ICRI CONCRETE REPAIR BALTIMORE WASHINGTON

The Newsletter of the Baltimore Washington DC chapter of ICRI

The Aggregate

4th Quarter 2019

Chapter Calendar

4th Quarter Dinner Meeting & Awards Banquet
November 7th, 2019

2019 Technical Seminar
December 5th, 2019

ICRI National Conference
November 11 - 13, 2019

Address Update For The Chapter:

ICRI BW Chapter
10482 Baltimore Ave
Suite 133
Beltsville, MD 20705

Visit us at:
icribwchapter.org

Message from our President

Kevin Kline - *Concrete Protection & Restoration, Inc*

Hello again fellow ICRI B-W Chapter Members! Football season is officially underway and with that has come pumpkin flavored EVERYTHING as well as colder temperatures. Fall has always been my favorite time of year. However, in the construction industry, especially in our part of the county, it means snow and ice are up next which leads to less work getting done through the winter months. If anyone needs information on cold weather safety, our 1st Quarter Aggregate issue from earlier this year included an article on risks and ways to protect yourself and your crews from cold weather exposure.

As I sat down to write my final President's Message… I began to reflect on the year and what we were able to get done in 2019. At the start of the year, I knew one of my main goals for the chapter was to increase our involvement with local colleges and universities. Kevin Goudarzi (KGS Construction) has made great strides with both Morgan State University in Baltimore and Catholic University in DC, reaching out to professors and scheduling presentations in classrooms. Justin Long (SK&A) has also been busy spreading the word about our scholarship opportunities at university of Maryland and has signed us up for a table at one of their upcoming career fairs on October 17th, 2019. Our goal is to get the word out to local students about ICRI. Who we are, what we do… and then use this as a foundation to connect our member companies to these students for internship and/or career opportunities. If anyone has any questions about this or would like to get involved in these efforts, please do not hesitate to reach out to myself, Kevin Goudarzi or Justin Long. Another goal we have year after year is to grow our membership numbers… and part of that is to also increase our chapter member companies and chapter sponsorships. Paul Askham (Gale Associates) has reached out to numerous companies within our region who were either once involved with ICRI as a chapter sponsor, have employees who are individual members, or companies who have potential to join our group and benefit from being a chapter sponsor. One major change that was made in late 2018 was shifting the billing cycle to once a year with everyone being billed in December in hopes that this would make it easier for us and them to track their status. We are hoping that our growing involvement with local schools will prove as another exciting benefit for our chapter sponsors. With that being said, I would like to thank FMC Associates, East Coast Building Services and Structural Restoration Services who all recently signed up as chapter sponsors. We appreciate your contribution and look forward to your companies being involved with our chapter.

Also… just to touch on the few remaining events for 2019:

- Our fourth quarter dinner meeting and annual awards banquet will be held at The Hotel at the University of Maryland on November 7th, 2019. We ended up with 4 award submissions this year so we are looking forward to a little competition and seeing who the winners are!
- The fall convention for ICRI National this year will be held in Philadelphia, PA from Monday November 11th through Wednesday the 13th. The theme for this convention is "Historic Restoration – The Art and Science of Preserving Structures". Paul Askham will be attending as our delegate for this convention, but I know several other board members are planning to make the short drive up I-95. If you are interested in attending, but not sure what is involved, please do not hesitate to reach out to me or one of the other board members. This is an easier one for us to travel to and would be a great opportunity for those who have not been able to attend conventions in the past due to travel.
- Final event for the year will be our Annual Fall Seminar which is scheduled for Thursday December 5th, 2019 at Concrete Protection & Restoration's main office in Baltimore, MD. The topic for this year is "Focusing on New Technologies and Advancements within the Concrete Repair and Restoration Industry". Stay tuned for the event flyer and more information on presentation topics and speakers.

Please visit our website at www.icribwchapter.org for more information on events as well as chapter updates. As always, do not hesitate to reach out to myself or any of the board members if you have questions, concerns, feedback or recommendations on how we can continue to make our chapter better.

Finally, I would just like to give a big thank you to the 2019 Board of Directors as well as all our volunteers and members for helping to keep the Baltimore-Washington Chapter of ICRI alive and thriving. It is the members and their commitment to growth that makes us such a successful chapter and why we continue to win the Chapter of the Year Award. I am hopeful we can keep doing the things we do well and continue to build on some of the positive changes we have made over the past few years.

Looking forward to seeing everyone at the Awards Banquet in November and Technical Seminar in December.

