PG&E BUILDING AT 215 MARKET STREET

San Francisco, CA

ICRI Northern California Chapter
2017 Concrete Repair Awards
Simpson Gumpertz & Heger Inc.

OVERVIEW

The historic 215 Market Street Annex is a seven-story office building in downtown San Francisco. The steel-framed structure clad in polychrome glazed architectural terra-cotta on the street elevations and cast-in-place concrete on the rear elevations received a seismic retrofit in 1993 following the Loma Prieta earthquake. At that time, full height concrete shear walls, infilling the existing window bays, were added at two bays along the south elevation.

Following long-term leakage complaints, Simpson Gumpertz & Heger (SGH) conducted interior and exterior surveys of the building to investigate performance and maintenance of the windows, and subsequently performed a complete repair of the architecturally exposed concrete walls and historic wood windows.

THE STRUCTURE

Architects Bliss and Faville designed the 215 Market Street Annex, built in 1948, for the Matson Shipping Lines. Today the building is part of the general office complex for Pacific Gas & Electric Company (PG&E) and incorporates the same materials and design as the adjacent original 1924 building. Known as the Matson building, it is a historic landmark, included on the National Register, and designated a Category I building (highest historic merit) under Article 11 of the San Francisco Planning Code.

The building's south elevation is cast-in-place concrete covered by a painted plaster parge coat. The façade is punctuated by original double hung wood windows (Photo 1).

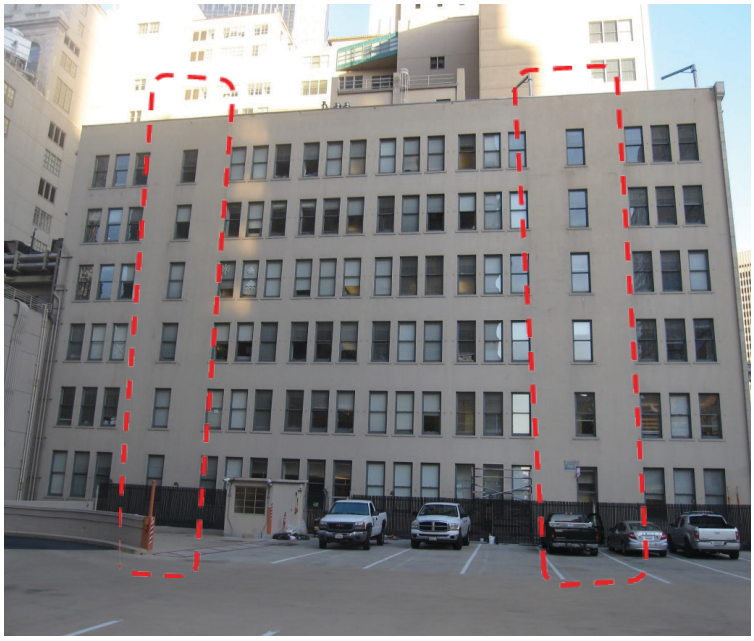

PHOTO 1: *South Elevation. Outline shows areas where shear walls were previously added.*

PHOTO 2: *Blistered and peeling paint. Concrete is cracked.*

PHOTO 3: *Blistered, peeling, and stained paint.*

INVESTIGATION

The project was initiated because PG&E had concerns about the waterproofing, as well as ongoing maintenance of the windows. Building occupants had reported water leakage and deteriorating building components, which became the basis for the owner's decision to implement repairs.

SGH conducted interior and exterior visual surveys, sounded the concrete wall, and water tested the windows and surrounding concrete. We conducted our initial surveys primarily from ground level with binoculars and from one swing stage drop.

The exterior wall finishes on the south elevation of the 215 Annex Building consisted of plaster-coated concrete. The plaster coating was in turn covered by numerous applications of paint, which was blistered, filled with water, and peeling in various locations (Photo 2). In addition to the failed coatings, we observed localized cracking and spalls in the concrete substrate, corrosion of embedded metal, as well as failing previous patches (Photo 3).

PHOTO 4: *Water testing with window isolated to test concrete wall.*

Where we sounded the wall at our one drop, we detected areas of hollow sounding plaster or concrete. The hollow areas aligned with the edges of the added shear wall.

Differential pressure water testing per ASTM E 1105 revealed numerous leaks in the wood window frames, glazing joints, and perimeter sealant joints (Photo 4). Water also penetrated through the concrete walls at cracks and joints (Photo 5).

PHOTO 5: *Water inflitration appears on interior face of concrete wall.*

INITIAL RECOMMENDATIONS AND BIDDING

For this type of barrier wall assembly, the exterior paint and plaster layers act as the waterproofing of the concrete and prevent moisture penetration into the building. As such, we recommended repairing cracks and spalls in the concrete and plaster followed by an elastomeric coating system to restore the wall to watertight condition. We also suggested that PG&E repair the wood windows at the same time as the coating and concrete restoration work to ensure a comprehensive and warrantable repair.

PG&E bid the project with allowances for spall removal and replacement, and crack repair. The coating specified was Sikagard 550W Elastocolor, two-coat elastomeric system with Sikagard 552W Primer. Construction drawings included details for infilling and flashing around the windows at the shear walls. The historic windows were replaced in-kind with new wood windows, but with laminated glass, stainless steel sill pans, and perimeter flashings for enhanced performance.

