Chapter hosted its Annual Cigar/Whiskey Social Networking event on Wednesday, June 22, 2022. The chapter was very pleased with the great turnout of 43 friends and guests, as well as the excellent feedback it received from everyone. Plus, it was a great opportunity to promote their upcoming technical event.

The location, Grand Cathedral Cigars, offered an incredible interior as well as a spectacular outdoor space for those who wanted to cool down a bit. The venue provided attendees with a short lesson on cutting and lighting cigars. Everyone was thrilled with the catering from the local food truck, Sandwichi.

The outdoor space at Grand Cathedral Cigars was pretty spectacular

Even the indoor space was unique and inviting

Did we mention the outdoor space?

Food from Sandwichi was a great compliment to the social outing

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ICRI**CHAPTER**NEWS

CHAPTERS COMMITTEE CHAIR'S LETTER

MICHELLE NOBEL
Chapters Chair

So, how did your summer go? It was extremely hot in my neck of the woods and beaches! It's getting harder and harder to stay cool in the summer in Florida. I'm looking forward to the fall and cooler weather. There have been record-breaking hot days in Tampa Bay this summer. The Gulf of Mexico and my swimming pool have been in the mid to high 80s. As the intuitive Ralph Waldo Emerson said, "*Live in the sunshine. Swim in the sea. Drink in the wild air.*" I've done that and more this summer, always trying to find a bit of shade.

Speaking of Fall, we are planning a Chapter Roundtable later in the season, either virtual or in-person—more details to follow.

I'm excited to go to Atlanta for the 2022 ICRI Fall Convention, November 7–9. at the beautiful InterContinental Buckhead Atlanta. The convention runs three days and will be jam-packed with technical sessions, networking, social event opportunities, and committee meeting sessions. I can't wait to find out what the Georgia Chapter has planned and I hope to see you there!

The 2022 ICRI Spring Convention technical sessions are available at ICRI.org in the ICRI 2022 Spring Convention in Review section. So, if you missed it, you still have a chance to see them.

We will have some exciting news from the ICRI International Membership subcommittee at the Fall Convention. There will also be news coming from ICRI Certification and Education. Lots of exciting new things are happening for ICRI! We're expanding our footprint around the world.

Have you looked at the Certification and Education tab on the ICRI website lately? It has information about the CSMT and CSRT programs, webinars, and the ICRI Learning Center.

Did you know that your chapter can receive rebates? Host an event at your chapter; you'll receive rebates if the participant identifies the chapter as the promotional source. These programs have been taking off! Don't miss out on opportunities to earn rebates for your chapter. The program information is on the Certification and Education tab of the ICRI.org website.

Not to sound like a broken record, but the Women in ICRI Committee is looking for like-minded women to join our distinguished group of talented women. We'd love you to join this group of women working in the concrete repair industry. We highlight the accomplishments of women from all around the world. If you want to join this group, please reach out to Tara Toren-Rudisill at TTorenrudisill@ThorntonTomasetti.com, Monica Rourke at MRourke@mapei.com, or me at mnobel@mapei.com.

Dates to mark on your calendar are:

CHAPTERS COMMITTEE CHAIR'S LETTER *(continued)*

- 2022 ACI Concrete Convention—October 23-27, Dallas, Texas
- 2022 ICRI Fall Convention—November 7-9, Baltimore, Maryland
- 2023 World of Concrete—January 16-19, Las Vegas, Nevada
- 2023 The International Surfaces Event—Jan 31-Feb 2, Las Vegas, Nevada
- 2023 ACI Concrete Convention—April 2-6, San Francisco, California
- 2023 ICRI Spring Convention—April 17-19, Vancouver, British Columbia

I'm pleased to see the ICRI website calendar full of events from local chapters! It is a fantastic resource if you travel for your company. You can see what's happening in the area you're visiting. So, please continue to send your scheduled chapter events to Dale Regnier at daler@icri.org for posting on the ICRI website and in the *Concrete Repair Bulletin*. Check out the website's ICRI & Industry Calendar to find out more: https://www.icri.org/events/event_list.asp

If you need anything, don't hesitate to reach out to the Executive Committee, your Region and At-Large Directors, your chapter leaders, or ICRI staff. We are all here to work together to enhance this great organization.

