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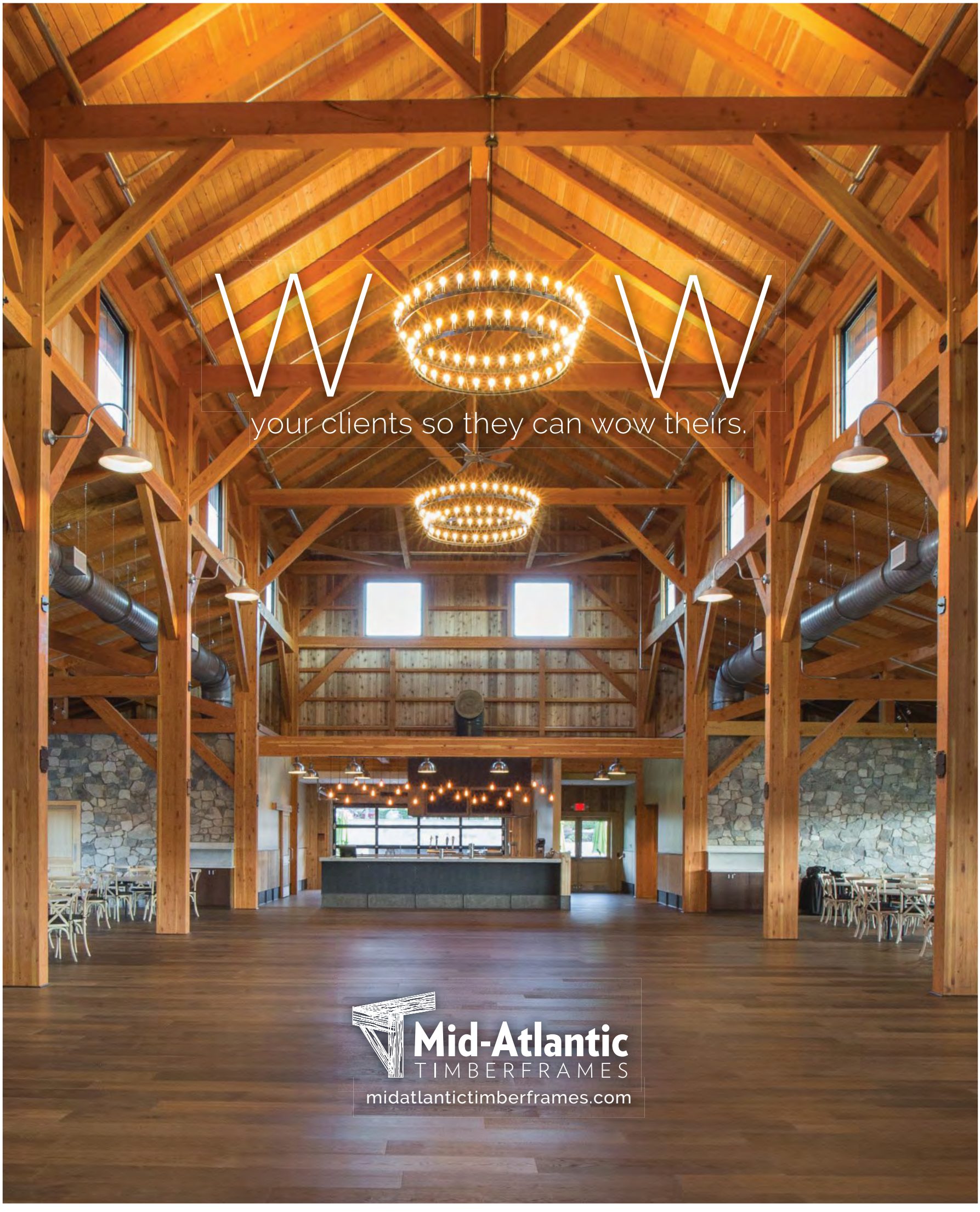
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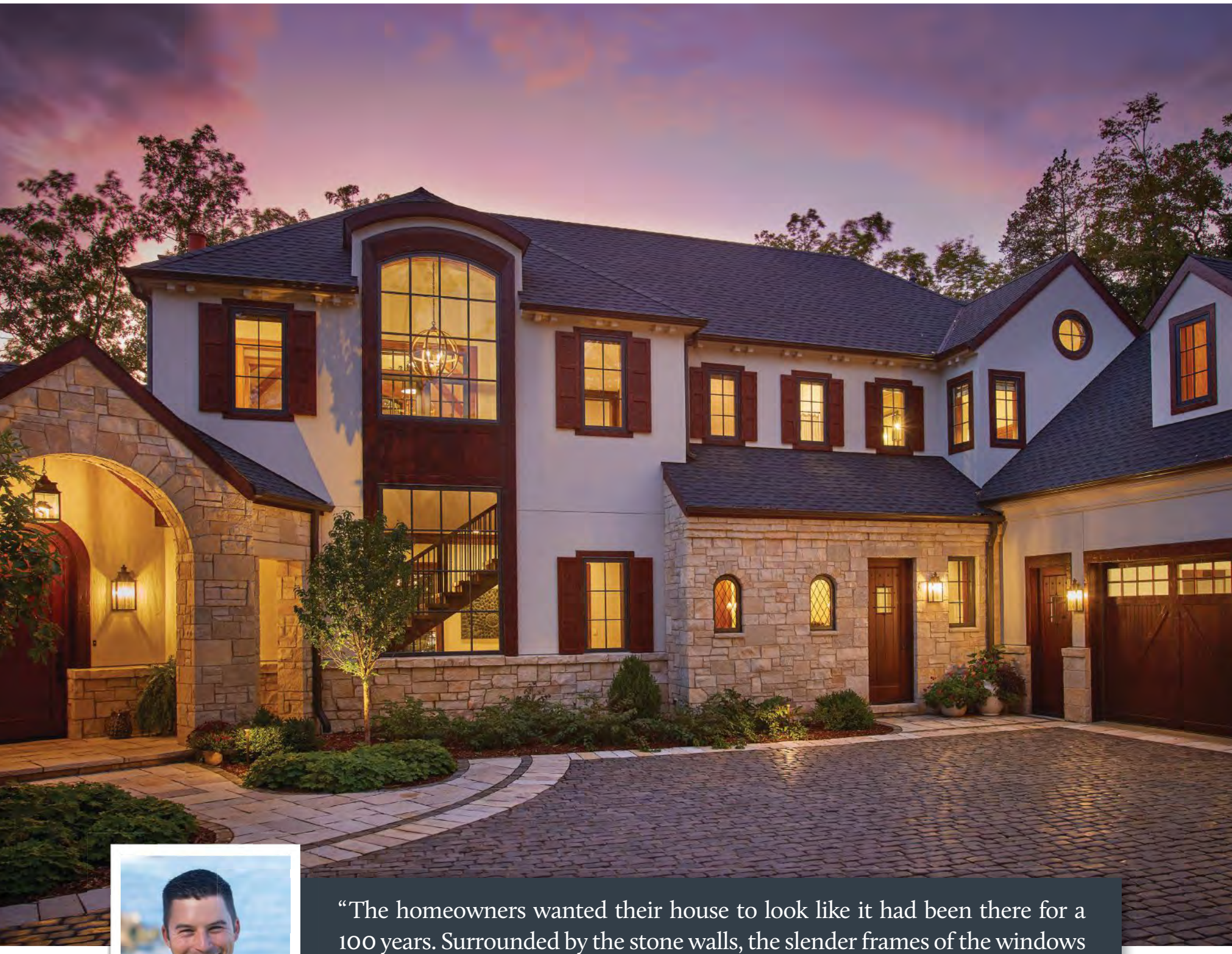

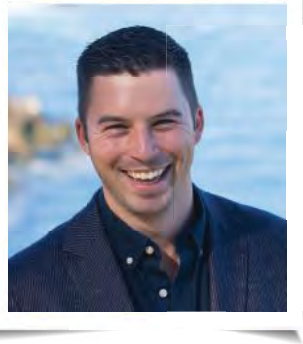

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INTERVIEWED BY ERICA FIRPO

A gracious New England Colonial embraces the landscape with an elegant screen porch overlooking the terraced rear garden.

Sleight of Hand

Jan Gleysteen has made a career out of creating seamless design.

Photo courtesy Jan Gleysteen

JAN GLEYSTEEN, ARCHITECT

RIGHT & TOP: Richard Mandelkorn photos

Jan Gleysteen loves every style, genre, and era of architecture. And every conversation with the Wellesley, Massachusetts-based architect and former Institute of Classical Architecture & Art New England chapter board member is a deep dive into detail—architectural and otherwise. Ask him about Andrea Palladio and, in one breath, he'll share a summer adventure exploring the Veneto, describe railings, stairs, horizontals, masonry, and Palladio's Villa Rotunda, and charm you with tales of chatting up gatekeepers beckoning with 'viene, professore,' and then flip the conversation about a Plymouth Barracuda or exploring Aalto Alvar buildings in Helsinki.

A peripatetic student thanks to his father's career in the Foreign Service, Gleysteen's passion for building was cemented long before academics and drafting. In the summer months during high school and university and U.S. hiatus, Gleysteen worked in construction learning the craft of building creation and giving him a deep knowledge of how things are put together.

"I watched a condo building go from a foundation, poured concrete, up to the next level on Wisconsin Avenue in Washington, D.C. Bring the windows in. Run pipes. The electricity... and then at the end when they put the roof on, I had that 'aha' moment," tells Gleysteen.

That "Aha" moment brought him to Tufts and then Columbia with archi-

Sarah Winchester photo; Illustration courtesy Jan Gleysteen

LEFT Architect's sketch for a rear garden room addition to an 1878 Queen Anne style home picks up on the lines of an octagonal wraparound porch removed decades earlier.

BELOW Custom kitchen cabinetry with a pop of color for an 1899 lakefront home.

tect and educator Robert A. M. Stern. "He instilled the ability to understand different styles," attributes Gleysteen. Stern's intensive courses in architectural history had their payback a few decades later when Gleysteen transitioned from commercial architecture (where he was overseeing blockbuster building projects, thanks to his construction knowledge) to residential—new buildings inspired by traditional design and renovations on century-old properties.

Traditional design is a cultural commitment for Gleysteen. Ask him about brick masonry and he'll break down exactly how to recreate 19th-century blends. Ask about slate, he talks quarries. Ask about details, and he'll wax on the challenges of turning building corners. "When you work on an older home, it's like a detective hunt. You've got a mystery challenge. Where did these materials come from? How can I match these materials—oftentimes from the original sources?"

Gleysteen investigates all of it, and studiously comes up with solutions, which keep him onsite with his team of builders and craftsmen. "Now, I'm the biggest pain. In order to get it done, I have to be a pain," he explains because when it comes to the build it's all about complete authenticity in design, construction, and craft.

"The joke is that my favorite thing is that I want to go hang out at the construction site, and I always wanted to be a builder, but I guess I'm an architect more than I am a builder, but I would call myself the 'engineer architect.'"

Gleysteen's encyclopedic knowledge of architectural history and expertise in construction has led him to become one of the foremost restoration and renovation architects in New England. We Zoomed with Gleysteen for a few more questions:

RIGHT Architect's rendering for a historic replication addition to an 1899 Jacobean style home.

MIDDLE Completed addition is a seamless continuation of the original architecture.

BOTTOM The new addition stretches into the landscape to take advantage of water views of the lake below.

1 ***Which do you love more new builds or renovations?***

My favorite is really doing the addition renovations to antique houses. And what's so much fun is that we've acquired all this experience on how to update and fix technically or mechanically, these houses, but when we add on, it's like we take a course internally on working in that architect's office, and it's like a hundred years ago, and we got a call, "We need an addition on an old house." And it's my job to make the addition look like it was done by the same designer from 100 years ago. The strange thing is that it might be a three-car garage, which didn't exist, but all the details and the massing, the connections are authentic to the time.

2 ***How do you blend the new into an old building?***

There's a subtle blend of detail of the new. In order to blend disparate styles that have been done over the decades, one has to choose what's going to be dominant but you want to bring in quotations of the one that's not dominant in order to have the two kind of blend a little bit. It's not 50-50. It has to be an 80-20 ratio because you need to establish whether it's the massing or the primary exterior materials. You need to decide what is going to govern when you're in between two different eras.

3 ***What is architecture like in the time of COVID-19?***

What I do notice is that with the lockdown, people are quarantined or working at home and saying, "You know, I should fix the kitchen. And since I'm Zooming, let's set up a wall with bookcases behind me." We're setting up areas where people can Zoom with a backdrop. Outside of that, we're seeing the restrictions have made people appreciate their homes, and they can't go out to eat. So, they're using their homes more, and that leads them to want to either renovate or expand them.

Warren Patterson photos; illustration courtesy Jan Gleysteen

BY GORDON BOCK

Once lock gates on Ontario's Welland Canal, huge Douglas fir timbers now frame the concert pavilion at Point of the Bluff Vineyards in wine country, New York. .

A Changing Timber Frame of Reference

In their third life, massive timbers are recycled into a second, new timber-frame building.

Timber framing can be crafted not only from standing trees but also beefy old-growth wood beams recycled out of mill buildings and even water-preserved logs recovered from the bottoms of rivers and lakes. An unusual combination of both was finding a wood source in gates from the Welland Canal in Ontario, a waterway that connects Lake Ontario with Lake Erie through some of the largest locks in North America.

The 48-foot long, 32-inch by 48-inch Douglas fir timbers found their first new life in 1927 when the canal was upgraded. Estimated to be over 400 years old when cut, the timbers served as the gate of Lock #8 until the late 1990s when they were retired and moved to the Farmington yard of Pioneer Millworks in the Finger Lakes region of New York. There, they were milled into framing for the Cove Restaurant at Steamboat Landing. With its open, rectangular central space topped with a pyramidal roof and cupola, the eatery was for many years a distinctive landmark on the shores of Canandaigua Lake.

Fast forward to 2015 when the restaurant was slated for demolition to make way for a new, lakefront development. Ty Allen, lead architect and design/build manager at Pioneer Millworks, stated, "We said 'This is a pretty special timber frame and the canal timbers are amazing.'" As Allen recalls, they had a hunch that someone would be interested in the frame. "So we approached the necessary parties and said, "We would like to buy this back from you and dismantle it."

Turns out, the hunch was right on target because the nearby Point of the Bluff Winery in Hammondsport was interested in building an event space at a site on Keuka Lake. "The owner was intent on having a gable end that looked towards the view, so we added that little appendage, reconfiguring it slightly." Principally, however, the frame was re-used in the form that was found in the restaurant. "That main rectangular shape with the cupola in the middle was preserved, and we just made a few modifications around the periphery for some of their needs."

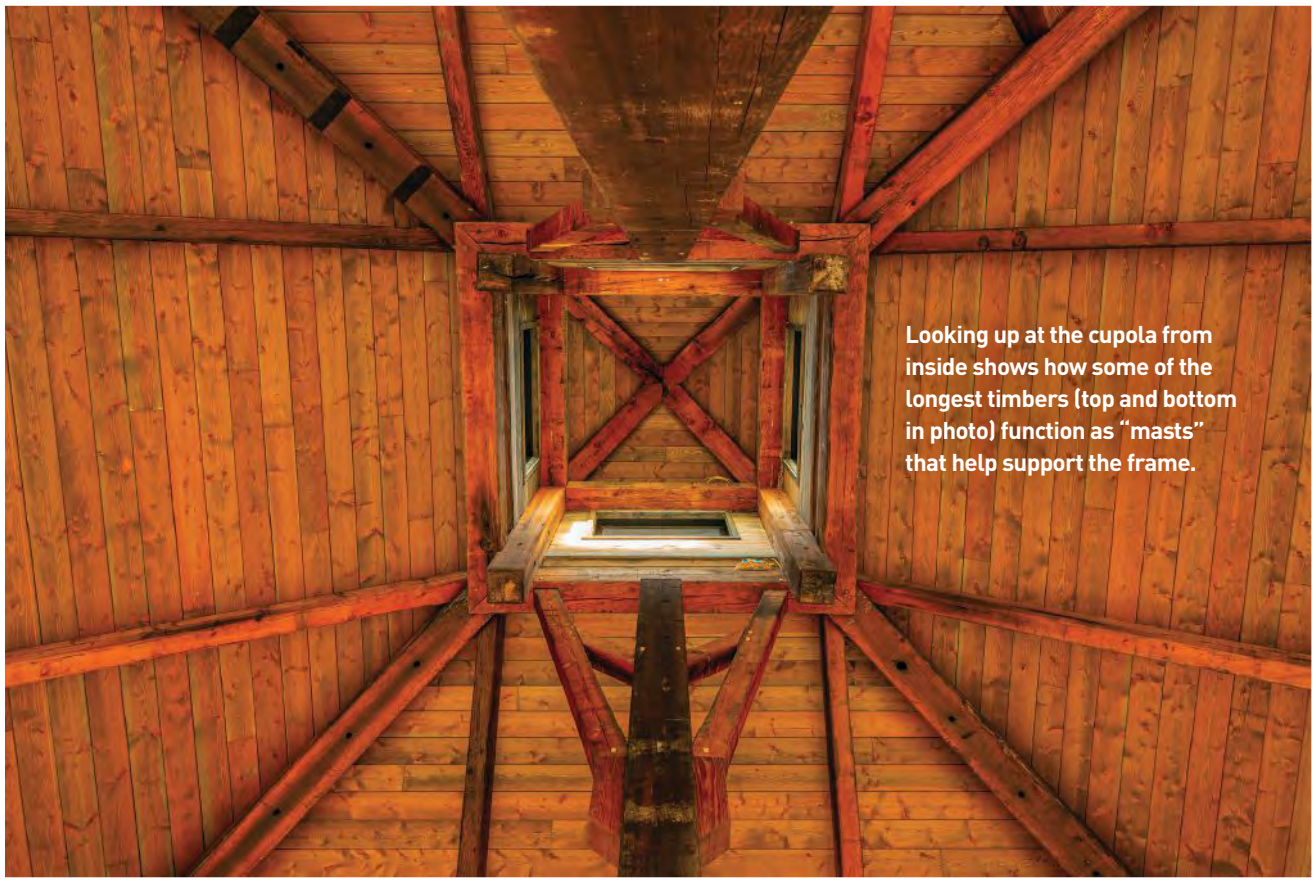
Don Cochran photo

BELOW The Cove Restaurant demolition reveals the basic plan of the timber frame, with its central rectangle, that was repurposed almost as is at the Winery.

BOTTOM Steel bolts that bound the immense timbers into doors had to be removed before milling, but gave the frames unique character in holes and staining.

Photos courtesy of Pioneer Millworks

The pavilion construction is slab-on-grade. Footings support the frame posts with isolation details between wood and concrete to block moisture.



Looking up at the cupola from inside shows how some of the longest timbers (top and bottom in photo) function as "masts" that help support the frame.