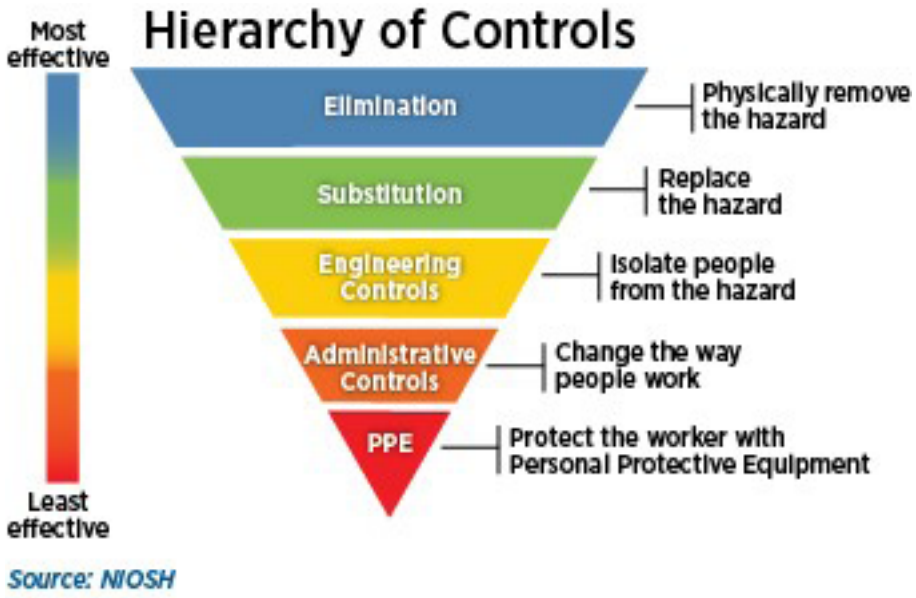
TASK HAZARD ANALYSIS

Charles J Brienza, CSP

The Concrete Repair Industry is populated by all sorts of contractors of varying size and scope. You can find companies that operate around the globe with thousands of employees with an extensive safety budget. On the other end of the spectrum there are companies that employ 10 employees operating in a single regional market with a limited budget of time and money to dedicate to safety. Regardless of size and scope every company is required by law, and ethical obligation, to provide their employees a safe work environment free of hazards. Focusing in the United States, there are a multitude of regulatory agencies and safety standards governing bodies that can provide thousands upon thousands of pages of rules, regulations and best practices that can overwhelm even the largest of companies; let alone the smaller less budgeted ones. So the question becomes, "how can safety be simplified yet achieve results?".

The answer is the Task Hazard Analysis. In a Task Hazard Analysis, Managers must plan a task, asking the question "can an employee be injured in this process?". If the answer is "yes" there is a hazard. Whenever a hazard is present, a hazard control must be implemented. It's always wise to consult a regulatory agency or standards body but a company can make a jobsite safe, in some cases safer by applying basic safety principals.

The most basic of safety principals is the Hierarchy of Hazard Controls. There are several variations of this principal, but it usually looks something like this:



Graphic left shows the Hierarchy of Hazard Controls in which the controls are listed from top to bottom in order of effectiveness. Many common industry practices have already applied some of these controls. For example, silica sand hasn't been widely used for abrasive blasting for quite a while. Coal slag, commonly referred to as "black beauty" seems to be the abrasive media most frequently used in substitution, but there are several suitable substitutions available. The substitution reduces a worker's exposure to respirable crystalline silica; thus safer.

Notice that the hierarchy places far less emphasis on the use of Personal Protective Equipment (the least effective control) and Administrative (second least effective control) hazard controls. It is for this reason that it is wise only to consult OSHA to ensure an organization is in compliance with the regulatory minimum standard. Why? Because if a company does a proper Task Hazard Analysis it should, in theory, find more suitable hazard controls that exceed OSHA standards that sometimes allow the use of training and PPE as primary hazard controls. For instance, OSHA will certainly allow a company to utilize a ladder for access to elevated work areas. However, a suitable ladder, properly erected, ascended by a trained employee is still inherently dangerous. A more effective hazard control when accessing elevated work areas would be to erect a scaffold stair tower. Guardrails and stair rails isolate employees from falls. Isolation is an engineering control which is known to be more effective than any employee training or PPE (fall protection) that can be implemented.

Another poignant example of a task hazard analysis as a tool for enhancing worker safety can focus on scaffold safety. Scaffolds are very common in the industry. OSHA requires fall protection be employed on supported scaffolds when workers are elevated 10 or more feet above the next lower walking/working surface. 10 feet. We can all agree that a 9-foot fall can be very dangerous and under the wrong circumstances, deadly. It would be no comfort to most to know that a worker killed in a 9-foot fall from a scaffold was in compliance with OSHA regulations. Applying the Hierarchy of Hazard Control to the Task Hazard Analysis should yield, at a minimum, that worker will be required to erect guardrails even on "short" scaffolds. Depending on access logistics, a small scissor lift may substitute the supported scaffold all together. The scissor lift would be the safest of the options per the hierarchy (substitution).

In conclusion, OSHA compliance is an important part of being in business. Any company that has paid a citation or been disqualified to bid work due to OSHA history would agree. However, if the culture of the company is truly motivated to protect employees from injury, a proper Task Hazard Analysis applying the Hierarchy of Hazard Controls, focusing on more effective control strategies, is a simple method for all companies (large and small) to employ.

Charles "Chuck" Brienza is Safety Manager for Freyssinet, Inc.

