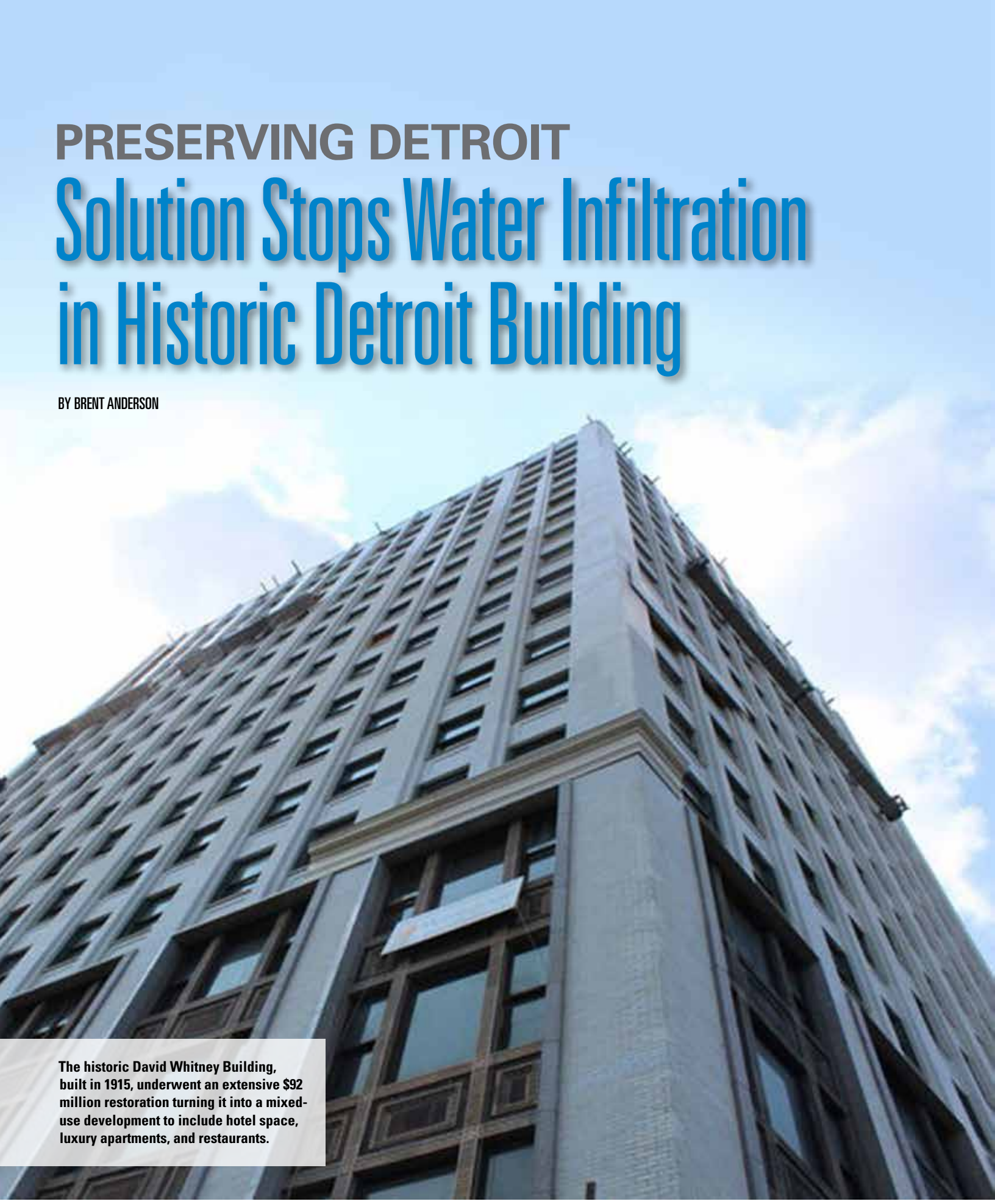
PRESERVING DETROIT

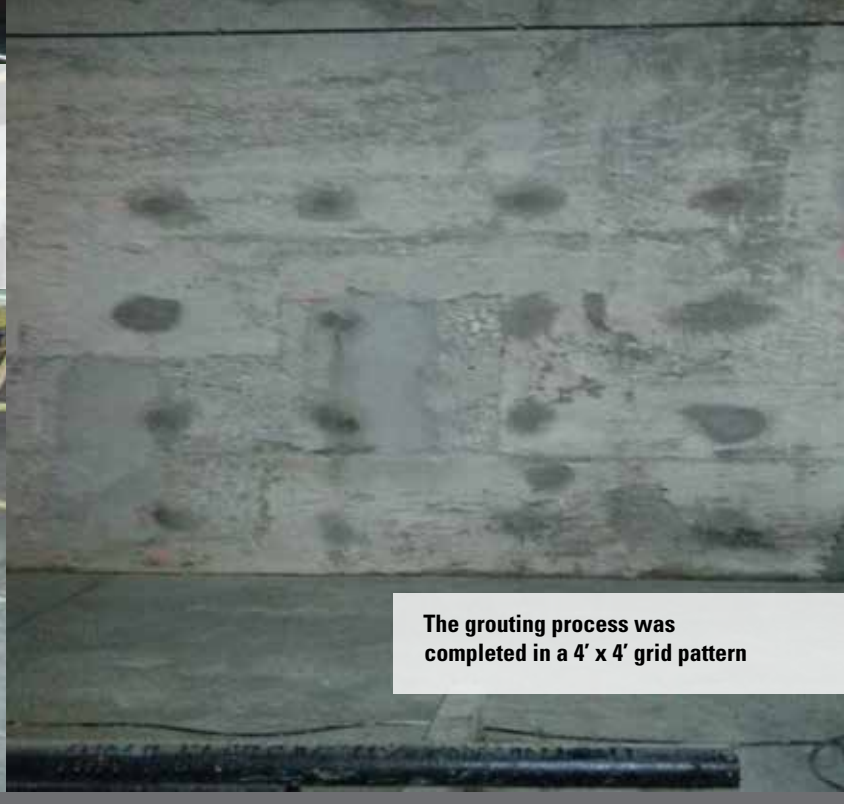
Solution Stops Water Infiltration in Historic Detroit Building

