January/February 2021
Vol. 34, No. 1

CRB

CONCRETE REPAIR BULLETIN

2021 ICRI President Elena Kessi

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ON THE COVER: 2021 ICRI President Elena Kessi.

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DEPARTMENTS

NOTE FROM THE EDITOR

Welcome to 2021. The concrete repair industry is entering a new year and is still changing with the times. COVID-19 remains a concern around the world, but we now have several vaccines available and the light is at the end of the tunnel. ICRI is continuing to roll out new and updated programs this year.

ICRI will continue with its virtual format for the 2021 Spring Convention and hopefully we will be able to get together for the 2021 Fall Convention. Chapters are continuing to hold virtual meetings to provide their members with education and to stay in touch. Please continue to send your ICRI chapter events and updates to Dale Regnier.

This *Concrete Repair Bulletin* contains: a message from 2021 ICRI President Elena Kessi and articles on Façade Inspection and Ordinances; Façade Inspection Comparative Study; Design and Load Testing of Façade Access Equipment; and Evaluation of Portland Cement-based Plaster on Concrete and Masonry Substrates. This issue also contains an introduction to ICRI Technical Guideline No. 510.2-2019—*Guide for Use of Penetrating Surface Applied Corrosion Inhibitors for Corrosion Mitigations of Reinforced Concrete Structures.*

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

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

PRESIDENT'S MESSAGE

#myICRIstory

ELENA KESSI

While writing this, my first message as ICRI President, I can't help but both reflect on the unprecedented events of 2020 and focus on the positive future that I know is on the horizon.

Amid the hardships we've faced this year, I am encouraged by the perseverance I saw all around me. Dedicated ICRI members and staff came together to adapt to our new "normal" and not just maintain our organization, but help it grow and even thrive. I especially want to thank my predecessor, Mark LeMay. His passionate determination to stay positive was the beacon of light always leading us ahead. As I step into the role of ICRI president I am excited by the opportunities I see and humbled by your support and confidence in my nomination.

Looking back to when I first joined the organization over 15 years ago, I never imagined myself in this position. Now that I am here, I am excited to be part of the team that made ICRI what it is today. We are *the* industry leader for concrete repair. And this is due to the nearly 2,500 members who make up ICRI and dedicate their time and talents to our amazing organization.

One of my goals as ICRI President is to shine a spotlight on all the great work our members are doing and show those interested in joining us who we are and why they should get involved! As you flip through this edition of the CRB, look for the new *Women in ICRI* section and keep an eye out on LinkedIn as we launch a campaign to feature our dedicated Technical and Administrative Committee Chairs as well as authors of ICRI Technical Offerings.

Everyone has a story about how they got involved in this awesome industry and the great professional organization we call home, and I'd love to share mine with you.

Starting in sales, I was told to attend local chapter meetings for all the various industry organizations to network and get to know people. So that's what I did, and I'll tell you most of the meetings were pretty intimidating!

I was young and didn't know much about concrete repair or construction. Of all the different meetings I attended, it was my first ICRI meeting where I truly felt welcomed from the moment I stepped through the door.

When I first got there, John Crowley—then president of the Metro New York Chapter—walked right up to me and introduced himself. I told him I was new and wanted to get involved. He invited me to an upcoming board meeting, and before I

knew it, I was volunteering with chapter meetings and making all kinds of new connections. I soon became a board member and eventually served as the local chapter president. As my involvement in the local chapter grew, I became interested in the national organization. I was lucky enough to have the local chapter sponsor part of my trip as a chapter representative to the national convention. When I got to my first convention, I again felt immediately welcomed and was able to get involved in both administrative and technical committees.

The more I got involved, the more I made new connections. I really began looking forward to attending national conventions because I was not only learning about concrete repair and making valuable business connections, I was meeting up with people I began calling my friends—it didn't even matter if we worked for competitors. When you walk into an ICRI meeting or event, everyone is there to make the industry a better place and to be helpful. In fact, some of the people I consider to be my closest friends today are those so-called "competitors" I met at ICRI events. Don't get me wrong, we still compete on a day-to-day basis when it comes to business, but when we walk into an ICRI meeting, we leave that part of the day outside the door and focus on making our industry the best it can be.

ICRI members have become my go-to "Rolodex" for advice and guidance. (Some of you may be too young to know what a "Rolodex" is, so you'll have to Google it!) Last year when the COVID-19 pandemic made it difficult for small businesses to source certain types of PPE, for example, I reached out to other ICRI members to pool buying power so we could get cloth face masks at an affordable price. When I come across a new situation on a jobsite that I am unfamiliar with, I know I can call a fellow ICRI member who specializes in exactly that situation.

Now it's your turn! If you are new to ICRI or have never participated on a national committee, I encourage you to get involved today. All ICRI national committees are using Zoom to meet virtually so you do not have to attend a convention to contribute to a committee.

We are always looking for new volunteers and we need your expertise! If you haven't met your local chapter, reach out to a local chapter leader today. I know you will be welcomed. I want to meet you and hear your ***#myICRIstory***. Please share your story on social media or email me at elena@aquafin.net. I look forward to hearing from you and I look forward to a great 2021!

Sincerely,

Elena Kessi
2021 ICRI President

ICRI Mission and Strategic Plan Benefit Members and the Industry

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

- Develop industry professionals
- Professional networks
- Champion innovation and safety

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

- Expand certification
- Quality programs and products
- Enhanced product program services

ICRI 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.

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.

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

- Engage members
- Strengthen chapters
- Grow staff capacity and capabilities
- Serve members

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

- Strengthen strategic partnerships
- Strengthen brand
- Engagement of diverse participants

TACTALK

MARK NELSON

THE VALUE OF TECHNICAL COMMITTEE VIDEO CALLS

Welcome 2021. We are all happy to leave 2020 behind and move forward to a new year. However, let's not forget that the shutdown led to a substantial and positive change in the ICRI Technical Committee meeting format. We found out that most of our Technical Committee work can (and should) be accomplished over virtual calls. Last year, our technical committee chairs discovered how much work can get done by scheduling consistent video conference calls between conventions. As a result, a main ICRI TAC focus for 2021 and beyond will be to utilize these video calls to become more efficient in our committee work while also using this vehicle to attract productive technical committee members who ordinarily are unable to attend the physical conventions.

TAC GOALS FOR 2021

In addition to promoting the use of video technical committee meetings, ICRI TAC has four specific goals for making the ICRI technical committees better in 2021:

1. *Universal Technical Committee Calendar*—Through the help and support of TAC Secretary Dale Regnier, ICRI will establish an easy-to-find and easy-to-use calendar on the ICRI website that will list all of the upcoming technical committee meetings.
2. *Chair Training Program*—ICRI TAC will create and implement a Technical Committee Chair Training Program to train and support Technical Committee Chairs in managing their committees as well as with running their individual committee meetings.
3. *Recognize and Promote Technical Committee Leaders*—ICRI will find additional ways to recognize and promote members who give so much time to supporting our technical committees.
4. *Five New Active Committee Members for Each Committee*—ICRI technical committee chairs will be tasked with adding five new members to each of their committees by the end of 2021.

In the next four TAC Talk articles, I will explain our progression in achieving these goals during the course of 2021.

WELCOME NEW TAC MEMBERS

I would like to welcome two new members to ICRI TAC this year:

LIYING JIANG
Jensen Hughes

MARK DeSTEFANO
DeStefano Engineering

Both Liying and Mark have committed to ICRI TAC for the next three years. They have contributed to ICRI technical committees for many years and each is a repair industry leader and expert. Thank you both for committing to improving the ICRI technical committees and the repair industry.

ICRI committees are open to all and they are looking for your involvement. Lend your expertise and help improve the industry!

ATTEND A TECHNICAL COMMITTEE MEETING

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

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

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

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

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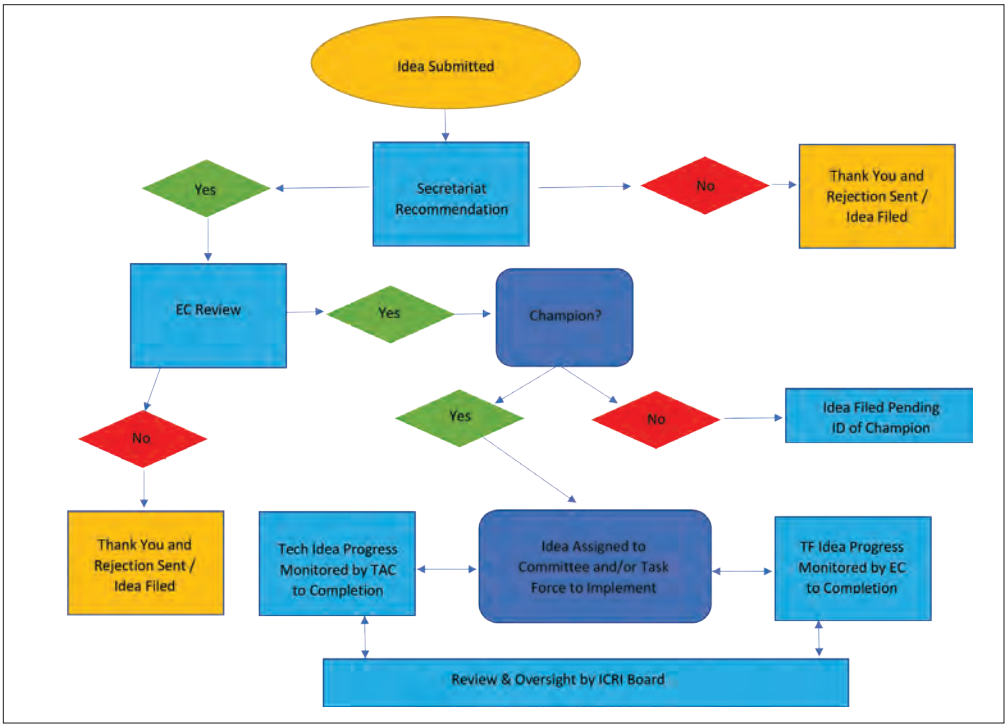
SECRETARIAT UPDATE

RICK EDELSON

In 2017 I wrote, "Buckle up and hold on to your hat. ICRI is on the move." Then I introduced the Secretariat. Now, in 2021, buckle up again and hold that hat—ICRI and the Secretariat are on the move.

The Secretariat has consisted of four individuals each serving a four-year term and have been responsible for reviewing, assigning, and monitoring each idea submitted through the ICRI website (77 total ideas submitted since 2016).

With the advent of a new tracking system authored by TAC Secretary Dale Regnier, technical ideas that are being worked on by the Technical Committees will now be monitored and followed by TAC. Any other ideas that are not technical in nature will be undertaken by a Task Group led by an Idea Champion monitored by the Executive Committee. The Secretariat will again be the think tank originally planned and all ideas will be heard by the Executives of ICRI. The main impetus behind this change is the fact that the Executive Committee (EC) tends to have the most comprehensive and complete view of the total bandwidth of the organization, from both a financial and volunteer standpoint. The EC also understands that in order for a new idea to move forward, there has to be a main driver—i.e., an Idea Champion—willing to lead the new initiative to fruition. Refer to the flow chart below.



Now the upgrade. Secretariat membership will be open to anyone interested in working to take ICRI to new heights. Each term is only two years and all meetings will be held virtually. Even the meetings held at conventions will be virtual for those members not attending the convention, i.e., convention attendance is not required. So, anyone, anywhere can participate. Our Executive Committee will also be involved, with the ICRI President-Elect serving as the chair and the ICRI Vice President serving as the vice-chair. The current Secretariat members are excited to stay on as mentors, and we hope that young members, such as ICRI's inaugural group of 40 Under 40 award winners, may be interested in working with the Secretariat.

New ideas of a technical nature will still be assigned to technical committees, assuming there is adequate bandwidth to handle the new initiative. New non-technical ideas that have an Idea Champion identified and are deemed appropriate by the Executive Committee may also proceed forward via a Task Group comprised of interested volunteer members.

Interested? We want ***you!*** Grab your hat, take the helm, and let's go. To volunteer as a member of the Secretariat, just go to the Volunteer Job Board and sign on to be considered!

Rick Edelson *is a member of the ICRI Secretariat and a past President of ICRI.*

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Façade Inspection and Ordinances

by Jason Coleman and Matthew Mowrer

Fig. 1: Engineer performing façade inspection using industrial rope access

Building façades require investigation for a number of reasons—including to evaluate the condition of a façade that is showing visible signs of deterioration, to comply with a city ordinance, to investigate a known problem that may include leaks, or to improve the building for a modification or change in use. The selection of individuals who perform these investigations and the techniques used are critical for owners, developers, and property managers who use the investigation results to make decisions for repair, reconstruction, and possibly demolition. Engineers, architects, and in some instances, contractors typically perform façade inspections. The investigator and methods used are crucial to conveying accurate and correct opinions on the condition of the façade and/or specific elements. Cities like New York City are requiring façade inspectors to have a specialized certification—QEWI (Qualified Exterior Wall Inspector)—where they demonstrate the specialized knowledge unique to building façades to ensure that people who perform these inspections are conducting them with an appropriate standard of care.

A newly designed building façade may have components specified across as many as 30 various specification sections. Simultaneously, there may be more than 15 different trades that are responsible for its construction. The coordination of those trades, materials, and quality of installation is strategic to the construction, sustainability, and performance of the façade. In addition, the construction will be completed in an era utilizing computerized modeling, aggressive schedules, and competitive bidding. For aging and historic structures, the original design documents are likely no longer available. Building construction varies significantly; from some of our oldest mass masonry bearing wall construction types and materials, to steel supported terra cotta that blossomed early in the 20th century, to the transition to cavity wall and curtain wall construction. For these reasons, building façade construction is diverse and performing a façade inspection is becoming a more challenging task. The individual or team performing the façade inspection must have an in-depth knowledge of façade construction, materials, and inspection techniques. Façade

deficiencies can be complex and it's up to those performing the inspection to understand visible signs on the surface as well as other patterns and signs that may be concealing a more severe defect or deficiency that is not visible.

FAÇADE INSPECTION METHODS

For nearly all façade inspections, access is both costly and a substantial challenge. There are many methods to access a façade, including ladders, aerial lifts, swing stages, house rig, and industrial rope access. A swing-stage scaffold or house rig is ideal if exploratory probes have to be performed for a high-rise building. Industrial rope access may be the best method for a high-rise or building with unusual geometry as it allows an inspector to get access to an area that may be challenging to reach (Fig. 1). An aerial lift is a great method for conducting investigations in rural areas on buildings with long façades. An aerial lift can provide a means for the inspector to get up close to large quantities of the façade (Fig. 2).

All of these access methods also have their limitations. For instance, a swing-stage scaffold (Fig. 3) requires counterweights and may take several days to relocate, while an aerial lift is sensitive to the topography and likely requires permitting in urban environments. Rope access limits the tools the inspector can use. An experienced investigator will provide the most benefit to an owner as they will be able to select the most efficient access while inspecting the appropriate area of façade, and are familiar with façade construction methods, materials, and common problem locations such as projecting finials, corroding lintels, anchor locations, ornamental collar and belt courses, etc.

Another important challenge a façade inspector faces is the inspection method (visual versus physical or tactile methods) and the tools required. Façade inspections that are being performed prior to a building or façade rehabilitation, or façades with readily visible deficiencies, often require exploratory probes to allow for assessment of concealed items (Fig. 4). It is the inspector's obligation to select an appropriate quantity of façade wall area and include a representative sample of the façade elements for their client.