ACCELERATION OF THE WORK

Kenneth K. Sorteberg, Esquire

Acceleration of construction work is often required to recover delays to the project. Acceleration generally causes the contractor to incur additional costs. Overtime payroll premiums for extended workdays and weekend work quickly come to mind as a cost of acceleration. Some other forms of acceleration (such as increasing crew size, bringing in additional crews, working out of sequence and stacking of trades in tight work areas) do not appear at first glance to have a direct impact on payroll cost.

However, all of these acceleration measures can and often do lead to costly inefficiencies in the form of lost productivity. Prolonged periods of overtime can lower work output and efficiency through fatigue and poor mental attitude. Adding new workers to the project breaks up the labor rhythm and causes learning curve productivity losses. Placing too many workers in a limited work area leads to inefficient work. All of these measures can lead to loss of morale and to mistakes which require come-backs. (For calculation of lost productivity, reference can be made to Mechanical Contractors Association of America, Inc.'s Bulletin No. PD2 Revised (2011), entitled "Factors Affecting Labor Productivity.")

Unless the contractor is at fault for the project delay, acceleration costs are likely recoverable. A clear directive to accelerate from the Owner should result in a negotiated change order to cover the additional costs.

Often, however, an Owner will demand on-time completion without taking into account time extensions to which the contractor is entitled for excusable delays. This is called "constructive acceleration." The Owner's demand has the effect of requiring the contractor to work at a faster rate and/or under conditions other than those required by the contract in order to make up the delay. Such a demand is thus equivalent to an express order to accelerate. Under such circumstances, the contractor should be entitled to recover for its effort to accelerate the work.

Please feel free to contact Ken Sorteberg at sorteberg@constructionlaw.com with any questions or suggestions for future Legal Columns. Mr. Sorteberg is a civil engineer and an attorney (licensed in MD and DC) who focuses his practice on construction law.

ICRI BALTIMORE WASHINGTON 3rd QUARTER DINNER MEETING

By Brian Radigan

The members of the Baltimore-Washington Chapter of ICRI assembled for their 3rd Quarter Dinner meeting once again at Maggiano's Little Italy restaurant at the Tyson's Galleria in McLean, VA. We have held several meetings at this location over the years and I think it has become somewhat of a favorite among our members. Geographically it is fairly easy for everyone to get to and from, and the food is always a hit. Thanks to Brian Baker (PPSI) who coordinated and made the arrangements for the event. As always, the evening began with a social hour providing the opportunity for all members to catch up with old friends, network with new contacts and chat about the Redskins 0-2 start to the season.

The dinner kicked-off with opening statements and announcements from our President, Kevin Kline (CP&R). He reminded everyone of the upcoming events… Q4 Dinner/Awards Banquet on November 7th and the Fall Seminar on December 5th. Additionally, there will be 3 open positions on the Board of Directors for 2020. Afterwards, Dave Bickel (CP&R) also provided a short standup routine and gave some information on the upcoming annual golf outing.

Kevin then introduced the speaker for the evening, Gary Schue. Gary has worked in construction since the summer of 1969 and graduated from George Mason University in 1974. In 1974 Gary began working in masonry with United Masonry and went on to open his own masonry company, GC Schue Inc. in 1985. In 2009 Gary decided to close GC Schue Inc. to work as a masonry consultant for large masonry companies completing marquis masonry projects all around the Mid-Atlantic region. In 2018 Gary brought his unique skillset in both new and historic masonry to United Building Envelope Restoration working as General Superintendent.

In his presentation, Gary discussed a brief overview of historic masonry and techniques as well as a deeper discussion of "Old vs. New" in which we discovered how technology in masonry construction has evolved over time. Specific examples of real-world repair techniques will be related neatly within the confines of historic masonry. He showed photos and examples from several unique historical restoration projects he has worked on throughout his career. A very interesting presentation.

Thank you to all who attended the dinner meeting and we look forward to seeing everyone at our Q4 Dinner/Awards Banquet on November 7th.

ICRI Baltimore Washington Chapter 4th Quarter Dinner Meeting

Thursday, November 7, 2019

The Hotel at The University of Maryland
7777 Baltimore Ave.
College Park, MD 20740

SCHEDULE:

4:00 pm Board Meeting
5:30 pm Social Hour
6:30 pm Dinner & Presentation

REGISTRATION:

Member Rate: $50
Non-Member Rate: $60
All after 10/26/18: $60

REGISTRATION DEADLINE IS NOVEMBER 1, 2019

Company: _____

Name: _____

E-mail: _____ Phone: _____

Number of Attendees: _____ Attendee Names: _____

_____

2019 Awards Dinner and Board Elections

Join us for our last dinner meeting of the year where we will present our annual awards for outstanding projects. Competing projects are judged on a number of criteria including, but not limited to: overall presentation of the project, innovative or difficult approach to making repairs, specialized materials or equipment required, difficulties during construction related to site issues or owner issues, tight construction deadlines or compressed schedules and that the project's success can be attributed to utilization of ICRI techniques and guidelines in the repairs.

Elections for our 2019 Board of Directors will also be held at this meeting.

Scan and email this completed form to Chapter Secretary, Brian Radigan by 11/1/19. Checks may be mailed with your form or you can bring them with you to the meeting.

