Symposium Abstracts

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Investigation and Repair of Masonry Separation at St. Bernard's Church Bell Towers

Kevin Vazquez, PE
Elizabeth Manning, PhD, EIT
Meyer Borgman Johnson

This presentation will focus on the studies and repairs made at the bell towers of the Historic Church of St. Bernard in St. Paul, Minnesota as part of restoration project in 2017. The Church of St Bernard was originally designed by the immigrant Slovenian-American Architect John Jager and constructed in 1907 for a Slovenian community. The Church of St Bernard was one of the first buildings in Minnesota that used reinforced concrete for elevated slab construction. The structure of the towers consists of unreinforced clay brick masonry bearing walls with limestone trim with reinforced concrete floor slabs. The Prairie School and Art Nouveau style Church features a cruciform plan 156ft long by 70ft wide and a symmetrical façade with two identical massive bell towers of 130ft in height. The corners of the towers gradually bow in to crate octagonal open belfries with round brick columns with smooth limestone capitals supporting conical caps topped by crosses. Each tower has narrow vertical rectangular windows with rock-faced sills and lintels.

The presentation will thus focus on the repair project of the bell towers. The project initially called for the repair of the concrete slabs that provide support to bells of over 4,000lb in weight at each tower. In order to understand and evaluate the implications of temporarily removing the slab, understanding the load distribution, state of stresses and stability in the masonry walls, finite element modeling and minor-destructive testing (flat-jack testing, horizontal cores and mortar petrography) were utilized. Additional decay in the masonry fabric of the towers was detected through UAV (aka drone) investigations with the use of thermography camera. The results of the testing, UAV investigations and analysis informed the construction sequence and structural design of repairs required.

Revitalizing Downtown Peoria: Adaptive Reuse of the Big White Store

Rachel Michelin, AIA, LEED AP BD+C
Lee Fink, AIA, LEED AP BD+C
Thornton Tomasetti

The Block & Kuhl Department Store, designed by Holabird and Roche, was initially constructed in 1904 and was known locally as the “Big White Store” for its gleaming terra cotta cladding and soaring seven-story height. At the time, glazed terra cotta was an innovative exterior cladding material touted for its fireproof and waterproof construction and its ability to form decorative ornamentation without the expense of carved stone. Over the years, various building additions constructed over phases added to the complex, including the Art Deco two-story brick masonry A&P Market Building in 1932, one of the earliest grocery stores in America, and the Annex in 1949, a stylistically separate building designed in a modern aesthetic for shoe retail.

While in operation, the store served as an anchor point for a thriving downtown Peoria. However, retail store eventually relocated to suburban shopping malls. Over the following years, small businesses moved in and out of the complex and the downtown became quieter.

Saved from demolition and after sitting vacant for several years, the entire complex is being adaptively reused for office space. These buildings have been identified as contributing structures within the Downtown Peoria National Historic District and seek recognition on the National Register. In order to effectively upgrade the building to contemporary performance requirements, material testing and analysis was completed to evaluate the thermal and structural performance of the historic masonry materials.

This presentation will outline the research, testing, analysis, and recommendations for renovation. For the hygrothermal analysis, results from masonry material testing were incorporated into a hygrothermal (i.e., WUFI) model to determine if the addition of insulation and/or vapor barriers are feasible without detriment to the historic building fabric. For the structural analysis, in situ and laboratory testing was completed to verify the structural strength of the materials and to evaluate the masonry performance with regards to current wind loading requirements and the addition of a potential rooftop gathering space. A variety of exploratory openings were included in the investigation phase to verify the existing construction.

The presenters will describe some of the challenges in replicating 100 year old designs with modern technologies, including considerations for evaluating glass fiber reinforced concrete (“GFRC”) panels versus terra cotta, as well as meeting current loads for windows and curtain wall with minimal original frame sizes and large glass areas. Given that construction is currently ongoing, this presentation will also summarize several unforeseen conditions that have required reworking of repair details in close collaboration between Thornton Tomasetti, the Contractor, and the Design Architect.

Water Leakage in Masonry Buildings

Kenneth Itle, RA
Wiss, Janney, Elstner Associates, Inc.

Water leakage is perhaps the most challenging and frustrating issue encountered by owners of historic masonry buildings. How can the preservation professional investigate and address this problem? Drawing upon recent case studies, this paper will discuss common sources of water leakage observed in traditional masonry mass wall construction. Recent case studies reveal how water migrates through masonry wall assemblies, the role of mortar joints in resisting water leakage, the volume of moisture that can be absorbed by sound mortar joints, and differences in performance resulting from variations in construction types.

Various strategies for remediation of water leakage will be reviewed, as well as common shortcuts to be avoided. Examples will include early twentieth century historic structures in the Midwest region. Topics to be discussed include typical historic construction practices, commonly encountered pre-World War II wall assemblies, approaches for testing and diagnosis of moisture issues in masonry mass wall construction, and strategies for repair.

Modification of a Historic Structure – The Minnesota Museum of American Art

Jason Pederson, PE
Elizabeth Manning, PhD, EIT
Kevin Vazquez, PE
Meyer Borgman Johnson

This presentation will focus on the modification of one area of the Historic Pioneer Endicott Building in St. Paul, Minnesota as part of a multiphase adaptive reuse project to house the Minnesota Museum of American Art. The Endicott building, where the modifications took place, was originally designed by the renowned Architect Cass Gilbert and constructed in 1891. The structure consists of unreinforced clay brick masonry bearing walls, early steel columns, beams, and purlins, with structural clay tile flat arch floors. The architectural design for the adaptive reuse project called for the removal of a portion of the existing floor at the second level to create a new two-story-tall Sculpture Court with a new suspended steel bridge between the second level skyway and a new elevator. The existing portion of the floor to be removed included support for discontinuous masonry piers. In order to understand the load distribution in the masonry piers and the masonry structure below and the implications of removing the floor, finite element modeling and minor-destructive testing (flat-jack testing) were utilized. The results of the analysis and testing informed the construction sequence and design of concrete piers to support the discontinuous masonry piers and transfer the load back into the historic masonry below.

