



INSIGHT™

ISSUE NO. 15

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

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

This issue’s *Project Profile* discusses RRJ’s investigation of an early twentieth century high rise office building featuring intricate terra cotta mansards and ornamentation. Prolonged water leakage in the penthouses and at the perimeter of the upper main floor areas caused concern over the condition of the terra cotta and supporting steel elements. RRJ documented existing terra cotta conditions through a combination of telescopic and close-up examination. In the *Tech Tip* article we discuss why close-up examination and proper investigation is necessary for these types of structures and how severe corrosion of hidden anchors can be detected.

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Inspection of hidden terra cotta anchors using a fiberoptic camera.

Project Profile

Two Mellon Bank Center Terra Cotta Restoration

Two Mellon Bank Center is a prominent early twentieth century high rise office building located in downtown Pittsburgh. Available records indicate that the building, originally called the Union Arcade, was built for Mr. H.C. Frick in 1916 by the American Bridge Company, based on an architectural design by F.J. Osterling. Today, the building is listed in the National Historic Register of Historic Places and is classified as an Historic Landmark by the Pittsburgh History and Landmarks Foundation.

The building is comprised of 11 main floors topped by two five-story penthouse towers. The exterior building cladding consists of cut limestone, modern aluminum windows, and ornate terra cotta. The terra cotta portions of the exterior envelope include the vertical



Figure 1 – Terra cotta clad penthouse, one of two on the building.

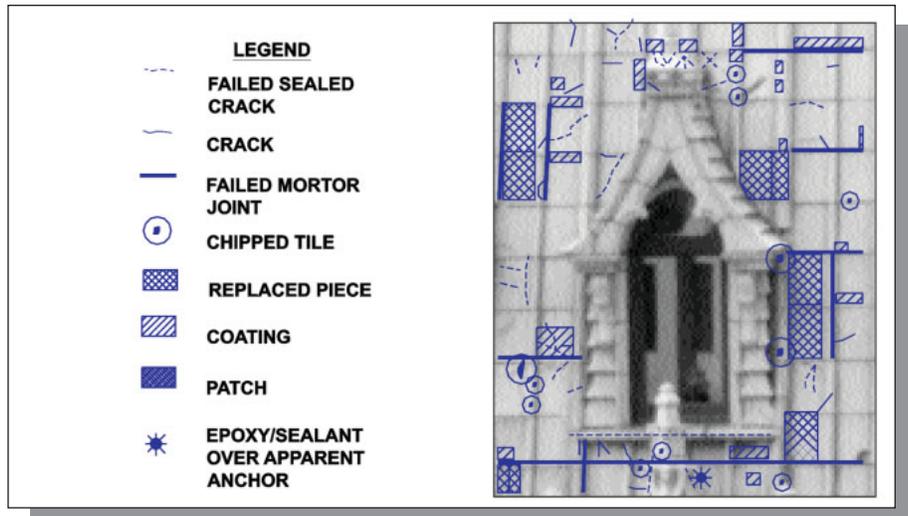


Figure 2 – Small portion of inspection recording sheet which uses a scanned photo of the actual building for plotting observed defects.

walls of the eighth and ninth floors, a two-story mansard with three tiers of dormers encompassing the tenth and eleventh floors, the exteriors of both penthouse towers, and decorative cornices, parapets, balustrades, pediments, pinnacles, finials, and gargoyles. Terra cotta pieces are supported by mild steel rods, angles, and channels attached to the steel building structure.

Prolonged water leakage in the penthouses and at the perimeter of the upper main floor areas caused concern over the condition of the terra cotta and supporting steel elements, and prompted the Owner to retain RRJ to evaluate the facade. Diligent “excavation” through over 70 years worth of accumulated drawings in the basement plan vault located portions of the original structural and architectural plan sets (ink drawings on linen), as well as some of the terra cotta shop drawings, and restoration plans from 1984. Armed with this information RRJ proceeded to document existing terra cotta conditions through a combination of binocular and close-up examination requiring the installation of a custom-fabricated man basket system capable of three axis movement (up/down,

left/right, and in/out). RRJ’s close-up work included piece sounding, fiberscope inspection, and investigative openings. Comparison of features visible during the binocular examination to those found during the hands-on work revealed significant differences and highlighted the inadequacies of binocular surveys.

RRJ’s inspection data was compiled into a set of detailed condition drawings showing the exact location (on a piece-by-piece basis) of all significant cracks, chips, glazing spalls, broken pieces, deteriorated mortar joints, and previous repairs (failed and intact) observed. (See Figure 2.) This information was then used to prepare terra cotta restoration plans and specifications addressing the deficiencies noted above as well as the need for supplemental hidden water diverters to control leakage at the mansard dormers. Repair implementation is following a phased approach with full-time inspection. One elevation is being addressed each year with completion anticipated in 2002, followed by periodic re-inspection to monitor the performance of the repairs.