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745 Darlow Drive
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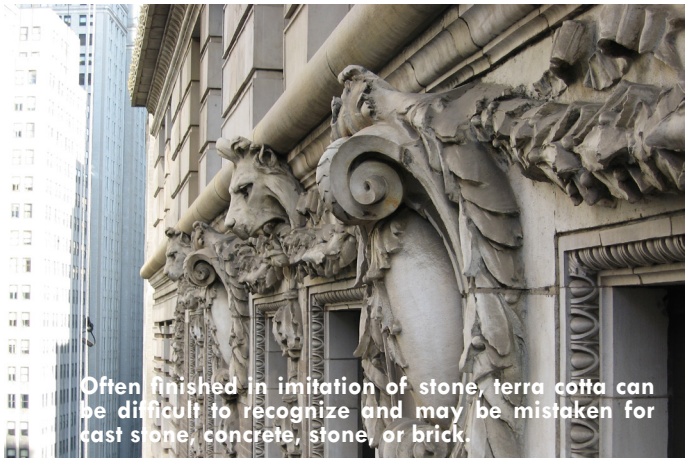
Caring for Glazed Architectural Terra Cotta

Arthur L. Sanders, AIA and Kara L. Shypula, Assoc. AIA, LEED Green Associate
Hoffmann Architects, Inc.

One of the most prevalent materials found on historic buildings, glazed architectural terra cotta was popularized in the late nineteenth century as a versatile, lightweight, economical, and adaptable alternative to stone. Through the 1930s, the sculptural properties of terra cotta gave rise to diverse architectural styles, including the Chicago School, High Rise, and Beaux Arts styles.



Often finished in imitation of stone, terra cotta can be difficult to recognize and may be mistaken for cast stone, concrete, stone, or brick.

Weighing roughly one-tenth as much as stone, architectural terra cotta is composed of kiln-baked clay called bisque—a mixture of clay, previously fired clay products (or grog), and water—which is finished with a protective glaze. Terra cotta can be molded and fired at high temperatures to a hardness and compactness comparable to that of brick. Readily shaped into sculptural forms, terra cotta offered designers an extensive color palette and range of textures at a much lower cost than that of quarried stone.

Glazed architectural terra cotta is composed of hollow, hand-cast units, and adorns a number of noteworthy turn-of-the-century buildings. As styles changed over time and production costs increased, terra cotta fell into disuse. The scarcity of qualified manufacturers and skilled craftspeople can present challenges to the ongoing maintenance and restoration of historic terra cotta.

When properly installed and maintained, terra cotta is a durable, long-lasting material. Most significant problems are due to inappropriate repairs, lack of maintenance, or both. By following good preservation practices, with attention to detail and workmanship on par with the original design and craftsmanship, building owners and design professionals can achieve lasting restoration solutions to terra cotta deterioration.

Fabrication and Construction

Terra cotta units are cast as hollow blocks, open at the back, with webbing that augments strength and loadbearing capacity. A mold is made from a model for each type of unit, and the clay is pressed against the inside of the mold. Alternatively, terra cotta may be extruded or ram-pressed.

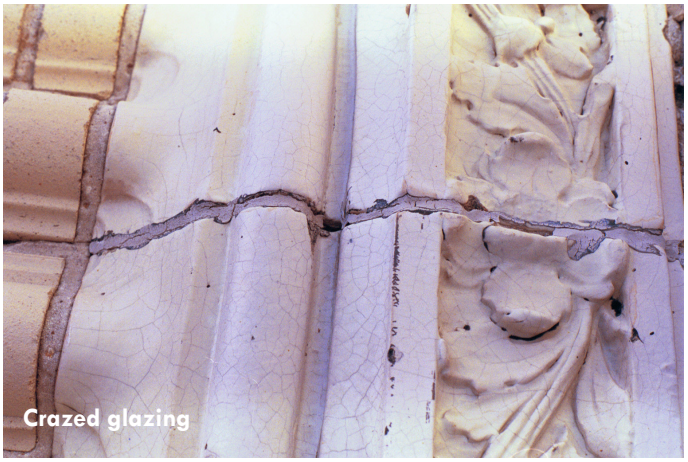
Once the mold is removed, the unit is finished by hand and allowed to dry. The outer face is sprayed or brushed with glaze. Not only does the glaze add color and finish effects, it creates a relatively impervious surface that protects the terra cotta from moisture. Once the glaze has been applied, the unit is fired in a kiln. Finished terra cotta units were typically installed with masonry backup and supported by steel lintels and angles.

Failed prior repair effort.

Causes of Deterioration

Exposed and free-standing terra cotta detailing, such as balusters and parapets, tends to deteriorate more quickly than other facade elements. Where anchoring is extensive and complex, deterioration and failure likewise tend to be more pronounced. Deterioration to terra cotta used as load-bearing masonry tends to be less severe, owing to its simple or limited anchoring system, which presents fewer opportunities for corrosion-induced cracking and failure.

For most architectural terra cotta, deterioration may be traced to some combination of four basic factors: moisture infiltration, the resultant corrosion of embedded steel, structural and thermal movement, and the ill effects of improper repairs.