Recent innovations in technology are providing façade inspectors with more options for investigation, including the use of laser scan equipment and drones. Laser scan equipment and software can replicate building façades when existing drawings are not available. They can pinpoint cracks and damages and the sizes of the damage. The generated drawings and deficiency locations can be valuable for developing a repair program. Drones are a great tool for getting up-close visual surveys and photographs of areas that are difficult to see otherwise, especially on skyscraper and taller structures. Both laser scan equipment and drones are great solutions to aid inspectors for challenging access. However, both tools give only visuals and do not provide the same level of detail as a

Fig. 2: Aerial lift used to access long or isolated sections of walls

Fig. 3: Swing-stage scaffold erected for façade inspection

physical or tactile inspection that is required on many façade elements. In sedimentary rocks such as sandstone, limestone, and brownstone, dark bedding planes can be mistaken for cracks. Performing only a visual investigation of a concrete crack can be problematic as it may not allow the inspector to properly identify the fracture plane. This could lead to a portion of the concrete breaking free (Fig. 5). Hands-on sounding of deteriorated concrete can identify the full delamination perimeter and depth. It will also allow the inspector to identify the section loss due to corrosion of the embedded reinforcing steel.

FAÇADE INSPECTION PUBLICATIONS

There are a number of standards, guidelines, and publications regarding façade inspection to aid and educate façade inspectors on methods and procedures. ASTM International currently has two standards specifically dedicated to assessing building façades: ASTM E2270[1], *Standard Practice for Periodic Inspection of Building Façades for Unsafe Conditions* and ASTM E2841[2], *Standard Guide for Conducting Inspections of Building Façades for Unsafe Conditions*. There are also other relevant ASTM documents such as those related to accessing façades and recording façade conditions. Although ASTM is a standards committee, individual trade, industry, and material-based organizations also publish documents that assist a façade inspector, including ICRI 410.1[3], *Guide for the Evaluation of Masonry Façade Structures*, ASCE/SEI 30[4], *Guideline for Condition Assessment of the Building Envelope*, and TMS-1700[5], *Guide for Condition Assessment of Masonry Façades*. Understanding a façade system components, materials, and construction prior to visiting the site will significantly enhance the assessment and help in determining the true condition of the façade.

Fig. 4: Corroded shelf angle exposed during exploratory probe

Fig. 5: Delaminated concrete with potential to break free from façade

INSPECTOR QUALIFICATIONS

The inspector is responsible for performing an appropriate level of inspection and determining if a general inspection is adequate, if a more detailed one is required, and if testing is required to accomplish the goals of their client. The inspector should have prior training and education specific to façade construction, façade repairs, and façade design so they can properly identify, evaluate, and recommend repairs and improvements when warranted. ASTM E2270 notes that the qualified professional who seals the report shall oversee all of the work of the qualified inspector and the inspection process. For city ordinance inspections, a licensed architect or engineer is responsible for directing and overseeing the façade inspection. New York City recently increased the requirements for a QEWI in 2020 as part of their continued development of their Façade Inspection and Safety Program.

ORDINANCE INSPECTIONS

There are currently 13 cities across the United States that have local ordinances requiring building owners to have their façades inspected during regular cycle periods, typically every 5 years. Unfortunately, most of these cities enacted these ordinances after deaths were caused by failing façades. New York City currently has the longest continuous façade ordinance, dating back to 1980, enacted following the death of Grace Gold in 1978. Philadelphia enacted their façade ordinance in 2010, nearly 13 years after Beral Caesar, a local judge, was killed in 1997 when portions of a parking garage fell. Cincinnati has one of the newest façade ordinances, it became effective in 2016. These ordinances are excellent methods to increase the protection and safety of the public. We have performed façade ordinance inspections in multiple cities and it is apparent that there are wide-ranging criteria in these ordinances regarding the required knowledge and activity of the inspector, the area or quantity of wall that shall be inspected, the building façades that have to be inspected, the height of which building façades require inspections, the gateway or minimum techniques used for the inspection, and classification of the façade by the inspector.

Wall or Inspected Area

Each city's ordinance has individual requirements defining the minimum representative wall area or quantity of wall to be inspected. The ordinances also vary on which walls must be inspected; for example, walls facing a public right-of-way or each building façade. Some ordinances will state a minimum spacing between up-close inspections for the

full height. ASTM E2270 provides a table based on the façade material, the age of the façade, the façade inspection level, and then the category. This table is to be used by the inspector as a guide and recommends a minimum of 25% of all façade elevations. Of the numerous professional standards available for performing façade inspections, ASTM E2270 is the only document that provides a criteria and percentage. The city with the most stringent criteria is likely New York City, which recently revised this portion of their ordinance to include a max 60 ft (18 m) spacing between inspection drops and requires an inspection of cavity wall anchors (as a result of numerous wall tie failures). Some cities, like Boston, do not require a minimum area of wall to be inspected. In Boston for building façades under 125 ft (38 m) in height, the inspector does not have to perform a physical assessment. Frequently, the owner will rely on the design professional performing the assessment to select the elevations and amount of wall area to be inspected. NYC now requires the QEWI to visit the site and direct the inspection following poor practices of inspectors. Clearly defined minimum standards of care not only make bidding more competitive but implement stricter regulations to continue making the safety of the public paramount.

Classification Variances

Most city ordinances require the inspector to classify the building based on three common classifications: Safe, Safe with Repairs, or Unsafe. Although the classifications and category names may differ slightly, these three classifications attempt to provide an owner with a clear understanding of the condition of the façade—and more importantly, how it affects the safety of the public. Prior to filing with a city, it is important to provide the owner with the definitions of the classifications not just for the current condition of the building, but also for the next assessment. New York City has a safe with repair classification labeled "Safe with a Repair and Maintenance Program." An owner may read that description and interpret it to mean the building is safe for now and should perform some repairs in the future. However, the NYC ordinance states that if any repairs recommended to be completed prior to the next inspection are not performed, the building becomes unsafe. Buildings classified as unsafe can lead to fines and stop work orders on the building. Detroit does not have a set classification for the building, only a directive that the report shall "set forth the true condition of the wall."

STRUCTURAL VERSUS NONSTRUCTURAL COMPONENTS

One of the most important aspects of a façade inspection is understanding the façade construction and detailing. Reviewing both the original and previous repair documents when available is valuable for providing this information to the inspector. However, as noted earlier, those documents are frequently unavailable. Therefore, the inspector must determine and evaluate if components are properly supported and anchored as designed. For older structures, the façade may be a load-bearing masonry wall and the façade deficiency may be problematic for both the façade and for the structural stability of the building. For transitional façade construction, large terra cotta may not be a structural load supporting element for the overall structure; but the size of the unit, the steel support system, and the anchorage may need to be evaluated for the capability of supporting the intended load (Fig. 6). In contemporary cavity wall construction, the inspector must evaluate the thermal performance, watertightness, anchors, and joints

Fig. 6: Terra cotta removed exposing corroded steel support system

Fig. 7: Sealant pushed out of joint due to thermal movement of brick

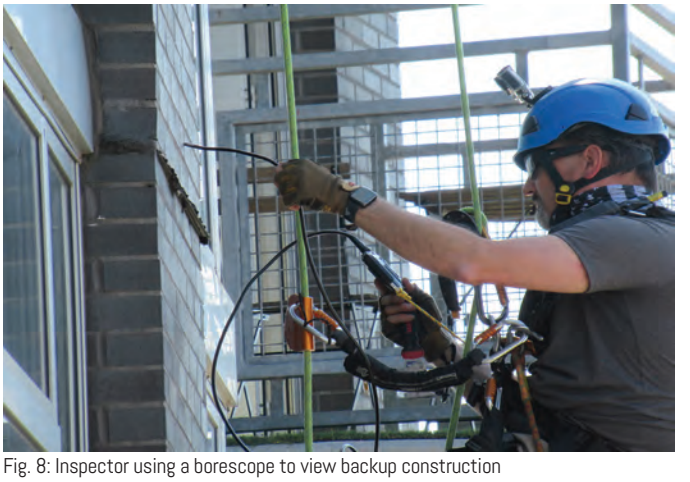

Fig. 8: Inspector using a borescope to view backup construction

of the masonry, which are typically non-structural components (Fig. 7). The corrosion or loss of masonry veneer anchors can be very problematic when the façade experiences positive and negative wind forces (Fig. 8).

CONCLUSION

Owners, property managers, developers, and other stakeholders that request façade inspections are looking to do more with less. Building façades are becoming more complex and the inspection of façades is only learned through experience while working with others. The competitive environment of construction is resulting in the development of numerous innovations, and façade inspectors must balance the appropriate level of care while staying cost competitive. It is strongly encouraged that licensed design professionals such as engineers and architects review the building history prior to performing the inspection, review the industry standards and guidelines, and perform the inspection with the highest standard of care to protect the public while providing the best service for their client.

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5. TMS-1700, *Guide for Condition Assessment of Masonry Façades*, The Masonry Society, Longmont, CO, 2017.

Jason Coleman, PE, CDT, is Director of Restoration/Project Executive at O'Donnell & Naccarato Structural Engineers with more than 20 years of experience as a practicing structural engineer. His engineering expertise includes condition assessments and rehabilitation design of several high-profile historic façades and parking structure projects. As a SPRAT Certified Rope Access Lead Technician, he can often be found rappelling from a skyscraper or local landmark. Jason is the past president of the ICRI Delaware Valley Chapter, is the chair of ICRI Technical Committee 410, is a member of the ICRI Board of Directors, and a voting member of ASTM E06.55 Performance of Building Enclosures.

Matthew Mowrer, PE, is Project Executive at O'Donnell & Naccarato Structural Engineers with more than 15 years of experience. He received his B.S. degree in Civil Engineering from Drexel University. His engineering expertise includes condition assessments and rehabilitation design of façades and parking structures. He is also a SPRAT Certified Rope Access Technician, with over 400 hours of rope access inspections. Matt is past president of the ICRI Delaware Valley Chapter, and a voting member of ASTM E06.55 Performance of Building Enclosures.

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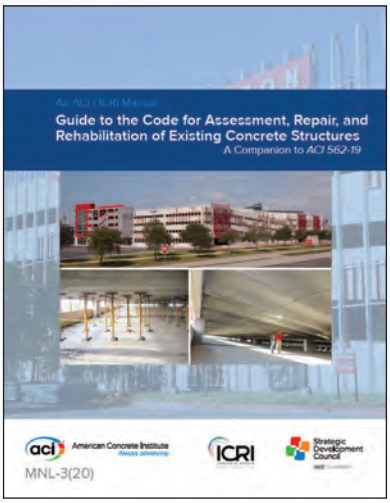
New ACI/ICRI Guide to the Code for Assessment, Repair, and Rehabilitation of Existing Concrete Structures



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

This updated guide features 3 main components:

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

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

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

Façade Inspection Comparative Study: Binocular, Close-up, and AI-assisted

by Katarzyna Burzynska, Nur Sila Gulgec, Ken Maschke, and Badri Hiriyur

Fig. 1: Centrepoint East North Building

Fig. 2: Centrepoint East South Building

The Centrepoint East buildings are two residential mid-century modern high-rises in Toronto, Canada, recognized as examples of brutalist architecture by the Architectural Conservancy Ontario (ACO), although not currently listed as historic buildings. Alongside an effort to upgrade the energy efficiency of the buildings, numerous unsafe spalls and cracks were observed on the concrete façades, leading to the opportunity to use an artificial intelligence-based screening tool, combined with a binocular and close-up inspection, to understand the extent of the conditions.

The taller North (Fig. 1) and shorter South Building (Fig. 2) of the Centrepoint East complex were designed by Ryan and Lee Architects and built in 1974. Connected by a concrete park with welded bronze sculptures by Krystyna Sadowska (1967), the buildings are a statement of the architects' attempt to follow Le Corbusier's Five Points of Architecture within the economic restraints they faced.

The building façades typically comprise architecturally exposed concrete, masonry knee walls, and ribbon windows. Each unit has a balcony, consisting of an extension of the concrete floor plate and concrete fin walls on the sides. As part of thermal efficiency improvements to the buildings, the façades were to receive overcladding at the brick knee walls and associated concrete slabs. However, prior to the alteration, the concrete façades needed to undergo a comprehensive examination and restoration program. The envelope renewal program included concrete and crack repairs to the concrete façades, balcony slabs, parapets, roof ornamentation, and a protective coating at the repaired exterior walls.

To determine the quantities of cracks and spalls, an initial binocular inspection of all areas of the façades was performed. The conditions were documented with photos using a hand-held digital camera. Multiple instances of concrete spalls, cracks and exposed rebar were observed, which necessitated further investigation via hands-on inspection from a suspended scaffold.

FAÇADE INSPECTION STUDY

As capable image-based sensing systems become more abundant and artificial intelligence techniques become more advanced, they provide an opportunity to collect high resolution images and make smart predictions on these images. Compared to traditional façade inspections, AI-assisted façade inspection promises increased inspection flexibility and efficiency, while reducing human error and inspection time. In order to confirm the observations and quantities, an AI-based application was used to perform a comparative study of efficiency between conventional and AI-assisted façade surveys.

The aim of the study was to evaluate both conventional and AI-assisted façade inspections and identify the most efficient and accurate way of façade inspection, data collection and evaluation, considering the following factors:

- Ease of calculating accurate quantities for future pricing of repair work; and
- Involvement of inspection staff and the corresponding time and cost.

Methodology

The study compared results of three types of visual façade inspections: binocular inspection and close-up inspection from scaffolds, which were analyzed manually, and AI-assisted inspection, performed on photographs collected during the close-up inspection, analyzed by an AI-based application.

Binocular

Visual examination of all viewable façades was performed from the street and backyard, using 8x zoom binoculars. Observations were manually marked on elevation drawing printouts, and then transferred into Building Information Modeling (BIM) in further phases of the project.

Visual Close-up

Visual close-up inspections were performed on the entire façade via 52 suspended scaffold drops and manually marked on elevation drawing printouts. The time specified for this survey was one hour per scaffold drop for each employee, not including commute time.

AI-assisted

The application utilized in this test used computer vision—a narrow form of artificial intelligence built with deep learning—to automatically detect and localize façade deterioration by analyzing photographic images or drone footage. It can be deployed as a mobile app or via a web-based interface.

The app used deep convolution neural networks for image classification and object detection built on frameworks for machine learning. It was trained extensively on project images collected over many years of building investigations and repairs. Under its hood, it consists of multiple modules to enhance detections including:

- A structural segmentation tool that identifies the structure relative to its background;
- A proximity classifier that determines if the image is taken at a close-in or a wide-angle range;
- A material classifier that identifies the type of substrate material; and
- Multiple damage detection models for different substrate materials (these material-specific damage detection models can identify various damage condition types across different material substrates, such as cracks and spalls for concrete structures required in this survey).

Dataset

The datasets were tested using a concrete-specific machine learning model trained on thousands of images showing concrete conditions. Images used for the AI test were collected during the close-up inspection described below.

The selected datasets (drops A, B and drops C, D, E, F) were prepared by two inspectors and were varied in terms of building components and image counts, as described in Table 1.

Table 1: Dataset Characteristics

Dataset	Image Count	Building Area
A, B	110	Architectural concrete wall
C, D, E, F	1204	Concrete slab edge, brick veneer knee wall, architectural concrete balcony side walls

Results and Discussion

The case study was performed on two datasets, including two (A, B) and four (C, D, E, F) scaffold drops, respectively. See Tables 2 and 3 for comparison of achieved results.