Don Cochran photos

What makes timber framing appealing for modern buildings is not only the way it can span open space but also the character of natural wood and the evident structure itself. "One of the cool things about this particular building is that the central ring that forms the primary structure is essentially a parallel chord truss, a bridge truss. You can see how it kind of runs around in the middle of the structure at the sides." In this case, the even canal construction added personality. "Where steel rods went through the timbers, it leeched ferrous staining into the Douglas fir itself, creating an amazing green gradient inside the wood."

No surprise, the massive canal timbers were more than up to the job of a large timber frame. "We didn't make use of the full 48 foot length, but some of those hip rafters are pretty darn close," recalls Allen. "Our goal is always to get as much economy out of the timber as possible, so the fact that we had those huge timbers probably afforded us the opportunity to use some of those longer pieces back in the 1990s."

Allen says they like to use traditional mortise-and-tenon joints in the framing, but that isn't always possible. "Where we want to make sure that the joinery holds together tightly over time, and meets more modern code-related structural needs based upon loads, we'll introduce hidden steel or exposed steel." He adds that, increasingly, clients ask them to do more challenging things with timber frames, such as increased spans. "At some point pure wood-to-wood joinery can't hold up the imposed load, based

Like the restaurant, the reclaimed timbers are oriented to showcase their previous life with large bolt holes, grooves, and mineral staining featured in all areas of the frame.

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upon what clients are asking for with the design, so we'll add some steel. And that's okay, we're not purists in that regard." For a more traditional look, they'll hide the steel, typically when used to resist tension loads.

The project is among their favorites. "I think what's important about the project is that we got to reclaim again some reclaimed timber for an all-new structure," muses Allen. "We're thankful to be part of such projects, and with the folks from Point of Bluff, to able to create a space that people will enjoy for many, many years to come." *pioneermillworks.com*

GORDON BOCK *is an architectural historian, instructor, and speaker through gordonbock.com.*

BY SUSAN D. TURNER

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Tile By Design

The history of ceramics as a building material.

Tiles are unitized elements of fired clay, metal, glass, or stone used for a finished surface on the floor, wall, or ceiling. They are used on the interior and exterior of buildings, and can be monolithic, or highly decorative in color, texture, and profile. The focus of this article is ceramic tiles, non-metallic minerals (clays) fired at high heat to produce a hardened tile. Due to the prevalence of clay globally, brick and tile making is widespread in its production.

HISTORY OF USE

The earliest examples of tilemaking originated in the Holy Lands, about the 4th century BC. From there, the Romans brought tiling to Europe as they occupied lands. In the 8th and 9th centuries, Uighur people of north west China developed what became the basis for 13th-century Turkish and Middle Eastern tiles, notable for their geometric symmetry and botanical motifs.

The Roman artform died off, to be rediscovered by the Cistercian monks in the 12th century. They developed a pressed tile with an imprinted pattern with multiple color known as encaustic tiles. This method was lost later in the 16th century until the 17th century saw a rise of these tiles in Turkey, as well as Delft tile in Holland. In the mid-18th century, the tile industry rose into popularity again, with production spreading across Europe. Herbert Minton began encaustic-tile making again in England about 1843. This method was overtaken by machine pressing drier clay to mass produce tiles. While solid color tiles were produced in central and south America as early as the late 16th century, they weren't prevalent in the United States, which imported tiles from Europe until the United States generated its own industry starting in 1870.

With the Victorian era, the push for cleanliness and public health, popularized tiles as a surface that could be cleaned and sanitized. Until this time, encaustic tiles were the dominant form of tiles. Starting in the 1890s, white and colored ceramic tiles were produced, followed by faience (variegated) glazed tiles. With the emergence of ready-mix glazes in 1900s, consistently colored tiles were possible.

TILE'S INHERENT PROPERTIES

Typical ceramic tile is made from clay, formed when malleable, and then dried before it is fired in a kiln. Clays are natural materials which vary regionally, resulting in varying workability, color, texture, density, and porosity. The color and hardness of the produced tile is also affected by the temperature at which it is fired.

There are two types of tiles: glazed and unglazed. Glazed tiles receive a colored surface on either green or fired tiles, which is then fired. Unglazed tiles get their color from either the clay itself, or from additives such as dye, pigment, or oxides. Unglazed tiles include quarry tile, encaustic tiles, and mosaic tiles.

Quarry tiles were originally stone

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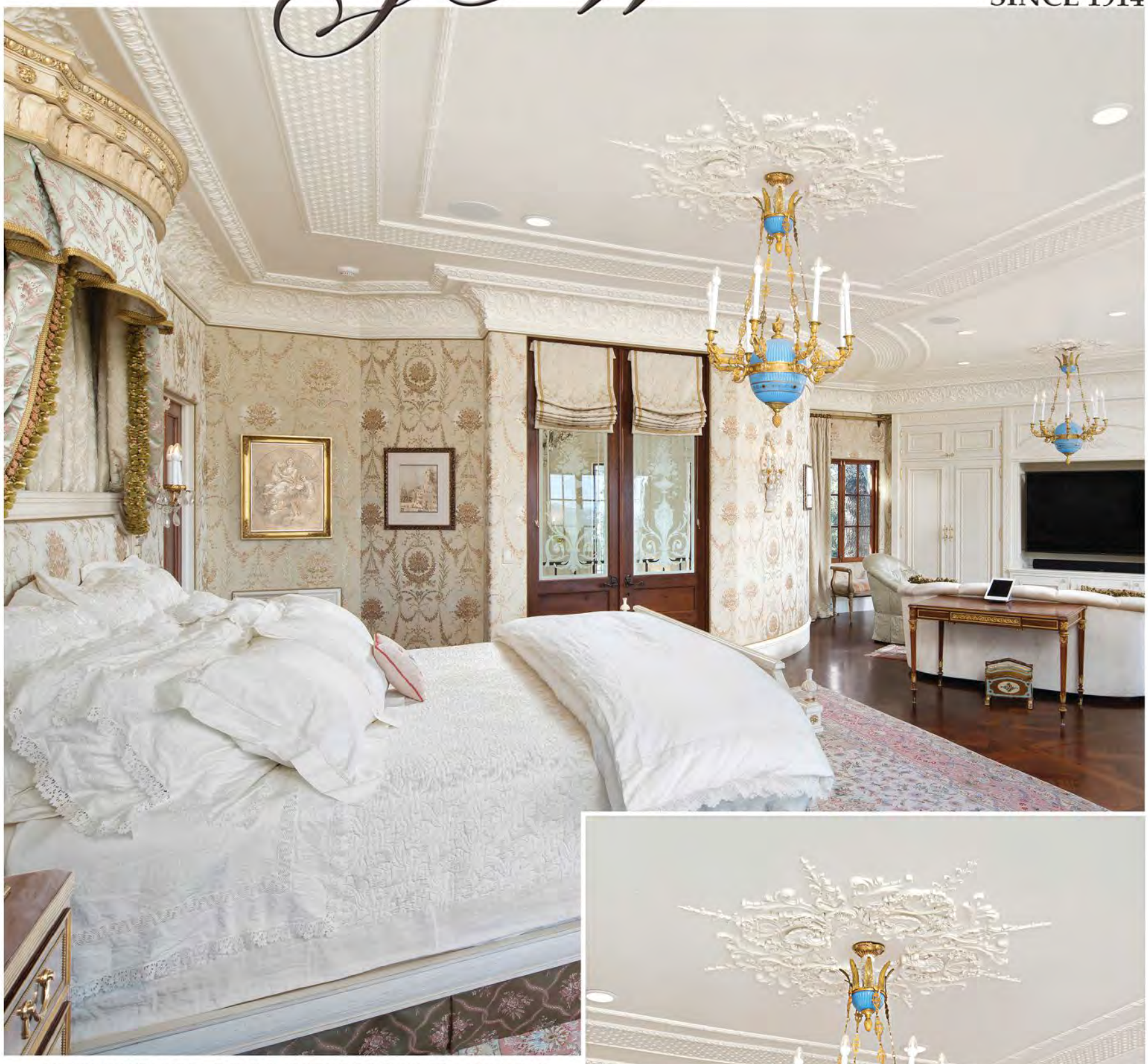

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LEFT Decorative tile is used throughout Portugal and Spain as a decorative element on buildings.

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BELOW Delft pottery was invented in the mid-1600s as a response to the popularity of Chinese blue and white porcelain.

pieces taken from the quarry, cut into small units, and laid as tiles. Modern manufacture of quarry tiles extrudes clay, cuts it in consistent but thick slices, and fires it, resulting in standard squares or rectangles in earthen colors of brown, grey, or red.

Encaustic tiles are clay bodies that have a pattern pressed into the top of the tile, and liquidized clay, or very thin, colored 'slip,' was poured into the pattern to make the final appearance, and then fired.

Mosaic tiles initially began as tiny cubes of colored stone called tesserae, arranged individually by hand to depict geometric patterns, or a complete picture. Modern manufacture uses clay to form the individual tesserae, pre-arranges them and attaches them to mesh for ease and speed of installation.

Prior to WW II, commercially manufactured dust-pressed glazed tile could take up to seventy hours to produce from start to finish. Advances in automation developed a conveyor system that took tiles through a tunnel kiln, producing consistently thin tiles, applying an even glaze, firing them, cooling them and boxing them in as little as two hours, substantially reducing cost and increasing availability.

TYPICAL INSTALLATION METHODS

Tile setting has not changed much over the ages. Tiles were soaked in water and laid in a mortar bed over a solid substrate of bricks or concrete. Once set, the crevices between tiles would receive a pure cement mortar, sometimes with lampblack mixed in for color. Where wood floors were present where a tile finish was desired, the planks were taken up and set flush to the top of the supporting joists. A tar paper was laid to separate the wood from a poured concrete underlayment. Early in the 20th century, newer technology was introduced as substrate, such as plywood, but over time, these substrates deteriorated with moisture, and are no longer recommended by the Tile Council of North America. A small change for modern installations is the introduction of an anti-fracture membrane and expansion joints, which would not be typical of historic installations.

MAINTENANCE

Cleaning should always begin with the gentlest means possible. Sweeping, then warm damp mopping could be sufficient. No abrasive or acidic cleaners should be employed. Where any type of chemical cleaner is being considered, it should be tested on a small inconspicuous area, to ensure it does not discolor, or abrade the tile, or leave etching or efflorescence behind. Always thoroughly wet the floor tile first before applying any cleaner, as this will fill pores with clean water, and deleterious chemicals will not be able to penetrate as far.

Stains should always be identified prior to cleaning, to prevent setting the stain. For stubborn stains such as oil, heel scuffs, or asphalt, a mild ammonia cleaner could be used on wetted tiles, and thoroughly rinsed afterwards.

Historic ceramic tiles did not typically receive any treatment once laid, other than wax. Caution should be used in considering any treatment—coating, sealant, or wax—before it is applied, since these will require more maintenance that the ceramic tile alone. They can show wear patterns more, blister or wear off inconsistently, or cloud, obscuring the beauty of the original tiles. Ensure that any coating will not negatively impact the static coefficient of friction for slip resistance required under the Americans with Disabilities Act.

FAILURES AND CAUSES

Ceramic tiles are durable but suffer a variety of failures.

The first enemy of tile is abrasion. Floor tiles are typically strong, and resistant to wear, but with decades of foot traffic, tiles can lose their pattern, or even reduce in the thickness of the tile, which is especially noticeable on heavily used walk patterns and stair treads.

Glazes are typically as strong as the tile but occasionally can exhibit pitting or crazing. This is more frequently observed with lead-glazed which were fired at low temperatures in the 1800s. The crazing can retain dirt from damp mopping, and if it extends through the entirety of the glaze, it will increase the porosity of the tile.

Ceramic tiles are extremely hard but are susceptible to breakage or chipping due to the impact of a dropped tool or the point load of a metal wheel on a cart.

Moisture can saturate the bedding mortar, loosening the bond of the tile to the substrate, and mildewing the grout. Where tiles with a porous substrate are constantly exposed to moisture, the tile can spall.

Loose, popped or unbonded tiles are due to a failure of the setting bed. There are many causes: mortar which is too strong, or was not well prepared, a substrate which flexes and breaks the bond of the mortar, or strong cleaning solutions which degrade the grout and permit moisture to reach the mortar bed.

Tile can be damaged or lost due to building works, such as plumbing changes or moving walls. Frequently the repairs completed afterwards are inappropriate, leaving unsightly patches using tiles which are not consistent in size, shape, thickness, color, or pattern.

CURRENT CONSERVATION APPROACH

As with any repairs to historic materials, use the gentlest and least invasive

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ABOVE Examples of decorative tiles. BELOW Arequipa Pottery was produced in California from 1911 until 1918.

Heritage Tile Foundation

methods possible, with the smallest impact to historic fabric. In approaching these repairs, address the cause first, then repair the symptom that was observed to need repair. For the most part, repairs to tiles should be left to the experts for anything beyond routine cleaning and maintenance.

To prevent wearing of the tile surface by abrasion, frequent vacuuming or sweeping will remove the grit which can be ground in by carts and foot traffic. At locations such as doorways and corridors, walk-off mats can be used to reduce the tracking of grit, and to protect the heaviest trafficked areas.

When glaze pitting or crazing is encountered, there is not a lot that can be done. While the dirt can't be easily removed without further damage, it does not typically contribute to further failure. Occasionally, a conservator can be hired to treat the glaze with a densifying agent followed by a repellant, but this should only be attempted by experienced professionals familiar with the chemistry and application of such interventions.

Where moisture has damaged tiles, the source of the moisture should be removed. If the damage is the loss of the mortar bed, then the tiles can be salvaged and reinstalled once the source of moisture is removed. Where mildew or mold has developed, a dilute (5-10%) solution of TSP (tri-sodium phosphate) can be used, rinsing well. The dwell time should be momentary (a minute or two) since the alkali nature can cause efflorescence.

Removal of an individual broken tile can frequently damage more adjacent tiles during its replacement. Cracked tiles can be repaired with epoxy injection, and small pieces that have broken off can be re-secured by epoxy. Consistent with retaining the most historic fabric, small chips can be repaired with an epoxy mixed with colored enamel, or for unglazed tiles, a tinted mortar patch.

A comprehensive approach is required for replacement of any tiles. First, determine the cause of the damage and eliminate it.

At areas of loose, popped or unbonded tiles, the cause could be a poor substrate, a lack of expansion joints, or deterioration of the grout. The tiles can be salvaged in that area, and re-laid, after stiffening the substrate, providing an anti-fracture membrane, and soft joints of colored sealants to control movement. Where individual tiles are impact damaged and cause a tripping hazard, or there are tile losses due to building works, they can be carefully removed. This should not be done with hammer and chisel, as the impact can fracture or debond adjacent tiles. An experienced tile professional will use a hand grout saw to remove or salvage tiles. Where grout joints are wider (>3/8"), a diamond blade mounted in an angle grinder can remove the long sides, while the corners are carefully chipped out by hand.

Replacement tiles are the greatest challenge of repairs. They need to be exact in size, shape, thickness, pattern color and detail. Even if attic stock is found or exact replication is achieved, they will not share the patina of adjacent tiles. Where tiles require replacement in conspicuous areas, historic tiles can be salvaged from areas out of public view and used in the conspicuous areas. Replica tiles can then be used in the inconspicuous areas.

PROS AND CONS OF USING IT TODAY

Ceramic tiles have long term durability, and their detail is often a significant contributor to the edifice's historic character. When intervention into historic tile installation is warranted, it is best to engage professionals accustomed to specifying and executing the repairs required. Many well-intentioned DIY efforts can lead to further damage which can irreparably harm the historic fabric.

Resources

www.tileheritage.org *Education, identification and archival information.*

archive.org/details/buildingtechnologyheritagelibrary

Associated Tile Manufacturers: Basic information: ingredients and processes, gradings, sizes, shapes, colors, finishes, nomenclature, 1921, public domain, located in the Building Technology Heritage Library noted above.

Tile Heritage - A Review of American Tile History Vol X No.2

Durbin, Leslie: Architectural Tiles: Conservation and Restoration, Routledge; 2nd Edition (May 12, 2014)

Fawcett, Jane: Historic Floors: Their History and Conservation, Butterworth-Heinemann Series in Conservation and Museology (July 22, 1998)

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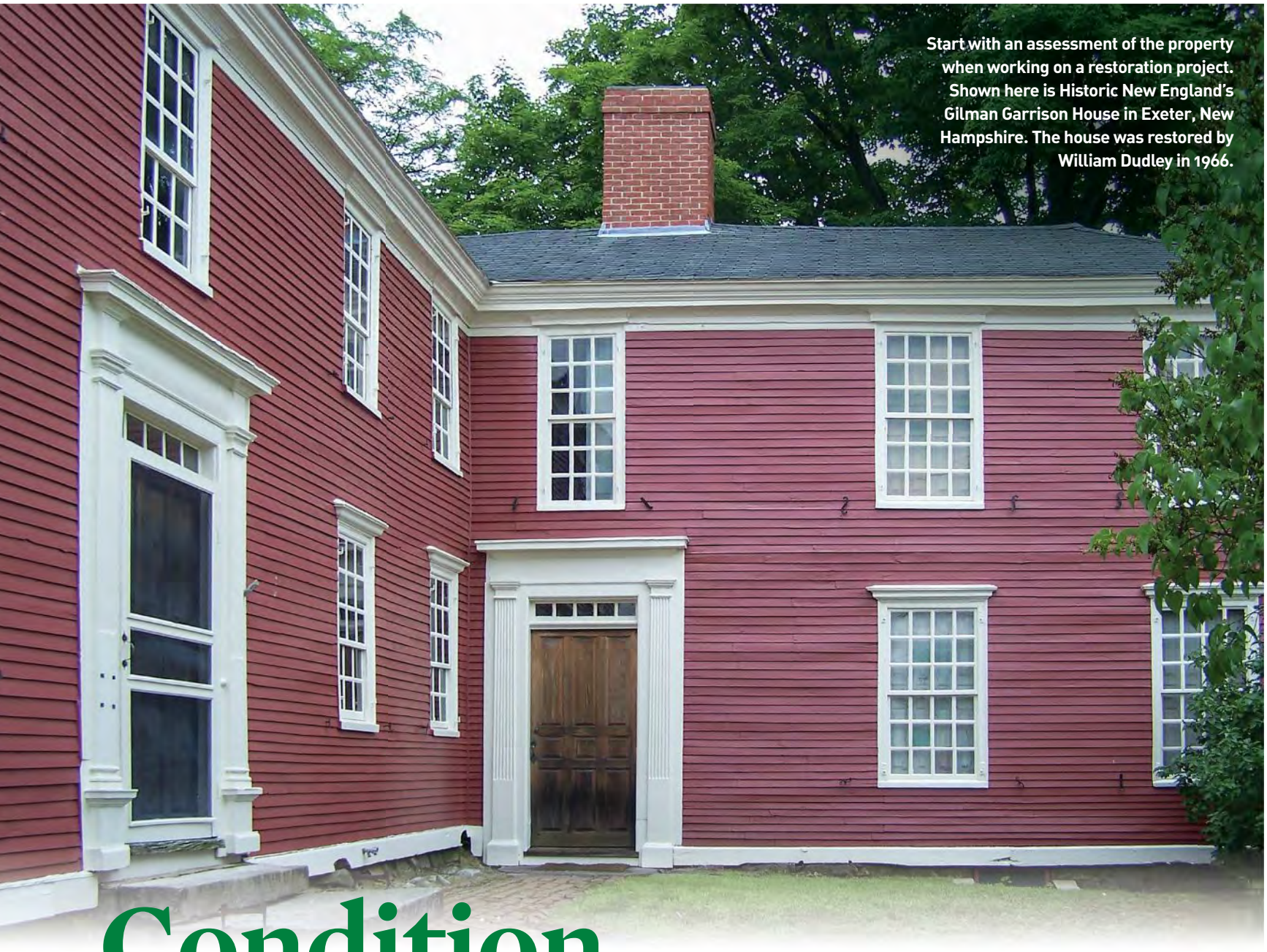
JUDY L. HAYWARD



Start with an assessment of the property when working on a restoration project. Shown here is Historic New England's Gilman Garrison House in Exeter, New Hampshire. The house was restored by William Dudley in 1966.