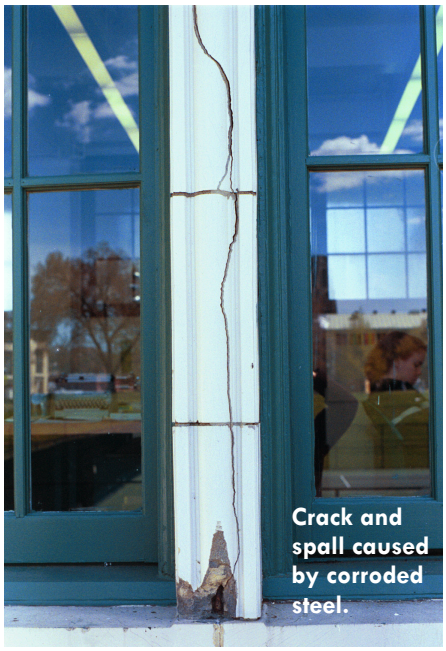

Crazed glazing

Moisture Infiltration

Water that penetrates between the clay bisque and finish glaze tends to migrate through the porous clay, leading to disintegration of the terra cotta. One source of water entry might be delamination of the finish glaze, which can occur when the thermal coefficient of expansion between the clay and the glaze don't match. Alternatively, the original design may have supposed exaggerated waterproofing properties of the finish glaze, and systems for water management, such as flashings, weep holes, and drip edges, were never incorporated.

Cyclic wetting/drying and freezing/thawing can lead to glaze deterioration, cracks and spalls in the body of the terra cotta, and fracturing and displacement of the units. Crazing, the formation of small random cracks in the glaze, occurs when the terra cotta unit absorbs moisture from the air and expands over many years. When new terra cotta is removed from the kiln, firing has shrunk it to its smallest size; over time, the porous clay grows, and the glaze goes into tension. Once the strength of the glaze has been exceeded, it cracks and shatters, increasing the water absorption of the terra cotta unit and exacerbating water infiltration in a self-perpetuating cycle.

When water enters the wall system through poor detailing, insufficient maintenance, rising damp, a leaking roof, or other sources, the impervious glaze may impede moisture migration and trap water inside the terra cotta unit. As temperature fluctuations increase pressure, sections of glazing or of the terra cotta itself may break off or spall. Glaze spalling tends to begin as blistering, when trapped water migrates to the surface and builds up pressure behind the glaze, eventually forcing pieces off the face of the unit. Glaze spalling may also be caused by corrosion of internal metal anchors.
When the terra cotta itself breaks apart or spalls, the result is a loss of visual integrity. With the porous underbody and anchoring exposed to the elements, the potential for water entry and further destructive effects increases.


Crack and spall caused by corroded steel.

Corrosion of Embedded Steel

As water penetrates, it comes in contact with embedded steel anchors and reinforcement. In historic applications, steel was often untreated, making it particularly susceptible to corrosion. As it corrodes, the steel expands, exerting pressure on the surrounding terra cotta and causing cracking and displacement. Embedded steel corrosion may be caused by unmaintained roof drainage systems, which admit water into the cladding assembly.

What makes embedded steel corrosion challenging to treat is that it tends to be difficult to diagnose unless it is severe. By the time symptoms are visible at the surface, corrosion is likely already advanced. Initial outward signs of metal anchoring deterioration might include staining and spalling. Total anchoring failure can result in loose terra cotta units, which are in danger of falling from the building.


Cracking at building corners.

Structural and Thermal Movement

Large cracks running through multiple units or stories usually indicate problems with embedded structural elements. Rehabilitation often requires removal of pieces to examine and treat defects, such as corroded steel columns.

Most high-rise buildings from the early 1900s had little or no provisions for movement, so unaccommodated thermal expansion and contraction, along with building-frame shortening under load, placed sufficient strain on building materials to cause displacement and cracking. Without proper expansion joints, buildings create their own, in the form of long cracks that admit significant water infiltration and invite further problems.

Improper Repairs

Many repairs fail prematurely because they do not address the root cause of distress or failure. Often, repair materials are not durable and are incompatible with the existing terra cotta, creating a poor visual match and a short-term fix, at best. Where repairs fail, they tend to make deterioration worse.


Joint deterioration

Poor detailing, including failure to properly anchor the patch to the backup, leads to failure of not only the repair area, but also the surrounding terra cotta. For example, replacement brick and cement stucco are neither watertight nor flexible enough to accommodate movement, so they tend to pull free or crack and spall. Surface-applied sealants are likewise not watertight, and bituminous patches are ineffective and aesthetically unsuited to terra cotta repair. In an effort to keep out water, non-breathable coatings are sometimes applied; these have the effect of trapping water inside the terra cotta, particularly if the source of water entry has not been addressed.

The misuse of sealant in place of mortar for joint repairs serves to trap water within the terra cotta, leading to corrosion of embedded steel and cracking and spalling of terra cotta. Unlike impervious sealants, mortar is porous and allows moisture to escape.


Blistering coating.

Alterations and additions to the building, such as signs, screens, marquees, and bird proofing, may also cause damage, where anchoring involves boring holes or cutting into the glazed terra cotta. When the appurtenances deteriorate or are removed, the holes remain, admitting water infiltration.