Table 2: Inspection Results on Drops A and B

Scaffold Drops A, B			
Type of Inspection	*Number of cracks (percentage of close-up quantity)*	*Number of spalls (percentage of close-up quantity)*	*Number of exposed rebars (percentage of close-up quantity)*
Binocular	3 (4%)	27 (25%)	- (0%)
AI-assisted	51 (75%)	129 (121%)	38 (88%)
AI-assisted inspection after manual adjustment	62 (91%)	98 (92%)	36 (84%)
Visual close-up	68	106	43

Table 3: Inspection Results on Drops C, D, E, and F

Scaffold Drops C, D, E, F			
Type of Inspection	*Number of cracks (percentage of close-up quantity)*	*Number of spalls (percentage of close-up quantity)*	*Number of exposed rebars (percentage of close-up quantity)*
Binocular	6 (10%)	22 (10%)	1 (10%)
AI-assisted	375 (614%)	188 (88%)	546 (5460%)
AI-assisted inspection after manual adjustment	214 (350%)	278 (130%)	39 (390%)
Visual close-up	61	213	10

Fig. 3: False positive indication—lifeline detected as exposed rebar

Dataset "A, B" included photos of architecturally exposed concrete. There were three examples of errors which required manual enhancement:

- Multiple photos showing the same condition at a different angle due to the photos being manually taken with a digital camera. In the post-production process (described further as manual adjustment), doubled photographs were removed;
- Lifeline detected as exposed rebar. Most likely due to the shape of lifeline, there were several instances where it was detected as exposed rebar; and
- Spalls which exposed rebar showed double detections in several cases. Although not necessarily a wrong indication, this was manually adjusted to show spalls in deeper conditions and exposed rebar in more shallow, smaller conditions.

Dataset "C, D, E, F" consisted of some areas of brick veneer, which caused an additional false positive indication. Some areas of brick were detected as rebar. This false positive indication may have been caused by the color of brick being similar to the exposed rebar in other locations.

Fig. 4: Double positive indication—spall and exposed rebar

Fig. 5: Example of AI condition detection (red boxes display detected exposed rebar, green—spall, yellow—crack)

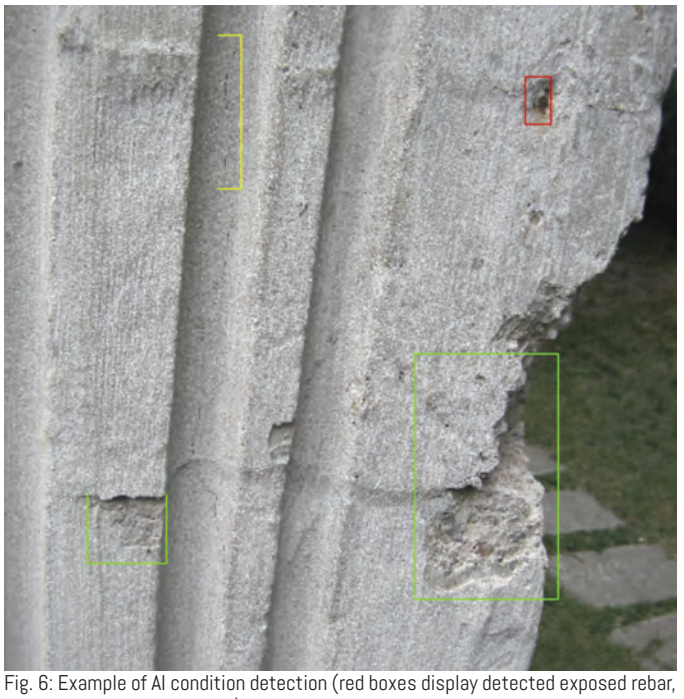


Fig. 6: Example of AI condition detection (red boxes display detected exposed rebar, green—spall, yellow—crack).

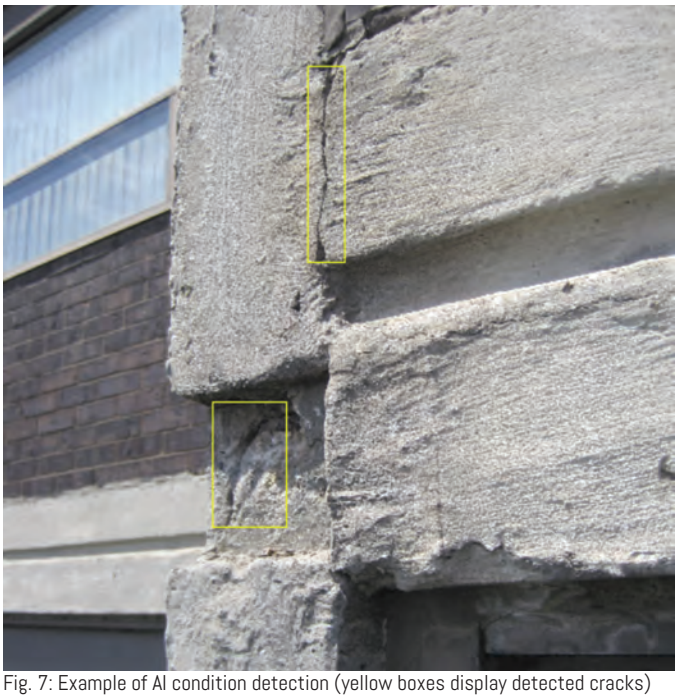


Fig. 7: Example of AI condition detection (yellow boxes display detected cracks)

Table 4: Combined Inspection Results

Scaffold Drops A, B, C, D, E, F			
Type of Inspection	*Number of cracks (percentage of close-up quantity)*	*Number of spalls (percentage of close-up quantity)*	*Number of exposed rebars (percentage of close-up quantity)*
Binocular	9 (7%)	49 (15%)	1 (2%)
AI-assisted inspection after manual adjustment	276 (214%)	376 (118%)	75 (142%)
Visual close-up	129	319	53

The total count of AI-assisted condition count was approximately 150 percent of the conditions mapped manually during close-up inspections (refer to Table 4). This is most likely due to a number of hairline shrinkage cracks which were not mapped by the inspector, and other minor conditions.

CONCLUSIONS

This case study shows that computational techniques such as the AI-based façade condition detector can reduce the time of a visual survey by over 90 percent and be very useful in rapid and accurate repair work budget projections for clients. The use of AI technology presents the construction industry with an opportunity to significantly reduce time of initial inspections (refer to Table 5) and increase the accuracy of condition quantity forecasts.

When combined with drone data collection, this AI-based tool eliminates the need to engage a contractor for close-up access for the investigation, such as supported or suspended scaffolding. This reduces the time the scaffold is installed on the building to only the repair phase, which will be appreciated by both owners and occupants.

An additional benefit of using the computational method supported by drone data collection is the possibility to automatically generate drawings showing the locations of detected conditions. The additional time needed to transfer hand sketches into CAD drawings or BIM was not included in this study.

Table 5: Summary of Extrapolated Time Expenditure during Each of the Inspections

Type of Inspection	Time Spent (person-hours) for 6 Drops	Time Spent (person-hours) for Two Buildings (52 drops) - Extrapolation
Binocular	1 hour	9 hours
AI-assisted	1 hour	4 hours of drone data gathering and less than 1 hour of app use*
Visual close-up	6 hours**	70 hours over 3 months

* Two drone operators are required

** Plus additional cost of engaging an external contractor to install suspended scaffolding, and associated man-hours of motor operators / riggers accompanying the inspector on a drop

Drone use would facilitate the geo-localization module of the app, which maps detected damage to associated locations on the structure. The location, altitude, and orientation data would be obtained from drone localization and presented to users on a dashboard. This module minimizes the time and cost spent on post-production of condition mapping in CAD or BIM.

Furthermore, at this stage of development of the app, some extent of manual adjustment of results was required. The app utilizes reinforcement learning to improve the framework continuously with the feedback coming from the users, which ensures better results in the future.

Based on this study, AI-assisted surveys provide more reliable assessment data than binocular inspections on some buildings. They can be faster and less expensive than conventional close-up inspections, while rapidly providing reports and drawings.

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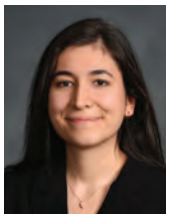

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Design and Load Testing of Façade Access Equipment

by Jonathan E. Lewis, Gwenyth R. Searer, and Stephen B. Schmitt, Jr.

Fig. 1: Building maintenance unit

Façade access equipment on mid- and high-rise buildings is used for maintenance activities, such as window washing and façade inspections, and construction activities, such as painting and façade repairs. In the United States, strength provisions for this equipment are specified by the Occupational Safety and Health Administration (OSHA), state and local codes, and the 2015 and 2018 *International Building Code* (IBC)[1]. OSHA requires such equipment be inspected and tested to verify compliance with applicable requirements, including capacity requirements. Load testing is commonly used to satisfy OSHA requirements and verify the strength of the equipment. Load test practices vary widely in the industry, with some engineers using test criteria that fall 50 percent short of their desired aim. Because design loads for this equipment are relatively new to the building code, it is important to understand how to properly design and load test façade access equipment. An upcoming façade inspection or repair project is an opportune time to improve façade access and compliance with OSHA regulations.

TYPICAL FAÇADE ACCESS EQUIPMENT

Façade access equipment, also referred to as exterior building maintenance equipment, comes in a variety of forms, from large crane-like machines called building maintenance units or BMUs (Fig. 1), to portable davit systems (Fig. 2) that can be erected at discrete points on the roof, to individual anchorages (Fig. 3) that support rope descent systems, worker lifelines, or tiebacks from temporary suspension equipment such as parapet clamps. Façade access equipment can be provided either by the building (e.g., BMUs, davit systems, anchorages, and dedicated work platforms) or by the contractor (e.g., parapet clamps, counterweighted outrigger beams, and transportable platforms). Façade access equipment has specific requirements for design and testing; many engineers and architects have historically been unaware of them.

DESIGN OF FAÇADE ACCESS EQUIPMENT

Two main subcategories of façade access equipment exist: equipment that supports powered motors or hoists for

raising/lowering platforms; and equipment that supports non-powered components such as rope descent systems or personnel lifelines.

Loads for Components that Support Hoists

OSHA requires components that support a hoist to be able to resist at least 4.0 times the "rated load" of the hoist. "Rated load" is the safe working load that the hoist is intended to lift and can range from 750 to 1,500 lbs (340 to 680 kg) for typical suspended window washing platforms. Equipment that is used to perform "construction" activities—such as concrete façade repairs—is also required by OSHA to be able to resist 1.5 times the "stall load" of the hoist. OSHA permits stall loads to be as high as 3.0 times the rated load, so 4.5 times the rated load of the hoist is an upper bound. These load factors may seem large, but the loads themselves can include significant dynamic effects and are generated by machines capable of imparting forces much larger than the load being lifted.

Where adopted, the IBC and ASCE/SEI 7-16[2] treat loads from hoists as live loads, and components that support hoists for façade access equipment must be designed for a minimum unfactored live load equal to the larger of the following:

- 2.5 times the rated load of the hoist; and
- 1.0 times the stall load of the hoist.

When multiplied by the live load factor of 1.6, the factored design load becomes the larger of the following:

- 4.0 times the rated load of the hoist; and
- 1.6 times the stall load of the hoist.

These loads match or slightly exceed OSHA's minimum requirements, and they eliminate the need to differentiate between building maintenance loads and construction loads, which is a nebulous distinction at best.

Loads for Components that Support Non-Powered Equipment

OSHA requires that anchorages used to secure non-powered components—like rope descent systems, lifelines, or fall arrest equipment—be able to resist at least 5,000 lbs (2270 kg) per attached worker in any direction of use. In alignment with OSHA, the IBC and ASCE 7-16 both specify an unfactored design live load of 3,100 lbs (1405 kg) for fall arrest anchorages. Multiplying this live load by the 1.6 load factor results in a factored design load of 4,960 lbs (2250 kg), or essentially 5,000 lbs (2270 kg).

Other Design Considerations

Other key considerations to keep in mind when designing façade access equipment are summarized below.

Spacing and Layout of Equipment. Where window washing is performed via rope descent systems, each drop location should have at least two anchorages (one for the descent line and one for the lifeline). The anchorages should be positioned such that the rigging ropes are within 15 degrees of perpendicular to the building edge. Similarly, for access with suspended scaffolding, independent anchorages are required for each worker's lifeline and for any tiebacks of temporary equipment such as counterweighted outrigger beams or parapet clamps. For a 30 ft (9.1 m) long platform used by three workers and suspended from parapet clamps, five anchorages would be required—two

Fig. 2: Davit system and suspended platform (stored on roof)

Fig. 3: Dedicated anchorages for securing lines

tiebacks and three lifelines. Figure 4 shows a conceptual layout for both rope descent and suspended scaffolding. Proper layout of anchorages can be challenging, requiring careful consideration of the activities and equipment involved.

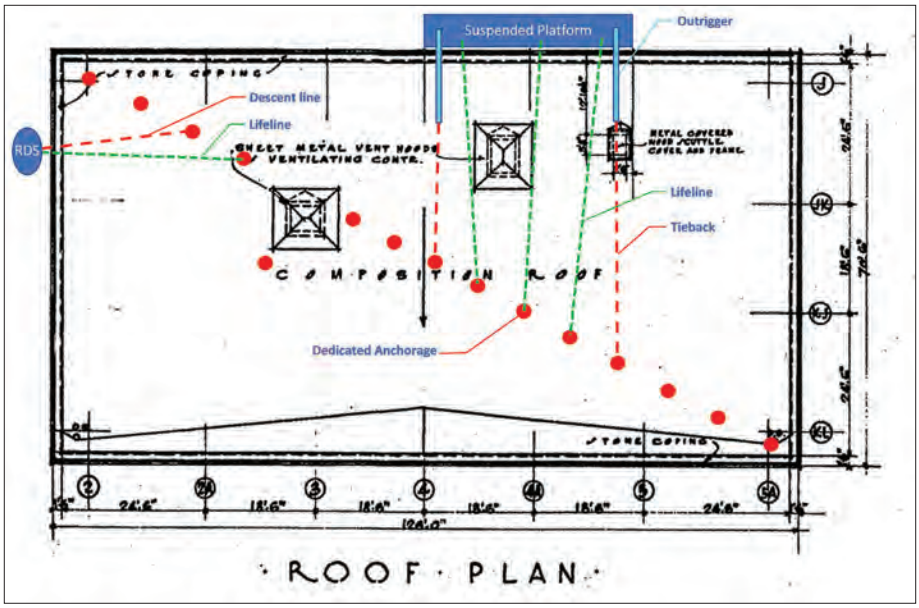

Fig. 4: Sample anchorage layout showing sample rigging configurations

Davit Systems and BMUs. Demands from davit systems and BMUs typically require specifically detailed structural framing. Davits and BMUs support forces similar in magnitude to anchorages, but the moment arm can be much greater, creating large overturning forces that must be resisted by the structural framing. For concrete-framed buildings, while individual lifeline/fall arrest anchorage loads can typically be resisted by a reinforced concrete roof deck, davits and BMUs typically require heavier framing to resist the imposed demands, which can pose significant challenges or make it impractical to retrofit an existing building.

Anchoring to Concrete. Façade access equipment is often secured to concrete framing. For new buildings, cast-in anchors can be incorporated into the original construction. For retrofits of existing buildings, post-installed expansion, adhesive, screw, or undercut anchors are commonly used, especially for installation of discrete anchorage points. When designing anchorage to concrete, use of the provisions of Chapter 17 of ACI 318-19[3] is appropriate. Although Chapter 17 excludes impact, blast, and shock loads, façade access equipment loads are better characterized as live loads with a dynamic component, and therefore fall within the limitations of the Chapter 17 provisions. Most anchor manufacturers are very familiar with façade access applications and can provide recommendations regarding anchors for this equipment, including susceptibility to loosening under cyclic loading. Quality control is also important during installation, and most equipment is subjected to post-installation load testing, which is arguably the strongest form of quality control available if done properly.