Alternate Materials for Terra Cotta Restoration: So Many Issues; So Many Options

Edward Gerns
Matthew Novesky
Wiss, Janney, Elstner Associates, Inc.

Terra cotta as a cladding material in the United States experienced a rise in popularity closely associated with the development of steel structural systems in the late 19th and early 20th Centuries. The United States was in a period of unparalleled growth utilizing innovations in early structural steel, wrought iron, and cast iron, with buildings growing taller and lighter. Terra cotta was uniquely suited to clad these new structural systems, being lighter and more economical to produce than traditionally carved stone while still contributing traditional decorative aesthetics. The Chicago Fire of 1871 illuminated an additional benefit of terra cotta as a fireproof material able to protect steel structures. After its sharp rise in popularity, terra cotta use declined and nearly disappeared starting with the Depression in 1929 and has only recently experienced a limited revival. The National Historic Preservation Act of 1966 placed an importance on the preservation of historic buildings as cultural and historic resources. This preservation act along with facade ordinances in many major U.S. cities, which are intended to help ensure public safety by requiring periodic inspection of building facades for unsafe conditions, have increased the demand for evaluation, maintenance, and repair of historic terra cotta clad buildings.

While scheduling and cost implications are an inevitable issue in almost any building repair project, terra cotta facade restorations present unique challenges when considering schedule and costs. Lead times for fabrication of new units often exceed six months and depending of the type and repetitiveness of units being fabricated, costs can also become a significant consideration. Nonetheless, terra cotta is the preferred material for replacement, so considerations of expense and lead time should be made early in the restoration project and fabrication should begin as soon as possible.

These factors have inevitably resulted in restoration designers and building owners considering alternate materials including: Glass Fiber Reinforced Concrete (GFRC), Fiber Reinforced Polymer (FRP), cast stone, natural stone, Microcotta, and Exterior Insulation Finish System (EIFs). Each of these materials offers both advantages and disadvantages when being considered as a substitute for terra cotta. Careful evaluation of any alternative material should be considered prior to using since mechanical properties as well as methods of mechanical attachment of these materials differ significantly from terra cotta. As such, while the material fabrication costs may be lower and the fabrication schedule faster, other unintended issues may need to be addressed that may add cost and time to the schedule.

The first part of our presentation will include a discussion of facade issues and mechanisms that mostly commonly result in considering various options regarding materials for the restoration of architectural terra cotta. The second part will address the various concerns that must inevitably be considered in the decision process, including advantages and disadvantages, opportunities, consideration, problems, and especially the owner’s perceived initial cost savings versus long term implications.

Jacob Schmidt Brewery: Rathskeller Floor Restoration

Casie Radford, AIA, LEED AP
Phil Gagne
New History
Jacob Schmidt Brewing

The locally designated and National Register-listed Jacob Schmidt Brewing Company Historic District is located in Saint Paul, Minnesota. The complex's Office Building was originally constructed in 1934 with 1950s alterations. The building houses office space on the first and second levels, with a Rathskeller and mechanical rooms at the lower level. In the United States, rathskellers were common elements in German-style breweries. The Office Building was well known for its rathskeller – a social center for employees.

The Rathskeller has plaster walls lined with limestone arcades on the two long sides. Transverse beams span the ceiling, each emblazoned with beer hall sayings in multiple languages. The ceiling also features wagon wheel chandeliers. A fireplace with a surround and short hearth of limestone adorns the far end. The adjacent Tasting Room and Bar are demarcated by four arches. Both rooms feature spigoted ends and sides of beer barrels protruding from the wall. The most distinctive feature in the Rathskeller, however, is the floor which is finished with approximately 18 varieties of randomly placed field stone, some no longer quarried.

Over the years, layers of wax finish were applied to the stone floors creating a dull and dark coating that obscured the detail, and consequently led people to believe that the floors were not stone, but rather, painted with a trompe l'oeil technique. Testing completed by the contractor, Solid Surface Care, Inc., confirmed that it was stone which informed a custom cleaning process (chemistry, technique) that would not damage the floors. Only one test sample was completed; however, the process involved trying different chemistries and products to develop the solution to satisfy the client and reviewing agencies (SHPO and local HPC). Abrasives were not used so there was little concern that the cleaning method would react differently to the different types of stone (hardness, porosity, etc.).

First the floor was stripped of the old layers of wax, then the floor was cleaned. At the time of stripping, methylene chloride-based products (Jasco) were still available on the market. This was the primary stripper used to remove the previous coatings. This product is no longer available, so recreating this procedure may be challenging. Non-methylene chloride strippers do not perform as well. Additionally, Zep water-based stripper was used to remove excess residue and deep clean. The same products were used for the grout; however, the stripping and cleaning required multiple passes and much detail work to get the desired results. The majority of the stripping was done mechanically with hand-stripping for the remaining detail. The entire stripping process took approximately 5 days.

After stripping, two coats of Fila stone enhancer/penetrating sealer were applied. This revealed the variety of rich colors in the stone, returning the floor to its historic appearance. The cleaning and refinishing of the stone floor yielded one of the most amazing transformations of the project.

Ongoing maintenance includes as-needed cleaning with a neutral pH floor cleaner with an annual deep cleaning to include re-application of the stone enhancer.