Photo courtesy of Historic New England

Condition and Character

Proven strategies and resources for documentation in your restoration projects.

Before any rehabilitation work begins, completing an inventory of character-defining features, available historical information, and building condition is essential to ensure that good decisions are made throughout project development and construction phases. Whether preparing a historic structures report for an entire site or a conditions survey of one feature such as windows, the following are some proven strategies and resources to guide the process.

CONDITIONS ASSESSMENTS OR SURVEYS

Assuming that preliminary work such as walk-throughs and basic photo documentation have been done, where you begin the report preparation will depend on the client, the structure's significance, and the scope of work. Conditions assessments or surveys are a good place to start and since the repair or replacement of windows is a common decision to make, let's use a window condition survey as a starting point. Create your work plan with the following in mind: You will prepare photos and a narrative description of each window and ultimately prepare a spread sheet that summarizes the repair conditions for the window.

Create an alpha-numeric code for the windows in structure.

Label each side of the building based on geographic direction; north, south, east, or west.

Beginning with the basement and working up label each level or story: Basement, First, Second, Third, etc.

Assign a number working from left to right: 1, 2, 3, etc.

You would arrive at an alpha/numeric system like this: the first window on the left of a south-facing first floor would be S11, and so on.

Photograph each window, inside and out, and take close ups of deterioration and make notes. It helps to follow the repair levels defined in ***Preservation Brief 9*** by the National Park Service. Prepare notes and summarize the condition by repair level for the spread sheet. Photos and sketches done by elevation can be very helpful for recall when you assemble the final report.

Images of the Gilman Garrison House taken by HABS. The photo below shows the interiors of the 1709 structure.

Photos courtesy of Historic American Building Survey

Photos courtesy of Historic American Buildings Survey

LEFT Archival illustrations, land records, and historic photos can help can help gather information about the original building.

Free, downloadable help to define historical significance through good documentation.

WWW.NPS.GOV/TPS/HOW-TO-PRESERVE/BRIEFS.HTM

Preservation Briefs were first published by the United States National Park Service in 1975. There are now 50 Briefs on preservation topics as far ranging as window repair to gas stations and lightning protection. They are available free of charge at the link above for download. The Briefs that are the most helpful for documentation include the following:

9. **THE REPAIR OF HISTORIC WOODEN WINDOWS**
17. **ARCHITECTURAL CHARACTER—Identifying the Visual Aspects of Historic Buildings as an Aid to Preserving their Character**
18. **REHABILITATING INTERIORS IN HISTORIC BUILDINGS—Identifying Character-Defining Elements**
35. **UNDERSTANDING OLD BUILDINGS: The Process of Architectural Investigation**
36. **PROTECTING CULTURAL LANDSCAPES: Planning, Treatment and Management of Historic Landscapes**

In addition to the Briefs, other documents found of the US NPS Technical Preservation Services website that guide documentation, project design, and implementation include the Secretary of the Interior's Standards for the Treatment of Historic Properties with various standards and guides regarding specialized topics of concern including sustainability and flood adaptation.

GATHER ARCHIVAL INFORMATION

Even for smaller projects, it helps to gather archival information. Old photographs or artwork, land records, fire insurance maps such as those produced by the Sanborn Map Company, and records of architects, builders, and craftspeople may be on file with local historical societies. You are looking for items like original drawings, as built drawings, material, and craft process information and changes that have occurred over time. If your client is a nonprofit organization or institution, this material may be archived already, or you may be able to get the client to assist you in compiling the records for your review. Moving throughout the 20th century, newspapers and periodicals become important sources of information about specific sites and the expanding world of building products. We have included articles previously in *Traditional Building* about the Association for Preservation Technology's Building Heritage Library. *https://www.apti.org/apt-building-technology-heritage-library*

HABS, HAER, AND HALS; THE NATIONAL REGISTER OF HISTORIC PLACES; AND STATE REGISTERS AND SURVEYS

Guidance, Standards, and resources for the Historic American Buildings Survey, Historic American Engineering Record and the Historic American Landscapes Survey are found at *https://www.nps.gov/hdp/index.htm* and the image archive is found at *www.loc.gov;* each is known by its acronym: HABS, HAER, and HALS. Even if their standards for documentation are not mandated for a given project, their documentation standards are worth following if time and budget permit.

Determine if the property is listed individually or as part of a district in the National Register of Historic Places. The Register is undergoing digital uploading but is not complete as of today's publication. If you can't find it at *https://www.nps.gov/subjects/national-register/index.htm*, you can check with the Architectural Historian in the State Historic Preservation Office where your project is located. Additionally, many states have a state register of historic places and the state preservation offices in the US work with local groups, usually preservation or historic district commissions. They offer funding through the Certified Local Government program that funds surveys of historic resources in local communities. Local planning and preservation offices are good sources for this information.

HAZARDOUS MATERIALS ANALYSIS

It is important to get tests about lead, asbestos, pests, and more. These tests will help plan for the safety of those working on your project and will inform decisions about preserving historic finishes and reusing historic building materials that may contain hazards.

DEFINING HISTORICAL SIGNIFICANCE

Reviewing the materials and information you have gathered will guide you in determining what must be saved during your rehabilitation project. If a given architectural element helps you tell the story of the property, preserve it. If losing an architectural detail would rob the building of unique character, preserve it. There are Federal standards regarding "adverse effect" or "threaten and destroy" that are considered when Federal funds, tax credits, or a Section 106 review are involved. But even when these standards don't impact projects, the process to evaluate them can inform your work.

THE VALUE OF HISTORIC STRUCTURE REPORTS

Whether you are working on a discreet project or a complete rehabilitation project, preparing a historic structures report will help you and your clients make the best long-term decisions in the interest of the property. Preservation Brief 43 recommends an outline for preparing such reports. See the call out box in this article to find it online and download it. A structures report can be built incrementally as discreet projects are developed and implemented. Good documentation will only serve to help current and future stewards of historic properties, large and small.

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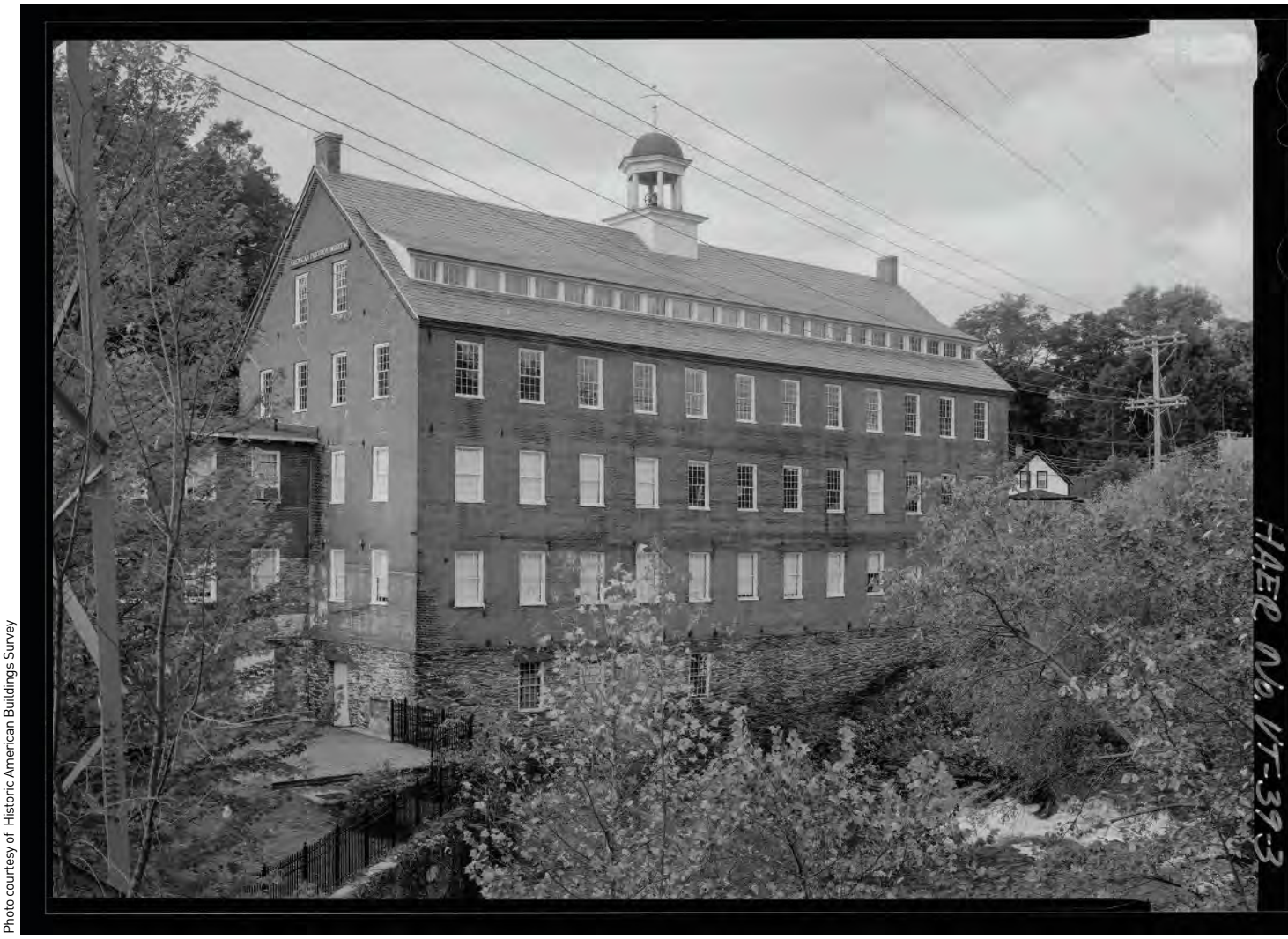


Photo courtesy of Historic American Buildings Survey

BY NANCY A. RUHLING

Photo courtesy of Huber + Associates

Up on the Roof

A look at roofing materials for historically inspired buildings.

ABOVE At the historic Oak Hill Memorial Park and Funeral Home Chapel of Roses in San Jose, California, which was designed by Francis Harvey Slocombe, Huber + Associates restored the 1920s cedar-shingle roof.

Whether they be of wood, metal, tile, or slate or even lowly thatch, roofs are the royal crowns of traditional buildings. Yes, they keep out the rain, snow, and sleet, but they also are designed to lead the eye to the sky. Creating a traditional-style roof is an art; here are some of the companies that have mastered it.

DURABLE SLATE CO.

DURABLESLATE.COM

Founded in 1986, this award-winning company, which is based in Columbus, Ohio, works exclusively on historic roofing. The company, which specializes in natural slate, clay tile, and historic metals, had worked on school, church, and museum roofs around the country.

Prominent projects include the Ohio Governor's Residence and Heritage Garden in Columbus; The Red House, Trinidad's House of Parliament; the Florida State Capitol in Tallahassee; the Baltimore City Hall in Maryland; the B&O Railroad Museum in Baltimore, Maryland; the Frank Lloyd Wright Westcott House in Springfield, Ohio; the Lorain Harbor Lighthouse in the middle of Lake Erie in Ohio; several buildings at The Ohio State University; Capital University in Bexley, Ohio; Kenyon College in Gambier, Ohio; Virginia Tech in Blacksburg; the University of South Carolina; and Wittenberg University in Springfield, Ohio.

Durable Slate's work has received recognition from several organizations. It was the only American company to win the International Federation for the Roofing Trade IFD Award for Project of the Year and has received the National Roofing Contractors Association's Gold Circle Award for Project of the Year several times.

"We will do work anywhere—even abroad," says executive vice president John Chan. "We also work on very difficult roofs—ones that many people consider impossible."

HUBER + ASSOCIATES

HUBERROOFING.COM

An awarding-winning, internationally recognized roofing company that holds three patents, Huber + Associates has been specializing in historic and custom roof restorations since 1976.

It supplies and installs slate, clay, metal, and ornamental metal, wood, and even synthetic and natural thatch that's made from vegetation such as palm fronds or straw.

"We strive to get every detail right, with a culture of solving problems," says president and founder Barry Huber. "Our patented techniques and custom designs ensure that every custom or historic roof restoration maintains the original look, right down to the most intricate details."

The company, which is known for what Huber calls "artistic" installations, replaced the copper cap ridge of the Biltmore Estate's north tower and has done work at the Nashville Zoo at Grassmere

A residence in Atlanta, Georgia features Ludowici roof tiles.

Photo courtesy of Ludowici

and at The Lodge at Bryce Canyon National Park in Utah.

It has received numerous recognitions, including the Florida Trust for Historic Preservation Master Craftsman Award; the Dade Heritage Trust Preservation Master Craftsman Award; the National Roofing & Contractors Association Gold Circle Award; and The Preservation Society of Asheville and Buncombe County Griffin Award.

Huber likes to tell the story of the company's initial patent. It was the 1980s, and the firm was working on its first custom residence. The project required steam bending of shingles, so Huber steamed them on his kitchen stove to produce samples immediately.

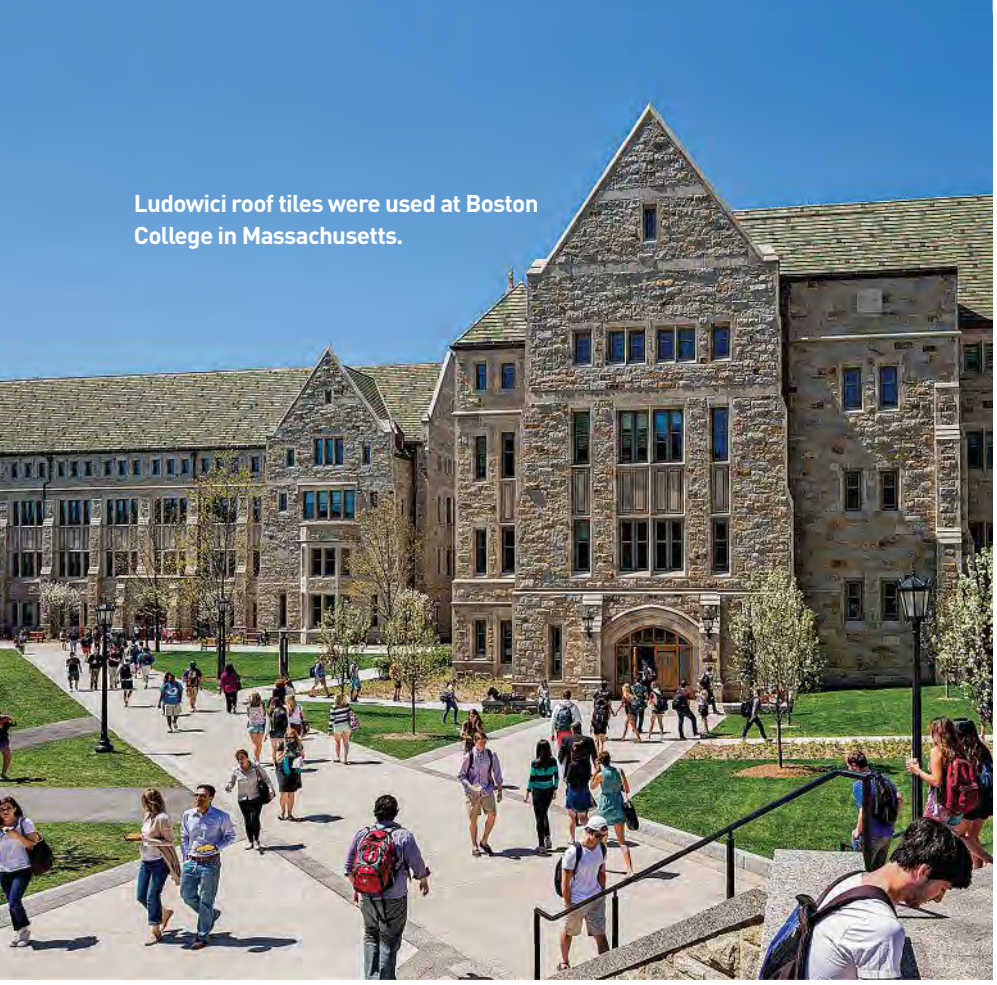
Another patent led to the launch of Endureed, a synthetic thatch roofing product that is used worldwide.

"We specialize in historic roof restoration that captures the original beauty of the roof while providing durability that carries it into the future," Huber says. "With our specialized techniques, we can offer intricate designs as stunning as the original."