TESTING OF FAÇADE ACCESS EQUIPMENT

OSHA Sections 1910.27[4] and 1910.66[5] contain provisions for post-installation certification and testing of façade access equipment, and while the specifics of the "testing" are not defined, most engineers typically rely on some form of in-situ load testing. The test setup and test load are left to the discretion of the engineer, who then uses the test results to certify that the equipment meets the OSHA minimum strength requirements.

Load Testing Controversy

Load testing has long been a valuable tool for determining whether a structural component possesses adequate strength. Alarmingly, some consultants advocate load testing to no more than 50 percent of the required strength and then use the test results to certify that the tested component possesses 100 percent of the required strength. For anchorages, this means testing to 2,500 lbs (1135 kg) and then certifying a strength of 5,000 lbs (2270 kg). For davits, a test load of 2 times the rated load is used to certify a strength of 4 times.

The concept and practice of half-strength testing has proven stubbornly difficult to extinguish, despite the obvious facts that one has never equaled two, two has never equaled four, and 2,500 has never equaled 5,000. In fact, two voluntary industry standards, ANSI/IWCA I-14.1[6], *Window Cleaning Safety Standard* (withdrawn in 2011) and ASME A120.1[7], *Safety Requirements for Powered Platforms and Traveling Ladders and Gantries for Building Maintenance*, actually limit load testing to 50 percent of the required strength. These voluntary standards cannot supersede requirements of mandatory provisions on load testing in standards like the IBC, ACI 318, and ANSI/AISC 360[8], all of which require testing to essentially 100 percent of the required strength, not 50 percent of it.

Some proponents of half-strength testing cite concerns that testing to the required strength could damage the equipment, the supporting structure, or even the waterproofing. There are some equipment designs that must mobilize significant or even excessive levels of inelastic deformations to develop the required strength, and load testing would not be a good choice in these instances. But, in the authors' experience, these situations are rare. In many instances, the concerns regarding damages can be alleviated by simply designing equipment to remain elastic at the required strength.

Risks of Half-Strength Testing

There is zero scientific basis for extrapolating a load test. A weld, an anchor, or a breakout cone that satisfactorily resists 50 percent of the required strength could fail suddenly at, say, 60 percent of the required strength and lead to an accident. As the authors have observed firsthand, testing something to only half of its required strength has the potential to leave a critical defect undetected and expose workers and the public to concealed risk. The folly and danger of half-strength testing should be readily apparent, especially for powered hoists, which can exert stall loads of up to 3 times the rated load, well in excess of 2 times the test value.

Load Testing Best Practices

Proper load testing of any structure or component must verify that the component has at least the required strength. Section 1708 of the IBC governs in-situ load tests and requires testing to at least factored loads, which means either 4.0 times the rated load or 1.6 times the stall load for hoists, and 1.6 times 3,100 lbs (1405 kg) = 4,960 lbs (2250 kg) for anchorages. Testing to lesser amounts violates the IBC and Section 27.4 of ACI 318-19.

Load testing should be performed prior to initial use of the equipment to satisfy requirements in OSHA 1910.27 and 1910.66, after any major modification to the equipment, and after any damage has occurred. While not specifically mandated, common industry practice (differences on load magnitude notwithstanding) is to re-test every 10 years to catch any damage or gradual deterioration that could be concealed.

It is also important to load test components in the actual direction(s) they are loaded during use, particularly toward the edge of the roof. Wherever possible, deflection of the tested component should be monitored during the test. It is good practice to apply the required load at least twice, comparing deflections at each peak. If the deflections are essentially equal, there is good confidence that the component is behaving elastically and is fit for service. Figures 5 through 7 show some common load testing setups.

CONCLUSIONS

Façade access equipment plays a critical role in facilitating safe and efficient maintenance and construction on building façades. Proper design and testing of this equipment improves worker and public safety. Structural engineers have benefited from recent updates to the IBC and ASCE/SEI 7 that clarify façade access equipment loads and harmonize these loads with other loads commonly encountered in the design of roof structures. Although there is still some misunderstanding in the industry regarding test loads, the IBC, ACI 318, and ANSI/AISC 360 are clear: in-situ load testing must be conducted to the factored loads, and not half these loads. Failure to test to the proper loads conceals risk from the equipment users and the general public.

Fig. 5: Load test of fall arrest anchorage (right) reacting off a davit base (left)

Fig. 6: Load test of davit pedestal replicating overturning moment generated during use

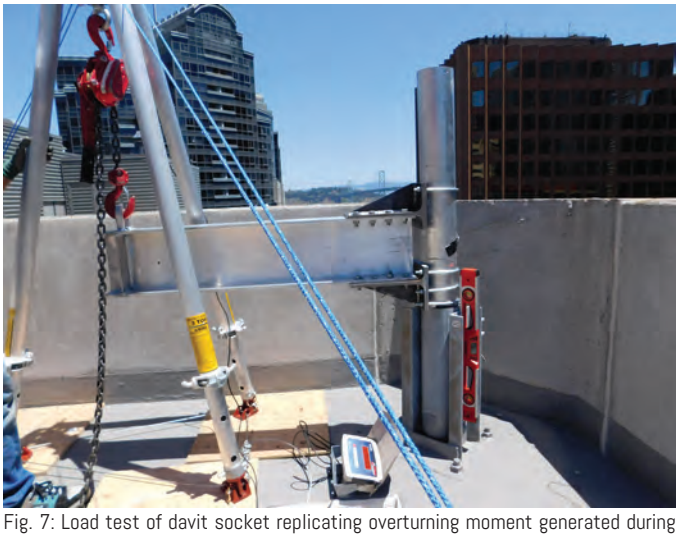

Fig. 7: Load test of davit socket replicating overturning moment generated during use

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

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Stephen B. Schmitt Jr., PE, has been with Wiss, Janney, Elstner Associates since graduating from the University of Illinois at Urbana-Champaign in 2007. Before joining WJE's Chicago office in 2016, he worked in WJE's Janney Technical Center (JTC) and Structural Laboratory in Northbrook, Illinois. He has over 12 years of experience in the investigation, evaluation, and repair of a variety of concrete structures, including buildings, parking garages, industrial facilities, dams, and silos. His work has taken him across the US and to India. His investigations have involved materials sampling, field and laboratory testing, and nondestructive evaluation. He currently serves on technical committees for SEAOI and the ICRI Chicago Chapter to develop and coordinate local educational programs.

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Part 4—May 12	***Floor Slab Moisture Mitigation*** Presenter: Peter Craig, FICRI, FACI, CCSMTT
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WOMEN IN ICRI

by Monica Rourke

The Women in ICRI are excited to be able to benchmark our progress. Since our first meeting in 2018, we have become not only a recognized task group, but also an approved ICRI administrative committee with technical offerings and industry goals.

Under the leadership of Committee Chair Tara Toren-Rudisill, we have enjoyed dynamic meetings, webinars, and brainstorming events. ***Passion for career opportunities, excitement for the future, fun, friendship, and enjoyment are all part of our meetings.***

We welcome contributions, attendance, and interest from all members whether you are active nationally, in a local chapter, or at an individual level. Please do not miss an opportunity to meet a new face.

In 2021, we welcome new ICRI President Elena Kessi. She brings to her new leadership role a professional voice for women business owners and has been a champion for Women in ICRI for many years.

Diversity, my friends, is intentional; make no mistake about it! The Women In ICRI are committed to making our ICRI events, committee meetings, social and virtual gatherings inclusive for all ICRI members, industry professionals, educators and students.

Don't miss your opportunity for a face-to-face meeting with the women who are changing the face of the concrete repair industry!

"Today, women are valued members of the project management team across the concrete repair industry."

—Monica Rourke
MAPEI Corporation
ICRI Past President

ICRI CONCRETE REPAIR WOMEN

"Facing the challenges of 2020 required creativity and fortitude. Through this, we found new ways to successfully collaborate and connect leading to greater innovation and inclusivity."

—Tara Toren-Rudisill
Thornton Tomasetti
Women in ICRI Committee Chair

"Industry golf outings are always a great opportunity for networking and connecting with other industry experts. Last year I hosted a fantastic team of women representing all sides of our industry: contracting, engineering, manufacturing, and technical sales. What a great day!"

—Elena Kessi *(2nd from right)*
AQUAFIN, Inc.
2021 ICRI President

"We understand materials, their durability and their performance, and construction detailing to solve the root of the problem... not apply a bandaid."

—Sara Peters
THP Limited, Inc.

"Women in ICRI birds eye view!"

—Michelle Nobel
MAPEI Corporation

"I'd argue that the challenges I face don't masculinize me, but rather reinforce my femininity. If you have a passion for what you do, you'll shine no matter who you are."

—Stacia Van Zetten, P.Eng.
EXACT Technology Corporation

"Different people, different cultures, different visions; together, we make a unique face of the concrete repair industry!"

—Liying Jiang
Jensen Hughes, Inc.

"The industry is transitioning to more flexible hours and working from home on a consistent basis due to the pandemic."

—Julie Bolding
Armstrong-Douglass Partners, LLC

"WICRI opened doors for me to collaborate with individuals across the country, facilitate networking opportunities, mentorships and education. This group has changed me personally and added great value to my work and personal life."

—Natalie Faber
National Waterproofing Supply

"Women making a bang."

—Amy Lamb Woods
International Masonry Institute

"I think celebrating diversity and inclusivity are crucial within ICRI. A diverse and more inclusive organization will empower leaders for a more robust and more creative industry."

—Lisa Viker
Vector Corrosion Technologies

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Evaluation and Repair of Portland Cement-based Plaster (Stucco) on Concrete or Masonry Substrates

by David G. Tepke, Kent S. Yarborough, and Jeffrey S. Miller

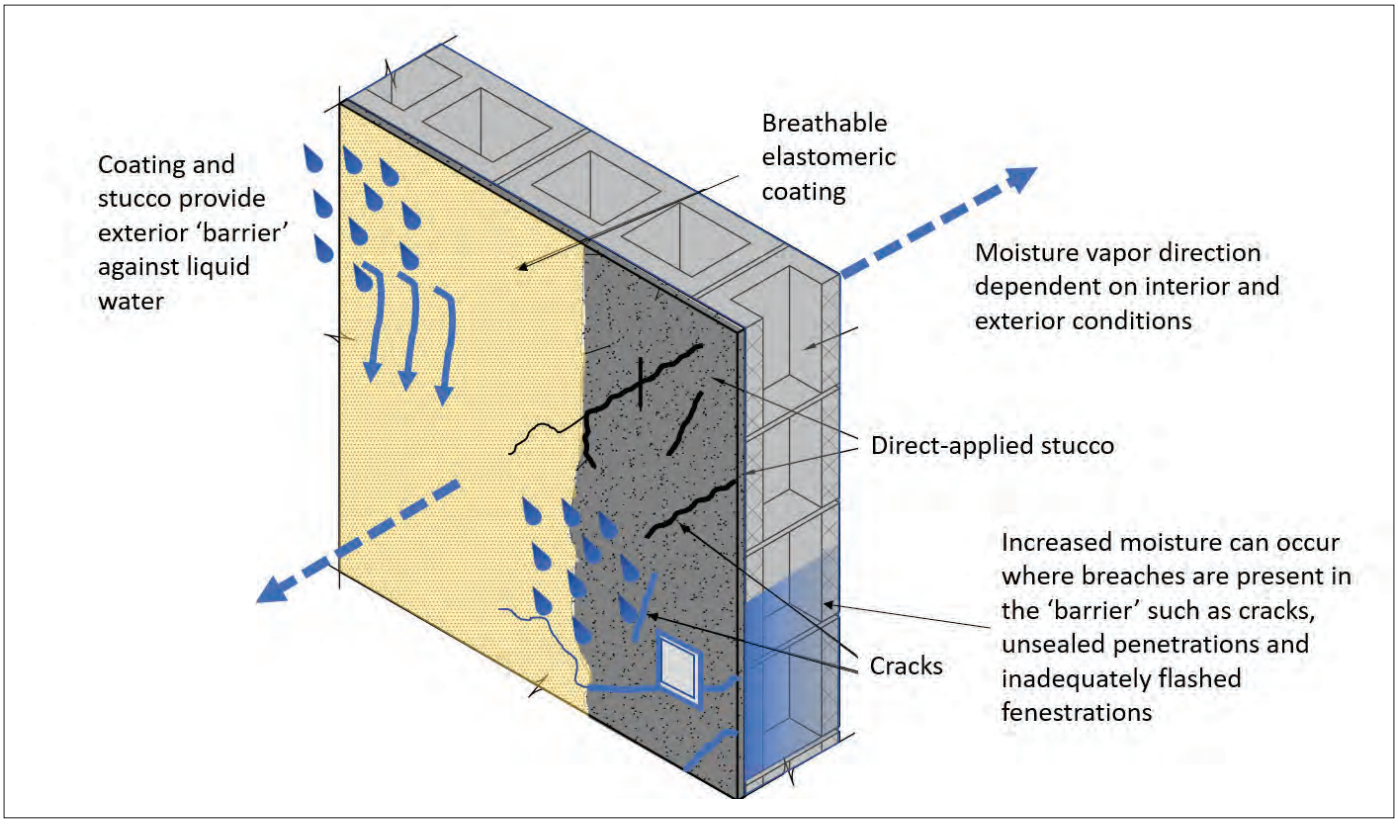

Fig. 1: Stucco on concrete masonry

Portland cement-based plaster (stucco) directly applied to concrete or concrete masonry units (CMU) can provide a durable and visually appealing finish. However, inadequate surface preparation, proportioning, mixing, application, environmental conditions, and/or protective coatings can result in distress and loss of bond with associated safety risks and serviceability issues. Distress and deterioration, unsealed penetrations, and ineffective waterproofing at fenestrations can permit moisture infiltration and increase potential for coating distress, damage to interior finishes and mold. This article will discuss some key considerations for evaluation and repair of direct applied stucco and wall coatings.

BARRIER CLADDING SYSTEMS

By design, direct-applied stucco systems are meant to function as a barrier system. That is, water is meant to be repelled along the exterior plane to prevent infiltration behind the system (Fig. 1). Note that the term "barrier" is used as a practical descriptor, but more accurately, it functions to retard ingress of liquid water. Unlike a cavity system that includes a moisture barrier, internal drainage plane, and through-wall flashing behind the stucco to discharge incidental water to the exterior, water that enters a barrier cladding system through defects or deficiencies does not have a planned direct path of escape. Thus, water that enters or bypasses the system must primarily dissipate as vapor through materials. This often leads to distress where

excessive moisture is present. While masonry substrates have inherent water-dissipating capabilities, it is critical that masonry joints be well pointed and all gaps and bond separations be properly sealed (prior to stucco application) to prevent the system from being overwhelmed by a large influx of moisture. Stucco can provide a significant level of protection against water intrusion; however, performance relies on good construction practices and techniques.

CONSTRUCTION CONDITIONS

Melander, et. al[1] lists various causes and remedies of stucco application problems. A common issue is incorrect surface preparation that may compromise bond to the substrate (Fig. 2). Surface preparation deficiencies that can impact bond include dry cementitious substrates, improperly applied bonding agents, dirty surfaces, or inadequate texture. Non-uniform thickness, lack of proper curing with early age moisture loss, or other issues can result in cracking that may additionally compromise the system (Fig. 3).

