

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.:

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:

(Check the box next to each addendum received)

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| <input checked="" type="checkbox"/> Addendum No. 1 | <input type="checkbox"/> Addendum No. 6 |
| <input checked="" type="checkbox"/> Addendum No. 2 | <input type="checkbox"/> Addendum No. 7 |
| <input type="checkbox"/> Addendum No. 3 | <input type="checkbox"/> Addendum No. 8 |
| <input type="checkbox"/> Addendum No. 4 | <input type="checkbox"/> Addendum No. 9 |
| <input type="checkbox"/> Addendum No. 5 | <input type="checkbox"/> Addendum No. 10 |

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Wiss, Janney, Elstner Associates, Inc.

Company

David S. Finley

Authorized Signature

May 27, 2015

Date

05/28/15 09:57:40
WJ Purchasing Division

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.
Revised 6/8/2012

May 28, 2015

Mr. Guy Nisbet
State of West Virginia
Capitol Complex
1900 Kanawha Boulevard, East Building 1
Room MB-80
Charleston, WV 25305

Re: Water Infiltration Investigation Letter of Interest
State Capitol Dome, Charleston, West Virginia
WJE No. 2015.2504

Dear Mr. Nisbet:

Wiss, Janney, Elstner Associates, Inc. (WJE) is grateful for the opportunity to introduce our firm to you as well as express our interest in assisting with the water infiltration investigation at the West Virginia State Capitol Dome designed by Cass Gilbert. WJE personnel had the opportunity to visit the West Virginia State Capitol building on May 12th, 2015, during the mandatory pre-bid meeting to become familiar with the reported water infiltration problems, meet with onsite personnel, and gain a better understanding of the roofing, facade, and interiors. Based on this visit, we truly look forward to the possibility to assist you with this important project with a general scope that will be mindful of the historic structure. Such a scope may include document review, water infiltration testing, and infrared thermography. This letter contains our firm overview, our experience with similar projects, and our project team qualifications.

Our Firm

WJE is a nationally-recognized, interdisciplinary firm of architects, engineers, and materials scientists dedicated to providing practical, innovative, and technically sound solutions to problems in both new and existing structures. Since our founding in 1956, we have successfully evaluated and developed repair, rehabilitation, and restoration designs for buildings and structures involving virtually every conceivable construction material, structural system, and architectural component. WJE personnel are leaders in their respective areas of professional practice and bring with them a level of collective wisdom and individual expertise that can only be gained through over a half-century of direct, hands-on experience in architecture, engineering, materials science, performance testing and instrumentation. In the context of historic preservation and building enclosure performance, WJE remains at the forefront of this process, and is recognized both locally and nationally for its commitment to ensuring that buildings and structures deliver - rather than simply promise - value, long-term durability, and performance. Please refer to Appendix A for our Firm Overview and Capabilities.

Project Experience

WJE was founded on one basic principle: Delivering better solutions requires a better understanding of the problem. Simply put, our mission is to *"ask the structure"*. From the start, we have delivered a hands-on, technically-sound, *first-principles approach* to our work, and an enthusiasm for problem solving that is reflected in the quality of our people, the delivery of our services, and the long and successful history of

Headquarters & Laboratories—Northbrook, Illinois

Atlanta | Austin | Boston | Chicago | Cleveland | Dallas | Denver | Detroit | Honolulu | Houston
Los Angeles | Minneapolis | New Haven | New York | Princeton | San Francisco | Seattle | Washington, DC

our firm. We are committed to intellectual rigor and technical excellence at every level of our company, and are proud of the many contributions that we have made to advance the understanding of long-term durability and performance in the built environment - arguably the very essence of *sustainable design*. Our experience with performance-critical buildings and structures is as deep and varied as the firm itself, and has included forensic investigation and the successful stabilization and repair of mission-critical infrastructure and nationally significant monuments, museums, hospitals, and research laboratories across the United States and around the world. We will be committed to bringing those lessons forward into this water infiltration investigation at the Capitol Dome. Over the last ten years, WJE has been involved in several related projects (see below) that have a similar scope of work in the investigation and repair of water infiltration into a historic buildings. Please refer to Appendix B for more information regarding the projects listed below and client references:

Governmental Project Experience

- *Idaho State Capitol, Boise, Idaho*
- *Alfonse M. D'Amato Federal Building, Islip, New York*
- *Nebraska State Capitol, Lincoln, Nebraska*
- *Rhode Island State House, Providence, Rhode Island*
- *Colorado State Capitol, Denver, Colorado*

Cass Gilbert Project Experience

- *Minnesota State Capitol, St. Paul, Minnesota*
- *Saint Louis Art Museum, St. Louis, Missouri*
- *Thurgood Marshall U.S. Courthouse, New York, New York*
- *Woolworth Building, New York, New York*
- *Finney Memorial Chapel, Oberlin, Ohio*

Project Team

Our commitment starts with people: People who possess the vision, character, expertise, and genuine enthusiasm necessary to become standard-setters in their respective areas of professional practice and technical expertise. With more than 500 employees nationwide, WJE has the resources to respond to virtually any problem and offers a wide range of technical services and expertise in virtually all aspects of design and construction technology. On a regular basis, we gather as a firm in Chicago to attend an in-house conference hosted by our senior staff on new technologies, problem-solving techniques, and lessons learned from recent projects. This investment in our people, together with the ground-breaking materials science and related research routinely conducted by our Jack R. Janney Technical Center, remain the hallmarks of our company and the foundation of our success.

The skills and expertise of the following WJE staff will be utilized to investigate and develop conceptual repairs to resolve the reported water infiltration. Each individual's Personnel Qualifications can be found in Appendix C:

- David S. Finley, *Project Manager* (Cleveland)
- Michael R. Nagle, *Project Associate* (Cleveland)
- Deborah Slaton, *Project Advisor for Historic Preservation* (Northbrook)
- Joshua Freedland, *Project Advisor for Stone Cleaning* (Chicago)

Closing

WJE is a provider of unique consulting services in the construction industry. Our wide range and depth of expertise in the fields of restoration, facade investigation, failure investigations and materials evaluation enables us to develop sound, innovative, and cost effective solutions to our clients' problems.

If you have any other questions, or if we can be of any further assistance, please do not hesitate to contact us. Thank you for the opportunity to submit this letter of interest; we look forward to working with you on this challenging project.

Sincerely,

WISS, JANNEY, ELSTNER ASSOCIATES, INC.



David S. Finley, CEP
Project Manager

Attachments: Appendix A: Firm Overview and WJE Capabilities
Appendix B: Project Profiles and Client References
Appendix C: Personnel Qualifications

APPENDIX A: FIRM OVERVIEW AND WJE CAPABILITIES



WJE CLEVELAND

Solutions for the Built World



Founded more than half a century ago, Wiss, Janney, Elstner Associates, Inc. (WJE), is an interdisciplinary engineering, architecture, and materials science firm specializing in delivering practical, innovative, and technically sound solutions across all areas of new and existing construction. WJE combines state-of-the-art laboratory and testing facilities, nationwide offices, and knowledge sharing systems to provide solutions for the built world.

OUR SERVICES

- Structural engineering
- Architecture and architectural engineering
- Materials science
- Testing
- Design
- Litigation consulting

OUR APPROACH

As materials, technologies, and structures change, our fundamental philosophy remains the same: developing better solutions based on an accurate diagnosis of each structure's unique problem.