BY BRENT ANDERSON



The historic David Whitney Building, built in 1915, underwent an extensive $92 million restoration turning it into a mixed-use development to include hotel space, luxury apartments, and restaurants.

Water intrusion was observed in the substructure walls. Multiple leaks kept the owner from finishing off the space until the issue was resolved.



The grouting process was completed in a 4' x 4' grid pattern

The 18-story David Whitney building, located in Downtown Detroit, Michigan, is a historic skyscraper. The building, constructed in 1915, is one of just three remaining Detroit buildings designed by renowned architects Daniel H. Burnham & Company.

Water Infiltration Delays Redevelopment

Currently owned by The Roxbury Group, the building underwent a full redevelopment to become a mixed-use site, including hotel space, luxury apartments, and restaurants.

While the redevelopment project was underway, active water leakage was occurring within the substructure, specifically at multiple and radiating hairline cracks, construction joints, and honeycombed concrete locations. Seepage also existed at old beam pockets, around mechanical penetrations and abandoned ground anchors. The substructure houses a critical dry storage room for restaurants, hotel laundry, office space, fire suppression control panels, and IT and phone systems. The spaces could not be finished until the water infiltration issues were addressed.

Challenges Identified

The owner had considerable past experience dealing with proposed solutions that included localized crack injection repair utilizing urethane-based technology – a temporary fix that would not meet the prolonged needs of the building. A long-term repair solution was needed – one that would not involve continued yearly maintenance.

Pullman was hired to assist with investigating the water intrusion challenges, perform a root cause analysis, determine the best repair option(s), and implement a solution.

One of the many challenges was determining the structural makeup of the 100-year-old concrete foundation structure, including the reinforcing patterns and wall thickness, because the building's historical data was unavailable. Another challenge was to develop a cost-effective solution when determining the scope and extent of grouting work because the owner did not have water control as part of the redevelopment budget.

Grouting Solution Developed and Implemented

Acrylamide chemical grout was selected by the moisture control solutions team as the most cost effective and highest performance material for this type of application. Pullman created a 350 SF mock-up area with substantial water infiltration to demonstrate performance and unit pricing. Mock-ups like this help quantify material usage, port-to-port spacing, proper grout set times for controlled migration lengths and crack penetration, and mix proportions/concentrations. Because wall thicknesses were unknown, the mock-ups also verified pump pressures, volumes, and drilling time.

Acrylamide grout is a two-part system consisting of components "A" and "B". These are blended separately and then subsequent components are pumped into place with a stainless steel, 1-to-1 pump. Before the acrylamide chemical grout was ready for injection, the right mixture had to be developed. Mixing ratios vary depending on crack size, port-to-port spacing, desired set time, size and amount of voids to be filled and interior humidity conditions.

Component "A" is the acrylamide monomer, with an accelerator, a colorant, ethylene glycol (if freeze/thaw conditions are prevalent); component "B" is the oxidizer or hardener with added colorant and ethylene glycol (when required). Food coloring was used as an additive colorant for differentiation of chemical grout from ground water. The "A"

and “B” components were injected in sleeve ports with ball valves for control and monitoring. The team established an ideal cure time of 30 seconds.

Pullman crews pumped the grout beginning at the lowest point moving upwards. Pumping continued until the chemical grout was transmitted from port to port. Once transmission of the grout was visible, which was determined by the colorant intensity, shutoff valves were closed and the process continued throughout the grid pattern.

After grouting was completed, the entire substructure is dry and ready for the owner to develop the space to house a dry storage room for restaurants, the hotel laundry room, office space, fire suppression control panels, and IT and phone systems.

Solution Stops Water Infiltration Completely

In addition to the mock-up area, Pullman crews performed an additional 1,000 SF of curtain wall grouting at strategic leakage locations throughout the remainder of the three-story substructure. Substructure grouting was completed successfully based on subsequent drying of the entire subsurface wall areas; thus allowing the owner to proceed with developing it into the spaces needed for on-time occupancy.

The efforts went beyond improving the water infiltration issue – the team provided a turnkey solution to stop the issue completely.

About the Author

Brent Anderson, P.E., is a Moisture Control Engineering Leader. With over 35 years of experience, Brent is an expert in below-grade and plaza deck waterproofing products, chemical grouting with urethanes, micro-fine cements, bentonites, acrylamides, acrylic’s and epoxies. •