CONDITION ASSESSMENT AND EVALUATION

Before conducting a site review, it is important to review original construction documents, repair documents, engineering reports and other available information, as well as discuss concerns and reported leaks with maintenance personnel. This establishes a basis for preparing an evaluation plan. Stucco field assessments may include:

- Visual review;
- Identification of disbondment by audible sounding or other non-destructive testing methods (Fig. 4);
- Water and/or wall moisture testing (Fig. 5);
- Exploratory excavations (Fig. 6 and 7);
- Evaluation of environmental conditions;
- Laboratory testing on extracted stucco and coating samples (Fig. 8); and
- In-situ evaluation of coating or stucco bond, embedments and coating thickness as appropriate.

ASTM E2270[2] provides guidance for evaluating facades for unsafe conditions. At the time of this writing, the authors are aware of at least 12 jurisdictions that require periodic façade inspections[3]. ASTM E2270 includes provisions for document review, cursory water tightness assessment, and inspection procedures such as visual review, audible sounding, bond testing, sealant evaluations, and probing and nondestructive testing for review of concealed conditions, as well as frequency, extent and required level of inspections, and reporting. It is critical that loose materials in danger of falling be removed if identified during an assessment. Additional guidance for evaluating stucco condition and coatings can be found in ACI 524R[4] and ACI 515.3R[5] respectively.

Joint layout, quality and condition of sealants, and thickness/coverage of stucco over purposefully added embedments should be reviewed. The wall should be holistically evaluated for potential structural damage projecting through the stucco, such as settlement. Patterns of cracking, leaching, efflorescence, delamination, blistering, and other signs of internal moisture should be reviewed. It may also be necessary or advisable to evaluate stucco bond strength per ASTM C1860.[6]

Water testing in accordance with AAMA 511[7] and ASTM E1105[8] at fenestrations can help identify leaks that may require correction as well as strategic water testing with an

Fig. 2: Debonded stucco on concrete substrate

Fig. 3: Cracking in coatings on stucco

Fig. 4: Debonded stucco identified from audible sounding survey (inset photos at right show subsurface conditions in debonded areas)

AAMA nozzle or by water saturation (soak) tests (Fig. 5). Radio frequency moisture testing[9] (Fig. 5) can be used to identify possible areas of high moisture in the stucco that may provide clues to water intrusion. Test excavations are critical in determining presence and causes of leaks for determining an appropriate repair (Fig. 6).


Fig. 5: Soak test on stucco façade (left) and radio frequency moisture testing (right)


Fig. 6: Interior opening showing significant moisture damage at base of CMU wall


Fig. 7: Exploratory excavations showing cracks through stucco and subparallel to the stucco surface (top), masonry/slab transition with improper spray foam filler (bottom left) and improperly installed window flashing (bottom right)

Exploratory excavations and probing in the stucco are useful for evaluating hidden conditions and observed distress, obtaining samples for laboratory testing and gathering information for repair design (Fig. 7). Petrographic examination and laboratory analysis per ASTM C1324[10], ASTM C856[11], and associated ancillary techniques, can be conducted on extracted composite samples to evaluate masonry and concrete substrates, individual stucco layer characteristics, cracking from poor surface preparation or inadequate curing, potential materials-related distress issues, carbonation and other characteristics (Fig. 8). Laboratory evaluation of coatings on extracted composite samples to assess failures and/or suitability for overcoating may include microscopy to evaluate surface preparation and the number, thickness, and condition of coating layers, and Fourier transform infrared spectroscopy (FTIR) for compositional information. Scanning electron microscopy with energy dispersive x-ray spectroscopy (SEM-EDS), chemical analysis (for instance by ion-chromatography), or other techniques may also be used for evaluating coating[12] or stucco distress. Information regarding constituents in each layer of stucco or applied coatings and bond of successive additional coatings can be useful in determining reasons for potential distress and developing a repair approach.

COATING CONSIDERATIONS AND REPAIR

Coatings are often applied to stucco for general aesthetics, to seal cracks and mask imperfections, and as an added level of protection from water intrusion. They can range from smooth to heavily textured and can have relatively flat to glossy finishes. Proper selection of coatings, adequate surface preparation and carefully controlled application are important for functionality and coating durability. Crack bridging ability, adhesion, compatibility with cementitious substrates, ability to hide imperfections, installation constraints (temperature, humidity), resistance to liquid moisture, UV resistance, water vapor permeance, life-cycle costs, and the number of recoats before vapor or adhesion issues can become problematic, are all important parameters for consideration.

Moisture vapor permeance of the coating system is a critical parameter that should be carefully considered. Commercially available software can be used to help evaluate moisture drive and anticipated moisture content within the wall system. In situations where vapor drive is favored toward the exterior (such as cooler, drier exterior conditions), it is critical that the coating has high enough permeance to allow escape of moisture vapor without consequence to the coating performance. Unsealed cracks, stucco delaminations, unsealed penetrations (electrical conduits, etc.) and improper waterproofing at fenestrations and component transitions can cause leakage and promote blister-

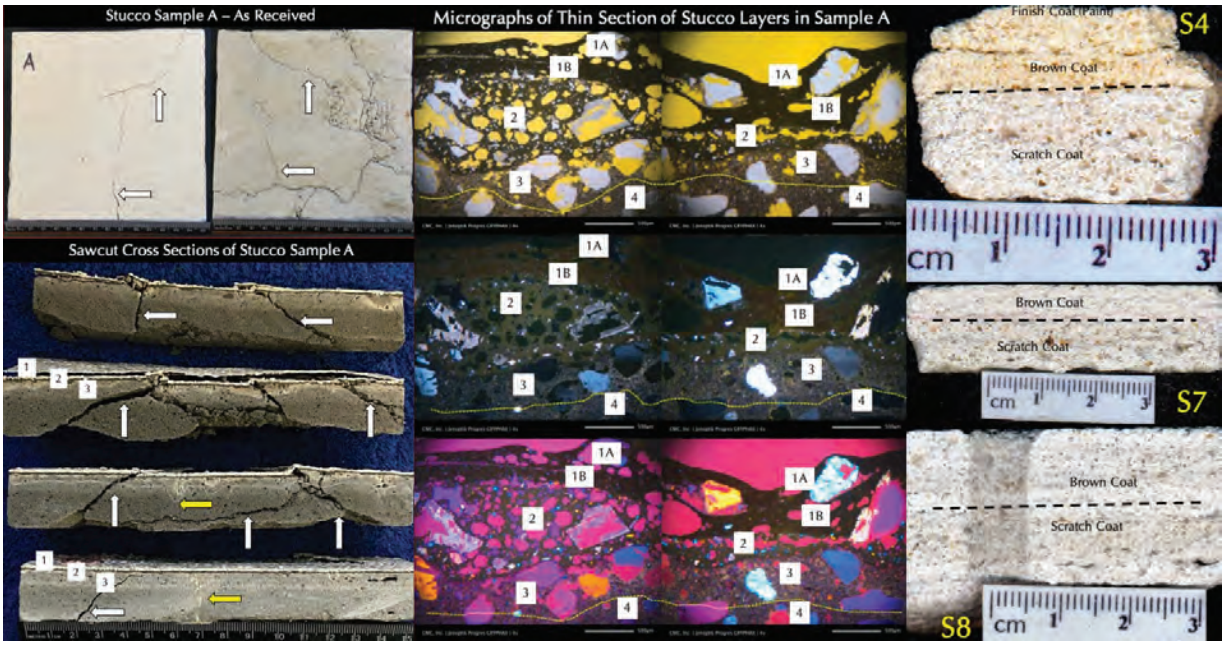

Fig. 8: Photos from laboratory evaluation showing general conditions (left), micrographs (middle), and cross-sections of stucco layers (right)—*Photos courtesy of Dipayan Jana, PhD, PG of Construction Materials Consultants, Inc.*

ing and debonding of the coating system from increased moisture.

Manufacturers' data sheets, as well as independent (and if appropriate) project specific testing should also be used to evaluate acceptability for coatings. Common systems include acrylic, latex, silicon-modified, or cementitious-based coatings, with or without aggregate for texture. Care must be taken not to use oil or alkyd-based coatings, as they can react with alkalinity to saponify in the presence of moisture in the wall system.

Effective specifications that include scope of the work, materials, surface preparation, and application and QC/QA requirements are important for a quality coating project. Pre-installation meetings and mock-ups should be used to address project-specific conditions and establish project standards. Inspections during the work should be performed to review and ensure adherence to the manufacturer's printed installation instructions and specifications. Testing should include environmental measurements, surface preparation evaluation, wet and dry film thickness testing, and adhesion testing. The principles of surface preparation per SSPC-SP 13/NACE No. 6[13] and ACI 515.3R[5], including surface profile, cleanliness, presence of contaminants, moisture conditions, and bond strength, as well as requirements from manufacturers, should be followed. Care must be taken to install coatings when the substrate has dried to a sufficient level in accordance with manufacturer requirements. Methods such as plastic sheet (ASTM D 4263[14]; ASTM F710[15]), electrical impedance (ASTM F2659[16]), radio frequency, and conductivity testing (ASTM F710), as well as suggested measurement frequency, are described in SSPC Guide 23[9]. SSPC PA 19[17] can be used to visually evaluate installed coatings for pinholes, provided that the surfaces are not aggregate filled, stippled, or intentionally porous.

Fig. 9: Coating distress (photo at lower right is an intercoat adhesion failure of coating directly applied to reinforced concrete)

Fig. 10: Coating bond testing (top), ultrasonic thickness testing (lower left), and direct thickness testing (lower right)

Coating over existing coatings requires knowledge of the underlying coating material, its condition, and characteristics. Application of incompatible coatings can lead to premature failure. Poorly bonded or critically damaged coatings should be removed. In-place bond testing on existing and installed coatings can be evaluated using methods such as ASTM D7234[18] or "cheese cloth method" at a sufficient number of locations. Thickness of existing coatings and impact of added thickness of new coatings should be evaluated with respect to overall water vapor permeability. Excessive layers or total thickness can change what was intended as a breathable coating into an effective vapor barrier, which can lead to some of the aforementioned concerns with coating delamination or peeling. Thickness can be evaluated using physical samples or non-destructive testing. Some examples of coating failures and testing are provided in Figures 9 and 10, respectively.


Fig. 11: Application of stucco during repair


Fig. 12: Repair area showing linear transition and sealants between new and existing stucco (inset shows the extent of the repair area)

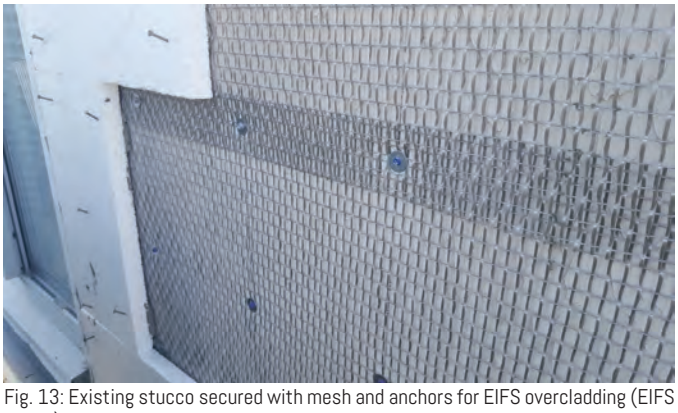
Fig. 13: Existing stucco secured with mesh and anchors for EIFS overcladding (EIFS at left)

REPAIR OF STUCCO DEFECTS

A proper repair approach should address identified causes and magnitude of distress, owner expectations, and applicable jurisdictional Code requirements. Structural deficiencies, if present, should also be repaired. Consideration should be given to evaluate disturbed materials for potential hazardous materials, and abatement of those materials in accordance with regulations, if applicable. Repair and flashing of fenestrations are beyond the scope of this article, but are important aspects of an overall repair strategy, as these areas can be significant sources of leaks. Following are some typical methods for repairing stucco damage and distress.

Crack Repair

Static hairline cracking in stucco generally can be addressed by the application of an elastomeric coating with crack bridging capabilities. However, larger cracks should be routed and sealed prior to coating application. Although this repair is necessary to reduce water intrusion, it will alter the aesthetics of the building, often resulting in what may be referred to as a "checkerboard" appearance. When widespread cracking is prevalent and/or aesthetics are an issue, a textured sealant or an "overcladding" option as described below can be considered.

Compatibility (particularly if coated), movement capabilities, and desired service-life are all important aspects of sealant selection. Silicone sealants are inorganic, flexible, and highly UV stable with a typical life expectancy of up to approximately 20 years. Urethane sealants, on the other hand, may have a life expectancy of 8-10 years.

Removal and Replacement

The most direct approach for repairing highly distressed or delaminated stucco is to remove and replace it with compatible material. A stucco replacement approach can be costly and time consuming (Fig. 11). Care must be taken not to damage the existing substrate when removing uneven and partially bonded sections, and to properly prepare the surface to receive repair stucco. Substrate concrete distress and embedded reinforcing steel corrosion, if identified, should be evaluated and repaired using industry guidelines such as ACI 546R[19], ICRI 310.1R[20], ICRI 320.1R[21], ICRI 510.1[22], and NACE SP0390[23], as applicable. Previous-

Fig. 14: EIFS being installed over secured stucco (left) and finished wall section with exterior coatings (right)

ly installed bonding agents can inhibit bond and generally require removal as part of surface preparation. Testing per ASTM C1860[6] can be conducted to evaluate bond of the newly applied stucco if appropriate. Stucco repair and installation should adhere to the guidelines in ACI 524R[4] and the requirements of ASTM C 926[24]. Replaced sections must be finished to match adjacent existing sections with clean terminations to avoid a patched appearance (Fig. 12). Re-skimming existing sections and matching coatings to an appropriate termination point (expansion joints, corners, etc.) are often aesthetically desirable.

Stucco Pinning and Overcladding Options

In some cases, it may be acceptable to anchor or "pin" the existing delaminated stucco to the substrate in lieu of removal and replacement. This is typically a quicker, less expensive repair option. Proper evaluation and design are needed to determine the type and spacing of mechanical supplements for resisting wind loads. In situations where the stucco is heavily cracked or has questionable continuity, pinning may not be feasible, or may require additional considerations. Fiberglass or metal lath may be required in conjunction with anchorage when additional continuity is required (Fig. 13). Localized removal and replacement may be required prior to pinning where distress is severe.

Once the stucco is properly secured to the substrate, overcladding with an Exterior Insulation and Finish System (EIFS) is often a viable option (Fig. 14). In many instances, a drainable EIFS cladding is preferred. This approach changes the wall system from a barrier system (relying on the performance of the skin) to a drainable system (that can collect and discharge incidental moisture out of the wall). Overcladding can also be used where stucco is well adhered but has objectionable appearance. It is important that tie-ins, sight lines and general aesthetics be considered in design due to the extension of the wall plane.

SUMMARY

Stucco applied to concrete or masonry substrates can be a durable water-resistant system, provided that it is designed and installed correctly and maintained during the service-life. Periodic safety evaluation and early recognition of potential water intrusion/material issues can reduce risk of disbondment and failures.

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Jeffrey S. Miller, PE, is the corporate director of SKA Consulting Engineers Building Solutions Group. He serves as a principal engineer and project manager specializing in engineering investigations, evaluations, remedial design repairs and project administration as it relates to water intrusion and building materials. Typical investigations and repair designs include waterproofing components, exterior cladding systems such as brick veneer, precast concrete, masonry, hard coat stucco, synthetic stucco (EIFS), all types of fenestration systems, concrete failures, parking structures, stadiums, plaza decks, and other material issues. Jeff also performs building envelope commissioning service for new construction, provides property condition transfer assessments and serves as building envelope expert in litigious projects.

