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Imperial Repairs High Above Kakaako

Remediation for leaky penthouse windows requires custom fabrication of replacement components

Unique and dramatic designs can become challenging remediations when life cycles near their ends. A great example is the Imperial Plaza in the heart of Honolulu.

Constructed at the peak of the early 1990s real estate boom, the design of the commercial and residential tower combines a distinctive copper reflective glass exterior with striking diagonal lines. The high-rise exterior façade was framed with custom extrusions supporting large laminated glass panels in both vertical and angled positions. The top penthouse floors are housed in glass walls and sloped ceilings, affording incredible views of the city, mountains and ocean.

The large and unusually shaped mirror glass panels began to leak into the penthouse units. The AOAO board charged Hawaiana Management and exterior design consultants Trinity | ERD with the task of stopping the water entry on a long-term basis. Trinity was familiar with the building and its exterior façade, having worked on mutiple aspects of the building envelope over close to a dozen years. The investigation team was joined by contractor American Bucher JV Glass (ABJV), an Alaskan firm in Hawaii working on the new airport. The team knew from the beginning that few repair components would be purchased "off the shelf."

Water entry through the glazing and related seals was ongoing for more than a decade as components began to age. The components of the glazed façade move where connected to one another and where the window system transitions with concrete, steel and other building elements that move as a result of wind, thermal changes and material

degredation. Maintenance protocols relied upon contractors finding breaks in the gaskets or seals and attempting to seal them. Though initially successful, the need for a more effective and permanent approach was clear.

The first challenge was to determine what could remain, what would require replacement and how disruptive and costly the process might be. The investigation required an evaluation of both vertical and sloped glazing, which literally had investigators "walking on glass." Trinity's experience with large sloped skylights helped develop the scope of investigation and eventual remediation. In addition to the exterior investigations, Trinity and ABJV surveyed interiors to identify leaks from the building interior and further develop a methodology to arrest them. Since water is able to move within the glazing pockets, leaks had a tendancy to move depending on the direction and intensity of the wind.

The originally installed window system is a combination of laminated glass (a window panel with an interlayer bonded between two or more glass plies), aluminum framing, neoprene

and EPDM gaskets, pressure plates and framing (holding the glass panels in place), sealant and exterior cover-plates. The components are attached together and finished mechanically with a "beauty cap" snapped into place for aesthetics.

As with many exterior systems, all components do not age consistently. Intensity of ultra-violet light, wind direction, mechanical damage and gravity loads all play a role in the system changing and degrading over time. Openings made during the investigation identified changes to the components as a result of age and shifting elements. Fully identifying the original dimensions of components and making modifications to fit existing conditions took a great deal of homework and a little bit of guesswork. Repairs required each replacement piece to fit "as new" to function as a system. Concise measurements were key, as was an intricate knowledge of the original system.

Trinity presented more than one repair option to the board, clearly spelling out the pros and cons of each. The board elected to take the most holistic and forward-looking approach, replacing all degraded elements, allowing for maximum service life for the window system. The outlook for the new system is 20 years, provided it is properly maintained.

The broad experience brought to the team by ABJV provided access to suppliers of "one-off" components that allowed for the replacment of existing "like kind" that were no longer available from the original glazing designer and supplier, Kawneer, a large window division of Alcoa Aluminum.

"There was and still is a great deal to do," says Trinity Project Manager Shawn Moseley, who has more than 20 years of glazing experience. "Coordinating the work and the delivery of special parts, along with the communication with the board and the building population keeps me very focused and busy.

"The Imperial Plaza's custom-built exterior façade is a signature aluminum and glass system. Each part needed for the repair was isolated to develop a methodology for detailing replica replacement parts. Ordinarily, we'd begin by studying the original shop drawings. But we only had original architectural details that identified the original manufacturer, but provided no technical detail for what was built.

"All new parts are custom fabricated. The replicated laminated glass is a combination of bronze and copper tints to match the existing tint and the current building code. Kynar paint was computer-matched with the existing vertical faded extrusions."

The clarity of the new custom glazing, especially when viewed side-by-side with the original glass, is striking in contrast. It shows the extent of the weathering of the existing elements and the advances in laminated glazing over the past 30 years.

The unknowns of remediation this complex can fray the nerves of the

folks in charge of the funds. The investigation and subsequent remediation allowed for an extensive evaluation of the system and collection of data for resetting the capital reserves to care for this unique aspect of the Imperial Plaza. Special assessments are never welcomed by the building community, so the data collected was used to establish future reserves and minimize crippling special assessments.

Trinity and Hawaiiana have worked together on many buildings throughout Hawaii, evaluating and re-tooling the capital reserves for both residential and commercial structures, developing long-range plans for incorporating components that, at the time of coming into service, have a service life greater than 30 years, and are often not evaluated in an initial capital reserve. Windows and window systems are one of the more common elements in this category.

From a distance, the change is unnoticeable. From inside the units, the clarity of the new glazing enhances the beautiful views.

The Imperial Plaza glazing project has demonstrated the value of teamwork and experience. Trinity anticipated the challenges of the micro-climate. The valuable contribution of a knowledgable contractor with extensive resources was critical to success. Hawaiiana brought the management and coordination skills to effectively communicate with all parties and provide the almost unseen support services needed for the ongoing project.

While not complete, the project is far enough along to have worked through the typical bugs encountered early in a project. The marvelous glass enclosures high above the streets will be dry and have a better view of the beauty that surrounds. ❖

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