- Kurt R. Hoigard, P.E.
- George R. Mulholland, S.E.

Tech Tip

Facade Inspections — Going Beyond the Surface

Due to its many taller and aging buildings, major cities such as Chicago, Pittsburgh and New York City have adopted laws which require routine inspections of building facades in an effort to minimize the risk of facade materials falling. In Chicago for example, owners of buildings greater than six-stories or 80 feet in height must either have a visual (binocular) inspection performed annually or undergo a close-up hands-on inspection every four years. The extent of the hands-on inspection is left to the discretion of a licensed engineer or architect and can be performed by any individual under the supervision of that professional.

Despite these inspection requirements, recent events where major sections of facade materials have fallen from these structures bring into question whether these requirements are sufficient. The nature and extent in which these mandated facade inspections are performed and reported may in some cases be misleading and not always beneficial to either the building owners or the general public.

To understand the potential problems associated with aging facades, one must be familiar with the materials and methods of construction and their potential problems. In these buildings, the facade is often comprised of brittle materials that rely on concealed reinforcement, supports, and anchors made of iron and/or steel. As time passes, the facade materials can deteriorate and fail due to the effects of thermal stress, freezing and thawing, water penetration, volume changes, and corrosion of critical structural elements that are hidden from view.

Although written with good intent, the legislation passed by cities that govern inspections may promote a cookbook mentality for dealing with facade safety which is based primarily on visual inspections that are limited. Each

building is unique in construction, design, age, maintenance, and repair history. All of these items can be critical to performance and if the program is to protect both the public and the building owner **each building should be properly investigated by a qualified professional, not just merely visually inspected.**

Comparison of binocular and close-up visual observation data sets (refer to the *Project Profile* article) suggests that aided (binocular) visual examinations from more than 30 feet are not always sufficient to detect significant cracking patterns, or displacement of facade units which may identify a hidden condition, or other deficiencies. Visual examinations from the ground also do not allow the inspector to touch and “sound” the surfaces to detect possible delaminations or even loose materials.

A “hands-on” inspection allows for close-up visual examinations as well as touching and “sounding” exterior surfaces. However, even if this type of inspection is performed on 100 percent of the exterior, it too has grave limitations for buildings constructed using facade

materials which rely on header coursing and/or hidden steel anchors and ties. Unfortunately, the deterioration of these critical structural components is concealed and problems are often impossible to detect from the exterior, even with close-up examinations. **Our firm has made investigative openings in areas of facades with no visual evidence of a problem on the exterior surface only to discover completely corroded anchors and ties lay beneath the exterior skin (see Figure 3).** An investigation which includes subsurface observations with a fiberscope or destructive openings through the exterior skin materials is often necessary to verify the condition of critical elements which are concealed within the exterior walls.

Although it is unreasonable to expect that all risk of facade failures can be eliminated on any given building, evaluations could be improved if high risk facades were not merely visually inspected, but actually investigated by expert professionals specializing in these types of construction.

- Kenneth M. Lies, AIA

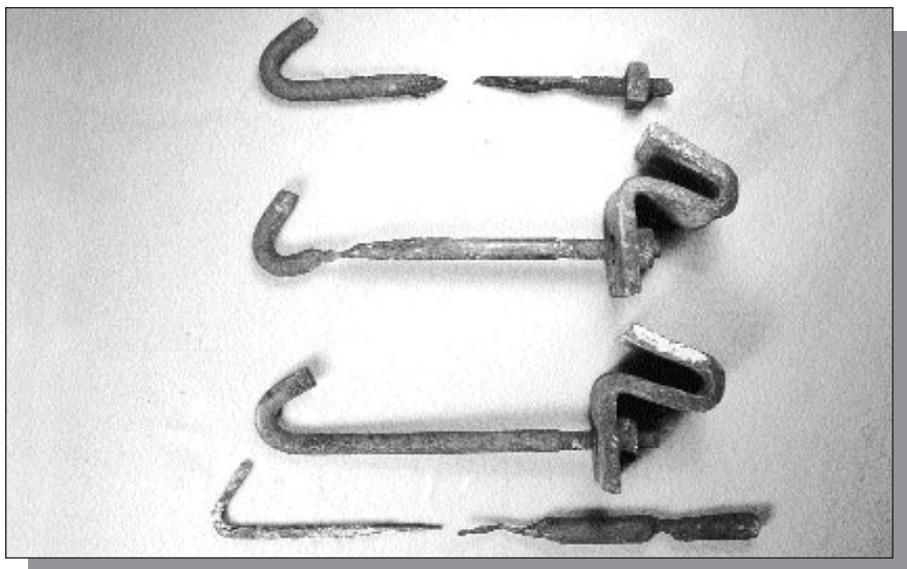


Figure 3 – Hidden anchors removed from a terra cotta facade showing varying degrees of corrosion.

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