LUDOWICI

LUDOWICI.COM

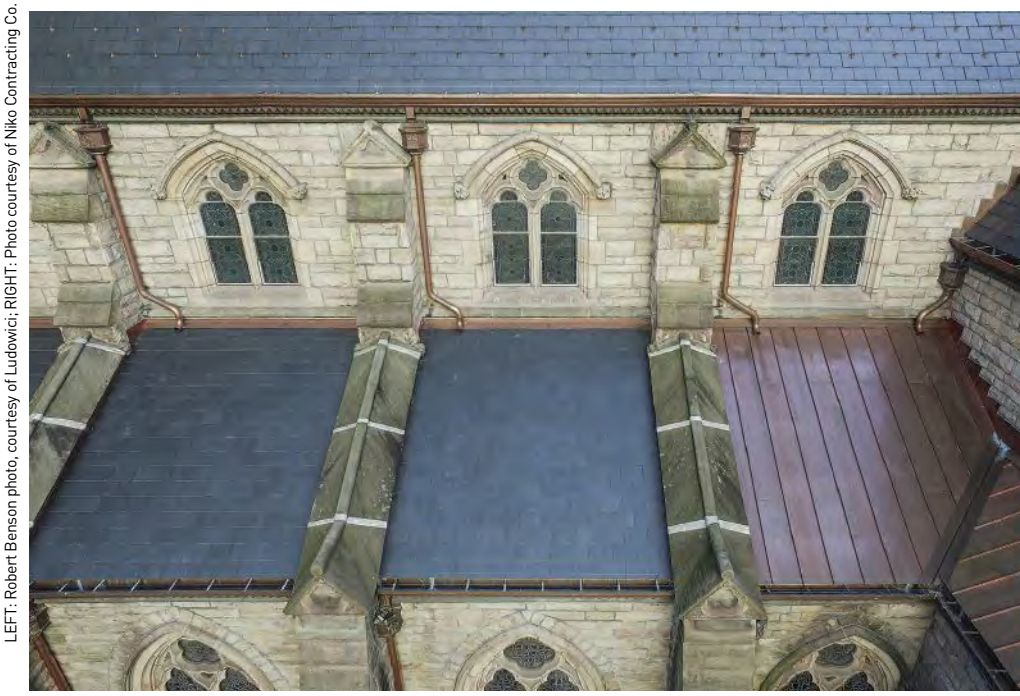
Architectural terra-cotta tile specialist Ludowici produces not only roof tiles but also floor tiles, wall cladding, and solar shades for new construction and renovation projects for the residential, commercial, educational, government, religious, and historic buildings markets.



Ludowici roof tiles were used at Boston College in Massachusetts.

BELOW The slate and copper roofing and custom gutters and downspouts on Trinity Cathedral in Pittsburg are by NIKO Contracting Co.

BOTTOM One of Northern Tile's more high-profile projects was the Frank Lloyd Wright Martin House in Buffalo, New York.



LEFT: Robert Benson photo, courtesy of Ludowici; RIGHT: Photo courtesy of Niko Contracting Co.

Stuart Matthews photo, courtesy of Northern Roof Tiles US

The company, whose New Lexington, Ohio, plant has been in continuous operation since 1888, has provided roof tiles to a number of iconic buildings. They include The Broadmoor hotel in Colorado Springs, Colorado, Boston College, the National Baseball Hall of Fame and Museum in Cooperstown, New York, The Plaza hotel in New York City, Finca Vigía, the Ernest Hemingway house in Cuba, the Boston Public Library, Harvard, Princeton, Yale, and The Basilica of the National Shrine of the Immaculate Conception in Washington, D.C.

Lauren Johnson, head of marketing, says Ludowici tiles are "made to withstand more stress than any other clay tile products on the market. Our production process allows tiles to form into a dense, vitrified material with the highest strengths available, which is essential for peak performance."

She adds that many of the tiles can resist loads of over 1,000 pounds before breaking, and all are ASTM C1167 Grade 1 Certified.

Ludowici has more than 50 standard colors and also custom-matches hues. In addition to 40 standard roof-tile profiles, the company has hundreds of accessory pieces and will custom design tiles to fit every project.

"We have shaped thousands of different tile profiles," Johnson says, "and we are still able to reproduce any tile we have ever made."

What's more, Ludowici tiles, she says, are made to last a lifetime. "They come with a 75-year warranty that includes the color on every tile we produce," she says.

NIKO CONTRACTING CO.

NIKOCONTRACTING.COM

Since 1974, NIKO Contracting Co., which is based in Pittsburgh, has specialized in the fabrication and installation of custom roofing and gutters. Its 6,000-square-foot shop fabricates copper and zinc roofing as well as copper gutters, cornices, cupolas, domes, steeples, and dormer surrounds. The company also installs slate and copper roofing. "We specialize in traditional styles," says owner/founder Nick Lardas.

The company recently worked on Trinity Cathedral, an Episcopal church in downtown Pittsburgh. The Gothic Revival church, which is also the cathedral for the Episcopal Diocese of Pittsburgh, was completed in 1872 and is on land deeded by heirs of Pennsylvania founder William Penn.

Other clients include the Cooper Hewitt, Smithsonian Design Museum in New York City and Southern Methodist University. "Its main roof is slate," Lardas says. "But we also worked on other parts of the roof that are standing-seam copper and flat-lock copper and supplied custom copper gutters and downspouts."

NORTHERN ROOF TILES US

NORTHERNROOFTILES.COM

This family-owned and -operated company, founded 29 years ago, imports clay roof tiles from around the world and also commissions the making of specialty tile, shapes, and fittings.

"We know how to detail a roof so it looks as if it is in the English or French countryside or on some sun-baked hillside around the Mediterranean," says founder and president Stuart Matthews. "Perhaps our approach is best described as 'Northern does not sell tiles, we sell roofs, one roof at a time.'"

The company has worked on a number of high-profile roofs, including those at The Breakers in Newport, Rhode Island; the Frank Lloyd Wright Martin House in Buffalo, New York; the Kirby Hall of Civil Rights at Lafayette College in Easton, Pennsylvania; and the Powder Magazine museum in Charleston, South Carolina.

In addition to supplying tiles, the company, based in Wilmington, Delaware, has expertise and experience in installation. "Consequently, when hip and valley tiles are needed to accommodate a swoop at the eaves, we can calculate different angles needed, provide each different template, and work with the tile makers to ensure a seamless detail," Matthews says. "We can also provide all the custom-size tiles for circular turrets and rounded hips."

He adds that when Northern replaces existing shingle-tile roofs, "we can re-create the existing size, thickness, surface finish and coloration along with all the necessary fittings. We did this for a re-roof on a residence in Greenwich, Connecticut. Months after the roof and other improvements were completed, a friend of the owners was overheard saying, 'I thought you were having a new roof?'"

Key Suppliers

SLATE & COPPER SALES
ROOF TILE & SLATE
B&B SHEETMETAL
HEATHER & LITTLE
CLASSIC GUTTER SYSTEMS
COPPERCRAFT

New Traditions

A new high-rise complex in Manhattan promises ultraluxury in a classic setting.

BY NANCY A. RUHLING | RENDERINGS BY NOE & ASSOCIATES: THE BOUNDARY

PROJECT Beckford House & Tower
ARCHITECT Studio Sofield

on the Rise

In Beckford House & Tower, soaring ceilings and other classical detailing such as geometric cornicing, herring-bone-laid oak flooring and statuary marble finishes abound.

Beckford House & Tower, a pair of classic, contemporary, complementary condominium complexes that celebrate craftsmanship, are the latest epochal additions to Manhattan's elegant Upper East Side.

Designed by William Sofield, whose Studio Sofield is based in New York City, the structures overlooking Central Park and the East River along 2nd Avenue have a timeless aesthetic that makes them appear to be contemporaneous with the historic neighborhood's iconic pre-war buildings.

"Even amongst the old buildings in New York, these are incredibly unique," Sofield describes the project. "One of the buildings is very grand and sort of New York style, and one is elegant and understated and certainly finely detailed, so there's kind of a nice balance, depending on what your individual style is."

He notes that "my intention was to create some of the most legendarily gracious apartments anywhere in Manhattan, with custom millwork, proper dining rooms, and intricate detailing."

The buildings, whose facades are made of hand-carved, hand-laid variegated Indiana limestone, Brynne Brownstone, and a custom blend gray brick, are replete with classical detailing, including geometric cornicing, and feature large windows and open layouts for luxurious modern lifestyles. Units are selling for $2 million to over $25 million.

"It's important to have something that feels it is of the neighborhood," Sofield says. "There's a certain color sensibility we brought with the brownstone and the limestone and hand-crafted custom brick that tonally tied into the adjacent buildings."

Sofield, who is known for residential and commercial projects for clients like fashion designers Tom Ford, Ralph Lauren, Gucci, and YSL as well as The SoHo Grand Hotel, David Barton Gyms and Harry Winston, describes himself as a Modernist by temperament and a historicist by training.

More than a decade after graduating from Princeton University with a degree in architecture and urban planning, he established Studio Sofield in 1996. In 2010, he was a recipient of the Cooper Hewitt National Design Award for Interior Design.

The designer, whose studio is in the historic Schermerhorn Building in Manhattan's NoHo neighborhood, takes a holistic approach to design, immersing himself in the environment, often spending weeks on location, observing the goings on in the area, chatting with residents and thinking about what it would be like to live there.

In the case of Beckford House & Tower, he says, "I really was trying to incorporate a lot of what I thought were more charming details of the neighborhood."

He was particularly taken by a church up the street from Beckford House & Tower. "It has the most elaborate terra-cotta work, beautiful roundels and details," he explains. "A lot of those patterns have been used as inspiration or reinvented in the detailing of Beckford House & Tower."

Sofield also took guidance from the neighborhood's original signature storefronts, noting that "everybody has a milk-glass globe, and I wanted to make sure with our buildings

OPPOSITE Beckford Tower's reception room speaks of old-world elegance.

ABOVE Beckford House & Tower feature eat-in kitchens with Christopher Peacock cabinetry and marble-slab countertops.

Large windows bathe the rooms in natural light, and French doors showcase the New York City skyline.

"My intention was to create some of the most legendarily gracious apartments anywhere in Manhattan."

—ARCHITECT WILLIAM SOFIELD

KEY SUPPLIERS

ARCHITECT
Studio Sofield

DEVELOPER
Icon Realty Management

STONE CARVER
Vermont Stone Art

LOBBY DECORATION
Ann McGuire Studio

FIREPLACE DESIGN
Jamb of London

KITCHEN DESIGN
Christopher Peacock

CHILDREN'S PLAYROOM
Roto

that we carried that rhythm along."

The boutique Beckford House, which is scheduled to open early fall, has only 32 residences, including three penthouses and one duplex, in its 21 stories. A series of gentle terraces and Juliet balconies open the building to views of the city's spectacular skyline.

The building's grandeur starts with the hand-carved, classically inspired stone medallion designed by Sofield that rests over the entryway and leads to the lobby, which has an American walnut reception desk whose staff offers 24/7 concierge service.

The uncommon common areas include a reception room and lounge as well as a dining room with a wet bar and a soaring fireplace custom made in England. In the sub cellar, there's a large fitness center and a yoga studio. The building is crowned by a roof terrace with a fully equipped outdoor kitchen.

The 31-floor Beckford Tower, which is set to open in 2021, houses only 72 residences. Its trio of penthouses, whose ceilings soar to 13 feet, are sited on setback outdoor terraces. At street level, Sofield's custom-designed wrought-iron ironwork and classical awnings speak of the tower's prestigious pedigree.

The tower's vaulted lobby is defined by a vintage Art Deco chandelier imported from Europe. Beyond that space, there's a grand reception room, a library lounge with a decorative fireplace and windows, a piano bar and lounge that's like an old-world private gentleman's club, a game room, a children's playroom, and a party room equipped with a catering kitchen.

The building also has a double-height basketball court, a fitness center, yoga and private training studios, and a 65-foot-long swimming pool that has a glass ceiling, metal detailing, and a custom glass mosaic wall.

The Beckford House & Tower buildings also features custom kitchens designed by Christopher Peacock that include hand-painted cabinetry and marble-slab countertops.

"My vision for the buildings was to extend the 79th Street Park Avenue Corridor eastward and become anchors in an architecturally rich neighborhood," Sofield says. "The private facilities and communal spaces with the tower are unabashedly amongst the most luxurious in the city."

Sofield says that every detail of Beckford House & Tower was of paramount importance.

"At heart, I'm an animist and believe that objects have souls and legacies," he says. "It is what they mean and the stories they tell." Buildings, too, he adds, have considerable things to say.

"A building is the story of the people who inhabit it," he says. "The role of the architect is simply to give them the space in which to live that story out."

He adds that "buildings have a soul, and they certainly have a point of view. I think the Beckford House & Tower buildings are fairly joyous from the window boxes to the rather theatrical canopies."

The Beckford House & Tower are legacy buildings designed to carry memories forward through the generations.

"I would like to think that these buildings are idiosyncratic and special enough for a child to say, 'Wow!' I grew up in that building,'" Sofield says.

FAR LEFT There's a 65-foot indoor swimming pool in Beckford Tower.

LEFT Beckford House's limestone and hand-crafted custom-brick exterior features stepped terraces.

CENTER Beckford Tower's more than 3,000 square feet of amenities include a double-height basketball half-court.

ABOVE The entry to Beckford Tower announces itself with understated grandeur.

PROJECT: French Normandy Manor
ARCHITECT: Charles Hilton

fit for a QUEEN

A cascading semicircular stone staircase leads to the entrance to this new French Normandy residence. The wood plank entry door is capped with a leaded glass transom, framed in a carved granite entry surround.

For a French Normandy manor house on a Greenwich, Connecticut, estate, architect Charles Hilton took inspiration from Marie Antoinette's Hameau de la Reine at Versailles.

BY JANICE RANDALL ROHLF

PHOTOGRAPHY BY ROBERT BENSON PHOTOGRAPHY
(UNLESS OTHERWISE NOTED)

While the finished product looks deceptively simple, bricklaying is a fine art, a skill that demands precision at every turn. Imagine the masons' confusion, then, when architect Charles Hilton stopped by a worksite of his one day and said to the craftsmen: "Throw away your transits, your plumb lines, your pointing. Just do it by eye." His encouragement of a free-style approach got the architect just the result he was after: more than 200 half-timbered bays in-filled with brick laid so randomly that no two patterns are alike.

Over his 40-year career, Hilton has put much thought into classical architecture's role in the modern world. He is a stickler for getting even the smallest details right, no matter what genre he's building in. But for this project, a French Normandy manor house in Greenwich, Connecticut, the definition of "right" was sometimes counterintuitive. "It didn't look rustic enough," says Hilton. "In the old days, they weren't doing all that stuff to lay the bricks straight."

Between the 15th and 17th centuries, in the Normandy region of France, the rural vernacular was expressed by post-and-beam dwellings clad in brick, stone, stucco, shingle, or any combination thereof. Decorative half-timbering on a portion of the façade was ubiquitous, and other features included multi-pane windows, dormers with hip or shed roofs, and plank-like entry doors with large decorative wrought-iron hinges. Barns were attached to the living quarters, and there was a central tower for the storage of grain or silage, usually cylindrical but in some instances square or octagonal.

The French manor house, a revival style that harkens back to medieval European architecture, inspired Hilton, whose charge was to design a residence on a 13-acre property where for over the span of two decades he had left his mark on a variety of projects—a Georgian house, a gazebo, a pool house, a tool shed and other service buildings, all complemented by landscape architect Charles J. Stick's magnificent gardens, orchards, and berry fields appointed with sculptures and follies. But it wasn't until a trip to France brought him to the Hameau de la Reine at Versailles that his stylistic hunch for the house in Greenwich was affirmed. "I loved the scale of the structures, the earthiness and tactile sense of the materials, and the playfulness of the designs," says Hilton. Built for Marie Antoinette in 1783, the Petite Hamlet so captivated the architect that he snapped hundreds of photos and once home announced to the homeowner, "I've found our aesthetic direction."

"It was really appropriate for the agrarian feel we were trying to create," says Hilton, explaining that his clients (husband and wife are both avid gardeners and cooks) dreamed

A sweeping spiral staircase with iron and nickel balusters and a French polished antique walnut handrail lead from the master bedroom to the master study above. Beneath is a hand scraped and finished Bordeaux pattern oak floor by Historic Floors in Greenwich, Connecticut.

Nicholas Rotondi Photography photo

The two-and-a-half-story great room is constructed with an antique timber frame in filled with French plaster walls. The west wall of the room opens to the property's ornamental gardens beyond through a two-story timber framed bay window inspired by Lutyens's Deanery.

"It's a journey I didn't know I was going on when I started."

—ARCHITECT CHARLES HILTON


MATISSE

of having their own organic farm. "We used brick, slate, and stone, which were the materials we used on the main [Georgian] estate, so there was a tie to the materials used earlier, making it stylistically compatible but distinct." In contrast to the Georgian dwelling, the French Norman building, referred to as the Barn, is less formal in structure and uses more casual materials.

"Once we selected the architectural direction, we tried to stay fairly pure to that inspiration," says Hilton, "but we have to build for our local climate and to meet today's codes." So, for example, whereas an authentic French Normandy house would have been built with native beige limestone, they used Connecticut fieldstone, knowing that limestone wouldn't hold up well in the New England weather. To get one particular effect they wanted without using French limestone, "We had an off-white granite carved for the front door surround and some other accents," notes Hilton. Additionally, fieldstone for the base matches the stonewalls on the property, a vernacular treatment. In lieu of authentic oak windows from France that were beautiful but lacked proper weather-stripping and screens, the architect turned to Artistic Doors and Windows in New Jersey, who replicated the casements based on a traditional French knuckle design, customizing them in a way that was true to the period and style of the house. To get the right, period-appropriate colors, sizes, and shapes for the Roman brick nogging, Hilton commissioned custom bricks from Ludowici, who typically produce terra cotta roofing tiles.

The French Normandy aesthetic continues inside where authentic materials were used more faithfully than on the exterior since weather factors weren't a concern. The great room's dramatic walk-in fireplace was a thoroughly transcontinental collaboration—the U.S.-based architectural team supplied drawings to a quarry team in France who cut, carved, and antiqued the surface texture of the French Camargue limestone pieces before shipping them to Greenwich. With its massive hearth and 30-foot height, the great room is the focal point of the home and sets its prevailing stylistic tone, overseen by designer Isabelle Vanneck. The soaring ceiling is composed of antique timber planks supported by a dramatic system of antique hand-finished timber trusses that replicate the old construction. Greenwich-based Stephen Gamble finished all the distressed stained wood, antiqued the casework, and skillfully applied the imported French plaster.

Adjacent to the great room, a 27-foot-long timbered arch announces the entryway to the kitchen, a near-professional grade work space where rustic period details like French Camargue limestone flooring and oak cabinetry set the stage for complementary elements like extra-large concrete countertops and other modern amenities. From top to bottom, the tower houses an office, the master bedroom, and a 250-square-foot wine cellar where several thousand bottles can be stored.

Hilton's French Normandy manor house took shape on a trip abroad, so it's apt that the architect refers to its detail- and labor-intensive execution, along with the other seven buildings on the property, this way: "It's a journey I didn't know I was going on when I started," he says. "I'm definitely lucky!"

ABOVE The guest bedroom is approached from an oak staircase with carved balusters and newel posts. A 12' wide pocket door retracts to reveal a balcony overlooking the soaring great room below.

OPPOSITE Opposite the dining area and bay window is the two-story carved Camargue stone fireplace and seating area with a painting commissioned from artist Robert Kushner.

