INSIGHT

ISSUE NO. 6

A technical newsletter by Raths, Raths & Johnson, Inc. for the construction industry.

“Insight: to see into and understand; an item of knowledge gained by this power.”

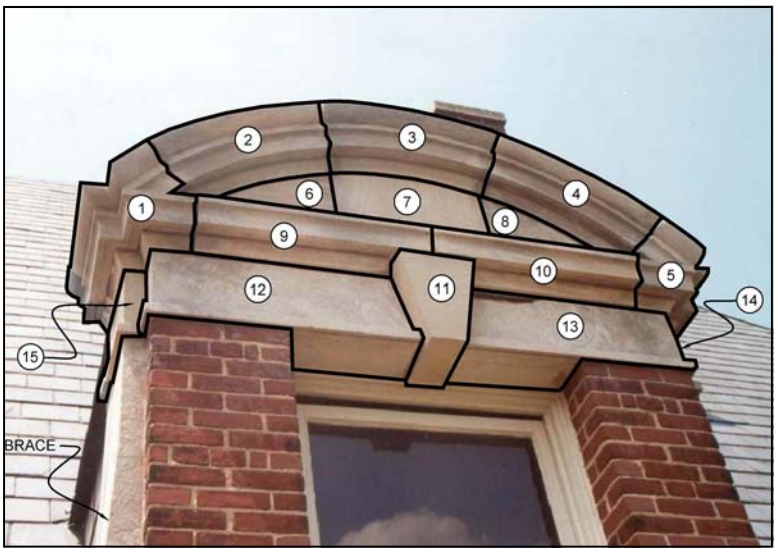
This issue of *RRJ Insight* discusses the restoration of a vintage masonry condominium structure in the Baltimore area and the typical problems found in these structures. Additionally, one of the many tools RRJ uses in investigating water leakage in building facades by hose testing is discussed in a continuing article from our first issue of RRJ Insight.

INSIDE

Warrington Condominium built in the early 1920’s, a classic structure with typical masonry expansion problems.

Project Profile

The Warrington Condominium Restoration



Method used for tracking stone pieces during removal and reinstallation.

In the early 1920's several luxury high-rise masonry and steel apartment buildings were built in the prestigious North Charles Street area of Baltimore, Maryland. Characteristic features of the up-scale construction of that day included balustrades, belts and dormer portico detail features made of Indiana Limestone. Additionally, triple wythe masonry and tile walls were supported on concrete encased, fireproof structural steel frames and floors. Like other cities, the ravages of time have changed much in Baltimore but The Warrington has endured time and condominium conversion as well.

For the last 70 years, The Warrington has performed like the solid, high class building befitting its prestigious address. Over the years, the brick facade has developed numerous cracks and the structural steel supports deeply embedded in the limestone balustrades and dormers, have corroded and expanded. This expansion has created irreversible movements which cracked the bricks and forced the stones apart allowing water infiltration and necessitating a long term repair. **RRJ assisted in the restoration of the historic Baltimore landmark.**

The Owners and their Contractors called upon RRJ to review the performance of earlier repairs and develop more long lasting repairs. Earlier repairs included several topical repairs or cosmetic repairs to the masonry mortar which had re-cracked several times over the past 70 years. To assist them **we applied the same time-tested methodology** that has been described in previous RRJ Insight Newsletter articles and which has been successfully applied to more modern buildings. RRJ first inspected the building and mapped the cracking. This revealed a characteristic pattern which was a result of the design methods used in the twenties. During this time period, expansion of the building walls was not taken into consideration. The walls cracked as a result of the thermal and moisture expansions. Ironically, this same behavior, long since recognized and addressed by modern masonry design recommendations, is not always considered today and continues to regularly be responsible for similar problems in modern buildings routinely investigated by RRJ. The repair is the same, relieve the expansion by cutting in new joints where nature has cracked the walls.

Additionally, we found expansion of rust pack at steel angles used to support the limestone pieces of the dormer and balustrades had forced the stones apart and in the process **weakened the steel angles to a point where they now require replacement**. The figure shown was used in the repair documents to number and identify the stone of the dormer which needed to be removed and replaced to access the steel angle.

Following the repairs, The Warrington should continue to serve its proud owners on North Charles Street for many more decades.