OUR PEOPLE

With twenty-four employees in Cleveland and more than 500 employees nationwide, WJE has the resources to respond to virtually any problem, with expertise in all aspects of construction technology. The firm's engineers, architects, and materials scientists are supported by technicians who are experts in testing and instrumentation. WJE's understanding of structural behavior and the performance of materials is enhanced by experience gained from more than 125,000 projects worldwide.

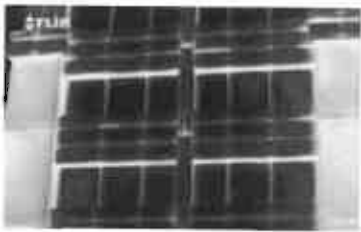
OUR RESOURCES

Our Janney Technical Center laboratory and testing facility is one of the nation's largest privately owned construction-based testing laboratories; it enables WJE to provide reliable answers to questions about construction systems, components, and materials. Additionally, WJE Cleveland houses a 1,300-square-foot petrographic laboratory. No firm is more qualified to break new ground in finding practical, innovative, and technically sound solutions to problems in the built world.



WJE | ENGINEERS
ARCHITECTS
MATERIALS SCIENTISTS





CLEVELAND REPRESENTATIVE PROJECTS

- **Church of the Saviour**
Cleveland, OH
Water Infiltration Investigation and Repair Design
- **University of Cincinnati – Tangeman University Center**
Cincinnati, OH
Cladding Evaluation, Water Testing, and Repair Strategies
- **Westinghouse Corporate Headquarters**
Cranberry Township, PA
Air Leakage Investigation
- **The Ohio State University, Wooster Campus**
Wooster, OH
Tornado Damage Assessment
- **Museum of Art**
Cleveland, OH
Condensation Investigation
- **Lorain County Community College**
Elyria, OH
Fire Damage Investigation
- **Cleveland Renaissance Hotel**
Cleveland, OH
Multi-year Facade Stabilization and Rehabilitation Program
- **PNC Center**
Cleveland, OH
Roofing Replacement and Fall Protection Design
- **FirstMerit Tower**
Akron, OH
Facade Rehabilitation
- **David L. Lawrence Convention Center**
Pittsburgh, PA
Collapse Investigation and Structural Condition Assessment
- **North Point Plaza**
Cleveland, OH
Plaza Waterproofing and Structural Repairs

WJE CLEVELAND

9655 Sweet Valley Drive
Suite 3
Cleveland, OH 44125
216.642.2300



Historic Preservation



- Historic, technical, and materials research
- Condition surveys
- Difficult access assessment
- Materials conservation analysis
- Restoration master plans
- Historic structures reports
- HABS and HAER documentation
- National Register nomination
- Contract documents for preservation
- Construction observation

Working within well-established preservation guidelines and standards, WJE architectural, structural, and conservation professionals balance the need to provide practical, long-term solutions with the ability to sensitively conserve a structure's historic fabric. From planning and investigation through implementation, no firm is better qualified to respond to the technical and aesthetic needs of significant historic structures.

Historic buildings and structures are a tangible link to our past. From private owners to large institutions and government agencies, clients worldwide trust WJE to preserve their historic properties for generations to enjoy. WJE preservation professionals have extensive expertise in the repair and conservation of a wide range of historic construction materials and building systems. Using sophisticated testing and materials analysis techniques, WJE professionals apply the science of preservation to develop appropriate and innovative solutions to restore historically significant properties.



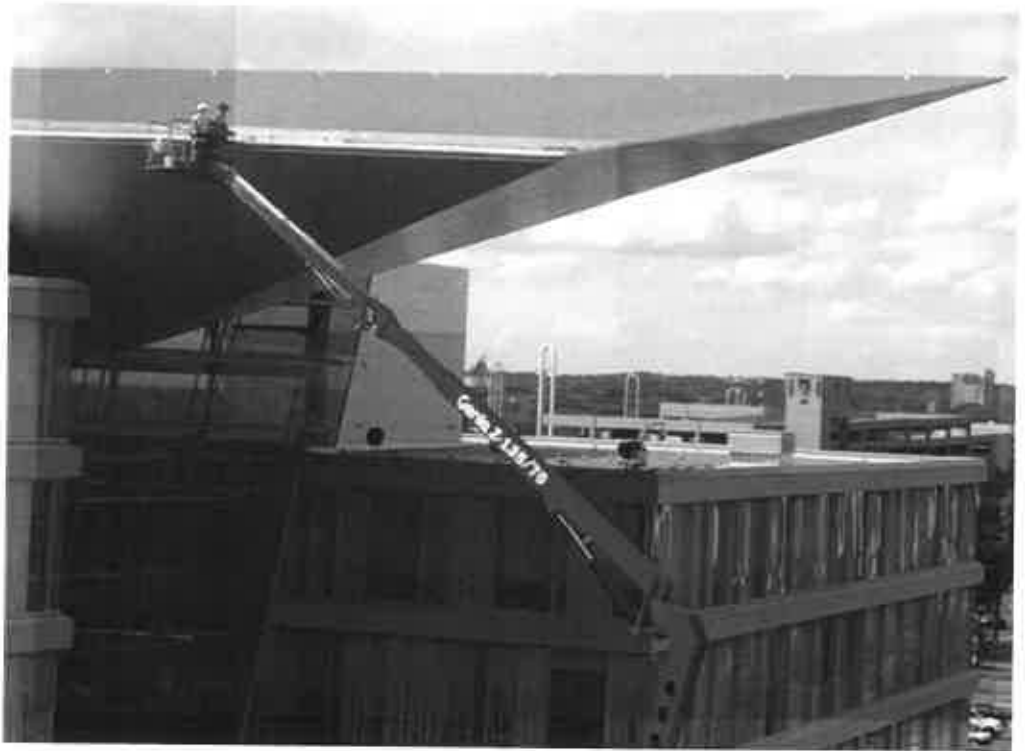
Historic Preservation

REPRESENTATIVE PROJECTS

- Alcatraz Cellhouse - San Francisco, CA: Documentation, assessment, and seismic upgrade design
- American Museum of Natural History - New York, NY: Assessment and preservation of Seventy-Seventh Street facades
- Antelope Valley Indian Museum - Lancaster, CA: Seismic stabilization and historic restoration design
- Gateway Arch - St. Louis, MO: Corrosion and materials conservation study and Historic Structure Report
- Nebraska State Capitol - Lincoln: Exterior restoration and rehabilitation
- New York Public Library - New York, NY: Investigation and exterior restoration
- Old South Church - Boston, MA: Structural stabilization study and restoration design
- Saint Elizabeths Hospital - Washington, D.C.: Historic Structure Report and preservation plan
- Virginia Governor's Mansion - Richmond: Condition assessment, restoration plans, and construction administration
- Wawona Hotel - Yosemite National Park: Seismic strengthening and preservation design



Roofing and Waterproofing



- Visual inspections and condition surveys
- Roof asset studies
- Failure and damage investigations
- Design of roofs and waterproofing systems for new buildings
- Commissioning services
- Contract documents
- Field observation during construction
- Wind uplift testing
- Laboratory analysis and testing
- Infrared camera and capacitance meter moisture surveys
- Electronic integrity testing
- Roof management programs

The success of any roofing or waterproofing system depends on well-conceived and constructed details. Whether the structure has a low- or steep-slope roof system, a plaza deck with various hardscape elements and water features, or a below-grade foundation system in variable soil conditions under hydrostatic pressure, the selection of the right product and its detailing in the context of the project application is of paramount importance. Attention to even the smallest detail can dramatically impact the performance of a roofing or waterproofing system.