Investigating Terra Cotta Conditions

Before a comprehensive investigation, it may be helpful to clean terra cotta, as dirt can conceal problems. A unit-by-unit visual inspection should be performed to note surface deterioration, including staining, crazing, cracking, and spalling. Where possible, a hands-on, close-up examination is best.

To identify hidden deterioration, tapping may be used, in which each unit is struck with a wooden mallet. To the experienced ear, an undamaged unit will give a pronounced ring, whereas deteriorated units produce a flat, hollow sound. While inexact, tapping provides a measure of the integrity of terra cotta without invasive testing.

Metal detection, by means of an oscilloscope, may be used to confirm the locations of anchors indicated on original drawings. A negative reading where an anchor would be expected may indicate that it is missing or deteriorated.

Together with visual inspection and non-invasive testing, laboratory analysis can provide a picture of terra cotta conditions and composition, in order to develop an appropriate program of repair. The evaluation might include glaze absorption, permeability, and adhesion, as well as terra cotta porosity.

Other non-destructive test methods include infrared scanning, which uses a thermal camera to measure heat, and sonic testing/ ultrasound, which emits sound waves and reads the patterns that bounce back. Both methods compare the readings of intact terra cotta with those of damaged units to identify concealed conditions.

Proper Maintenance and Repair

Before attempting to fix terra cotta damage, causes must be addressed. Eliminating sources of moisture infiltration is critical and may necessitate adding flashings to protect water entry surfaces. For structural problems, including long, vertical cracks at building corners, an engineer may need to evaluate the integrity of the embedded structure before repairs to terra cotta units are made.

Glazed terra cotta was designed to be cleaned cheaply and easily. Typically, all that is required is water, detergent, and a natural or nylon bristle brush for gentle scrubbing. Strong acid solutions may deteriorate mortar, release salts in the terra cotta, and cause efflorescence, and are best avoided. While generally not necessary, some proprietary commercial solutions may be suitable for use on terra cotta; check manufacturers' recommendations. Avoid abrasive cleaning, such as sandblasting, as well as high-pressure water or metal bristle brushes, all of which can damage glazing irreversibly.

Although persistent water infiltration may make a waterproof coating seem like a good idea, indiscriminate coating of the entire wall is generally inadvisable, as it may trap water and make matters worse. Serious crazing may be treated on a limited scale; however, most glaze crazing does not substantially increase the flow of water into the wall. Unless the source of moisture infiltration is addressed, applying an impervious coating will only serve to prevent outward migration of water from within the assembly.

Maintaining mortar joints is very important to the lifespan of the terra cotta. Periodic repointing prevents water entry and inhibits deterioration. It's important to use a mortar with a compressive strength that is lower than that of the adjacent terra cotta, since a hard mortar may prevent the outward migration of water and may cause point loading. Never repoint with sealant, as it impedes moisture movement. Use sealant selectively, such as at joints in horizontal surfaces of copings and sills.

For spalled glazing, coat or seal blistered areas to prevent water infiltration, using color-matched products. At lower stories where visual integrity is critical, the unit may need to be replaced. Patches tend to be aesthetically unappealing and don't bond well over the long term. Cementitious materials, especially, have a coefficient of expansion that differs from that of terra cotta. For major spalls, the only solution is to replace the unit. Partial repairs don't last, and may cause problems later.

As a stop-gap measure to prevent further water infiltration, structural cracks in units not slated for replacement may be sealed with a waterproof material that accommodates movement. For static cracks, butyl sealants or acrylic latex caulk may be recommended, while dynamic cracks are better sealed with polysulfide caulks or other proprietary products. Take care never to use these compounds for repointing; only mortar should be used in mortar joints.

Where the existing steel has corroded, it should be treated, repaired, or replaced, as appropriate. For new anchors, protected stainless steel should be used to prevent future corrosion.

Deteriorated, unstable, or visually incompatible previous repairs, including cementitious stucco, bituminous compounds, and brick infill, should be removed and replaced with appropriate, properly detailed repairs. Rehabilitation should address the root cause of distress, using materials that are compatible with the existing terra cotta, and which do not compromise the breathability and moisture balance of the assembly. In addition, maintaining materials adjoining the terra cotta, including flashing, capping, roofing, and sealant at doors and windows, is vital to averting deterioration.


Untreated deterioration can result in hazardous conditions.

Temporary Stabilization

Where deterioration is so severe that pieces may fall from the building, temporary stabilization or replacement may be necessary to protect public safety. Particularly in urban areas or locations with high seismic activity, code compliance—and civic responsibility—dictate the immediate securing of identified hazards. Until a permanent solution can be implemented, nylon netting and metal strapping are commonly used to secure unstable pieces.

Where hazardous deterioration necessitates removal of units, leaving open gaps can increase the structural load on the remaining pieces and provide an avenue for water infiltration. When fabrication time, budget considerations, or seasonal factors delay restoration, temporary replacement can prevent further deterioration until the long-term repair is completed.