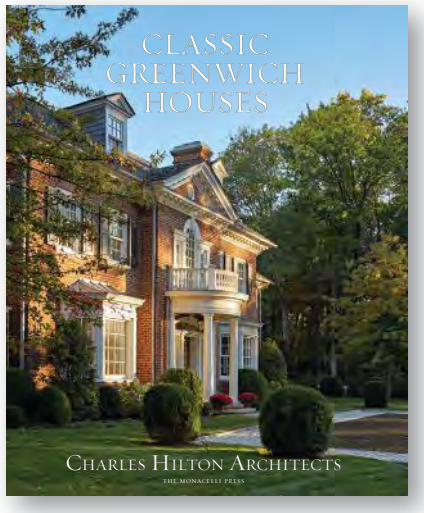
ABOVE Visitors arrive up a stone and cobble lined drive to the parking court. A majestic stone tower anchors the north-east corner of the building overlooking the surrounding apple orchard.

RIGHT The third floor master study is tucked beneath the tower's roof and enjoys panoramic views of the farm's gardens and orchards below.

CENTER The façade is clad with Connecticut fieldstone with carved granite quoin accents, antique hand-hewn oak and chestnut timbers, and custom-made Ludowici Roman brick nogging.

FAR RIGHT The homes wine cellar is framed with heavy rusticated antique beams fitted with custom oak cabinetry. The flooring integrates the cellar Roman brick and Camargue stone flooring.

RIGHT: Woodruff/Brown Architectural Photography photo



Charles Hilton is the founder of Charles Hilton Architects. For more than three decades, he's practiced in Greenwich, Connecticut. Committed to designing imaginative buildings that inspire and delight, Hilton's desire is to create humanistic architecture that embodies the aspirations of his clients. His new book, *Classic Greenwich Houses,* highlights his range in style, providing striking examples of Georgian, Colonial, and Shingle Style architecture.

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PROJECT Trust Building

ARCHITECTS Architectural Resources Group with Gensler Architects

Creamy travertine stone and silky black marble greet visitors to the entrance lobby of the 1928 Trust Building, while vibrant gilded ceilings enlighten with hand-painted company wisdom.

QUEEN OF COMMERCE

An Art Deco landmark gets revitalized down to its office eye-candy.

BY GORDON H. BOCK

PHOTOGRAPHY BY HUNTER KERHART

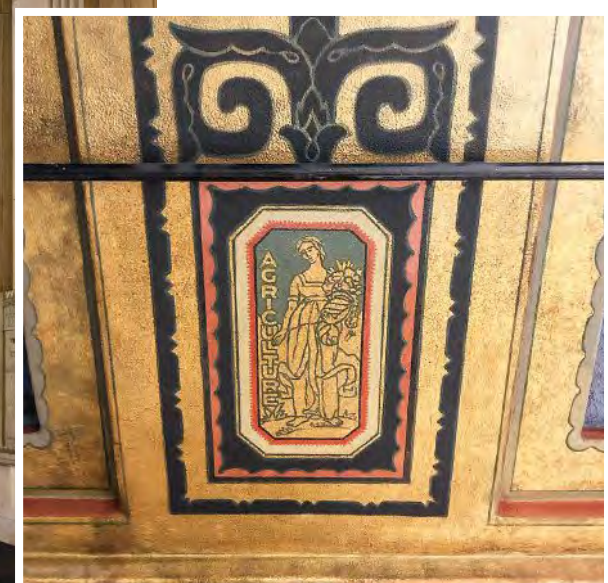
Office buildings of the early 20th century are often so intriguing to modern eyes because of how owners and designers blended progressive architecture and prosperous business with traditional finishes. The newly restored Trust Building in downtown Los Angeles is just such a building, and its success is a testament to how that partnership still works in the 21st century.

Opened in June 1928 for the Title Insurance and Trust Company, the building is the product of father-and-son firm Parkinson & Parkinson Architects, an imposing, 10-story example of the Art Deco Moderne style. Clad in sleek terra-cotta, and finished with marble, bronze, and polychrome tile murals, it quickly took center stage in LA's financial district. "It was called the Queen of Spring Street," explains Katie E. Horak, principal, at Architectural Resources Group in Los Angeles who worked in conjunction with Gensler Architects on the renovation, "and built at a boom time, the 1920s." The Title Insurance and Trust Company occupied the building for 49 years until, following a series of owners, it was acquired by Rising Realty Partners.

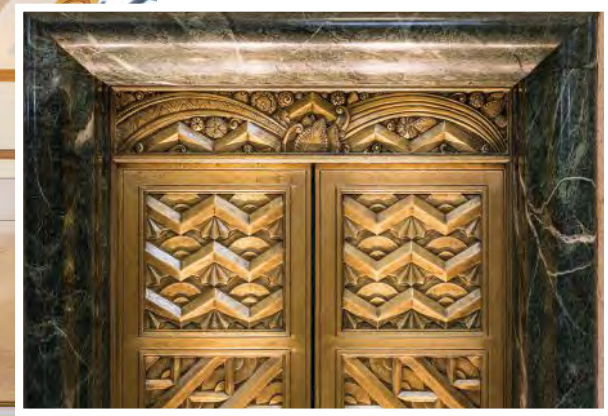
After decades, the exterior terra-cotta was in good condition, needing only a little cleaning, but the decorative finishes of first-floor lobby and second-floor banking level hadn't fared as well. "When the previous owners started seismic retrofits, they opening up ceilings and walls," says Horak. "The new owner has fully restored these ceilings—a tremendous effort due to the extensive, hand-painted finishes." A major issue was over-painting. "The main lobby ceiling has beautiful stenciling in the

LEFT The second floor is as richly decorated as the first floor, and needed as much ceiling and decorative painting restoration. Note the bronze registers.

BELOW Reworking the banking floor mezzanine led to the discovery of this corner ceiling emblem, probably once one of four.



BELOW The elevator lobby shines with car doors in Art Deco Moderne motifs (inset). One shaft now houses ducts for HVAC and mechanicals.



ceiling, gold lettering of company mottoes that had been covered over. Since a little was still visible through the paint, we were able to work with a fine art conservator to bring the lettering back."

As if trying to read the obscured inscriptions wasn't enough, there was the puzzle of deciphering the letters themselves. According to Justine M. Leong, AIA, senior associate and project manager on the Trust Building, "The font wasn't conventional like Helvetica or Old English; it appeared to be the Trust Company's own custom letterform. It required somebody with sign-making experience to interpret what each letter looked like—not just what it said." Of the

three lobby coffers, each with different sayings, the center one inscribed 'The Trust is the keystone of the edifice of society' made most sense to restore. "It's bright blue with, originally, gold flake—prohibitively expensive today, so we used gold paint with the same effect," says Leong. The fine artist spent many hours not only on the first floor but also on the second-floor elevator lobby and the entire ceiling of the banking space, stained and damaged over the years from leaks and cigarette smoke.

Ultimately it is the second-floor banking area that steals the show, literally. "For several decades, previous owners rented it out for filming," says Leong, "so many movies, television shows, and music videos have been shot there." It's not hard to understand why. The space, which was built with sumptuous hand-decorated ceilings and gilded paintings, is two stories high with a mezzanine. As a consequence, though, they had to undo much motion picture veneer. "Even though the real thing was underneath, we removed a lot of Hollywood 'fakeness' such as wallpaper resembling travertine and bronze gates painted to look like bronze."

What's more, maintaining the character of that two-story banking area—in effect, a soft-story in the middle of the building—posed challenges for seismic retrofits. Explains Horak, "It's such an enormous, open space, so dramatic from the height of the ceilings and volume, the goal was not to break up that volume, which is such significant feature. So even though we had to insert these new seismic elements—columns and moment frames—they were added very strategically so as not to detract from the open-ness."

"The building is a steel frame encased in concrete with brick infill," explains Leong, "so it's not strictly unreinforced masonry but a hybrid." She says the firm worked very closely with Nabih Youssef Structural Engineers and Gensler to design an appropriate seismic upgrade. "Along the perimeter we decided to put moment frames, which are basically a series of beams and columns that are tied to make a sort of U around the windows. Then, in the middle of the space we added a shear wall that's symmetrical on both sides, two stories high, and pretty long as well."

Part of the challenge included dealing with the mezzanine /balcony that overlooks the floor, which the owner wanted to expand to create more office area. Since this required adding shear walls, Leong says, "we worked with Gensler so that one of the shear walls is actually adjacent to a secondary stairway and becomes a backdrop for the stair."

ABOVE Original bronze work (left) and light fixtures were carefully restored.

BELOW The Trust Building is 10 stories of textbook Art Deco form: symmetrical, with a major central block and lower extensions at both sides.

The seismic work also included adding more columns adjacent to the existing travertine-clad, fluted columns. "At first, we were really concerned about how this was going to look, but because the new, square columns are differentiated, they didn't compete with or impact the historic columns." The finished seismic retrofit exceeds FEMA requirements.

The project just received a LEED Gold Certification, reports Leong. The HVAC is a very high-performance, modern system, she says, requiring much new air/return ductwork, but the ducts were located in shaft walls along the perimeter where they can't be detected. "One of the six elevator shafts was converted into a duct shaft for new conduits and ductwork, and we re-used a lot of the existing diffusers, such as the original bronze grilles in the lobby." All of the over 300 windows are operable, so they can admit fresh air, and most are the existing double-hung steel that will be upgraded with heat-blocking clear window film. "With lots of good light, views, and ceiling space, the building is really conducive to offices," notes Leong, "because that's how it was originally built."

GORDON BOCK *is an architectural historian, instructor, and speaker through gordonbock.com.*

The town of Nantucket.

Shutterstock

CLIMATE CHAOS AND HERITAGE-CONSERVATION VALUES

The Urgency for Action

How will the community of practice in historic conservation rise to the challenge and opportunity of Climate Chaos, now upon us?

BY MARK THOMPSON BRANDT & CORY ROUILLARD

First published in *APT Bulletin*

The community of practitioners who deal with the built environment, like society in general, has now entered a defining moment. It is a period of great opportunity and great risk. The Intergovernmental Panel on Climate Change (IPCC) tells us we have only a decade to slow or stop the processes of "Climate Chaos," to prevent what is otherwise the assured rapid acceleration of Earth's destruction.[1]

Make no mistake: This is the challenge of our lives. It renders pale all our otherwise noble professional efforts and technological advancements towards the conservation of historic places and with them, our collective memory and understanding of who we are. This is our generation's urgent clarion call, like President John F. Kennedy's 1961 challenge to the United States to land a man on the moon. That challenge was fulfilled in less than a decade, 50 years ago. Will we be able to look back at a successful fulfillment of this new challenge, 50 years from now?

Today's carbon challenge is much more complicated than a successful moon landing, with much more at stake. It must involve collaborative and strategic efforts by many professionals, including the conservation community. It requires significant "stepping up" by those whose particular skills and leadership can provide major contributions to the required complex matrix of decarbonizing solutions. Our collaboration must occur throughout multiple disciplines, involving many nations.

Heritage-conservation professionals have developed advanced skills of questioning further, delving deeper into root causes, and probing wider to gain a clearer understanding of our projects. We have skills and experience in determining value and knowing how to protect it. We are truly cross-disciplinary and collaborative. We have honed these

skills in our work with interventions to existing buildings. This is the very resource—existing buildings—that is determined to be the single largest contributor to carbonization and Climate Chaos.[2] "Stepping up" therefore is not just our opportunity; it is our urgent responsibility, now and for at least the next 10 to 30 years. It must become an integral part of the next 50 years of conservation.

This paper emanated from the special theme plenary entitled "Climate Chaos and Historic Building Environments: The Intersection of Preservation and Resilience," which was one of the three opening plenaries for the APT Buffalo-Niagara 2018 Conference and contributed to the post-conference Next Fifty Symposium.

INTRODUCTION: CONSERVATION AND DECARBONIZATION

The challenges of Climate Chaos and its symptoms are profound. Overcoming them will require reasoning with new frameworks and approaches; as Albert Einstein said, "We cannot solve our problems with the same thinking we used when we created them."

In the face of these threats, the solutions for historic conservation will challenge the very foundation of its precepts, such as authenticity, context, and integrity. Fundamental questions arise. How will we:

- apply *The Secretary of the Interior's Standards for the Treatment of Historic Properties* or Parks Canada's *Standards and Guidelines for the Conservation of Historic Places in Canada* in the context of new climate realities?
- mitigate impacts from severe weather events upon historic places and increased climate variabilities that are already happening?
- adapt our built heritage to new climate-disaster realities?

These areas of inquiry will be keystones in heritage-conservation work for the next three decades.

With the onset of the "low-carbon economy," its associated "race to net-zero," and concerns for protecting built heritage from climate-based threats, heritage conservation must now fully integrate with, and adapt to, decarbonization and climate-protection planning.

Heritage conservation contributes to creating a sustainable built environment and resilient communities; but in a chaotically changing world, how can conservation persevere? Must we reimagine historic buildings and landscapes?

PREVENTION, MITIGATION, AND ADAPTATION

When it comes to understanding and fighting Climate Chaos resulting from escalating built-environment carbon emissions, there are generally three areas of endeavor: prevention, mitigation, and adaptation. Mitigation and adaptation are the foci of this article.

The term **"prevention"** is about finding ways to reduce embodied and operating carbon emissions to zero, or even to net-positive, through material decarbonization, the use of renewable energy sources, and carbon sequestering. The conservation community has a large role to play in prevention, especially in the adaptive reuse of older buildings and the development of a greater understanding of embodied carbon and its role.[3] The Association for Preservation Technology's Technical Committee on Sustainable Preservation (TC-SP), among its other mandates, delves into that task. The TC-SP, in turn, has a focus group that is specifically concerned with carbon reduction; its APT representatives are the current co-chairs of a five-organization strategic collaborative, the Zero Net Carbon Collaboration for Existing & Historic Buildings (ZNCC).[4] The ZNCC is focused on research, solutions development, and networking of groups that are participating in the search for massive reductions of operating and embodied carbon toward a carbon-free world in 2050, as per the *Paris Agreement* targets.[5] This is a significant task. APT's role will continue to include ensuring cultural values remain central to objectives and planning in this field.

The term **"mitigation"** is the collective set of actions aimed at neutralizing the effects of carbon-generated Climate Chaos on existing and historic places. It is the development of "strengthening" interventions that can be undertaken to reduce impacts upon properties from climate-generated destruction, such as floods, excessive heat or cold, high winds, tornadoes, hurricanes, sea-level rise, and more.

The term **"adaptation"** is the collective set of actions aimed at modifying existing and historic properties in significant ways to reduce the need for more mitigation. Adaptation could involve, for example, raising historic buildings, moving them away from the coast, or taking other actions that may change the perception of the original building and its contextual relationship.

With both mitigation and adaptation, there are hard questions to be answered with respect to maintaining the character-defining elements that give a place its heritage value. Finding new, creative solutions are required for both. Over the last two centuries, we have increasingly used technology-based solutions to solve large challenges in overcoming natural processes or systems. Recently, we have seen exponential change brought on by rapidly advancing technologies.

THE ANTHROPOCENE AND EXPONENTIAL CHANGE

The Anthropocene has been defined as denoting "the current geological age, viewed as the period during which human activity is the dominant influence on the earth and its ecosystems, including, but not limited to, anthropogenic climate change."[6] This period continues through to the present and will do so until a massive paradigm shift in human nature occurs. This shift would be characterized by the willingness to work within natural processes and systems, rather than by a continuation of behavior that seeks to disregard, dominate, or overcome nature. In other words, such a shift would require embracing nature-based systems instead of applying only technology-based systems ***(Fig. 1).***

FIG 1 Former Don Valley Brickworks, Toronto, Ontario, built 1889, shown here ca. 2010, being adaptively reused as the Evergreen Brick Works, a community, education, event, and commercial mixed-use center. Included in its adaptation plan, the rehabilitation design and new use purposely allows the annual Don River flood to carry water over the property, respecting the laws of nature.

Courtesy of Loozrboy, Flickr, https://www.flickr.com/photos/loozrboy/5013030914/

SOLUTIONS: TECHNOLOGY, ECOLOGY, AND HYBRIDS

Some would have us rely on the imminent employment of rapidly advancing or "exponential" technologies to overcome the Climate Chaos problem, retaining business as usual.[7] But if, for example, the technology solution is simply to cover properties with photovoltaic panels and wind turbines, how does that impact historic properties? Is that a heritage-conservation approach? Relying on technology alone to solve this problem is fraught with risk and may even prove disastrous.

Others would have us look to nature itself to generate solutions, that is, to develop biological or nature-based solutions (for example, cultivating forms of algae or natural building materials that store massive amounts of carbon), to reverse the natural destruction we have now ignited. The ecologist István Kenyeres has postulated, "We don't have to save the environment—the environment is us."[8] That sentiment is compelling, but it does not equate to an imminent bio-solution to the carbon problem nor comfort us that humankind's great disasters inflicted upon the planet can be fully overcome by nature itself.

Perhaps then, complex hybrids are the most likely conservation solution to achieve effective mitigation and adaptation, where we use both advancing technology and the lessons of nature to generate solutions, framed with a heritage-conservation approach. For example, "deep green" rehabilitation of a historic building—the use of advanced green technologies—will help us reduce carbon emissions; however, also harnessing the inherently and naturally sustainable features of the building itself (such as applying the natural principle of "hot air rises") will put us over the finish line to zero-net carbon. The interconnectivities between culture, nature, art, and science, first identified by Alexander von Humboldt in the early nineteenth century, may be instructive here. In fact, the Prussian polymath, earth scientist, and cultural geographer "was the first person to describe the phenomenon and cause of human-induced climate change, in 1800 and again in 1831, based on observations generated during his travels."[9]

APT'S 2018 CLIMATE CHAOS PLENARY

Finding both technological and nature-based solutions for climate-related threats to heritage permeated the theme of the plenary session "Climate Chaos and Historic Building Environments: The Intersection of Preservation and Resilience" at the Buffalo-Niagara conference. The session examined mitigation and adaptation against extreme weather threats to historic places. The question was posed: How can we simultaneously preserve our heritage and plan for climate resilience? Resilience has been defined as "the capacity to adapt to changing conditions and to

maintain or regain functionality and vitality in the face of stress or disturbance."[10] Historic buildings and districts can be both supportive of community resilience and resilient themselves.

The panel of speakers and their presentations were:

- ***Mark Thompson Brandt,*** session lead, "Nexus of Preservation and Resilience: Re-Imagining Historic Places for Climate Chaos"
- ***Robert Hotes***, "Coastal Resilience: Strategies Addressing Sea-Level Rise in Historic Districts"
- ***Priya Jain***, "Houston's Buffalo Bayou: Present Challenges and Visions for the Future"
- ***Tom McGrath***, "Resilience: A Preservation Response to Sea-Level Rise and Climate Change"

Brandt introduced the plenary by inviting attendees to think broadly about resilience, including consideration of Indigenous and nature-based approaches. For example, environmental scientist David Suzuki describes Indigenous peoples' "deep attachment to place" as the ingrained sense or drive to automatically and simultaneously care for both natural and cultural conservation of a given place. This underscores the essence of our realization that historic conservation is inextricably linked with environmental realities, ecological processes, and natural conservation.[11]

The speakers at the plenary explored various responses to sea-level rise and extreme storms driven by climate change, incorporating resilience measures into practice. We were provided insight through case studies into community preparation in anticipation of these events, actions in the aftermath of flooding, and other examples from the perspective of heritage professionals.