WJE's roofing and waterproofing experts have reviewed thousands of system failures and have an intimate knowledge of a wide range of roofing systems—from historic clay tile to the latest in green roofs and sustainable design, to plaza decks, and foundation waterproofing systems in positive and negative side applications.

Building owners know the importance of a water-tight structure. WJE roofing and waterproofing professionals provide a holistic approach to each project by addressing the roofing or waterproofing system, the supporting structure, and integration details that tie-in with enclosing or perimeter elements.

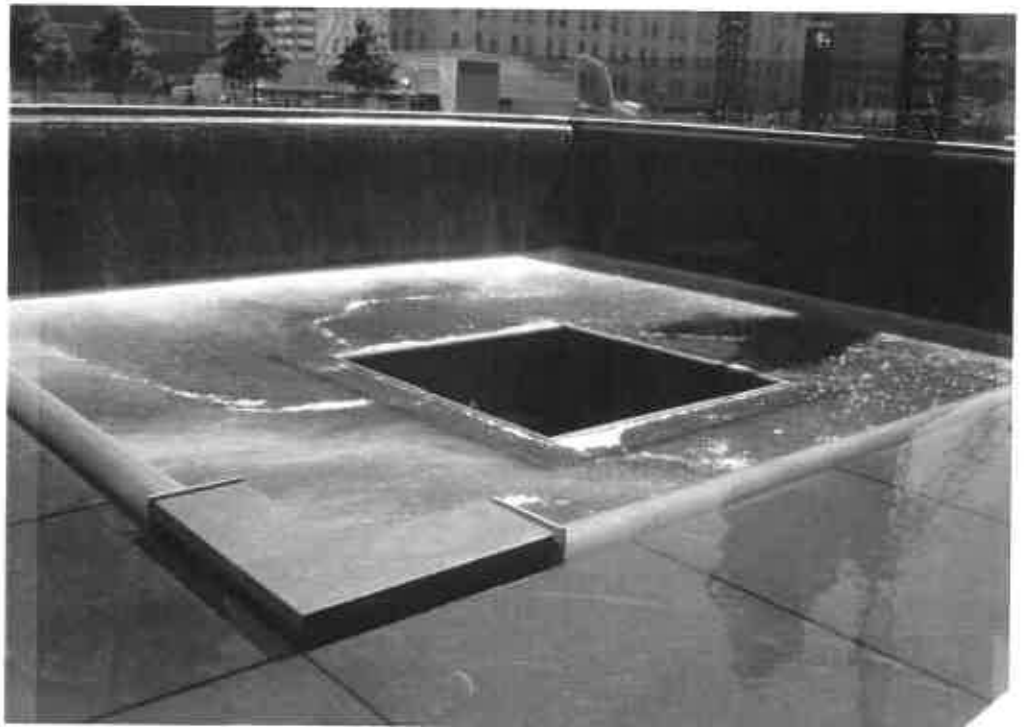
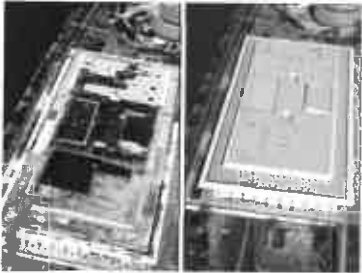
WJE's commitment to every project carries through the construction phase. WJE's roofing and waterproofing professionals work hand-in-hand with contractors to ensure design concepts are met and the building and its contents are protected from the devastating effects of water.



Roofing and Waterproofing

REPRESENTATIVE PROJECTS

- California State Capitol - Sacramento: Re-roofing design and consulting
- Candler Building - Atlanta, GA: Roof replacement design
- Continental Airlines Terminal - Newark, NJ: Roofing assessment
- Denver Art Museum's Frederic C. Hamilton Building - CO: Consulting and repair design for water leakage at skylights and atrium roof
- Grove Park Inn Resort and Spa - Asheville, NC: Clay tile roof replacement
- Halekulani Hotel - Honolulu, HI: Roof investigation
- Hilton Waikiki Prince Kuhio Hotel - Honolulu, HI: Roofing replacement design for tower
- John F. Kennedy Center for the Performing Arts - Washington, D.C.: Investigation and rehabilitation design for roofs and plaza areas
- Lake Point Tower - Chicago, IL: Roof replacement design
- Lyndon Baines Johnson Library and Museum - Austin, TX: Plaza assessment and restoration design
- Minneapolis Central Library - Minneapolis, MN: Icicle formation investigation
- National September 11 Memorial & Museum - New York, NY: Waterproofing consulting
- Quicken Loans Arena - Cleveland, OH: Roofing condition assessment



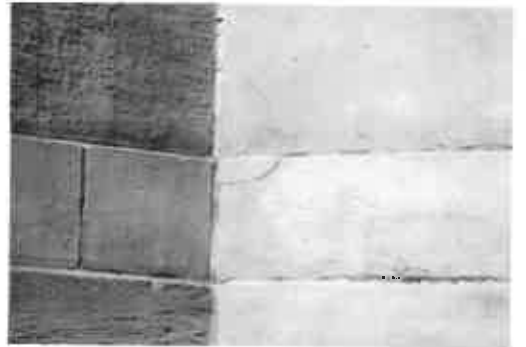
APPENDIX B: PROJECT PROFILES AND CLIENT REFERENCES



PROJECT PROFILE

Idaho State Capitol

Exterior Facade Consultation | Boise, ID



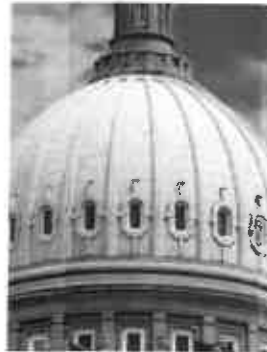
CLIENT

CSHQA/Isthmus

BACKGROUND

The Idaho State Capitol was designed and constructed over a 15-year period, from 1905 to 1920. The center section and dome were designed by J.E. Tourtellotte to resemble the U.S. Capitol in Washington, D.C. The wings were designed by Tourtellotte and Charles Hummel. The base of the building is Barre granite, quarried in Vermont. The upper portion of the walls is native sandstone from a state-owned quarry in nearby Table Rock. The dome of the building is terra cotta. The interior is finished with various materials including marble wall claddings. The sandstone masonry exhibited limited cracking and spalling. Distress and water leakage was occurring at the terra cotta dome.

WJE was engaged to serve as technical architectural and engineering consultant to a project team that completed a comprehensive rehabilitation of the building envelope and selected interior features.