In-kind Replacement

Since glazed architectural terra cotta tends to be a complex, interlocking system, it may be difficult or even impossible to remove damaged units without destroying them. If a terra cotta unit is very loose or severely deteriorated, it may be necessary to replace it, rather than salvage and restore it. It's best to completely remove all of the deteriorated original material, as leaving half-units is not likely to yield a satisfactory repair.

During production of new terra cotta units, meticulous design, specification, and quality control are imperative. Both structural and visual compatibility are major considerations, and specifications must account for factors that affect strength and durability. Key considerations include:

- Compressive strength
- Absorption (saturation coefficient / cyclic freezing testing)
- Glazing compatibility with the terra cotta and resistance to crazing
- Uniform joint widths and unit dimensions
- Tolerances for face dimensions and warping/chipping of the finished face
- Surface color/texture/shape/size/profile matched to existing units
- Finish defects/imperfections
- Low coefficient of moisture expansion (for new units set into existing terra cotta)

Given the variegation, intricate textures, and sculptural forms of historic terra cotta, most replacement pieces must be custom cast. These hand-crafted units are expensive, and they have lengthy delivery times, on the order of eight to ten weeks. Machine-made, standardized terra cotta units may be available for some pieces, such as plain ashlar blocks, and provide a faster, more economical solution. While more uniform than hand-made terra cotta, these factory-produced units tend to be less durable and less dense, having glazing that is thinner and more brittle, with color less rich and varied than its historic counterparts.


Until permanent repairs are made, netting may be used to secure unstable terra cotta.

For both machine- and hand-fabricated terra cotta, it's important to obtain material samples and quality control units from each firing, to test compressive strength and absorption characteristics and to confirm the properties of special glazes. To facilitate correct installation of replacement pieces, a unit numbering system should be used, both in shop drawings and on the units themselves. Prior to installation, the terra cotta pieces should be laid out in configuration, to confirm dimensions and colors. Where possible, replacement units should be anchored similarly to the originals.

Replacement with Substitute Materials

While in-kind replacement is always preferable from a historic preservation standpoint, there are other viable options that may be appropriate where new terra cotta is not feasible.

Stone is durable and may be the best match for terra cotta that was originally cast and glazed to imitate natural stone. However, it weighs significantly more than terra cotta, and the cost may be just as high, especially where ornately detailed carving is involved.


Designated landmarks or buildings listed on historic registers may require permitting for terra cotta restoration.

Precast concrete is cost-effective, offers rapid production times, and can usually replicate original detailing. When cast hollow with lightweight aggregate, its weight is comparable to that of terra cotta, and it typically produces good results in color matching. For visual compatibility and waterproofing, a clear masonry coating should be applied to the weather face. On the downside, precast concrete may not be as long-lasting as is terra cotta.

Glass-fiber-reinforced concrete (GFRC) is a precast product composed of Portland cement-based composite with alkali-resistant glass fibers randomly dispersed throughout to add flexural, tensile, and impact strength. Strong and lightweight, GFRC may be formed into complex shapes and offers a range of colors, textures, and surface finishes. While similar to terra cotta in terms of weight and wall thickness, GFRC typically has no structural capacity; some varieties incorporate different glass content and admixtures to gain some structural strength. GFRC is perhaps most appealing for its substantial cost savings over terra cotta, typically upwards of 50 percent. Be aware, however, that it may be difficult to match the finish of existing terra cotta.

Glass-fiber-reinforced plastic (GFRP, FRP, or GRP) or fiberglass can be cast from intact pieces of original terra cotta and has limited use as a replacement material for elements with fine detail, provided the size and scale are not too large. Originating in the boat-building industry, GFRP is lighter than terra cotta and may be a viable option for buildings in areas of high seismic activity, or where existing structural supports proved inadequate. Surface gelcoats offer a wide range of colors and patterns; however, ultraviolet light degradation is a consideration, as is fire resistance. Several blends of resin, gelcoat, and glass fibers may need to be tested in order to obtain the requisite strength and finish properties.


Cornice repair at a historic terra cotta building.

Micro-cotta, a polymer-based composite concrete, is a proprietary product developed for terra cotta rehabilitation. Lightweight and capable of reproducing detail with sharp definition, Micro-cotta uses a finer aggregate than does cement-based concrete and has a lower absorption rate. However, there is some evidence that early formulations tended to fade and yellow in sunlight, and may have been susceptible to excessive crazing.

On the whole, substitute materials tend to offer faster manufacture and cost savings over replacement terra cotta. However, even closely matched alternatives may have a slightly different appearance than terra cotta; some are glossier, and concrete products tend to darken when wet. Unlike decorative elements or cladding, structural terra cotta may be difficult to substitute, as an entirely redesigned structural system may then be required.

Toward a Durable Solution

Many architecturally significant buildings from the late 19th and early 20th centuries in the U.S. incorporate terra cotta facade elements, and as these buildings age, they demand ongoing care and maintenance. Restoration of glazed architectural terra cotta should employ the same level of care and attention that went into the design, fabrication, and installation of the original historic material.