Robert Hotes reported on Weather It Together Annapolis, a model for community engagement in preparation for the anticipated 44-inch rise in the Chesapeake Bay within the next hundred years. Through a combination of subject-matter expertise and community engagement, Annapolis has established a collective vision with goals, objectives, and community buy-in that will shape the city's response in the years to come ***(Fig. 2).***

FIG 2 In preparation for the anticipated 44-inch rise in the Chesapeake Bay within the next hundred years, models for community engagement—like this concept for adaptation, raising, and slight relocation of a historic house—helped establish a collective vision for Annapolis. This suite of shared goals, objectives, and community buy-in will shape the city's climate-change response over the years to come.

Hotes also shared the perspectives of the emerging generation of design professionals as they confront the issues of rising water levels in the neighborhood surrounding historic Bridge Street, in Newport, Rhode Island. Three student projects, undertaken in a Rhode Island School of Design studio, approached the problem in very different ways. One presented a long-term strategy of turning the streets into linear parks with built-in water-retention capacity; the parks would eventually become canals

FIG 3 Climate-smart interventions in historic places. "Grey Green Blue" is a project of Angelica Carvahales, Eder Romero, and Sneha Mathreja, then students in the master's in adaptive-reuse program at the Rhode Island School of Design. It proposes a long-term strategy of turning streets into linear parks with built-in water-retention capacity; the parks would eventually become canals as the sea level rises.

(Fig. 3). Another, more theoretical project, provocatively relocated historic homes into a vertical exoskeleton. The third strategy took a playful, educational-outreach approach as it created a virtual, augmented-reality game to allow players to see what the higher water levels would look like on Bridge Street and collaboratively try to "save the street." Through all examples, Hotes made clear the necessity of working collaboratively across disciplines and within the community.

Speaker Priya Jain described the geographical and historical context of Houston, Texas, and how Hurricane Harvey proved so devastating in 2017, despite the city's presumed readiness, given its long history of flooding. The city's flat topography and series of slow-moving rivers, or bayous, had led to flood mitigation and prevention strategies in the past, including the development of hardened reservoirs for water retention and control. Intense citizen action spared the Buffalo Bayou the fate of the city's other bayous, which had been straightened and lined with concrete and would worsen the flooding over time Jain presented a series of case studies of adaptation designs in both buildings and landscapes along the Buffalo Bayou. Some examples, such as buyouts of developed flood-prone parcels to create bayou greenways, demonstrated the potential of thoughtful design to transform necessary adaptation and mitigation strategies into amenities and catalysts for improvements in the surrounding community. Other examples, such as building flood-proofing measures, illustrate the sobering reality that if not built to match the severity of the flooding, even the best intended adaptation measures may fail.

Tom McGrath's presentation translated the effects of sea-level rise into the daily work of conservation professionals, including the need to incorporate resilience strategies into building evaluations for heritage properties. Through his observations and experiences working in Key West, Florida, and Nantucket, Massachusetts, after severe storms, he presented clear lessons learned, examples of flooding-resilience measures, and resources for technical guidance.[12]

Cumulatively, the speakers raised important emerging concerns. Within the conservation community and the general public, awareness and comprehension are needed first. Far too often we need to live through the effects ourselves before they are fully understood. But we must help develop that understanding in advance, through augmented reality, modeling, continuing education, and other tools.

This new awareness must turn quickly to collective, active response, in preparation for these threats. While many individual responses are necessary, it is through collective action that a cohesive and improved context will allow us to retain the integrity of our built environment. This preparation will then also shape prioritization of decisions made in the aftermath of severe weather events, when it is necessary, yet most difficult.

Between the on-the-ground activities of communities building a body of knowledge and resilience and the sometimes radical next level of reimagining the long-term adaptation of historic places, one thing becomes clear: Much creativity, natural science, and technology need to be developed and applied before we get to a "comfort zone" for both the protection of and the adaptation for historic places in the face of climate threats. There is much to be done to both mitigate threat and protect heritage value.

THE VULNERABILITY ASSESSMENT

The community actions against the impacts of Climate Chaos described at the APT conference show us what people are doing to mitigate for and adapt to climate change. Some of these efforts are projections for more extreme solutions, which will perhaps be the norm in the future.

LEFT: Courtesy of Lisa M. Craig, of The Craig Group, for Weather It Together Annapolis; ABOVE: Courtesy of Liliane Wong, 2017

Practically speaking, how does a property owner or jurisdiction get started?

The first step is to understand and assess the situation on the ground. Climate-change vulnerability and adaptation (CCVA) assessments are relatively new methods of documenting conditions and outlining actions with respect to severe weather events and their impact, including those upon historic places. Conducted by scientists, engineers, and conservation professionals, CCVAs analyze "current impacts and projected future risks of climate variability . . . [and] to identify policies and programs to increase resiliency to these risks." CCVAs provide property owners, "emergency management officials, stakeholders, and the public with information on the magnitude and pattern of current and future health risks" associated with severe weather events. They also identify opportunities to prevent or reduce the severity of future risks and "serve as a baseline analysis against which future changes in risks and in associated policies and actions can be monitored."[13]

CCVA planning is currently being undertaken for a historic precinct for the Canadian city of Ottawa by MTBA Associates Inc., along with prime consulting architects, engineers, and planners and earth-science and landscape specialists. MTBA's role was to provide advice on how the heritage qualities and assets of the precinct are vulnerable or resilient.

The approach is holistic and integrated with wider approaches to combat the effects of Climate Chaos in, for example, public safety or urban planning. Holistic and integrated approaches are familiar to conservation professionals; this is another reason why the heritage-conservation community can take a leadership role in making wise decisions about mitigating the effects of climate change while minimizing long-term, irreversible impacts to the heritage value of buildings or districts. This CCVA concentrates on the early stages, where a vulnerability assessment helps us better understand the nature of the historic place (a primary tenet of the *Standards and Guidelines for the Conservation of Historic Places in Canada,* the national reference). In this case, the focus is on the broad range of potential vulnerabilities that the historic precinct may have.

To establish an organizing order for the overall assessment, the team used the PIEVC ("pie-vee-cee") Protocol, which was developed by Engineers Canada to create a framework that can identify risks, highlight areas to protect, and build resilience. Since its release, this protocol has been applied dozens of times in Canada and several times in Central America.

The protocol is not a software program, but a common-sense process with several steps:

- ***Define the boundaries to be evaluated.*** The boundary could be one specific building or a district.
- ***Collect information.*** Locate sources from which to get reliable data about the buildings and infrastructure, for example, from recent roof, foundation, or ventilation-system inspections.
- ***Determine the climate events that may impact the place.*** For example, prolonged heat is not an issue for concrete, but it could severely affect the building's HVAC system.
- ***Perform a risk analysis.*** This is often a huge matrix, with potentially hundreds of infrastructure components and a dozen or more potential weather event elements. The protocol's risk-assessment analysis helps eliminate the unimportant interactions among these components and elements, cutting, say, a thousand interactions down to a hundred. Establish an iterative process for managing and monitoring risks.
- ***Consider solutions (the adaptation step).*** Ask questions such as "How are we going to adapt?" "What are mitigative measures to minimize the impacts of those risks?" Look at how component failures will impact the building and the community. This is the creative part of the process. Integrate and collaborate widely with professionals from a variety of disciplines: planners, operators, policy experts, architects, engineers, conservationists, and other specialists. Examine potential benefits and hindrances of adaptation and mitigation options implemented in related sectors. Require rational logic sequences in developing of potential solutions to resilience enhancement. For example: How practical is it to disassemble and reinstall 150-year-old roof slates using a new technologically advanced clip system? What are the relative advantages with elevating a building versus constructing a permanent flood-restraining perimeter wall?

Comparative scenarios could involve a protracted level of analysis, modeling, and sometimes even community input-gathering to ascertain the optimum solution. In each case, the alternatives for historic places are filtered through the lens of the physical and visual impacts upon heritage value. Otherwise, they go through the same filters as all infrastructure, including community, cost, and health impacts.

PIEVC Protocol can be applied to a wide range of infrastructure, including heritage structures. Establishing a "climate risk, vulnerability, and mitigation profile" focuses on actual key risks. Identifying these enables the development of useful solutions.

From a heritage-conservation perspective, the emphasis is on identifying character-defining features of the historic place. Threats to these features become the "key risks." Risk assessment for historic properties may be able to benefit from many years of meteorological data, which may reveal patterns and resilience; for example, a one-in-one hundred-year flood or hurricane that has previously threatened similar historic elements in the vicinity. On the other hand, the age of historic properties may lower their tolerance to impact, potentially increasing the degree of unknowns and risk with severe weather events not experienced to date ***(Fig. 4).***

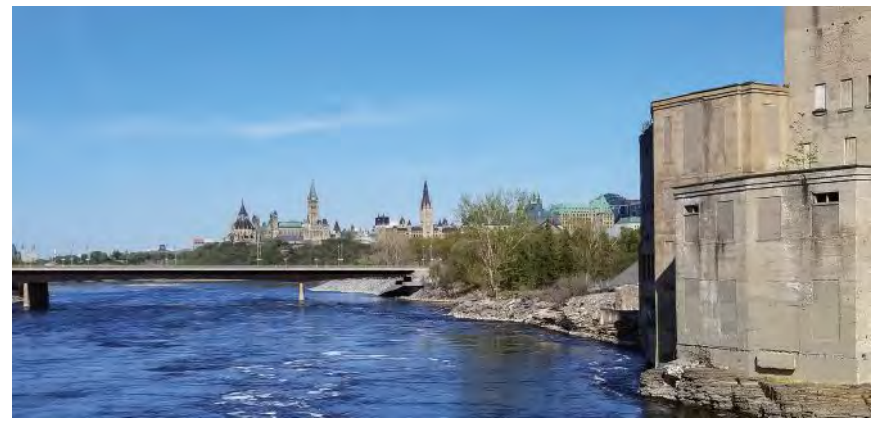


FIG 4 Parliament Hill, Ottawa, Ontario, built 1859–1927, on its escarpment above the Ottawa River, which is exposed to extreme west winds and storms. This 2020 view is from the historic Chaudière Bridge across the Ottawa River, a historic crossing that first joined Upper and Lower Canada. In 2018 a one-in-one-hundred-year flood, the second in only two years, caused the closure of the bridge and flooded the base of the escarpment. At right is the Booth Board Mill complex (built 1912, enlarged 1918 and 1928, closed 1980). It is part of the Chaudière Islands Historic District and an element of a $1 billion district rehabilitation and mixed-use redevelopment and is particularly vulnerable.

Courtesy of MTBA Associates Inc.

DEFINING CLIMATE HAZARDS

The assets of the Ottawa historic precinct range from low-level heritage resources to some having the highest value in the country. There are many designated heritage buildings, plus many other historic resources, which together make up a significant (though not yet designated) cultural-heritage landscape. Therefore, any impact, not just to individual properties but to the entire area, is cause for concern.

Generally speaking, due to their age (90 to 160 years), these properties are more susceptible to impacts from weather events, despite an ongoing, intensive program of maintenance and rehabilitation of a number of buildings. Meanwhile, other damaging weather events can occur. This is a significant factor, as it will take more than another decade of rehabilitation to complete the current program.

The key hazards that will likely have a critical impact upon these heritage buildings include such phenomena as:

- **severe heat waves** (impacts upon roofs, windows)
- **extreme temperature fluctuations**, especially above 0°C (impacts upon roofs, windows) and freeze-thaw cycles (impacts upon entire building envelopes)
- **heavy or intense rainfall** (impacts upon doorways, drainage systems)
- **snow accumulation** (impacts upon roofs and, due to salting maintenance, to doorways and facades)
- **extreme wind gusts, wind-driven rain, and ice storm/ice accretion** (impacts upon entire building envelopes)

Vulnerability assessments will soon be common, as realities of the onset of Climate Chaos sink in and the need for mitigation and adaptation become increasingly apparent. Like building codes and the increasing use of sustainability codes, these assessments may become required by law.

RECOMMENDATIONS FOR APT'S ROLE

Over the next 10 to 50 years, the force of Climate Chaos issues will transform heritage conservation. To maintain its leadership position, APT will need to plan now for its role and take swift follow-up action, in at least four areas:

- ***Data gathering and new frameworks.*** The conservation community needs evidence-based, defensible, and easily digestible data to articulate compellingly the critical need to vastly increase building reuse and decarbonization. When it comes to the heritage contribution to climate action, we need to explain why "deep green" rehabilitation matters and back it up with this data, in order to change minds of policy makers and build an onboard broad coalition in this work. APT must help its membership and the conservation community develop best practices to acquire the data needed to assist decision-making in the formation of optimal solutions to zero-carbon building rehabilitation, improved and more widespread use of life-cycle assessments, new decarbonizing

strategies (such as carbon calculators and design-assist tools), and new frameworks for climate adaptation and mitigation strategies.

- ***Evolving the conservation standards.*** APT must help lead the discussion about how Climate Chaos may encourage us to expedite what Gustavo Araoz has called the "new paradigm" in historic preservation.[14] This parallels the Historic Urban Landscape Approach (UNESCO HUL, 2010), where the standards for types of acceptability or levels of intervention address new realities of an intangible, fast-forward, rapidly urbanizing, climate-impact world. Conversely, can APT help foster development of technologies to address these impacts, while staying in front of safeguarding or evolving accepted standards and guidelines for the conservation of historic places? This is now a "front burner" issue.
- ***Prevention.*** APT must help the conservation community take a leadership role in the "Race to Net-Zero," using its members' expertise in "managing change to existing buildings while retaining value." This work must take a collaborative approach with other disciplines to address the required dramatic acceleration of context-sensitive rehabilitation of the massive stock of the world's existing, abandoned, and heritage properties. A large task will be the sustainable rehabilitation of heritage buildings from the modern era, which collectively, mainly due to their abundance, are the greatest greenhouse-gas "culprits."[15]
- ***Mitigation and adaptation.*** APT must also help members lead in developing best practices for urgent actions, such as vulnerability assessments for historic places. APT should be a leader in supporting new research and development for creative mitigation and adaptation of climate effects and in supporting the reduction of greenhouse gases. This can also be accomplished through the rediscovery of traditional, nature-based solutions, as well as hybrid solutions. New policy development is also required. Given the collaboration imperative, should APT also help lead best practices for education and outreach in this area?

CONCLUSION

Heritage-conservation professionals have strong insights to contribute to the planning, testing, and implementation of mitigation and adaptation that will be needed to address climate-change disruption. Experience in community planning, rationale development and vetting, envisioning of creative alternatives, logic sequencing of potential outcomes, and other skills developed by conservation architects and other professionals in their design and change-management practices for existing and historic properties—all will provide valuable foundational expertise for vulnerability assessment and adaptation solutions.

Both the U.S. National Park Service and Parks Canada have developed initial climate-change strategies for cultural properties and are slowly working them forward from policy to implementation. For example, Park Canada's "Climate Change Adaptation Framework for Parks and Protected Areas, and the accompanying adaptation workshop approach, were developed to support adaptation action across a range of protected places. The approach emphasizes the use of rapid vulnerability assessments, allowing practitioners to identify adaptation options as soon as possible and pinpoint those that meet the greatest climate-change risks and vulnerabilities." More importantly, "recent efforts at Parks Canada are focused on accelerating implementation of adaptation actions: translating lists into comprehensive action plans."[16]

Much of the understanding, planning, and executing of Climate Chaos mitigation and adaptation for historic places will be the discourse on what is appropriate. We do not have the luxury of time to explore this for long; urgent action is required, both for our responsibility to help lead the effort and for our responsibility to preserve our built cultural heritage. Developments in this field are already accelerating. Less-than-accelerated action may mean losing a place at the table as events overtake a lack of preparedness.

The APT Technical Committee on Sustainable Preservation (TC-SP) is already evolving, as evidenced in the program at the APT 2019 Miami Conference, where many paper sessions and a full-day symposium were dedicated to Climate Chaos intersection issues. But there is much more to be done. The TC-SP and APT's other technical committees must work collaboratively with others in the expanding climate-action communities to help develop nature-based and technology-based best practices for both mitigation and adaptation. For example, the ZNCC is currently co-coordinating with the California State Historic Preservation Office and Working Group 3 of the ICOMOS-generated Climate Heritage Network's Climate Action Plan.[17] Also needed is help to develop best practices for when and to what degree more comprehensive changes to historic places are acceptable.

.