SCOPE OF SERVICE

- Document review
- Condition assessment of building facade
- Visual survey from grade
- Selective close-up inspection
- Laboratory materials testing
- Water leakage testing
- Repair design
- Construction phase services

SOLUTION

- Performed visual surveys of facade from grade and accessible building elements; close-up inspections of representative areas of the building facades; inspection openings and removal of samples
- Completed laboratory materials testing of samples of distressed elements to provide an overall evaluation of stone characteristics and conditions
- Developed an illustrated report summarizing the results of the study, and condition assessment drawings keyed to a photograph log illustrating conditions observed on the facades
- During additional phases, performed detailed investigation of the terra cotta drum, dome, and lantern; including water leakage testing
- Participated in development of the technical repair documents and assisted with construction phase services during the repairs





PROJECT PROFILE

Alfonse M. D'Amato Federal Building

Facade Analysis | Islip, NY



CLIENT

U.S. General Services Administration, Perkins Eastman Architects and Planners

BACKGROUND

The Alfonse D'Amato Federal Building is an eleven-story federal office and courthouse building designed by Richard Meier. It is a steel-frame structure with insulated, prefabricated wall backup panels. The cladding panels are granite and white aluminum intended to function as a non-partitioned rain-screen system. The windows are contained in an aluminum frame curtain wall system. Below grade pedestrian corridors are cast-in-place and prefabricated concrete with sheet membrane waterproofing.

WJE was retained by Perkins Eastman Architects and Planners to assist with the investigation of the existing cladding system, the existing waterproofing system at below grade corridors, and development of short-term repairs at locations deemed critical by GSA. WJE was also asked to provide a detailed analysis of the existing curtain wall system and to propose building-wide cladding repair and maintenance options.



SOLUTION

After reviewing the as-built documents, WJE engineers performed a close-up investigation using WJE's Difficult Access Team (DAT) to observe the facades and subgrade surfaces. Water tests and probe openings were conducted to observe existing conditions and to verify the accuracy of the as-built documents. Based on the findings of the investigation, the engineers assisted Perkins Eastman Architects and Planners in developing a feasibility study which included various levels of intervention and cost projections.

Short-term repair documents were developed for select locations, including construction documents for waterproofing repairs at numerous individual locations. WJE also provided construction administration services, including on-site observations and design consultation of unforeseen conditions.





PROJECT PROFILE

Nebraska State Capitol

Exterior Facade Investigation and Restoration Design | Lincoln, NE



CLIENT

State of Nebraska

BACKGROUND

The historic Nebraska State Capitol is a 400-foot-tall monument design by Bertram Grosvenor Goodhue and constructed between 1922 and 1932. A result of a national design competition, the building follows the Beaux-Arts design tenets and melds the traditional domed state capitol building with a post-World War I skyscraper.

WJE provided specialized architectural and conservator services for the restoration of the building facade, including limestone masonry, ceramic tile dome, clay tile arches, sculptural elements, windows, roofing, and related structural systems.



SOLUTION

WJE engineers and architects performed a comprehensive investigation of the exterior building systems including the dome, facades, promenades, windows, and copper roofing system. The team utilized rappelling techniques for inspection of the dome and other difficult access areas. Petrographic analysis of the limestone masonry was performed as well as an evaluation of cleaning and biocide treatments.

In cooperation with Bahr, Vermeer & Haecker, WJE developed restoration drawings and specifications for the restoration of the historic structure. All work was performed in strict accordance with the *Secretary of the Interior Standards* following a “conservative philosophy,” salvaging and respecting the historic building fabric whenever possible. WJE also redesigned inconsistencies in the original design and construction to give the building fabric increased durability.

WJE provided observation services and continuing laboratory analysis on an as-needed basis throughout the multiphase project.





PROJECT PROFILE

Rhode Island State House

Leak Investigation and Temperature Monitoring | Providence, RI



CLIENT

Brewster Thornton Group Architects, LLP

BACKGROUND

The Rhode Island State House was constructed from 1895 to 1904 and designed by the architectural firm of McKim, Mead & White. The structure boasts the fourth-largest self-supporting marble dome in the world. In preparation for the bicentennial in 1976, the marble was cleaned, which included sandblasting. During the 1990s, the State House underwent renovation that included an application of a liquid roofing membrane. The iconic landmark is included in the National Register of Historic Places.

Brewster Thornton Group Architects teamed with WJE to assist in a leak investigation to determine the source(s) of water infiltration below the small corner domes (tourelles) of the Rhode Island State House. WJE was also asked to provide repair recommendations.



SOLUTION

WJE worked with Brewster Thornton Group Architects (BTGA) to diagnose and treat moisture issues within the marble tourelles at the four corners of the dome of the Rhode Island State House. WJE performed a document review, a survey of the interior and exterior, inspection openings, water testing, and testing of select materials. Research and investigations revealed several deficiencies in energy retrofits, cleaning efforts, aged materials, and inappropriate material applications throughout the tourelle construction. Investigative findings were presented and exterior repairs were designed and implemented in association with BTGA.



In an effort to measure the effectiveness of the repairs, WJE designed the layout and installed wireless electronic sensors designed to measure air temperature, relative humidity, and the moisture content of the material to which they were attached. These monitors would help determine if condensation was occurring within the unconditioned interstitial spaces or attics. This yearlong effort concluded that walls were slowly drying and that condensation or further water infiltration did not occur. Sensor data will be collected for another year as part of WJE's agreement with BTGA and the State of Rhode Island. The data will continue to be available through the commercially obtainable web-based data management system.





PROJECT PROFILE

Colorado State Capitol

Dome Condition Survey | Denver, CO



CLIENT

Fentress | Architects

BACKGROUND

The Colorado State Capitol Building was designed by E. E. Myers and constructed between 1886 and 1908. The two-tier drum, dome, and lantern rise to a height of 272 feet above the surrounding Civic Center Park. The gold leaf dome is forty-two feet in diameter, and the lantern is topped with a four-foot-diameter glass globe.

WJE provided specialized architectural conservation services for the evaluation of the Colorado State Capitol Building dome. The assessment included the cast iron cladding materials at the drum and lantern, copper cladding, wood and steel windows, and the gold leaf on the copper-clad dome.



SOLUTION

WJE architects and engineers performed an evaluation of the cast iron elements, including a close-up examination of the dome and drum using industrial rope access techniques. An analysis of laboratory testing to determine the cast iron composition was also conducted. The team performed coating studies, including a close-up visual examination, field testing, and laboratory analysis, of the gold-leafed copper dome as well as painted sheet metal and cast iron elements.



WJE evaluated the dome and drum fenestration, including the wood and steel-framed windows and glazing materials. Upon completion of the evaluation, WJE provided prioritized recommendations for remedial repairs to address observed deterioration of cast iron elements, coatings, and windows.



PROJECT PROFILE

Minnesota State Capitol

Comprehensive Facade Inspection and Marble Assessment | St. Paul, MN



CLIENT

J.E. Dunn Construction

BACKGROUND

The Minnesota State Capitol, situated on a hill overlooking downtown St. Paul, was completed in 1905. Modeled after St. Peter's Basilica in Rome, the capitol was the first major public building designed by Cass Gilbert, the architect who would later design the U.S. Supreme Court Building and the West Virginia and Arkansas state capitol buildings.

Ongoing restoration work at the capitol revealed that numerous exterior marble wall units were highly deteriorated with portions of marble falling where distress was most severe. In response to safety concerns, the building underwent a preliminary investigation, which revealed extensive spalling, disaggregation, surface roughness, and loss of surface area, especially on decorative stone elements. Subsequently, the client engaged WJE to perform a comprehensive investigation of the exterior marble elements and to evaluate potential repair options.