When cared for diligently, terra cotta is a resilient and relatively low-maintenance material. By repairing minor cracks, spalls, and other signs of deterioration promptly, building owners and managers can break the cycle of deterioration before damage becomes severe and irreversible. When coordinated among owner, design professional, fabricator, and contractor, terra cotta rehabilitation can revitalize the distinctive facades of historic terra cotta structures, while providing durable repair solutions that stand the test of time.

2019 ICRI Golf Tournament
October 3, 2019

by Dave Bickel

The 28th Annual ICRI-BW Chapter Golf Tournament was held on Thursday, October 3rd at The Timbers at Troy in Elkridge, MD. We had a great turnout of 103 golfers who participated in the tournament this year. There was also a total of 44 companies that supported the event through Premium Sponsorships and Hole Sponsorships along with the companies that support ICRI BW Chapter with yearly sponsorships. The Chapter is thankful for everyone's support.

The weather for the day was in the low 70's so it made for a great day of golf! The morning started off with a continental breakfast for all; liquid refreshments all day long, along with cigars and snacks that were served on the course; followed by a buffet lunch and the awards presentation ended the day.

A special thanks goes out to the following companies who donated items for the raffle:

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The Chapter also wants to recognize the following tournament sponsors for their support with Premium Sponsorships:

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The golf outing is a major fundraiser with the proceeds funding the ICRI Scholarship program. We couldn't have made this the success that it was without the dedicated and hardworking volunteers: Caitlin Corbitt, Patrick O'Malley, Sue O'Malley, Nancy Smith, Kevin Kline, and David Bickel.

Once again, thank you all for making our tournament a huge success. Enough cannot be said for all the time and effort our volunteers put forth.

We look forward to seeing everyone on the golf course next year!

2019 FALL TECHNICAL SEMINAR

December 5th, 2019

Concrete Protection & Restoration, Inc.
2811 Lord Baltimore Drive
Windsor Mill, MD 21244

The theme of the upcoming BWC Fall Technical Seminar will be "Focusing on New Technologies and Advancements within the concrete repair and restoration industry". From an update on the latest advancements in Carbon Fiber Technology to the advanced technologies now affecting Coatings, Sealants and Concrete Admixtures, our presenters will have the latest updates for all to share. Advancements in Equipment technology will be addressed and the utility of the ever-changing world of Phone Apps and computer programs will make for a lively discussion. And of course, there will be a live demonstration for everyone to experience following our speakers part of the program.

Look for details and registration information coming soon via email

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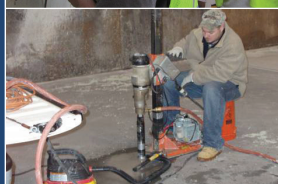

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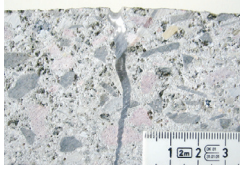

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UNIVERSITY OF MARYLAND CAREER FAIR

On Thursday, October 17, 2019, The Baltimore-Washington Chapter of ICRI attended the University of Maryland's Chi Epsilon Civil Engineering Career Fair held at the Stamp Student Union Colony Ballroom at College Park. The Baltimore-Washington Chapter unveiled their exhibition banners and was represented by Chapter President, Kevin Kline, EIT; Education Committee Chairman, Kevin Goudarzi, PE; and Industry Outreach Chairman, Justin Long, PE.

The event featured 50+ local engineering, contracting, and consulting firms dealing with areas such as environmental, construction, geotechnical, land development, structural, transportation, water resources, and materials. The fair was open to all University of Maryland undergraduate and graduate students seeking internships or full-time positions. The purpose of the Baltimore-Washington Chapter of ICRI attending the career fair was 1) to provide exposure to and information about the repair & restoration industry, 2) to provide promote student involvement in the Baltimore-Washington Chapter of ICRI and 3) provide a link between students seeking internships or employment and the company members who support ICRI.

The board members representing the Baltimore-Washington Chapter of ICRI were excited to meet the career-focused, civil engineering students to discuss the repair & restoration industry, ICRI, and career opportunities with our member contractors, engineers, and material suppliers. While many of the students were eager to pursue the next steps of their engineering education and careers in new construction, many were very interested and excited about the opportunities that the repair & restoration industry had to offer. Board members fielded questions brought to them by students who had no exposure to the repair & restoration industry while also engaging in more detailed conversations with students who were already considering a career in the industry and wanted to know more. Resumes were handed off to the board members who will share with Company Members of the Baltimore-Washington Chapter.

This was the first time the Baltimore-Washington Chapter attended the University of Maryland's Career Fair. The chapter's goal is to attend similar events more frequently in order to promote ICRI and the engineers, contractors, and material suppliers that support and make it such a great organization. If you are interested in supporting future ICRI career fair or university engagements, please contact:

Education Committee Chairman:
Kevin Goudarzi, PE @
kgoudarzi@kgsconstruction.com

Industry Outreach Committee Chairman:
Justin Long, PE @
justinl@skaengineers.com

Chapter Business Card Directory

Visit **www.icribwchapter.org/chapter-sponsorship** to purchase a business card ad and to see our full menu of sponsorship & advertising options.

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