Acknowledgements

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Bios

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Notes

1. Regarding the nomenclature of this article, "preservation" (U.S.) and "conservation" (Canada and international) describe essentially the same process; both are used throughout this article. "Climate change" is a phrase that hardly describes the devastating impacts or the urgent nature of relief required. The author prefers to use the more technically accurate phrase "Climate Chaos." As it is a real phenomenon today, the author prefers to capitalize Climate Chaos, as a proper noun, to help communicate it as a clear and present danger. Similarly, the IPCC issued a special report entitled Global Warming of 1.5ºC, in October 2018, where leading scientists provide statistics that affirm humanity has about a decade to hold global temperature increases to 1.5ºC.
2. The IPCC has issued previous reports that indicate the various factors influencing carbon emissions. Existing buildings account for about 40 percent of the carbon emissions globally and related impacts upon our natural and cultural heritage (including embodied and operational carbon). The "deep green" rehabilitation of existing building stock is arguably the single greatest area for change to achieve worldwide goals for reducing emissions and maintaining the temperature of the planet. Heritage buildings are an important subset of existing buildings. Sharon C. Park, "Sustaining Historic Properties in an Era of Climate Change," APT Bulletin: The Journal of Preservation Technology 49, nos. 2–3 (2018): 35–44.
3. The recent improvements in the understanding of embodied carbon in existing buildings underscore the necessity of "recycling" buildings rather than building new. Life-cycle assessments help us better understand how the choices of materials and decisions to reuse and rehabilitate can dramatically decrease our carbon footprint. Interestingly, "mainstream" architecture and green-building construction have just recently started to embrace the fact that to "slay the carbon dragon," we need to be mostly focused on "deep green" rehabilitation of existing buildings, not new "green" buildings.
4. "The ZNCC is a strategic alliance committed to coordinating/monitoring technology development and integration for, and providing a unified resource for, the goal of responsibly bringing historic places to zero-net carbon (ZNC) and accelerating the ZNC of existing and historic buildings and places, accounting for both embodied carbon and operational carbon emissions, through developing leadership in best practices for the ZNC rehabilitation of most existing buildings, and in the responsible reuse of built resources in general. The collaboration initially formed in October 2017 with five founding partner organizations: APT, the American Institute of Architects (AIA), the Royal Architectural Institute of Canada (RAIC), the International Council on Monuments and Sites (ICOMOS), and Architecture 2030"; Mark Thompson Brandt, ZNCC co-chair; www.zneccollaboration.org.
5. At the December 2015 United Nations Climate Change Conference, COP 21, held in Paris, parties to the United Nations Framework Convention on Climate Change (UNFCCC) reached a landmark agreement to combat climate change. The Paris Agreement's central aim is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century below 1.5ºC above preindustrial levels. The agreement aims to increase countries' abilities to deal with the impacts of climate change, matching finance flows with low greenhouse-gas emissions. Park, 35–44.
6. The Anthropocene Working Group "voted in April 2016 to proceed towards a formal golden spike (GSSP) proposal to define the Anthropocene epoch in the Geologic time scale and presented the recommendation to the International Geological Congress"; "Anthropocene," Wikipedia, accessed Sept. 19, 2019, https://en.wikipedia.org/wiki/Anthropocene.
7. Exponential technologies are "technologies that double in power or processing speed every year, while their cost halves"; Michael Haupt, "Exponential Technology Defined," Michael Haupt (blog) March 30, 2016, accessed Sept. 19, 2019, https://michaelhaupt.com/exponential-technology-defined-374e2db882b0.
8. Hungarian creative ecologist István Kenyeres is a founder, inventor, former CEO, and chairman of Organica, a wastewater-treatment, environmental, industrial-ecology, and ecological-engineering company. His view is that the planetary ecosystem's sustainability relies on our unique mental capabilities to create tools, technologies, and complex social structures to develop and maintain the delicate balance between natural, economic, and social forces. He is currently the president of Biopolus, an organization that promotes systemic reengineering of our urban metabolic systems to address economic and global warming crises.
9. Between 1799 and 1804, Friedrich Wilhelm Heinrich Alexander von Humboldt traveled around the Americas, exploring and describing them for the first time from a modern scientific point of view. Details and descriptions of his journey were featured in a "multi-volume treatise, Kosmos, in which he sought to unify diverse branches of science, art, and culture. This groundbreaking work also motivated a holistic perception of the universe as one interacting entity"; "Alexander von Humboldt," Wikipedia, accessed Sept. 19, 2019, https://en.wikipedia.org/wiki/Alexander_von_Humboldt.
10. Oruba Alwan, "The Impact of Emerging Technologies in Supporting Urban Resilience Planning in Canada" (honor's thesis, Univ. of Wolverhampton, March 2016), 14–15, https://wlv.openrepository.com/bitstream/handle/2436/617781/Oruba%20Alwan%20Final%20Submission%20June%202016.pdf?sequence=1&isAllowed=y.
11. "The future of environmentalism will be led by First Nations—because their fight is about a way of life, but it comes from a deep attachment to place"; David Suzuki, environmental scientist, interviewed for the 2017 Canadian Centre for Architecture exhibit in Montréal, It's All Happening So Fast: A Counter-History of the Modern Canadian Environment.
12. FEMA P-348: Protecting Utility Systems from Flood Damage Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems, 2nd ed. (Washington, D.C.: U.S. Dept. of Homeland Security, FEMA, 2017), https://www.fema.gov/media-library-data/1489005878535-dcc4b360f-5c7eb7285acb2e206792312/FEMA_P-348_508.pdf. "Floodproofing Info #1: What is Flood Proofing?" (New York Southern Tier Regional Planning & Development Board, June 2019), http://www.stcplanning.org/usr/Program_Areas/Flood_Mitigation/Floodproofing/FProof_01_Floodproofing.pdf. John Fidler, Chris Wood, and Brian Ridout, Flooding and Historic Buildings Technical Advice Note, 2nd ed. (London: English Heritage, 2004), https://www.ncptt.nps.gov/wp-content/uploads/Flooding-and-Historic-Buildings-Technical-Advice-Note-2004.pdf.
13. Kristie Ebi, Vidya Anderson, Peter Berry, Jaclyn Paterson, and Anna Yusa, Ontario Climate Change and Health Toolkit (Ontario: Queen's Printer for Ontario, 2016), https://peel.andornot.com/PDF/Climate_Change%20_Health%20Toolkit.pdf.
14. Gustavo Araoz, "Preserving Heritage Places Under a New Paradigm," Journal of Cultural Heritage Management and Sustainable Development 1, no. 1 (2011): 55–60.
This paper called for expansion and evolution of the theories and practice of modern heritage conservation, based upon contemporary global trends. It suggested that this "new paradigm" requires new tools to protect heritage.
15. See also Mark Thompson Brandt, "Buildings and Stories: Mindset, Climate Change and Mid-Century Modern," Journal of Architectural Conservation 23, nos. 1–2 (2017): 36–46, http://mtbarch.com/wp-content/uploads/2017/06/Buildings-and-stories-mindset-climate-change-and-mid-century-modern.pdf.
16. Elizabeth Nelson, Elyse Mathieu, Julia Thomas, et al., "Parks Canada's Adaptation Framework and Workshop Approach: Lessons Learned across a Diverse Series of Adaptation Workshops," Parks Stewardship Forum 36, no. 1 (2020): 77–83, https://escholarship.org/content/qt4jf7c0x1/qt4jf7c0x1.pdf?t=q45jbe.
17. "The Climate Heritage Network (CHN) is a voluntary, mutual support network of arts, culture and heritage organizations committed to aiding their communities in tackling climate change and achieving the ambitions of the Paris Agreement." Part of the CHN vision includes this regarding heritage and adaptation: "21st century heritage administration includes both addressing the impacts of climate change and planning for adaptation, contributing to disaster risk reduction, and helping to leverage heritage values to enhance communities' adaptive capacities and reduce vulnerability via participatory approaches guided by science and traditional, indigenous and local knowledge." Working Group 3 (also known as the Working Group on Making the Case for Building Reuse Through Better Metrics) is one of eight working groups undertaking the CHN's Climate Action Plan, with the first deliverables expected at COP 26, the UN Climate Change Conference in 2021; Climate Heritage Network, http://climateheritage.org/.

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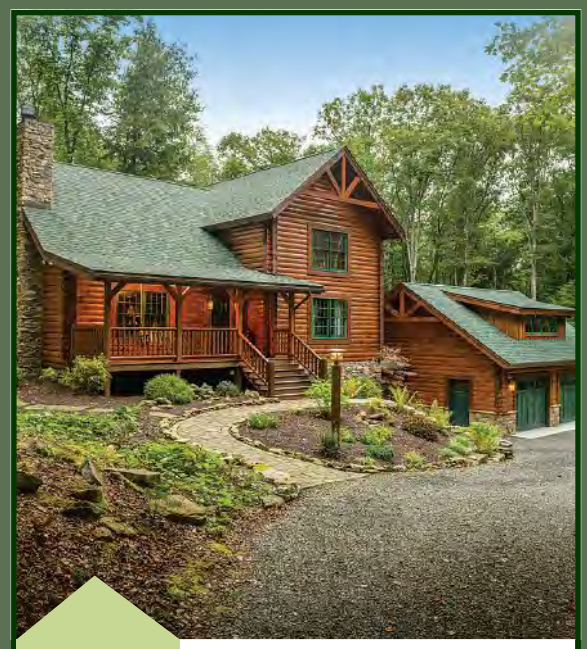

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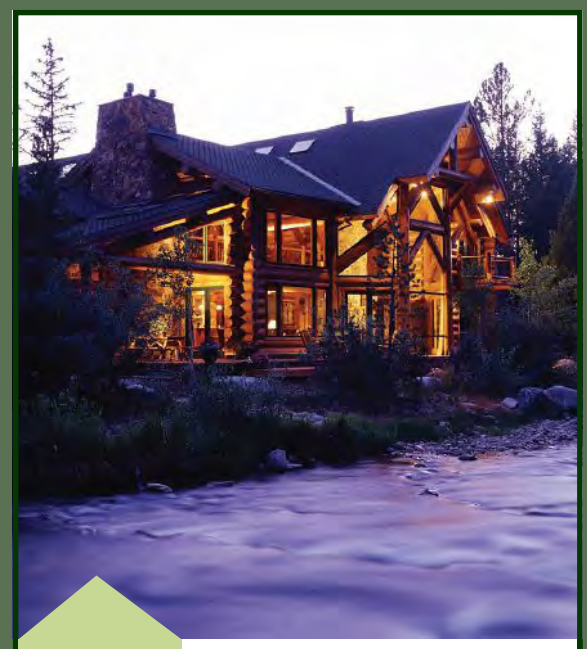

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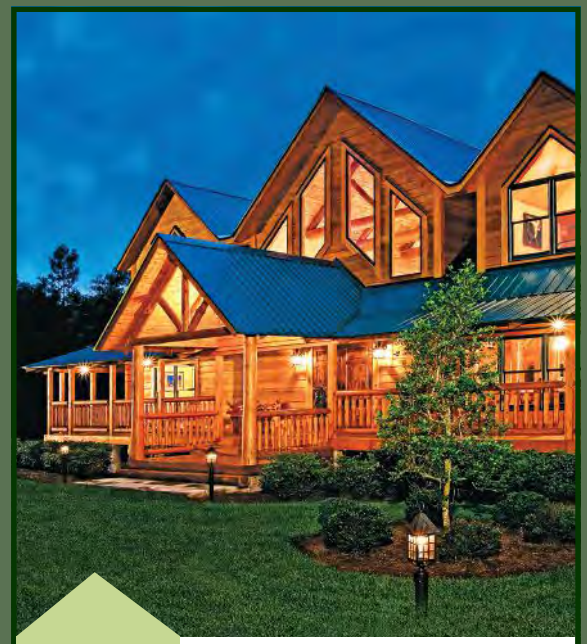

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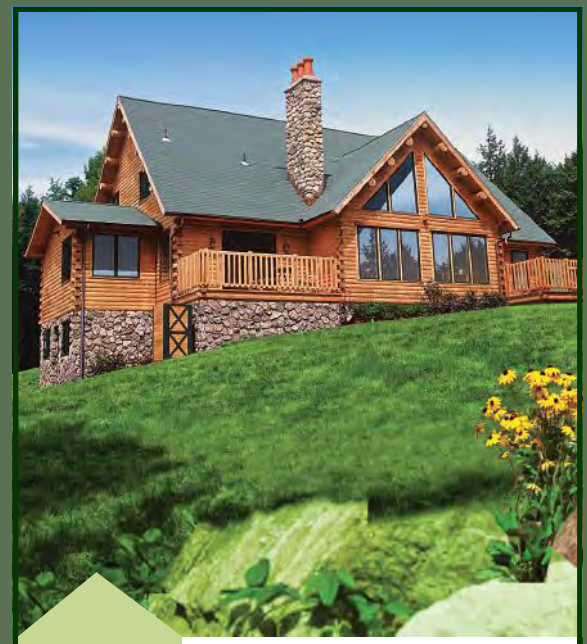

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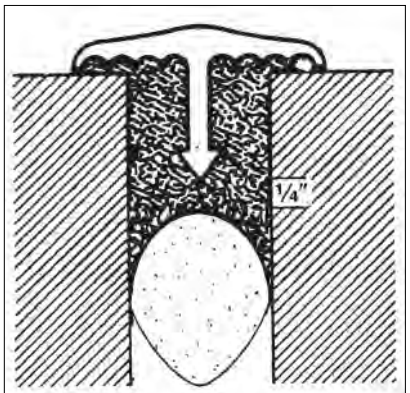

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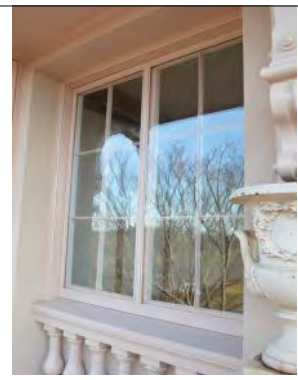

ALLIED WINDOW, INC.
800-445-5411; Fax: 513-559-1883
www.alliedwindow.com
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Manufacturer & installer of Custom 'Invisible' Storm Windows®; custom colors, shapes & glazing materials; aluminum; sound-reduction protection from UV & vandalism; interior & exterior; commercial & residential applications.

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www.archangleohio.com
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SEE OUR AD ON PAGE 65.

ARCHITECTURAL COMPONENTS, INC.
413-367-9441; Fax: 413-367-9461
www.architecturalcomponentsinc.com
Montague, MA 01351
Manufacturer of reproduction & custom wood windows & doors: true-divided lites with insulated glass; wood-framed storm sash & screens; renovation & restoration projects & new construction; paneled walls & storefronts; catalog $5.

SEE OUR AD ON PAGE 64.

BALL & BALL HARDWARE
610-363-7330; Fax: 610-363-7639
www.ballandball.com
Exton, PA 19341
Custom manufacturer & supplier of ornamental metalwork & hardware: door, window, shutter, gate & furniture hardware; fireplace tools; wrought iron, steel, aluminum, bronze, brass, copper & cast iron; custom reproductions.

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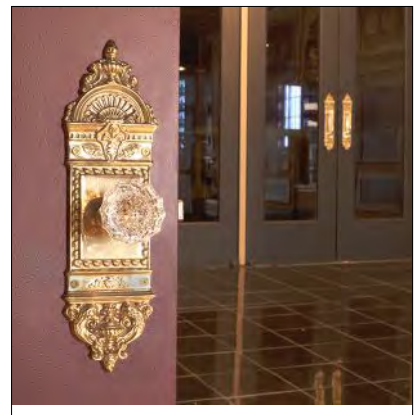

BRASS ACCENTS, INC.
877-332-7277
www.brassaccents.com
Salem, OH 44460
Creators of hot-forged and cast-brass decorative brass hardware. Interior door hardware, doorknobs, pulls, knockers, hooks, cabinet hardware, electrical cover plates, and bath accessories.

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CUSTOM SERVICE HARDWARE
262-243-3081; Fax: 262-375-7970
www.cshardware.com
Cedarburg, WI 53012
Wholesale supplier to the building, remodeling, woodworking and DIY industry since 1977. Products include: Rolling Library Ladders, Barn Door Hardware, Decorative Wood Products, Cabinets, Drawer Slides, Hinges, lighting, kitchen storage accessories.

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FAKRO AMERICA, LLC
630-543-1010; Fax: 630-543-1011
www.fakrousa.com
Addison, IL 60101
Manufacturer of attic ladders, skylights and roof windows.

GABY'S SHOPPE
800-299-4229; Fax: 214-748-7701
www.gabys.com
Dallas, TX 75207
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HEARTWOOD FINE WINDOWS & DOORS
585-340-9085; Fax: 585-254-1760
www.heartwoodwindowsanddoors.com
Rochester, NY 14606
Manufacturer of custom architectural wood windows & doors: Honduras mahogany & other species; traditional mortise-&-tenon construction; standard & decorative glazing; related window & door hardware; 68-year-old company.

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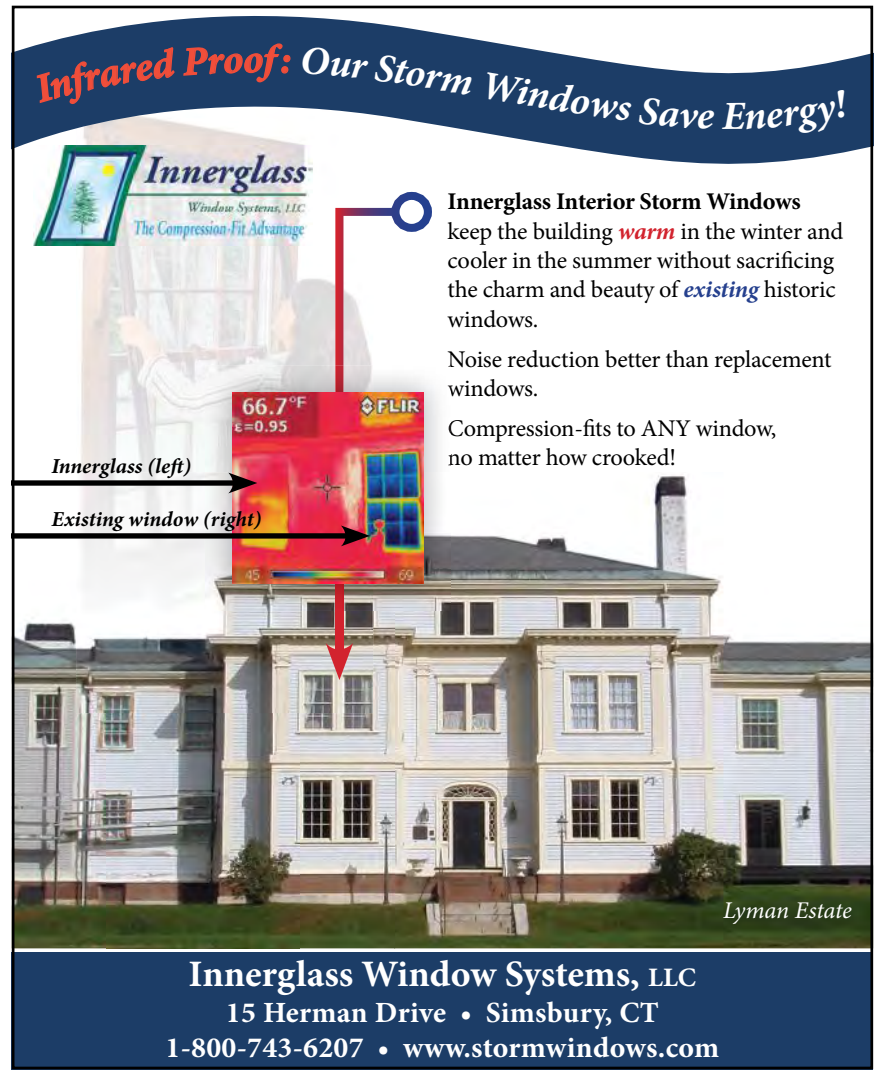

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www.hmwforge.com
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www.hopeswindows.com
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Manufacturer of custom-designed windows & doors: handcrafted, hot-rolled, solid-steel & solid-bronze window & door systems.
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800-743-6207; Fax: 860-651-4789
www.stormwindows.com
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Manufacturer of custom glass interior storm windows for energy conservation & soundproofing: out performs almost any replacement; automatically conforms to the opening, compensating for out-of-square conditions; no sub-frame needed; all glazing options available; easy do-it-yourself installation.
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JIM ILLINGWORTH MILLWORK
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www.jimillingworthmillwork.com
Adams, NY 13605
Manufacturer of custom wood windows, doors & moldings: for homes & historic buildings; matches any existing wood windows, doors, moldings; custom millwork.
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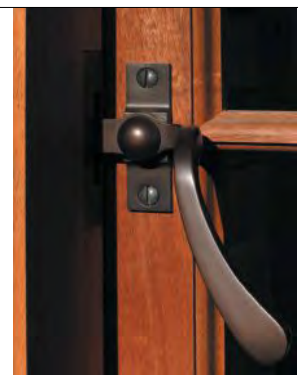
KOLBE WINDOWS & DOORS
800-955-8177; Fax: 715-845-8270
www.kolbewindows.com
Wausau, WI 54401
Manufacturer of windows & doors: traditional details; extruded aluminum-clad, roll-formed aluminum-clad, wood & vinyl energy-efficient windows & doors; fiberglass doors.
SEE OUR AD ON PAGE 7, 66.