SOLUTION

Using swing stages and industrial rope access equipment where necessary, WJE architects and engineers carried out a visual survey of the marble exterior, recording observations on inspection data sheets that utilized CAD elevation drawings drawn from laser scans prepared by others. At select locations, petrographic evaluations using field microscopy were performed to determine the extent and nature of the deterioration. The team also identified locations to extract core samples for laboratory testing of the marble, mortar, and patch materials.



Specifically, the marble samples will be subjected to a variety of chemical treatments designed to conserve stone. WJE will evaluate each treatment's ability to reduce water penetration and increase long-term resistance to weathering. Shelter coat treatments will also be tested and considered to improve water run-off and reduce the rate of soiling. Finally, the marble treatment samples will undergo a series of laboratory tests to assess the effects of water absorption, cyclical weathering, and exposure to UV light. WJE will issue prioritized recommendations for repair and conservation upon completion of the investigation.





PROJECT PROFILE

Saint Louis Art Museum

Vibration Testing/Monitoring and Air Barrier Consulting | St. Louis, MO



CLIENT

HOK Architects /
Saint Louis Art Museum

BACKGROUND

The Saint Louis Art Museum campus is composed of the original Cass Gilbert Building, a predominantly masonry structure constructed for the World's Fair in 1904, and surrounding additions constructed between 1957 and 1985. In 2007, a large museum expansion, designed by London architect David Chipperfield in collaboration with HOK Architects, broke ground to add approximately 95,000 square feet of new building space. Plans for the new four-level East Building, to be constructed next to the Cass Gilbert building, included three below-grade levels primarily for parking and one above-grade level for galleries. The project also included a below-grade circulation corridor and new loading dock.

WJE was retained during the design development phase to provide preconstruction vibration consulting services. WJE performed extensive preconstruction testing and analysis, consulted the museum on plans for artwork movement, and developed the vibration control specification for the project. WJE also was retained to monitor vibrations in the museum during construction as well as peer review enclosure design and construction documents, commission the wall air barrier system, and attend testing, including whole building airtightness testing.

SOLUTION

The primary objectives were to measure by field testing the vibration attenuation characteristics of the site and buildings, to estimate from the test data the degree to which the planned construction activities would transmit vibrations into the buildings, to assist the museum with preparations to safeguard the buildings and their contents, and to develop a project-specific vibration control specification to be incorporated into the contract documents for the expansion.

At the start of construction, WJE conducted vibration trials to verify vibration levels caused by actual equipment. During construction, WJE monitored vibrations using as many as twenty-two remotely accessed seismographs, which collected data continuously and sent immediate notifications of any above-limit vibration events.

At the architect's request, WJE provided several recommended specification sections, including air barrier quality control, airtightness specifications, enclosure commissioning, and under-floor air distribution system airtightness and testing. The various interfaces of old and new construction also necessitated close attention to the performance of the building enclosure. Thus, during construction, WJE was asked to provide services to observe the continuity of the air barrier system joints, junctures, and transitions between various materials and assemblies.





PROJECT PROFILE

Thurgood Marshall U.S. Courthouse

Exterior Envelope Assessment and Peer Review Services | New York, NY



CLIENT

U.S. General Services Administration, Parsons Brinckerhoff, and Vitetta

BACKGROUND

The last building designed by Cass Gilbert, architect of the Woolworth Building, the Thurgood Marshall U.S. Courthouse at Foley Square was completed in early 1936 in the monumental government building style. The building is located on Centre Street at the intersection with Pearl Street, a focal point of court facilities in Lower Manhattan. The facades are clad in granite with elegant bronze windows while the pyramidal roof is sheathed in decorative terra cotta tiles finished with a gold glaze. The courthouse is listed on the National Register of Historic Places.

After nearly seventy years in service, the courthouse was in need of systematic upgrades and modernization inside, in addition to careful restoration and repairs on the exterior. Initially WJE (with Vitetta) was retained to evaluate the overall condition of the exterior facades. At the request of the GSA, WJE and Vitetta provided peer review and concept design services for the reconstruction of the monumental front stairway. Working with Parsons Brinckerhoff, WJE provided third party reviews of ongoing exterior masonry restoration and flashing replacement.

SOLUTION

WJE conducted visual and close-up observations of the facades and roofs, finding the terra cotta sloped roof system to be in remarkably good condition. It required only careful flashing, sealant, and pointing work. The survey also determined the masonry facade to be in good condition.

WJE recommended preservation of the beautifully crafted bronze double hung windows and removal of the A/C units. A repair design for the monumental front stairs was developed based on the original "open" support system rather than creating a new sealed, stepped slab as initially planned.





PROJECT PROFILE

Woolworth Building

Terra Cotta and Masonry Facade Restoration | New York, NY



CLIENT

The Ehrenkrantz Group

BACKGROUND

The Woolworth Building is a fifty-eight-story office tower designed by Cass Gilbert and completed in 1913. It was the tallest building in the world until 1931. The structure is considered a historically significant landmark and is listed in the National Register of Historic Places.

More than sixty years after its construction, the terra cotta facade was becoming increasingly unstable, as chunks of the building began to fall into a courtyard below. On behalf of the F.W. Woolworth Company, WJE was retained by The Ehrenkrantz Group to serve as masonry consultant to perform all field and laboratory testing.

SOLUTION

WJE's multidisciplinary team performed a comprehensive series of field and laboratory studies and determined three main factors to be causes for rapid deterioration of the terra cotta. Spalling of the terra cotta glazing was due to thermal incompatibility of the glaze and clay body. WJE confirmed that no provisions had been made to accommodate moisture and thermal expansion due to extremely high compressive forces in the terra cotta. The team also verified corrosion of embedded steel elements as a result of water entering the walls, which in turn caused more distress.

To alleviate the mounting compressive forces, WJE architects and engineers carefully cut out selected horizontal expansion joints and re-anchored mildly deteriorated terra cotta units. Then, 26,000 severely deteriorated terra cotta units were replaced with architectural precast concrete.

As technical consultant, WJE developed and utilized several groundbreaking investigative methods, including strain relief testing, to diagnose causes of distress. Repair of the terra cotta at the Woolworth Building remains one of the most noteworthy building envelope rehabilitations ever undertaken—in terms of both the magnitude of the project and the importance of the building.





PROJECT PROFILE

Finney Memorial Chapel

Building Envelope Condition Assessment and Investigation of Water Infiltration | Oberlin, OH



CLIENT

Oberlin College

BACKGROUND

The Finney Memorial Chapel was designed by architect Cass Gilbert and completed in 1908. A bell tower is located in the southeast corner of the building. The building utilizes load bearing mass masonry walls clad with a sandstone outer wythe. The chapel's main entrance is flanked by ornamental red sandstone columns, which are also found in the bell tower. The interior surface of the masonry walls are finished with plaster. The roof consists of terra cotta clay roof tiles supported by heavy timber wood trusses.

Oberlin College requested that WJE perform a building envelope condition assessment and water infiltration investigation at the Finney Memorial Chapel, now a performing arts building. The purpose of the investigation was to perform a general assessment of the building envelope including the sandstone cladding, roofing, fenestration, and basement area wells with respect to service life and water infiltration, and to develop conceptual repair recommendations.