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Introduction to ICRI Technical Guideline No. 510.2-2019

Guide for Use of Penetrating Surface Applied Corrosion Inhibitors for Corrosion Mitigation of Reinforced Concrete Structures

by Timothy Gillespie and Matthew Sherman

ICRI Technical Guideline No. 510.2-2019, *Guide for Use of Penetrating Surface Applied Corrosion Inhibitors for Corrosion Mitigation of Reinforced Concrete Structures,* was published in 2019 to provide information to engineers, consultants, and others specializing in concrete restoration and assist them with the selection, evaluation and use of Surface Applied Corrosion Inhibitors (SACIs). SACIs are liquids containing one or more corrosion inhibitors that are intended to penetrate to the depth of the reinforcing steel in concrete, where they act directly on the steel surface to prevent or mitigate the corrosion reaction.

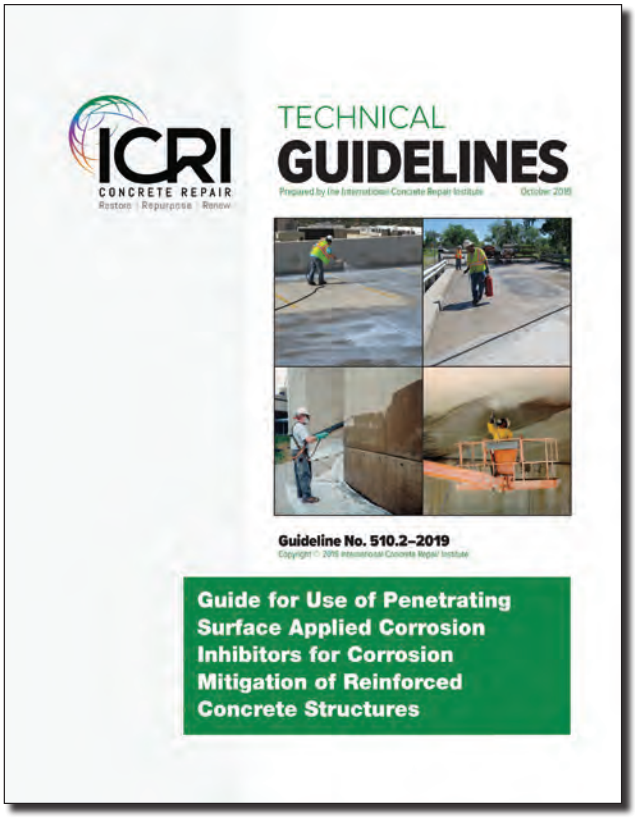
The primary objective for a SACI is to extend the service life of a structure by reducing future damage. SACIs may be used at any of the following stages:

- Reduce active corrosion where damage to the concrete has already occurred;
- Reduce active corrosion that has yet to cause damage to the concrete;
- Delay the onset of corrosion where the structure is exposed to conditions conducive to corrosion; and
- Retard the onset of ring/incipient anode corrosion near repair areas.

Because SACIs are typically used as part of an overall protection strategy, the guide starts by putting their use in context and provides a list of important considerations to understand, including existing conditions, protection objectives, the strengths and limitations of the proposed SACIs, past performance, installation and testing requirements, and planned evaluation and monitoring (Richardson et al. 2006b[1]).

The guide consists of eight chapters:

- Chapter 1: Introduction
- Chapter 2: Definitions
- Chapter 3: Corrosion of Steel in Atmospherically Exposed Environments



- Chapter 4: Concrete Evaluation
- Chapter 5: Penetrating Surface Applied Corrosion Inhibitors—Mechanisms of Protection
- Chapter 6: Performance Assessment Methods
- Chapter 7: Conclusion
- Chapter 8: References

Chapters 1, 2, 3, and 4 provide excellent background on corrosion and Chapters 5 and 6 are the heart of the guide, covering the various SACI options and methods to evaluate their performance, respectively. This article offers a glimpse of the information contained within each chapter.

The corrosion background material is required because it forms the basis for the reader to understand how SACIs work to mitigate corrosion due to chloride intrusion, carbonation, and anodic ring formation. Similarly, the evaluation background material is required because it forms the basis for the reader to understand the ways that SACI performance can be vetted and monitored to support their appropriate use.

As mentioned, the heart of the guide begins in Chapter 5, where anodic inhibitors, cathodic inhibitors, and ambiodic (mixed) inhibitors are described along with detail on how each type, and each variation thereof, works (Fig. 1). The chapter then describes the purpose and timing of applying a SACI as well as key considerations in addition to methods of application, surface preparation, the use of supplemental coatings, reapplication, and safety considerations.

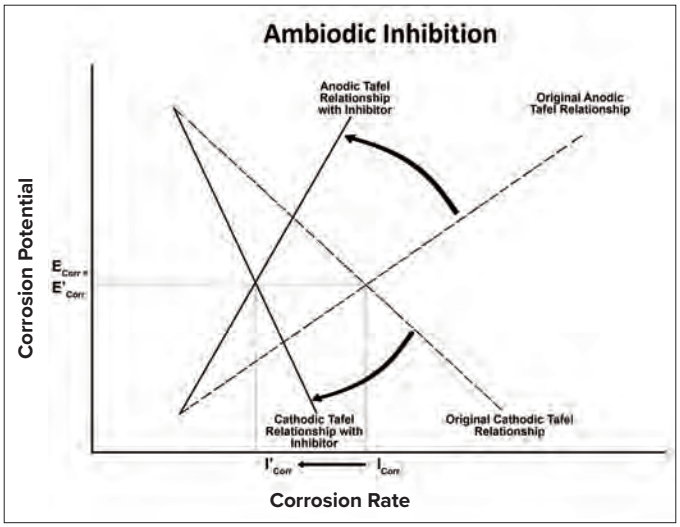


Fig. 1: Schematic Evans diagram for Ambiodic Inhibition (image courtesy of Simpson Gumpertz & Heger Inc.)

Because SACIs must penetrate to the level of the reinforcing steel to be effective, the chapter then provides a guide to the critical considerations required to determine the suitability for use and selection of a SACI, including:

- The depth of steel reinforcement and the ability of the SACI to penetrate to it;
- The permeability of the cover and the ability of the SACI material to penetrate (including the number of required coats and minimum drying times);
- The concentration of chlorides at the steel, as most SACIs have a limitation as to the level of chlorides they can protect against;
- The overall condition of the structure, because corrosion may be too far advanced to consider using such treatments; and
- The presence of other coatings or barriers, because they probably need to be removed before application of a SACI.

In describing application, the guide notes that surface preparation requires a clean and sound substrate with an open, unblocked pore structure, though manufacturer recommendations should always be followed. Application by roller, brush, conventional airless spray equipment, or hand-pressure spray equipment similar to the horticultural sprayer shown in Figure 2 are then described.

Fig. 2: SACI spray application to (a) horizontal surface and (b) vertical surface (images courtesy of Sika Corp)

Chapter 6 then builds on Chapter 5 by providing a list of test methods that can be performed in the lab or the field with guidance on acceptance criteria. The guide describes penetration testing, corrosion potential measurements, and corrosion rate measurements, along with detail about which test methods are appropriate for the SACI being considered as well as information on how to conduct the testing with reference to appropriate standards. Test evaluation summarized in the guide's Table 6.2 provides practical advice to assess success.

Table 6.2: Corrosion Testing Interpretation Guidelines for Indicating Treatment Success (Richardson et al. 2006b)

Expectation	Corrosion Potential After Treatment[1] (mV CSE)	Corrosion Rate After Treatment (µm per year)[2]	Corrosion Rate Relative to Pre-Treatment[2]
Delaying the onset of corrosion	More positive than -200	<5	Not Applicable
Reducing existing corrosion	More positive than -200	<5	>65% reduction
Ring anode control	More positive than -200	<5	No increase
Reducing future corrosion in other areas during repair	More positive than -200	<5	No increase

[1]Corrosion potential should not be used for evaluating ambiodic (mixed) inhibitors (see Section 5.4).

[2]Measurements to be taken no sooner than six months after application or per manufacturer's recommended timeframe to allow time for the material to penetrate through the concrete and act on the surface of the steel.

Because of the importance of monitoring to provide the use of data for ongoing management of the structure, examples of monitoring over time are then provided, including manual and automated measurements carried out over various time frames.

Finally, the guide provides an explanation of the limitations of SACIs, a partial list of which includes:

- They must reach the reinforcing steel to be effective, therefore SACIs tend to work best on concrete with low cover and high permeability;
- There is a maximum chloride level at which protection can be afforded;
- SACIs will not typically penetrate through sealers, coatings, paints, membranes, and other barrier materials, necessitating their removal prior to treatment;
- Section loss cannot be restored; and
- SACIs will not completely stop ongoing corrosion

SUMMARY

The information in the guide is intended to provide information to supplement sound judgement by engineers, consultants, and others specializing in concrete repair caused by corrosion induced damage. SACIs are one of many options to combat corrosion in order to extend the service life of a structure. Lastly, as with any repair strategy, in order to determine if a SACI is appropriate for a project, the user should:

- Understand the existing conditions and causes of the corrosion;
- Define the performance expectations;
- Understand how SACI treatments work and the limitations;
- Specify corrosion reduction expectations and define short-term and long-term performance monitoring measurements;
- Consider how the SACI materials will be applied and how the effectiveness of penetration will be measured in the short term; and
- Determine how the long-term effectiveness of the SACI application will be judged and monitored and whether reapplication of the SACI should be anticipated.

When this information is gathered, properly considered, and implemented with appropriate care and attention, SACIs can be a valuable component of a corrosion mitigation strategy.

REFERENCES

1. Richardson et al., 2006b, *Specification for the Use of Corrosion Inhibitors for the Rehabilitation of Concrete Highways Structures*, SAMARIS (Sustainable and Advanced Materials for Road Infrastructure), Deliverable D25a, EC Framework 6 program, http://samaris.zag.si/docsys/documents/SAM_GE_DE36v05_01.pdf

Timothy Gillespie is Vice President of Product Engineering/Technical Services for Sika Corporation, based in the corporate office located in Lyndhurst, New Jersey. Tim received a BS in Civil Engineering from Lehigh University in 1985. He worked for Turner Construction Company in New York City for 11 years before joining Sika in 1996. His duties include managing the Product Engineering and Technical Service departments that provide technical advice on the use of Sika products, product development and support relative to the commercial concrete repair business, residential retail business, and liquid roofing membrane business. Tim also manages the products used for corrosion mitigation. He is a Fellow and member of ICRI where he participates on several technical committees including 320 Repair Materials and Methods, 510 Corrosion, and was Subcommittee Chair for the 510.2 document. He is a voting member on ACI committees 546 Repair and 364 Rehabilitation, and a frequent speaker at repair industry conferences.

Matthew Sherman, PE, is a Senior Principal with Simpson Gumpertz & Heger (SGH), Inc. of Waltham, Massachusetts, and is a registered Professional Engineer in multiple states and Fellow of the American Concrete Institute and the International Concrete Repair Institute. He received a B.S. in Civil Engineering from Cornell University in 1991 and a M.S. in Civil Engineering (Structural) from The University of Texas at Austin in 1993. Matt has over 25 years of experience in consulting and heavy construction throughout the United States. His specialties include concrete materials, thermal and durability simulation, non-destructive testing, corrosion mitigation, and concrete repair. He is an active committee member of the International Concrete Repair Institute (ICRI) and American Concrete Institute (ACI), and a member of the American Welding Society (AWS) and The Concrete Society. Matt is a National Ready Mixed Concrete Association (NRMCA) Certified Concrete Technologist—Level 2, 3, and 4 and an ACI Concrete Field Technician – Grade 1.

CONCRETE REPAIR CALENDAR

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

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

INTERESTED IN SEEING YOUR CONCRETE INDUSTRY EVENT LISTED HERE?

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

INDUSTRY NEWS

CONCRETE ENTERS STRATO-SPHERE WITH WINNING QUIKRETE® ONE BAG WONDER PROJECT

A twist on its annual One Bag Wonder contest, QUIKRETE® challenged people to make concrete gifts for family and friends this holiday season rather than buying from a department store or a retail website. Prevailing in a very stiff competition, Johnny Brooke hit all the right notes with his winning strat-style electric guitar. Stephanie Leigh claimed second prize with her Christmas Tree Mannequin followed by Joseph Grout's Geometric Atlas Sculpture in third place. Judged based on creative, craftmanship, and quality. The winning DIY concrete projects netted Brooke, Leigh, and Grout $2,500, $1,500 and $500, respectively, as well as a trip to Atlanta for the Haven Conference next July. Alicia Castano received honorable mention for her Concrete Christmas Village. For more information visit www.quikrete.com.

INTERESTED IN SEEING YOUR NEWS IN THIS COLUMN?

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

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

ICRI CONCRETE REPAIR
Restore | Repurpose | Renew

ICRI**CHAPTER**NEWS

CHAPTER CALENDAR

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

CHICAGO
February 16, 2021
VIRTUAL DINNER PROGRAM
Chicago Chapter Project of the Year Award Program

CHAPTER NEWS DEADLINE

MAY/JUNE 2021
Deadline: March 10, 2021

JULY/AUGUST 2021
Deadline: May 10, 2021

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

ICRI**CHAPTER**NEWS

CHAPTER ACTIVITIES

NORTH TEXAS HOSTS VIRTUAL MEETING ON EXPANSION JOINTS

On November 5, 2020, the North Texas Chapter hosted a virtual membership meeting with around 40 people in attendance. The meeting featured a presentation by James Anderson of Master Builders Solutions. The presentation covered many aspects of the design, specification, and quality control for parking structure expansion joint systems. Mr. Anderson conveyed a great deal of knowledge and experience during the presentation as he reviewed various types of expansion joint systems, along with considerations for selection of an appropriate system. The presentation was informative and topical for all who attended. Even through the pandemic, the North Texas Chapter has continued to provide quality programs and events for our members and friends. We appreciate the support of all our members in this challenging year!

CHICAGO HOSTS WEBINAR ON RELEVANT LOCAL CHANGE

In response to the legalization of recreational marijuana in Illinois, the ICRI Chicago Chapter hosted a webinar in September on "Marijuana in the Workplace". Justin Maack of Assurance agency presented with John Campbell of Keefe, Campbell, Biery & Associates, providing insights and recommendations for employers on how the law has impacted company policies and workers' compensation claims. They provided a thorough examination of how policies and enforcement must adapt to remain effective, especially in the absence of adequate testing to distinguish between current intoxication and recent use. Thank you to those who attended.

ROCKY MOUNTAIN WOMEN GAIN STRENTH FROM MENTORSHIP

Natalie Faber with National Waterproofing is the current Secretary for the ICRI Rocky Mountain Chapter. She is slated to be the Chapter's Vice President in 2021. This is a photo of Natalie with her mentor Angela Echols at Natalie's first ICRI Convention in Philadelphia in 2019. Natalie says that Angela inspired her to push other women into this industry and reach out to others for mentoring opportunities through ICRI. Angela jumped at the chance to shadow Natalie for the Philly convention and has educated her on the ICRI organization as well as many industry situations. Working with Angela and the Women in ICRI Committee has opened doors for collaborations with individuals across the country and helped facilitate many networking opportunities, mentorships, and education. This group has changed Natalie personally and added great value to her work and personal life. Natalie looks forward to seeing how the Women in ICRI Committee evolves in 2021. Natalie says she feels lucky to be part of this industry group!