Please travel safe, be kind, and I will see you all in Atlanta or Philadelphia!

Sincerely,

Michelle Nobel, ICRI Chapters Committee Chair
MAPEI Corporation

INTERESTED IN SEEING YOUR CHAPTER NEWS & EVENTS LISTED HERE?

Chapter News & Event Deadlines

NOVEMBER/DECEMBER 2022 CRB
Deadline: September 10, 2022

JANUARY/FEBRUARY 2022 CRB
Deadline: November 10, 2022

Send Chapter News and Event dates by the deadlines above to Program Manager Dale Regnier at daler@icri.org.

ICRI
CONCRETE REPAIR
CHAPTERS

ICRI has 39 chapters, including two student chapters, in metropolitan areas around the world. Chapters hold technical presentations, educational meetings, symposia, and local conventions on repair-related topics.

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

PRODUCTINNOVATION

ADVANCING ORGANIZATIONAL EXCELLENCE (AOE) ANNOUNCES:

AOE Recipient of Four Industry Awards in 2022

AOE,a full-service consulting firm with unique expertise serving professional service and technical industries, has announced that they have received four industry awards in 2022:

- The Academy of Interactive & Visual Arts (AIVA) Communicator Award of Excellence, received for Coalition for Responsible Roads.
- Hermes Creative Platinum-Level Award, received for the Coalition for Responsible Roads campaign.
- Hermes Creative Honorable Mention, received for the Concrete Industry Management (CIM) Auction.
- AVA Digital Platinum Award, received for the Coalition for Responsible Roads campaign.

AOE Announces Expanded Sustainability Services and Staff Credentials

AOE announces Kari Moosmann, Director of Sustainability Communications, has earned designation as an Envision Sustainability Professional (ENV SP).

Credentialing as an ENV SP is part of the Envision Framework, a globally recognized and highly credible approach to creating sustainable, resilient and equitable civil infrastructure. The framework and its certification program, which focus on education, training, and third-party project verification, are administered by the Institute for Sustainable Infrastructure. ENV SP candidates are required to complete the official ENV SP training course, covering topics such as quality of life, leadership, resource allocation, the natural world, climate and resilience, and applying Envision to infrastructure projects.

In addition to serving as AOE's Director of Sustainability Communications, Moosmann is also Director of Marketing for NEU, an ACI Center of Excellence for Carbon Neutral Concrete – one of AOE's clients.

For more information visit www.aoeteam.com.

NO SANDBLASTING ALLOWED? TRY CORRVERTER® FOR RUSTY SURFACE PREP

Sandblasting, water blasting, and labor-intensive grinding are common methods of restoration and surface prep for rusty metal parts or structures. However, these techniques are sometimes prohibited or not preferred for a variety of reasons. To address this need, Cortec® offers an easy but effective surface prep alternative to abrasive blasting or grinding in the form of CorrVerter® Rust Converter Primer.

CorrVerter® is a fast-drying, water-based one-component primer for rusty surfaces. It contains a unique formulation of chelating agents combined with a high solids waterborne latex that has extremely low water vapor permeability. The combination of these materials converts surface rust into a hydrophobic passive layer, creating a specialty primer with excellent protection against re-rusting of metal surfaces.

GENERAL EQUIPMENT COMPANY OFFERS BITTYBREAKER™ MANUAL IMPACT BREAKER

General Equipment Company's model 102 BITTYBREAKER™ is a manual impact breaker/tamper designed to provide a simple, inexpensive alternative to jackhammers, sledgehammers, pick axes and other tools. Compatible with a multitude of industry-standard jackhammer tools, the hand-held BITTYBREAKER offers a powerful impact energy to effectively break concrete or frozen ground, cut asphalt, tamp dirt, chop roots, or remove ceramic tiles and brick pavers.

Featuring a lightweight, thin barrel design, the BITTYBREAKER weighs only 21 pounds (9.5 kg) and has a Posi-Grip handle for safe, comfortable operation. The internal piston and barrel are constructed of solid steel, helping the tool produce an impressive force of up to 1,450 foot-pounds (1,966 N.m.) of energy per blow. An operator can typically complete 10 to 20 blows per minute, depending on the rate of work. A spring-assist tool retainer is included to help prevent damage in the event of a dry fire.