SOLUTION

WJE assessed the overall condition of the exterior building envelope, including the sandstone cladding, mortar joints, clay roofing tile, low-slope roofing, and fenestration from grade, accessible roof areas, and from a personnel lift. In addition, WJE identified the causes of ongoing water infiltration, which had been causing damage to interior finishes, through the use of water infiltration testing, infrared thermography, and visual observations at several areas. WJE's findings were presented in a comprehensive report describing the condition of each building envelope system, correlation of distressed or deficient conditions contributing to water infiltration and damaged interior finishes, and recommendations for short-term and long-term repairs to mitigate ongoing distress, water infiltration, and to restore and extend the useful service life of the building envelope systems.



WJE also installed data loggers to monitor the interior and exterior temperature and humidity conditions to help evaluate whether seasonal temperature and humidity fluctuations contributed to any of the observed interior plaster damage.



CLIENT REFERENCES

Carol Broadbent

Church of the Saviour

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Cleveland Heights, OH 44118

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Project: Church of the Saviour, Cleveland Heights, OH (See Project Profile)

C. Travis Arey

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Project: St. John United Methodist Church, Scott Depot, WV (See Project Profile)

Mike Kiggen

CTF Development International

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Project: Cleveland Renaissance Hotel, Cleveland, OH (See Project Profile)

Rick Rampi

National Park Service

Denver Service Center

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Project: Perry's Victory and International Peace Memorial, Put-In-Bay, OH (See Project Profile)

Steven Varelmann

Oberlin College

Department of Facilities Planning and Construction

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Project: Finney Memorial Chapel, Oberlin, OH (See Previous Project Profile)

Church of the Saviour

Investigation of Water Infiltration | Cleveland Heights, OH



CLIENT

Church of the Saviour,
United Methodist

BACKGROUND

The two-story Church of the Saviour was built in 1928 and designed by architect John Corbusier. The bell tower was built in the 1950s. The exterior walls of the original church consist of granite facing stone in a random ashlar pattern. The base of the walls, exterior trim, and coping caps consist of honed limestone. The windows in the sanctuary consist of stained glass set in Gothic stone bay arches along the north, west, and south facades. The roofing of the sanctuary consists of slate shingles installed over felt underlayment on wood decking. The roof is framed with trusses and purlins. The trusses are presumed to be steel arched trusses which are encased in wood trim.

Internal box gutters along the north and south sides of the sanctuary originally consisted of tin gutter liners. In the past decade, several repairs had been made to the gutter liner and copings. Since the winter of 2002–2003, chronic water leakage and plaster deterioration had been reported above the stained glass windows along the north and south walls of the sanctuary. Plaster debris from the sanctuary ceiling was removed from the church pews weekly. WJE was asked to determine the cause(s) of the water related damage to the plaster.



SOLUTION

Through water infiltration testing of the masonry walls and internal box gutter, it was determined that the condition of the masonry mass wall mortar joints and the lack of water-tight terminations of the existing gutter liner largely contributed to water leakage into the sanctuary and damage to the interior plaster. As such, WJE recommended that the granite and limestone masonry walls be repointed and the internal box gutter replaced.

WJE performed a petrographic analysis of the original mortar to repoint with a similar, more compatible mortar than what had been installed in a previous repointing. WJE designed a new box gutter system that utilizes lead-coated copper, which more closely reflects the original design of the box gutter.

The church has been nominated for an award from the local historic preservation association for the restoration work.





PROJECT PROFILE

St. John United Methodist Church

Water Infiltration Investigation | Scott Depot, West Virginia



CLIENT

St. John United Methodist Church

BACKGROUND

The single story, wood-framed church is primarily clad with brick masonry and was built circa 1979. The roof of the church has a heptagon shape with several non-planar sections throughout the roof. The majority of the steep-sloped roofing consists of composite asphalt shingles while other areas of lower slope consist of ballasted membrane roofing. An aluminum clad, heptagon shaped steeple stands thirty-two feet above the apex of the roof structure.

Chronic water infiltration into the sanctuary from areas approximately below the steeple has been occurring for several years. The Church requested that WJE investigate the cause(s) of the water infiltration and provide conceptual repair recommendations to address the water infiltration. The investigation included a review of available documents as well as the findings from the on-site water infiltration testing.



SOLUTION

WJE determined the water infiltration into the sanctuary was caused by one or more apparent breaches in the EPDM membrane where the collection of water between layers of base flashing around the perimeter of the steeple occurs.

In order to remediate the water infiltration, WJE recommended the Church either remove the steeple and have it restored by the original manufacturer. Prior to reinstalling the restored steeple, repairs to the EPDM membrane can be addressed. In addition to this recommendation, WJE also suggested that the steeple could be converted into a barrier system; however, caveats regarding feasibility and future maintenance was also given.





PROJECT PROFILE

Renaissance Cleveland Hotel

Masonry Facade and Roofing Inspection and Repair Design | Cleveland, OH



CLIENT

CTF Hotel Holdings, Inc.

BACKGROUND

The Renaissance Cleveland Hotel, originally known as the Hotel Cleveland, was designed by Graham, Burnham & Company and completed in 1918. The exterior walls of the fifteen-story guest tower consist primarily of glazed face brick with a common brick and structural clay tile backup. Granite panels clad the base of the building. Architectural terra cotta adorns the roof cornice, multiple belt courses, the fourth floor balustrade, and the window openings.

Masonry distress of brick and terra cotta cladding, including cracks, spalls, displaced masonry, and deteriorated mortar, was present at building corners, window heads, floor lines, cornices, and the balustrades. Water leakage had been a reoccurring problem at several locations throughout the guest tower. Previous repairs, including sealant installation and a cornice reconstruction in 1992, failed to provide a long term remedy. The extent of masonry distress necessitated phased repairs with temporary stabilization of distressed facade elements.



SOLUTION

WJE initially performed a visual and close-range inspection of the building revealing that the masonry cracking at the decorative terra cotta cornices and windows was related to corrosion of mild steel anchors and adjacent framing while the distressed masonry at floor lines and building corners was related to under-accommodated movement provisions. With this understanding, WJE prioritized the necessary repairs and developed a phased restoration plan which has spanned over several years to meet the owner's budget. Along with the repair, WJE has integrated an annual facade stabilization program consisting of inspection and stabilization of the unrepaired areas of the facade using a combination of netting, stainless steel strapping, and restoration anchors.



In 2012, WJE completed Phase VI which was focused on restoring the east facade. Previous phases entailed reconstructing the terra cotta of the main cornice and balustrades, masonry repairs at building corners, and courtyard and canopy roof replacement. Through implementation of this phased approach, the elements of the facade in the most critical condition have been addressed first while less critical elements have been stabilized, monitored, and are being repaired.





PROJECT PROFILE

Perry's Victory and International Peace Memorial

Investigation and Restoration Design | Put-In-Bay, OH



CLIENT

National Park Service

BACKGROUND

Located on an isthmus of South Bass Island in Lake Erie, the memorial honors those who fought in the battle of Lake Erie during the War of 1812 and celebrates the long-lasting peace between Britain, Canada, and the United States. The memorial, completed in 1915, is built of Milford Pink granite with an unreinforced concrete backup for the column shaft and a reinforced concrete structure clad with granite for the observation deck and plaza levels. The column is capped by an eleven-ton bronze lantern.

In the summer of 2006, a 500-pound granite fascia panel fell 317 feet from the observation deck of Perry's Victory and International Peace Memorial, leaving a crater where it crashed onto the plaza below. When an initial physical assessment revealed other loose fascia stones, the National Park Service sought the help of WJE to complete a detailed inspection of the memorial and to plan for its comprehensive restoration.