Pictured, from the ICRI Rocky Mountain chapter, are Angela Echols, past chapter leader (left) and Natalie Faber, future chapter leader (right) experiencing the City of Brotherly Love during the ICRI 2019 Fall Convention

MICHIGAN ENDS 2020 WITH JOINT MEETING

The ICRI Michigan Chapter joined with the American Concrete Institute Greater Michigan Chapter to present a lunchtime technical webinar on Wednesday, December 9, 2020. Mr. Keith Kesner, PhD, P.E., S.E. FACI, of CVM Engineers located in King of Prussia, PA, presented an informative discussion on "Punctuated Equilibrium in Concrete Repair" via Zoom. Punctuated equilibrium has been used in various sciences to describe radical changes that occur in a short period of time after a long period of stability. The presentation highlighted the use of ACI 562 Code Requirements for Assessment, Repair and Rehabilitation of Existing Concrete Structures and ACI 563 Repair Standards to address durability of concrete structures and better performance of repairs. Keith included case studies looking back at 25 years of repairs including photos to highlight his discussion and how evaluation, codes, and standards have impacted the performance of the repairs. The meeting concluded with some very interesting questions from the attendees. This webinar was offered free to the attendees in part from a sponsorship from NTH Consultants, Ltd.

CHAPTER ACTIVITIES

DELAWARE VALLEY GOES VIRTUAL

The Delaware Valley Chapter recently got back to business by hosting their first virtual event on November 20, 2020 to listen about the City of Philadelphia's recent façade ordinance changes. William Fernandez, Director of Audits and Investigations for the Department of Licenses and Inspections, and Elizabeth Baldwin, Chief Code Engineer for the Department of Licenses and Inspections, discussed the revisions to Ordinance PM 315, the new Eclipse web-based system for submission of reports and permits, and the fines and legal processes owners may experience. The event was a success with over 50 attendees. The Delaware Valley Association of Structural Engineers also attended the virtual event.

The Philadelphia skyline

William Fernandez, City of Philadelphia Director of Audits and Investigations for the Department of Licenses and Inspection

Elizabeth Baldwin, City of Philadelphia Chief Code Engineer for the Department of Licenses and Inspections

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.

METRO NEW YORK HOSTS GOLF EVENT

Once again, the Golf Gods were looking down on us at our 17th Annual Metro New York ICRI Fall Golf Classic. The event took place on Thursday, September 17, 2020 at the beautiful Cedar Hill Golf Course in Livingston, New Jersey. The chapter gives a big shout out to everyone at Cedar Hill—our host for this event for the past 17 years. The day started off with a little trepidation about the numerous restrictions that were imposed by the State due to the pandemic—events and gatherings were not allowed indoors and limited to outside venues. Cedar Hill stepped up and provided a large tent that encompassed the entire outside patio. Along with the perfect weather, and despite the restrictions, the event was ***on***.

The day started with registration and attendee gifts that included an ICRI monogramed cooler, face mask, hand sanitizer, a Bluetooth speaker, cigars, golf balls, raffle tickets, and Mulligans. A full brunch was served on the patio before the official shotgun start. On-course challenges included closest-to-the-pin, longest drive, Challenge the Ladies, $50,000 hole-in-one, and the exciting (and loud) Golf Gun where a player shoots a golf ball from an AR-15 and plays that ball as a tee shot. Of course, there were 1st and 2nd place winners, and the not-so-much coveted rebar award. The Arnold Palmer/John Daly bar/booth on the course is always a favorite.

Golfers enjoyed a cocktail hour at the end of the round, with our very own singing "Frank Sinatra." Dinner was served on the extended patio and outside bar. During dinner there were presentations of the winners and raffle giveaways, including large screen smart TVs, Sonos sound systems, paddleboards, iPads, Bose eyeglasses, BBQ grills, wine coolers, and much more, along with the 50/50 cash raffle. Sadly, no one aced the hole-in-one to receive the $50,000 prize—maybe next year. As always, when the clubs are put away, and all is said and done, the chapter must take the time to thank all the sponsors. This event could not have taken place without the support of the sponsors!

WWW.ICRI.ORG

DELAWARE VALLEY HOSTS GOLF OUTING

The Delaware Valley Chapter found a way to come together for a socially distanced event—its 27th annual golf event on September 25, 2020, at Rock Manor Golf Club in Wilmington, DE. Eighty-five members and guests attended and received their very own ICRI Delaware Valley COVID mask. The attendees were treated to some wonderful prizes as the event organizers creatively maintained the popular raffles and giveaways. It was a wonderful day for everyone to take a break from the stress of life and enjoy the course and beautiful weather. The winning team was Team Pullman with Andy Garver, Mike Kandravi, Dave Stevenson, and Pat (Tiger) Gallagher.

The giveaway for the golfers at the Delaware Valley event was a mask with the chapter logo

Delaware Valley Board Member Danny Watts, Watts Restoration (left) and Tony Kmush, Ascent Restoration (right)

Past President Chris Lippmann properly socially distanced (believe it or not, he did have a team at the outing)

CHAPTERS COMMITTEE CHAIR'S LETTER

MICHELLE NOBEL
Chapters Chair

We made it through 2020! That's quite an accomplishment, especially given what we've experienced this past year, and that we had never experienced anything like it before!

I hope everyone enjoyed the holidays. Hopefully, we'll be able to get together again soon and remember the words of C.S. Lewis, *"You are never too old to set another goal or to dream a new dream."* So, let's dream of better times until we meet again, and make it a goal to appreciate our time together when we do.

We had an incredible ICRI Chapter Rountable on December 10. The turnout was fantastic and we had a lot of input from chapters across the US and Canada. I see great things on the horizon when we're able to reconnect in person. Even though we may tire of online meetings, it's been a great resource, and there are things that you can do to have fun during them as well.

I hope everyone had the chance to see the 2020 ICRI Virtual Fall Convention. ICRI is optomistic we can do an in-person convention for Fall 2021.

ICRI has decided to stay virtual for the 2021 Spring Convention scheduled for April 21-22. Many companies still have travel bans and the borders are still closed between the US and the Great White North—it's the responsible way for us to be together. There are new and exciting changes coming to the Spring convention and ICRI staff is working hard to make the virtual convention an experience where we can all learn and enjoy. The sessions will be recorded and accessible on-demand through the ICRI Learning Center. More details will be coming soon, so stay tuned.

The **Women in ICRI Committee** is a new and up-and-coming committee that needs the support of all members of ICRI. ICRI women bring a new and different dynamic to the restoration industry. Check out the article about the incredible women who are part of this committee on page 26. I'm truly inspired and empowered to be a part of this group. If you would like to join reach out to Tara Toren-Rudisill, TTorenrudisill@ThorntonTomasetti.com, Monica Rourke, MRourke@mapei.com, or myself, mnobel@mapei.com.

Do you know someone who stands out in the crowd? 40under40 is the buzz at ICRI again this year. If you know someone who fits the bill, nominate them for this prestigious honor. This award recognizes 40 accomplished professionals within ICRI who are under the age of 40, demonstrate high potential for continued success in leadership roles, and exhibit a strong passion for—and commitment to—the mission of ICRI. Details can be found at https://www.icri.org/page/40_under_40

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

For more chapter news and events, go to: https://www.icri.org/events/event_list.asp

Earlier in 2020, ICRI National announced an important update to its Concrete Surface Repair Technician (CSRT) program. For details, go to: https://www.icri.org/page/csrt-overview

An important date to mark on your calendar is World of Concrete, June 7-10, 2021, in Las Vegas, Nevada.

I would also like to take this opportunity to thank everyone at ICRI Headquarters for allowing me to serve as ICRI Chapters Committee Chair for the last three years. I will be serving as the ICRI Region 1 Director for the next three years, so I will be passing the torch to the next ICRI Chapters Committee Chair in 2021.

Remember to keep an eye out for announcements from ICRI Headquarters, and If you ever have any questions, do not hesitate to reach out to ICRI staff, executive committee, or any leader of ICRI.

We always welcome new volunteers for a new and different perspective. It's your input that keeps this organization vital and current. In the philosophical words of Socrates, *"The secret of change is to focus all of your energy, not on fighting the old, but on building the new."*

Remember to be safe, kind, and...happy New Year!

Sincerely,

Michelle Nobel
2020 ICRI Chapters Committee Chair
MAPEI Corporation

Neil Lawrence Savitch

December 20, 1949—December 21, 2020

ICRI extends its deepest sympathies to the family and friends of Neil Savitch, who passed away on December 21. Neil was an ICRI member since 1993 and served multiple terms on the Board of Directors for both the Baltimore/Washington and Virginia Chapters. Neil's dedication to our association and to our industry was apparent to all who knew him and he will be greatly missed.

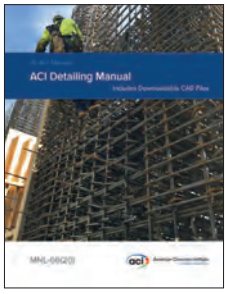
Obituary and memorial information: Baker-Post Funeral Home website—https://www.bakerpostfh.com/memorials/neil-savitch/4471066/obituary.php

The family welcomes donations to The American Cancer Society in Neil's name.

ASSOCIATIONNEWS

ACI RELEASES NEW CONCRETE DETAILING MANUAL INCLUDING DOWNLOADABLE CAD FILES

The American Concrete Institute has released a new and updated ACI Detailing Manual. Previously updated in 2004, the 2020 edition of the ACI Detailing Manual includes many new updates and revisions, plus the addition of valuable downloadable CAD files.



The updated ACI Detailing Manual includes example details and guidance to licensed design professionals on satisfying the provisions of ACI 318-19, Building Code Requirements for Structural Concrete. A copy of ACI 315R-18, Guide to Presenting Reinforcing Steel Design Details is included, along with design details for many commonly encountered reinforced concrete elements, methods for presenting necessary design information, articles published by concrete detailing experts, and supporting reference data.

The ACI Detailing Manual is developed specifically to meet the needs of engineers, architects, contractors, detailers, and engineering students. For more details or to purchase the ACI Detailing Manual, visit concrete.org.

SURENDRA P. SHAH MAKES DONATION TO ESTABLISH NEW ACI FOUNDATION FELLOWSHIP

In commemoration of a recent $50,000 donation from Surendra P. Shah, PhD, Hon. MACI, the ACI Foundation is pleased to announce the formation of the new S.P. Shah Fellowship. This new fellowship will be open for PhD student applicants in mid-2021 for the ACI Foundation's 2022-2023 awards cycle.

Surendra P. Shah currently serves as the Presidential Distinguished Professor, University of Texas, and Walter P. Murphy Emeritus Professor of Civil and Environmental Engineering, Northwestern University.

Professor Shah has been actively involved with research in concrete technology. His current research deals with using nano- technology to enhance the performance at macro scale. Shah has published more 500 journal articles, and is an honorary member of ACI, RILEM, and ASCE. He was the founding director of the USNSF-funded center of Advanced Cement Based Materials. This interdisciplinary center, based at Northwestern University, included Universities of Illinois, Michigan, and Purdue and NIST. Currently he is the director of the Center of Advanced Construction Materials at University of Texas at Arlington.

A fundraising campaign led by ACI Past President David Lange, Kejin Wang, and several additional former students of Shah is aiming to raise an additional $25,000 from the concrete community to fully fund the S.P. Shah Fellowship through 2027.

Details on applying for the ACI Foundation's inaugural S.P. Shah Fellowship will be announced in mid-2021. To contribute toward fully funding the fellowship, visit the "Giving" section of ACIFoundation.org.

NATIONAL STEERING COMMITTEE OF CIM ANNOUNCES PROGRAM EXPANSION TO SOUTH DAKOTA STATE UNIVERSITY

The National Steering Committee (NSC) for the Concrete Industry Management (CIM) program is pleased to announce that South Dakota State University's (SDSU) Jerome J. Lohr College of Engineering will soon offer a degree in CIM.

The announcement comes after a six-month selection process by the NSC and the North Central Region (NCR) patrons for the CIM program—a business intensive program that awards students with a four-year Bachelor of Science degree in Concrete Industry Management.

The CIM program provides graduates with both technical knowledge and management expertise to be hired into entry- or middle-level management positions. The goal of the program is to produce broadly educated, articulate graduates grounded in basic business management, who are knowledgeable of concrete technology and techniques and are able to manage people and systems as well as promote products or services related to the concrete industry. It entails a broad range of courses, from English and history to science and mathematics. A series of required business courses such as finance, marketing, management, and business law are also taken throughout the length of the program. The concrete-specific courses teach the fundamentals of concrete, properties and testing, concrete construction and more. All these courses utilize practical case studies and an internship to make sure the student obtains real-world experience essential to starting a successful career. Additional opportunities for growth include on-campus socials and other organized events providing industry networking and professional development.

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

ACI PUBLISHES 2021 WEBINAR LINEUP

The American Concrete Institute's live webinar lineup for 2021 is now available. These webinars are presented by ACI University and offer a wide variety of high-demand concrete related topics delivered by some of the brightest minds in the field of concrete materials, design, and construction.

2021 ACI University webinars include:

- January 12: Legal Considerations for Your Project Files—Bill Rushing and Jeff Coleman
- February 2: Strategies for Effective Quality Control—Khaled Awad
- March 2: An Overview of Salt-Scaling Damage—Peter Taylor and Kamran Amini
- April 6: Using and Designing Polymer Concrete—Mahmoud Reda Taha
- May 4: Low-Heat-Performance Concrete—Matthew D'Ambrosia
- June 1: Fiber-Reinforced Concrete and Ultra-High-Performance Concrete: A Holistic Approach—Liberato Ferrara
- July 13: Changes to the Seismic Design Provisions of ACI 318-19—Andy Taylor
- October 5: Emerging Innovations in Materials for Concrete Construction—David Lange

For details and to register, visit concrete.org/webinars.

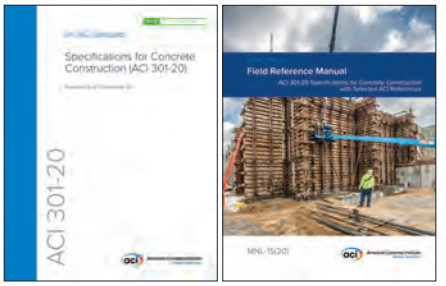
INTERNATIONAL CONCRETE REPAIR INSTITUTE

NEW ACI SPECIFICATIONS FOR CONCRETE CONSTRUCTION

The American Concrete Institute has released the new ACI 301-20, Specifications for Concrete Construction, along with the companion ACI Field Reference Manual.

ACI 301 is a reference specification that engineers, architects, and specifiers can apply to projects involving concrete construction. The scope of the new ACI 301-20 was expanded to include shotcrete, internal curing, mineral fillers, and recycled concrete aggregates. Evaluation requirements for concrete made with self-consolidating concrete and structures with defined requirements for modulus of elasticity of the concrete are also included. Compliance details throughout ACI 301-20 have been updated to align with ACI 318-19, Building Code Requirements for Structural Concrete—providing clarity on the information engineers must provide in the construction documents.

Two checklists for incorporating ACI 301 into concrete specifications are included. The first of these checklists indicates specific qualities, procedures, and performance criteria that the specifier must include in a project specification that are not defined in ACI 301-20, while the second checklist identifies choices and alternatives that the specifier can include as requirements in a specification.



Along with the release of ACI 301, the Institute has also published a new ACI Field Reference Manual. The ACI Field Reference Manual includes the complete ACI 301-20 specifications and more than 20 selected reference documents on measuring, mixing, transporting, and placing concrete; concrete pumping methods; hot- and cold-weather concreting; consolidation; and concrete formwork – providing a convenient resource for use in field offices, jobsite trailers, and more.

ACI Specifications for Concrete Construction and the ACI Field Reference Manual are both available in printed and digital formats.