PHELPS COMPANY
603-336-6213; Fax: 603-336-6085
www.phelpscompany.com
Hinsdale, NH 03451
Manufacturer of traditional hot-forged solid-brass window hardware: sash pulleys, weights, chains, lifts & locks; stop-bead adjusters, spring bolts, window ventilation locks, push-out casement hardware, storm/screen-door latch sets & more.
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SHUTTERCRAFT, INC.
203-245-2608; Fax: 203-245-5969
www.shuttercraft.com
Madison, CT 06443
Manufacturer of authentic mortise-&-tenon wood shutters: cedar & mahogany, exterior movable & fixed louver, board & batten & raised panel; cutouts, capping, arches & more; hinges & holdbacks; interior louvers, Colonial panels & open frame; painting services; made in USA; family-owned company since 1986; ships nationwide.
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ST. CLOUD WINDOW, INC.
800-383-9311; Fax: 320-255-1513
www.stcloudwindow.com
Sauk Rapids, MN 56379
Manufacturer of aluminum windows for heavy commercial & architectural replacement: dual windows for acoustical abatement; screens, metal windows & doors.
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WINDOWS, DOORS, SHUTTERS & HARDWARE

TIMBERLANE, INC.
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DEEP LANDING WORKSHOP
877-778-4042; Fax: 410-778-4070
www.deeplandingworkshop.com
Chestertown, MD 21620
Manufacturer of custom lighting fixtures: chandeliers, sconces, pendants & lanterns; new designs, historic reproductions & custom work; handcrafted in wood, tin, brass or copper; glass, mica or alabaster shades.
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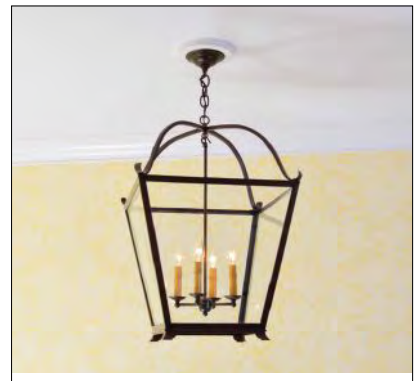

HERITAGE METALWORKS
610-518-3999; Fax: 610-518-7264
www.hmwpa.com
Downingtown, PA 19335
Foundry, blacksmith shop and custom metal fabricator offering historically accurate and custom-designed lighting, architectural hardware, and designer-envisioned metalwork including interior and exterior gates & railings.
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HISTORICAL ARTS & CASTING
800-225-1414; Fax: 801-280-2493
www.historicalarts.com
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Designer & custom fabricator of ornamental metalwork: doors, windows, hardware, stairs, balustrades, registers, fences, lighting, gutters, columns, weathervanes, snow guards, cupolas, planters, fireplace tools & more; iron, bronze, aluminum & steel; restoration services.
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HOUSE OF ANTIQUE HARDWARE
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Manufacturer & supplier of vintage reproduction door, window, shutter, cabinet & furniture hardware & accessories: Federal, Victorian, Colonial Revival, Craftsman & Deco styles; lighting fixtures, push-button switches & plates; bathroom accessories; registers & grilles.
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PERIOD LIGHTING FIXTURES
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Fax: 413-664-0312
www.periodlighting.com
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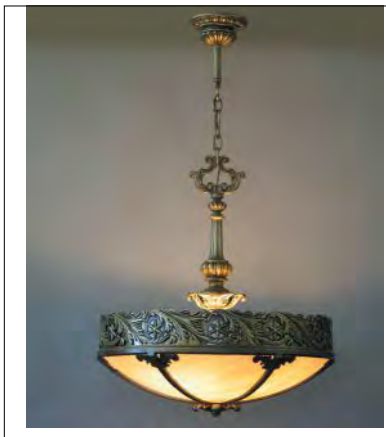

ST. LOUIS ANTIQUE LIGHTING CO.
314-863-1414; Fax: 314-863-6702
www.slalco.com
Saint Louis, MO 63130
Manufacturer & supplier of architectural lighting: all styles; historical reproductions & custom lighting; restoration services; commercial & ecclesiastical projects.

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STEVEN HANDELMAN STUDIOS
805-962-5119; Fax: 805-966-9529
www.stevenhandelmanstudios.com
Santa Barbara, CA 93103
Manufacturer of hand-forged traditional lighting, grilles & fireplace accessories: many types & styles of lighting & grilles; fireplace screens, grates & inserts; historic reproduction & restoration services.

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VINTAGE HARDWARE & LIGHTING
360-379-9030; Fax: 360-379-9029
www.vintagehardware.com
Port Townsend, WA 98368
Supplier of door hardware, window hardware: window locks & sash lifts; drapery hardware; bathroom accessories; reproduction lighting; weathervanes.

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WIEMANN METALCRAFT
918-592-1700; Fax: 918-592-2385
www.wmcraft.com
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717-382-4754; Fax: 717-382-4275
www.architecturalfans.com
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Manufacturer of decorative ceiling fans: historic & new designs; belt-&-pulley models & beltless single-motor units; iron, bronze & aluminum castings.

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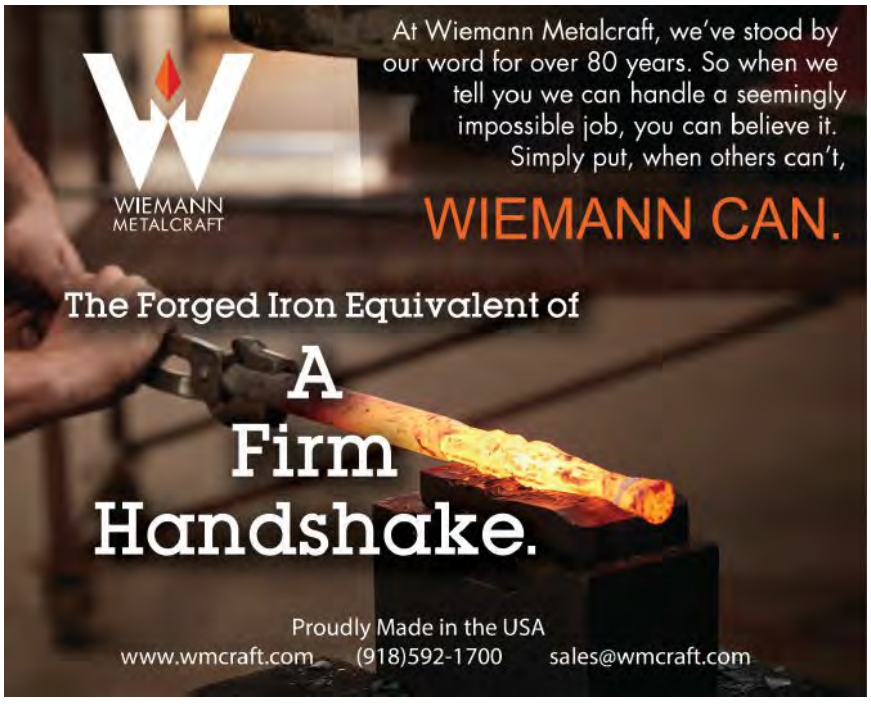

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Manufacturer of custom cabinetry in period styles: Shaker, Victorian, Arts & Crafts, Early American & traditional styles.
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CUSTOM SERVICE HARDWARE
262-243-3081; Fax: 262-375-7970
www.cshardware.com
Cedarburg, WI 53012
Wholesale supplier to the building, remodeling, woodworking and DIY industry since 1977. Products include: Rolling Library Ladders, Barn Door Hardware, Decorative Wood Products, Cabinets, Drawer Slides, Hinges, lighting, kitchen storage accessories.
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HOUSE OF ANTIQUE HARDWARE
888-223-2545; Fax: 503-233-1312
www.houseofantiquehardware.com
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Manufacturer & supplier of vintage reproduction door, window, shutter, cabinet & furniture hardware & accessories: Federal, Victorian, Colonial Revival, Craftsman & Deco styles; lighting fixtures, push-button switches & plates; bathroom accessories; registers & grilles.
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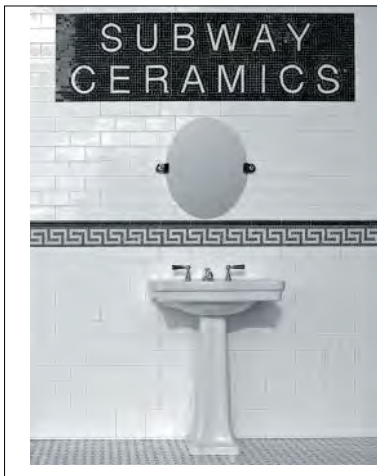

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COCO ARCHITECTURAL GRILLES & METALCRAFT
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Fabricator of grilles & architectural metal products: stainless steel, brass, aluminum & steel; linear bar grilles, perforated; custom work.

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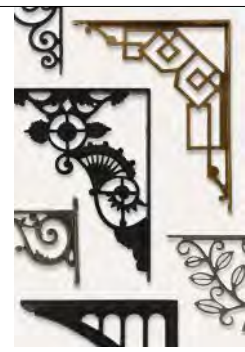

HOUSE OF ANTIQUE HARDWARE
888-223-2545; Fax: 503-233-1312
www.houseofantiquehardware.com
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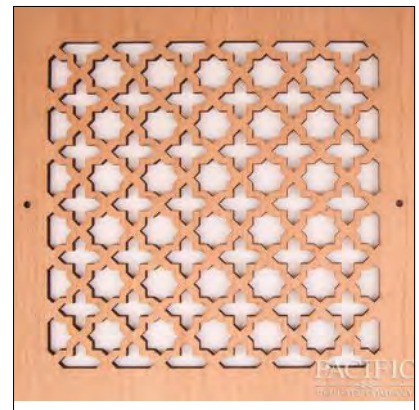

PACIFIC REGISTER COMPANY
805-487-7500
www.pacificregisterco.com
Oxnard, CA 93033
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www.reggioregister.com
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Santa Barbara, CA 93103
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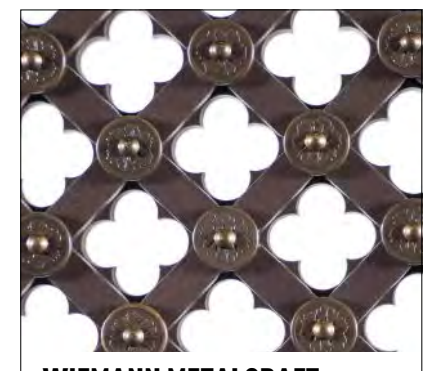

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HISTORICAL ARTS & CASTING
800-225-1414; Fax: 801-280-2493
www.historicalarts.com
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LUDOWICI ROOF TILE, INC.
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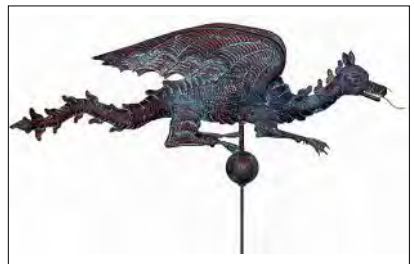

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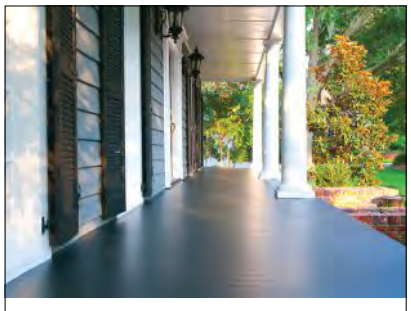

AERATIS PORCH PRODUCTS
888-676-2683; Fax: 480-907-1124
www.aeratis.com
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Chicago, IL 60607
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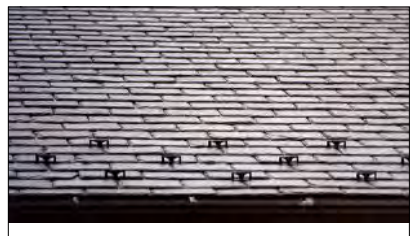

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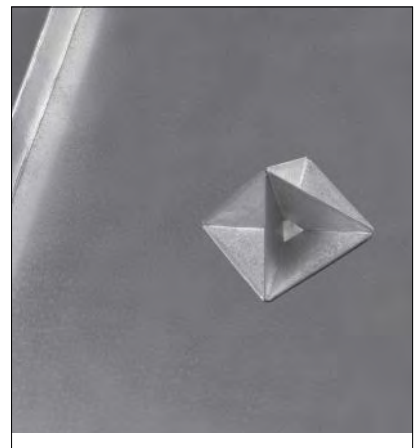

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www.driwood.com
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Supplier of molding: Stock & custom moldings for residential & commercial projects; embossed moldings, custom millwork, mantels, entrances, cabinet & panel work, custom doors.

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FORSHAW OF ST. LOUIS, INC.
314-874-4316; Fax: 314-874-4339
http://forshawmantels.com
St. Louis, MO 63044
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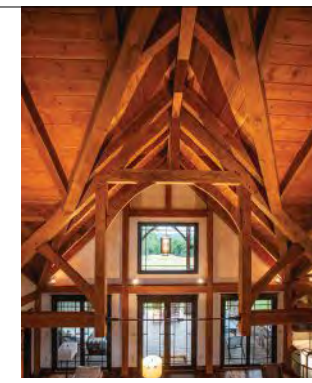

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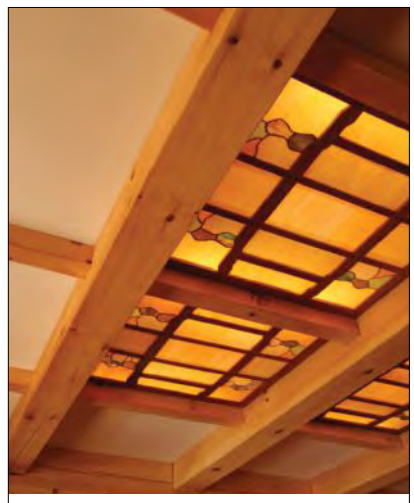

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Manufacturer of authentically correct architectural columns: complete line of columns, piers, pilasters & posts for interior & exterior use; variety of sizes, styles & materials, including wood; more than 30 years.
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www.chestnutspec.com
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DRIWOOD MOULDING COMPANY
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www.driwood.com
Florence, SC 29503
Supplier of molding: Stock & custom moldings for residential & commercial projects; embossed moldings, custom millwork, mantels, entrances, cabinet & panel work, custom doors.
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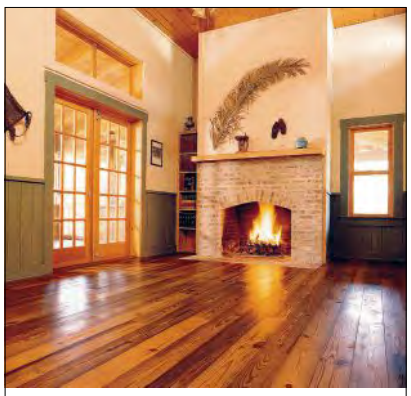

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www.heartpine.com
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www.woodcarver4u.com
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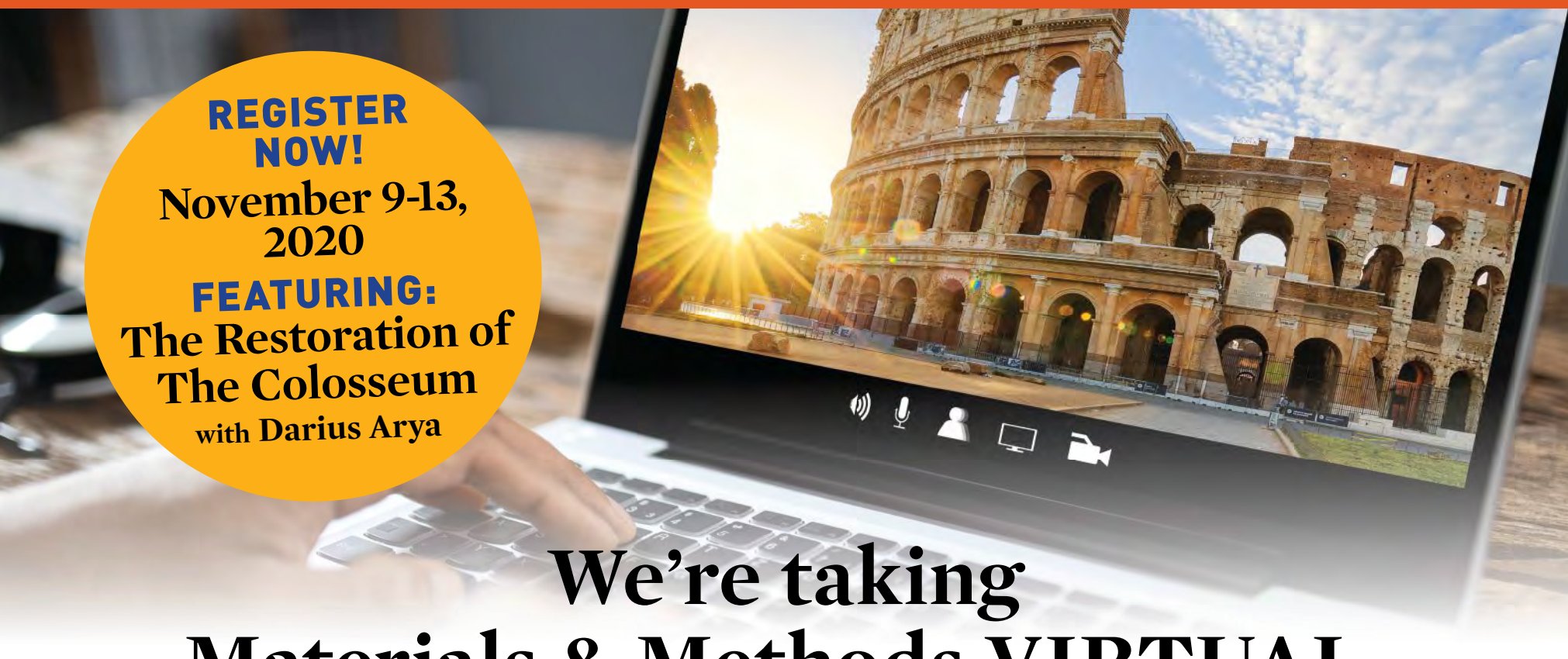

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