SOLUTION

After reviewing documentation of the memorial's original construction and analyzing its previous repairs, the experts at WJE used special access techniques, including rappelling and swing stages, to conduct a close-up visual inspection of the entire memorial and collect concrete and granite samples for testing in WJE's laboratories.

From the investigation, WJE determined that ineffective waterproofing systems allowed moisture to penetrate the concrete, resulting in freeze thaw deterioration of both the memorial and the plaza. This deterioration, coupled with through-structure anchors that had been installed as part of earlier repairs, led to cracking. Of particular concern were six fascia panels that exhibited cracking similar to the one from which a portion fell, presenting an imminent hazard.

WJE recommended measures for the memorial's immediate stabilization, including restricting public access, removal of panels, and short-term approaches to preventing further water penetration. These interim solutions allowed for continued public access while WJE developed options for long-term repairs and maintenance to preserve this treasured memorial.



APPENDIX C: PERSONNEL QUALIFICATIONS

David S. Finley | Associate III



EDUCATION

- The Pennsylvania State University
 - Bachelor of Architectural Engineering, 2008
 - Master of Architectural Engineering, 2008

PRACTICE AREAS

- Structural Evaluation
- Peer Review
- Condensation and Water Entry Studies
- Facade Assessment
- Roofing and Waterproofing
- Repair and Rehabilitation Design

PROFESSIONAL AFFILIATIONS

- American Society of Civil Engineers
- RCI, Inc.
- Sealant, Waterproofing and Restoration Institute

CONTACT

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EXPERIENCE

David Finley is involved in a wide range of numerous structural and architectural investigations. His building envelope experience includes water infiltration testing of windows, curtain walls, masonry facades, and plaza and below-grade waterproofing as well as condensation and air leakage testing of glazed fenestrations and masonry facades. Mr. Finley's structural investigations have included concrete, masonry, steel, and wood structures.

Mr. Finley has also assessed heaving of concrete slabs-on-grade caused by the use of expansive fill material as well as a proprietary prefabricated concrete block floor slab system (Dox Plank) that is most commonly found in the mid-Atlantic region. In addition to investigations, Mr. Finley has prepared repair documents, performed peer reviews, and performed construction observation of new and repair construction.

REPRESENTATIVE PROJECTS

Structural Evaluation

- Forest Resources Building - University Park, PA: Investigation of slab-on-grade heaving due to expansive aggregate fill
- Horace Mann Elementary School - Indiana, PA: Assessment of excessive deflection, and visual grading of historic wood framing

Peer Review of Building Envelopes

- Akron Public Schools - Akron, OH: Peer Review of multiple school additions and new school facilities
- Mercy Hospital West - Dayton, OH

Condensation and Water Entry Studies

- Kohl Building - Oberlin, OH: Investigation of air leakage and condensation due to vapor diffusion
- First Energy Complex - Akron, OH: Investigation of condensation with the exterior wall cavity
- Stone Oak Medical Center - San Antonio, TX: Investigation of water infiltration through curtain walls and masonry facade

Facade Assessment

- Graves Hall - Columbus, OH: Assessment of brick masonry cladding distress
- North High Street Office Complex - Columbus, OH, Assessment of limestone and granite cladding

Roofing and Waterproofing

- Lindner Hall - Cincinnati, OH: Investigation of water infiltration through plaza waterproofing
- Saint Sava Church - Cleveland, OH: Assessment and investigation of water infiltration through stainless steel standing seam roofing

Repair and Rehabilitation Design

- Beaver Stadium - University Park, PA: Sealant, waterproofing, and embedded railing grout repair
- Church of the Savior - Cleveland, OH: Built-in copper gutter design and granite masonry repairs

Michael R. Nagle | Associate Principal



EXPERIENCE

Michael Nagle is a building envelope consultant with specialization in facade, windows, and roofing problems in existing, historic, and new buildings. Since joining WJE in 2004, he has provided professional services for numerous projects involving water and air leakage, condensation, and distress conditions in a variety building envelope systems including: brick masonry, stone, terra cotta, windows, curtain wall, metal wall panels, EIFS, stucco, sealants, roofing, and waterproofing.

Mr. Nagle leverages his experience gained from the investigation and evaluation of building problems to assist building owners, contractors, and design professionals by performing building envelope peer reviews, commencing with the design phases and extending through completed construction with on-site observation and performance verification.

Prior to joining WJE, Mr. Nagle was a project manager facilitating the design, detailing, and construction administration of facade restoration, roofing replacement, and new construction projects.

REPRESENTATIVE PROJECTS

Facade Assessment

- College of Design, Architecture, Art and Planning at University of Cincinnati - Cincinnati, OH: Water infiltration investigation of EIFS facade and windows
- Finney Chapel at Oberlin College - Oberlin, OH: Masonry facade and clay tile roofing condition assessment
- Hollywood Casino - Toledo, OH: EIFS failure investigation
- Key Bank - Akron, OH: Water infiltration investigation of curtain wall and foundation waterproofing
- Loy Hall at Capital University - Columbus, OH: Facade and roofing condition assessment
- Perry's Victory and International Peace Memorial - South Bass Island, OH: Exterior condition assessment and restoration
- Westinghouse Corporate Headquarters - Cranberry Township, PA: Investigation of air leakage and thermal discomfort

Peer Review

- Cardinal Health - Dublin, OH: Building envelope peer review of office building
- Concord Medical Center - Concord, OH: Building envelope peer review of physician office building
- Dayton Public Schools - Dayton, OH: Building envelope peer review of several elementary, middle, and high schools
- Lindner Center of Hope - Mason, OH: Building envelope peer review of health care facility
- Springfield Regional Medical Center - Springfield, OH: Building envelope peer review, construction observation, and performance testing of health care facility

Roofing and Waterproofing

- LifeTime Fitness, Beachwood, OH: Roofing condensation investigation
- NEORS, Cleveland, OH: Condition assessment of several buildings
- Quicken Loans Arena - Cleveland, OH: Roofing condition assessment
- OARDC at The Ohio State University, Wooster Campus: Campus-wide tornado damage assessment

Repair and Rehabilitation

- Church of the Saviour - Cleveland, OH: Water infiltration investigation, built-in gutter replacement, slate roof repairs, and masonry facade repairs
- Fenn Tower, Cleveland State University - Cleveland, OH: Cast stone assessment, stabilization and replacement
- PNC Center - Cleveland, OH: Roofing condition assessment and replacement at thirty-five story office tower and five-story annex
- The Inn at Ohio Northern University - Ada, OH: Facade recladding and structural repairs
- Renaissance Cleveland Hotel - Cleveland, OH: Facade restoration and roofing replacement

TECHNICAL COMMITTEES

- ASTM C24 - Building Seals and Sealant
- Building Enclosure Council (BEC) - Cleveland

EDUCATION

- Erie Community College
 - Associate in Applied Science, Architectural Technology, 1988
- State University of New York at Buffalo
 - Bachelor of Architecture, 1991
 - Master of Architecture, 1993

PRACTICE AREAS

- Facade Assessment
- Peer Review
- Historic Preservation
- Repair and Rehabilitation Design
- Roofing and Waterproofing
- Litigation Consulting