To assist users in navigating the changes to ACI 301-20, ACI University will be releasing an on-demand course. This online course will be presented by members of the ACI 301 committee and will provide insight on the revisions and updates in this new specification.

To learn more visit concrete.org/store.

INTERESTED IN SEEING YOUR NEWS IN THIS COLUMN?

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

PEOPLEONTHEMOVE

DR. JUSSARA TANESI, CONCRETE RESEARCHER, JOINS AMERICAN ENGINEERING TESTING


Dr. Jussara Tanesi

American Engineering Testing, Inc. (AET), an engineering firm based in St. Paul, Minnesota, is pleased to announce that concrete materials research engineer Jussara Tanesi, PhD, FACI, has joined their Concrete Materials Laboratory team. Dr. Tanesi, a well-known concrete expert and author of over 50 technical publications, is highly respected, both nationally and internationally, for her expertise in concrete materials research, concrete specifications, materials characterization, evaluation of new materials and testing, standardization, and concrete durability and sustainability.

Before joining AET, Jussara served for almost 18 years as a lead contract researcher and laboratory manager at the Federal Highway Administration's Turner-Fairbank Highway Research Center (TFHRC), a US Department of Transportation facility located in McLean, Virginia. There, she conducted research related to concrete materials and concrete pavements and evaluated new and established tests for quality assurance, mixture qualifications and durability requirements.

The AET St. Paul office includes one of the largest construction materials testing laboratories in the US, conducting construction materials performance testing and evaluations for engineering projects across the nation and around the world. Dr. Tanesi's expertise will be instrumental on projects requiring analysis of the performance and durability of concrete and other related construction materials.

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

And...for the best contractors, manufacturers, engineers, distributors, owners, and concrete industry professionals, visit www.icri.org

ICRI CONCRETE REPAIR
Restore | Repurpose | Renew

PRODUCTINNOVATION

MCI®-309: THE EASY CORROSION SOLUTION FOR POST-TENSION GROUTING DELAYS—NOW WITHOUT SILICA

Delays in the construction industry are common. This is especially true for large projects such as bridges that may take several years to complete. For structures that use post-tensioning, grouting is one step that is often postponed for several weeks or months due to cold weather, transit of precast segments, or other project delays. During this time, post-tensioning (PT) tendons installed in PT ducts are at risk for corrosion, especially in environments of extreme moisture, chlorides, or high temperatures. While it can be difficult to protect these tendons in such hard-to-reach areas, Cortec® Corporation has provided a simple solution by offering MCI®-309—a Migrating Corrosion Inhibitor™ that requires no flushing before grouting. MCI®-309 has been improved this year by removing silica from its formulation!

MCI®-309 is a powder-based Migrating Corrosion Inhibitor™ for protection of ferrous and aluminum metals located in recessed areas, interior cavities, and structural voids. It is an extremely efficient dry method of protecting metals within an enclosed space by simply dosing MCI®-309 powder into the void. Upon application, it vaporizes and forms a molecular layer of corrosion inhibitors on the metal surface. If this layer is ever compromised (for example, by moisture or by opening the enclosed space), it will be automatically replenished by new vapor being continuously released from the powder carrier. MCI®-309 is considered ambiodic (mixed), meaning it protects both anodic and cathodic corrosion sites of the metal. It does not contain silica, silicates, phosphates, nitrites, or heavy metals.

Contact Cortec® to discuss the possibility of using MCI®-309 for your application: https://www.cortecmci.com/contact-us/

CORRVERTER® MCI® RUST PRIMER: THE CLEAR WINNER AGAINST REBAR CORROSION IN CONCRETE REPAIRS

Corroded reinforcement is the chief cause of concrete deterioration, which prompts subsequent repairs. For repairs to be sound, contractors must ensure adequate adhesion of new patch repair materials by proper preparation of exposed reinforcing steel. ICRI's 310.1R-2008 "*Guide for Surface Preparation for Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion*" states that exposed reinforcing steel should be free of any materials such as concrete, dirt, and corrosion products that could interfere with repair material adhesion, although a tightly bonded light rust on the rebar surface is usually not detrimental to the bond of patch materials. When it comes to tackling reinforcement surface prep and ongoing protection, CorrVerter® MCI® Rust Primer stands out among competitor materials with clear performance and application advantages to mitigate rebar corrosion.

When it comes to dependable corrosion protection and easy surface prep, CorrVerter® MCI® Primer is the clear winner among competitive rebar primers and bonding agents. CorrVerter® MCI® Primer offers engineers, owners, contractors, DOTs, and government agencies a convenient, low-labor option when performing repairs on heavily corroded rebar and other metal surfaces. It converts rust quickly and provides ongoing protection without compromising bond strength. Contractors may rely on it as an integral part of a high-performance repair system that extends the service life of concrete structures.

For details visit https://www.cortecmci.com/

BOSCH POWER TOOLS ANNOUNCES GHJ12V HEATED JACKET AND GHH12V-20 HEATED HOODIE, KEEPING WORKERS WARM THROUGH THE WINTER MONTHS

Bosch Power Tools, the world market leader for power tools and power tool accessories, today announced its newest heated gear additions, the GHJ12V Heated Jacket and GHH12V-20 Heated Hoodie.

Including enhanced, modern designs and light, durable materials, the jacket and hoodie feature three temperature settings for enhanced control and comfort. Strategically placed heat zones in the chest and lower back offer thorough, efficient heating in a lightweight, easy-to-wear package.

Both products come packaged with the Bosch GAA12V-21 12V Max Portable Power Adapter, enabling users to take full advantage of their Bosch 12V Max Battery, delivering heat as well as 2.1 Amps of accessory power for mobile devices, phones, tablets and more. Additional details below:

GHJ12V Heated Jacket:

- Jacket has three warming heat zones and six pockets for storage
- High-quality water and wind resistant design for maximum comfort
- Portable adapter delivers fast charging to phones and other devices

GHH12V-20 Heated Hoodie:

- Hoodie has three warming heat zones and large adjustable hood
- Portable adapter for fast charging of cell phones, other devices
- Specially designed lightweight fabric design for maximum comfort

For more information visit www.boschtools.com.

EUCLID CHEMICAL LAUNCHES NEW SOLVENT-FREE EPOXY COATINGS FOR CONCRETE MOISTURE CONTROL AND PROTECTION

The Euclid Chemical Company, a leading manufacturer of products for the concrete and masonry construction industry, announces the launch of two new products to the company's line of epoxy-based products, Dural Aquatight 100 Plus and Dural 50 LM FS. In response to the needs of concrete and construction professionals, Euclid Chemical is bringing forth new solutions to combat water-related damage and ensure optimal concrete protection and repair.

Dural Aquatight 100 Plus

Concrete moisture mitigation systems are widely accepted as a critical part of the flooring system, used even when the moisture content of concrete or vapor transmission rate are not high at the time of flooring installation. Dural Aquatight 100 Plus is a solvent-free modified epoxy coating designed to seal concrete surfaces and reduce moisture vapor emissions prior to applying a finished flooring system.

Concrete treated with Dural Aquatight 100 Plus is well protected and prepared for the installation of most floor covering systems, including cementitious underlayment, carpeting, wood and more. It can be applied to new and existing concrete slabs in warehouses, industrial/retail facilities, office spaces, supermarkets, and food & beverage processing centers. It exceeds the requirements of the industry standard ASTM F3010-13 by providing up to 25 pounds of moisture vapor reduction, as well as a barrier against high-alkaline conditions at the highest level.

Dural 50 LM FS

Dural 50 LM FS is a low-modulus, solvent-free, fast-curing epoxy sealer designed to penetrate concrete and protect it from the damaging effects of chlorides and water. Over time, water can seep into the concrete foundation and ultimately break down the concrete, causing damage to the surface such as cracks.

Dural 50 LM FS is designed to repair and seal cracks in concrete substrates, while also significantly reducing chloride intrusion. Its ultra-low viscosity ensures superior substrate wetting and easy penetration into static cracks of concrete surfaces. It can also be used as a fast-setting primer for epoxy polymer overlay systems. For more information visit www.euclidchemical.com/products.

INTERESTED IN SEEING YOUR NEW PRODUCT IN THIS COLUMN?

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

NEWMEMBERS

COMPANY MEMBERS

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Scott Baryiewski

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United States

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Dixon Inc.
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United States

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United States

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United States

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Alchemco
Henrico, Virginia
United States

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United States

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United States

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United States

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United States

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United States

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United States

Drew Zoromsky
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United States

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United States

Marc-antoine Levesque
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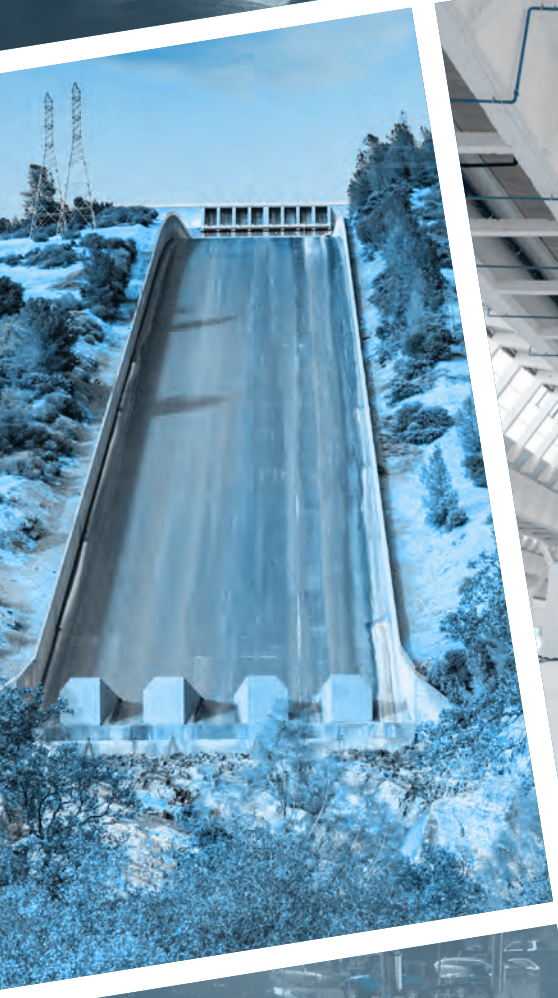
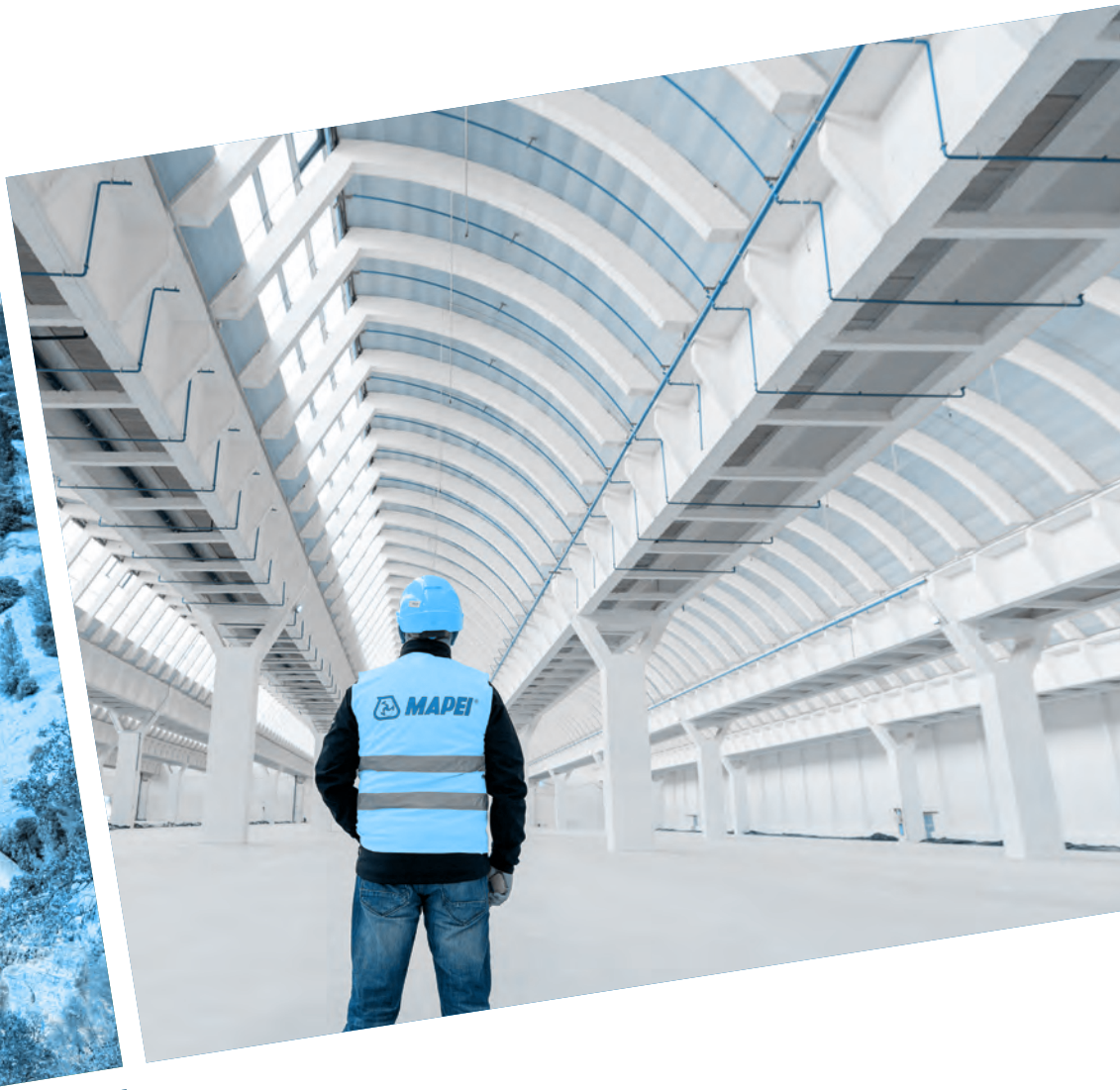




MAPEI offers a full spectrum of products for concrete restoration, waterproofing and structural strengthening. Globally, MAPEI's system solutions have been utilized for such structures as bridges, highways, parking garages, stadiums and high-rises.

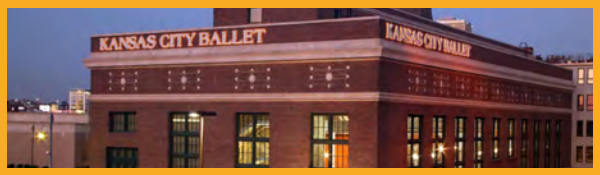
Visit www.mapei.us for details on all MAPEI products.

MAPEI®
ADHESIVES · SEALANTS · CHEMICAL PRODUCTS FOR BUILDING

SIKA IS HONORED TO BE A PART 8 OF THE LAST 9
ICRI PROJECTS OF THE YEAR

2012

The Todd Bolender Center; Kansas City, MO
Submitted by: Structural Engineering Associates, Inc.



2014

Baltimore Design School; Baltimore, MD
Submitted by: Sika Corporation

2015

St. Charles Air Line Bridge; Chicago, IL
Submitted by: Vector Construction

2016

Hibernia Bank Building; San Francisco, CA
Submitted by: Sika Corporation

2017

Alcatraz Quartermaster Building; San Francisco, CA
Submitted by: Sika Corporation

2018

The Edison Battery Building; West Orange, NJ
Submitted by: Sika Corporation

2019

The Île-aux-Tourtes Bridge; Montreal, Canada
Submitted by: Sika Corporation

2020

The Austonian; Austin, TX
Submitted by: Pivot Engineers

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BUILDING TRUST