To help it perform a wide variety of jobs, the BITTYBREAKER accepts tools that have a 1.125-inch (28.8 mm) hex shank, including those from competitive manufacturers. An integral tool retention system on the unit helps prevent the tools from falling out during use.

For more inofrmation visit www.generalequip.com.

USING MCI® TO ENHANCE SUSTAINABILITY OF CONCRETE OIL AND GAS STRUCTURES

MCI® Technology extends concrete service life by mitigating corrosion on embedded reinforcing metal.

The best time to apply MCI® is as a concrete admixture (MCI®-2005 or MCI®-2005 NS) in new cast-in-place structures or precast concrete elements. MCI® molecules form a protective layer on the surface of the reinforcing metal that delays time to corrosion and reduces corrosion rates once started. However, even existing structures can benefit from MCI®. CorrVerter® MCI® Rust Primer is an excellent option for prepping exposed rusted rebar during concrete repairs. Surface applied corrosion inhibitors (SACI) such as MCI®– 2019 (MCI® + water repellent) or MCI®-2020 (MCI® only) are excellent additions to enhance the lifetime of the repair or to apply simply for periodic maintenance on oil and gas structures. These MCI® SACIs migrate through the concrete pores to reach and protect embedded reinforcement. MCI®-2061 is a complementary biological-based cleaner that uses biodegradable surfactants and microorganisms to remove oil stains before the application of a SACI, a coating, or a membrane system..

For more information visit https://www.cortecmci.com/contact-us/.

V2 COMPOSITES INTRODUCES THE NEXT GENERATION T-BISCUIT®

V2 Composites, introduces the new and improved T-Biscuit, a premier product and go-to solution for the repair of failed shear connections in concrete parking structures.

PRODUCTINNOVATION

V2's proprietary carbon fiber T-Biscuit has proven to be the simplest and most economical solution on the market today to repair failed flange-to-flange shear connectors of pre-cast double tee beams, which often fail as a result of fatigue and/or corrosion.

Understanding the additional specifications dictated by the newer, thinner, and wider double tee beam designs, company engineers consulted with V2 customers to ensure the redesigned T-Biscuit met the new requirements and was more user-friendly for installers. The New and Improved T-Biscuit:

- Meets or exceeds precast concrete code requirements published by ACI and PCI.
- Increases in-plane bending capacity by 330% over the previous product.
- Closely mirrors the joint deflection characteristics of a standard welded connection.
- Significantly reduces stress in the tee flange during reverse bending and in-plane movements resulting from thermal volume change.
- Sports a new geometry that allows for the installation in all currently produced double tee beam thicknesses, and accommodates a deeper depression for the backer rod and joint sealant.

For more information visit https://www.v2composites.com.

INTERESTED IN SEEING YOUR NEW PRODUCT IN THIS COLUMN?

Email your 150-200 word news to editor@icri.org. Content for the November/December 2022 issue is due by October 1, 2022, and content for the January/February 2023 issue is due by December 1, 2022. One (1) high resolution product photo may be included. ICRI reserves the right to edit all submissions.

NEWMEMBERS

SUPPORTING MEMBERS

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Fuquay Varina, North Carolina
United States
John McDougall

COMPANY MEMBERS

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Seattle, Washington
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Jay McDaniel

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United States
Mariann Gerwig

Roofing & Exterior Products Services
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United States
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The Sherwin Williams Company
Dacula, Georgia
United States

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Kansas City, Kansas
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Ethan Mazzola
Concrete Protection & Restoration, Inc.
Baltimore, Maryland
United States

Chris McMahan
Roofing & Exterior Products Services
Malvern, Ohio
United States

Jeremiah Mosley
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Meagan Sanchez
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New York, New York
United States

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United States

Bars Turbold
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Baltimore, Maryland
United States

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San Nicolas de los Garza, Nuevo Leon
Mexico

Ivan De la Cruz
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San Nicolas de los Garza, Nuevo Leon
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Francisco Rene Vazquezleal
Monterrey, Nuevo Leon
Mexico

Robert Warren
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Szymon Zienkiewicz
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INTERNATIONAL CONCRETE REPAIR INSTITUTE
1000 Westgate Drive, Suite 252
St. Paul, Minnesota 55114
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