REGISTRATIONS

- Architect in NY, OH, and PA
- National Council of Architectural Registration Boards Certificate
- Association of the Wall and Ceiling Industry (AWCI) - Certified EIFS Industry Professional

PROFESSIONAL AFFILIATIONS

- ASTM International
- RCI, Inc. (formerly Roof Consultants Institute)

CONTACT

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Deborah Slaton | Principal



EDUCATION

- Northwestern University
 - Bachelor of Arts, Art History, 1975
- University of Illinois at Chicago
 - Master of Arts, English, Program for Writers, 1976
- University of Illinois at Urbana-Champaign
 - Master of Architecture, Architectural Engineering, 1982

PRACTICE AREAS

- Architectural Conservation
- Facade Assessment
- Construction Specifications
- Facade Cleaning
- Historic Preservation
- Historic Structures Reports
- Materials Conservation
- Historical Research

PROFESSIONAL AFFILIATIONS

- Association for Preservation Technology International
- American Institute for Conservation of Historic and Artistic Works
- Historic Preservation Education Foundation, vice president

CONTACT

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EXPERIENCE

Ms. Slaton specializes in historic preservation and materials conservation. She has completed investigation and preservation projects for numerous historic structures, sites, monuments, museums, and other institutions, including historical and technical research, development of preservation and repair documents, and problem-solving for archaic and modern materials. She has served as principal author of numerous investigation and preservation reports, conservation studies, Historic Structures Reports, Cultural Landscape Reports, HABS/HAER documentation projects, and National Register Nominations.

Ms. Slaton has published and lectured extensively on preservation technology, materials conservation, and architectural history. She is the editor of the proceedings of several national preservation conferences, the author of National Park Service Preservation Brief No. 43: Preparation and Use of Historic Structure Reports, and co-author of the new edition of Preservation Brief No. 15: Preservation of Historic Concrete.

REPRESENTATIVE PROJECTS

- Buffalo and Erie County Conservatory - Buffalo, NY: Investigation and restoration consulting
- Biloxi and Pensacola lighthouses - Biloxi, MS, and Pensacola, FL: condition assessment and historic preservation consulting
- Cape Hatteras Lighthouse - NC: Historic Structure Report; preservation consulting during move
- Cape Lookout Village and Portsmouth Village - Cape Lookout National Seashore, NC: Cultural Landscape Reports
- Centre Street Bridge - Calgary, AL: Investigation and preservation consulting for lion kiosks
- Gateway Arch, Jefferson National Expansion Memorial - St. Louis, MO: Historic Structure Report
- Les Quatre Saisons - Chicago, IL: Restoration of Chagall mosaic
- Logan Creek Bridge, Glacier National Park - MT: Preservation consulting

- Metropolitan Museum of Art - New York, NY: Facade restoration and cleaning
- Nicodemus National Historic Site - Nicodemus, KS: Historic Structures Report
- Promontory Apartments - Chicago, IL: Restoration of concrete facade on modern landmark
- St. Elizabeths West Campus - Washington, D.C.: Historic Structures Reports
- University of Chicago - Chicago, IL: Repair study for historic windows and preservation guidelines for modern landmarks
- Vicksburg National Military Park - Vicksburg, MS: Cultural Landscape Report
- Wyoming Monuments Study: Conservation study and recommendations for monuments statewide

TECHNICAL COMMITTEES

- AIA Chicago, Historic Resources Committee, past chair
- APT Publications Committee
- Transportation Research Board (TRB) Committee ADC50 on Historic and Archaeological Preservation in Transportation

Joshua Freedland | Associate Principal



EDUCATION

- Brandeis University
 - Bachelor of Arts, History, 1995
 - Master of Arts, Comparative History, 1995
- University of Pennsylvania
 - Master of Science, Historic Preservation, 1999
 - Advanced Certificate, Architectural Conservation, 2000

PRACTICE AREAS

- Historic Preservation
- Facade Assessment
- Materials Conservation Analysis
- Facade Cleaning Studies
- Coatings Investigation
- Monument Assessment and Conservation

PROFESSIONAL AFFILIATIONS

- American Institute for Conservation of Historic and Artistic Works (AIC), professional associate and Architecture Specialty Group (ASG) past chair
- Art Institute of Chicago-Graduate Program in Historic Preservation, instructor
- Association for Preservation Technology International (APT)

CONTACT

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EXPERIENCE

Joshua Freedland has extensive experience with materials conservation of historic buildings. His work has included materials analysis, building documentation, facade investigations, preservation recommendations, and construction observations. Mr. Freedland has worked with a wide variety of materials, including granite, marble, limestone, brick masonry, terra cotta, stucco, plaster, and architectural metals.

Mr. Freedland has provided preservation recommendations for hundreds of buildings, monuments, and sculptures, including many listed on the National Register of Historic Places and local registers. Multiple local and national organizations have recognized his preservation work for excellence.

Numerous archaeological sites in the United States and abroad have benefitted from Mr. Freedland's conservation consulting services. He has published and presented extensively on materials and site conservation, including laboratory studies on desalination efficiency, stone consolidants, and masonry cleaning and preservation.

REPRESENTATIVE PROJECTS

Historic Preservation

- Chicago Theatre - Chicago, IL: Facade and marquee restoration
- Eisenhower Executive Office Building - Washington, D.C.: Evaluation of interior finishes and granite facade
- Gateway Arch - St. Louis, MO: Historic structures report and terrazzo analysis
- Independence Hall - Philadelphia, PA: Historic preservation consulting
- Minnesota State Capitol - St. Paul, MN: Preservation of interior and exterior
- Washington Monument - Washington, D.C.: Assessment and repair design of damage from seismic event

Facade Assessment

- 30th Street Station - Philadelphia, PA: Facade restoration and restoration design
- Chicago City Hall - Chicago, IL: Facade investigation and restoration design
- Chicago Tribune - Chicago, IL: Limestone facade investigation

- Marquette Building - Chicago, IL: Evaluation of and repair design for terra cotta and brick facade
- Nebraska State Capitol - Lincoln, NE: Materials conservation and treatment recommendations
- North Dakota State Capitol - Bismarck, ND: Facade assessment and repair
- Old McLean County Courthouse - Bloomington, IL: Assessment and repair documents of limestone facade
- One Prudential - Chicago, IL: Repair of limestone facade and cleaning of aluminum window frames and spandrels

Materials Conservation Analysis

- New York Public Library - New York, NY: Evaluation of Vermont marble facade
- U.S. Custom House - New Orleans, LA: Evaluation and conservation of Tuckahoe marble interior

Facade Cleaning Studies

- Chase Tower - Chicago, IL: Cleaning of granite facade
- Museum of Science and Industry - Chicago, IL: Cleaning of limestone facade
- Philadelphia Masonic Temple - Philadelphia, PA: Stone cleaning evaluation and granite studies

Coatings Investigation

- 860-880 North Lake Shore Drive - Chicago, IL: Facade painting of steel curtain wall
- CNA Plaza - Chicago, IL: Recoating of steel cladding
- Farnsworth House - Plano, IL: Repairs and recoating of curtain wall
- TD Centre - Toronto, Ontario: Recoating of steel curtain wall

Monument Assessment and Conservation

- *Four Seasons* by Chagall - Chicago, IL: Conditions assessment of mosaic
- *Untitled* by Picasso - Chicago, IL: Conservation assessment of weathering steel monument