-Otto C. Guedelhoefer, S.E.

The Warrington Condominium.

Laboratory News

More About Curtain Wall Hose Testing

Figure 1—Multiplanar test area found on curtain wall and window system with protruding mullions.

Field leakage testing by means of the AAMA 501.2 test method, Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage is commonly included in window and curtain wall project specifications as part of the quality assurance requirements. This test method (commonly called hose testing) involves spraying water on the test area with a garden hose and a special calibrated nozzle, and visually examining the interior for water leakage. One of the test requirements is to hold the nozzle perpendicular to the test surface at a distance of 12 inches.

The topic of Pressures Generated During Curtain Wall Hose Tests was covered in the inaugural issue of RRJ INSIGHT. That article discussed **testing performed in RRJ's in-house laboratory to measure water impact pressures generated by the Monarch B-25 nozzle** when directed perpendicular to a flat vertical surface. At the standard nozzle distance of 12 inches, pressures of approximately 7 psf were measured over a 2 inch diameter area in the center of the spray pattern.

Real curtain walls, however, are frequently not flat. Instead, protruding profiles on mullions and intermediate horizontals are commonly employed for aesthetic and/or structural reasons.

The resulting multiplanar exterior envelope surfaces typically have frame seals and stack joints positioned significantly outboard of the glazing seals (Figure 1). The question then arises, **how should the Monarch nozzle be positioned to apply approximately equal pressure to all joints of interest.** To address this question RRJ went back to the laboratory for more testing on an instrumented mock-up.

The first configuration tested had the nozzle aligned with the mullion centerline (Figure 2A). Pressure probes installed in the mock-up indicated this configuration yielded no measurable water impact pressure at the glazing. The water simply missed the glazing seals because of the shielding effect of the mullion.

RRJ next tried angling the water spray into the corner formed by the mullion and glass intersection (Figure 2B). Water hitting the glass and mullion was directed into the corner causing the measured impact pressures to increase to approximately 20 psf. Since the angled approach produced pressures significantly higher than 7 psf generated by spraying a flat test area, RRJ tried a third configuration. In this test series, the nozzle was directed perpendicularly at the glass adjacent to the mullion (Figure 2C). In this position the glazing seal is wetted by water deflected by the glass surface alone. With the nozzle placed at a lateral offset of 2 inches from the mullion edge, pressures at the glazing seal measured approximately 7 psf, success!

This work demonstrates that uniform impact pressures can be achieved using the monarch nozzle, but only if care is taken in the placement and orientation of the spray nozzle. In multiplanar systems, indiscriminate spraying can easily result in either negligible or excessive impact pressure being applied to the test joint.

For additional information, see Hoigard, K.R., and Kudder, R.J., The Facts About Hose Testing, Water Leakage Through Building Facades, ASTM STP 1314, R.J. Kudder and J.L. Erdly, Eds. American Society for Testing and Materials, 1997.

-Kurt R. Hoigard, P.E.

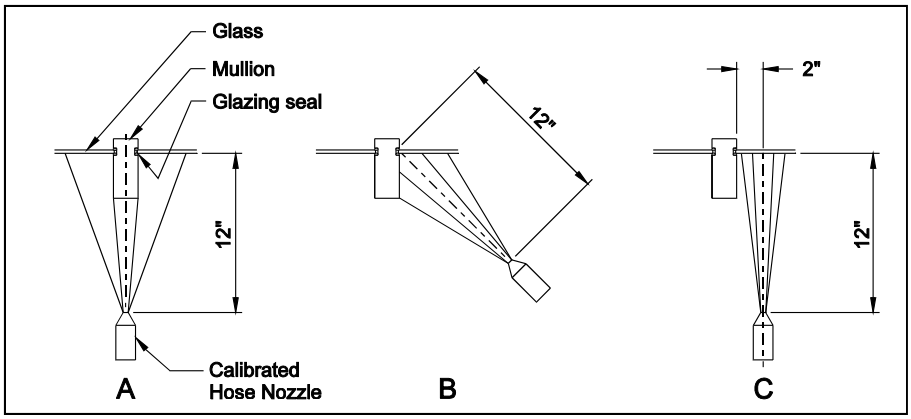


Figure 2—Nozzle configuration for hose testing.