CONSTRUCTION: CHALLENGES AND DESIGN CHANGES

The existing paint contained lead, therefore an abatement contractor shrink-wrapped the scaffolding and removed the paint. The contractor conducted mockups of various paint removal techniques including hand scraping, chemical stripping, and sandblasting, followed by application of the specified paint system. SGH performed adhesion tests of the new paint coating (described below). While the chemical stripping and sandblasting provided the best adhesion test results, hand scraping provided a substrate that resulted in satisfactory adhesion. The existing paint was removed using hand scrappers. Once the building was scaffolded, we conducted a close-up survey of the entire wall. To prepare for the concrete and parge coat repairs, the contractor and SGH developed independent surveys using sounding techniques to identify areas of delaminated or unsound material. During this phase, we found many localized areas of delaminated or unbacked material, including discontinuous backing at transitions from cement plaster to concrete parge (Photo 6). We found that the new shear walls were stopped short of the adjacent windows and the area between the concrete

PHOTO 6: *Discontinuous backing behind plaster around windows.*

shear walls and windows was filled with lath and plaster over minimal light gage steel framing. There were no insulation, sheathing, air barrier, vapor barrier or flashings around the windows in these areas (Photo 7).

Because of the variations in the substrate and the reliance on the concrete to act as a barrier wall, we recommended considering a more robust coating system than the originally specified elastomeric coating. The contractor installed Dryvit TAFS II finish system, consisting of a base coat, reinforcing mesh, and finish coat over the substrate (Photo 8).

PHOTO 7: *Gaps in wall substrate around windows covered simply with lath and plaster.*

PHOTO 8: *TAFS II fully reinforced base coat installed. Finish coat is not installed.*

PHOTO 9: *Existing concrete wall. Existing coatings are partially removed and localized spall and crack repairs are completed.*

The contractor made conventional concrete spall repairs using SikaTop 123, a polymer modified cementitious patching mortar, #16 gauge stainless steel annealed tie wire and Stalgard coated Tapcon anchors (Photo 9). Where we had voids in the wall, we integrated 20 gauge galvanized sheet metal (GSM) backing to provide adequate backing. To repair light gauge framed rough openings, we reframed the jambs with GSM clips and exterior grade DensGlass sheathing (ref. Figure 1 below).

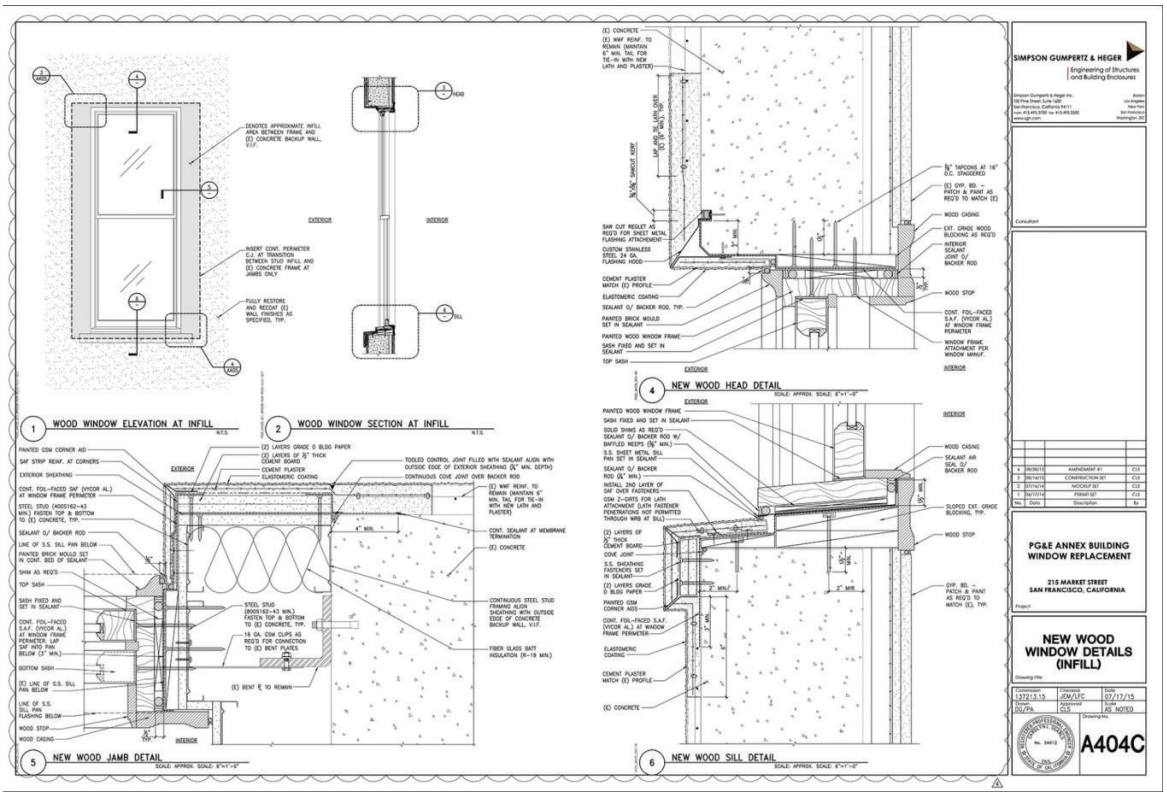

FIGURE 1: *Window details at modified infill conditions.*

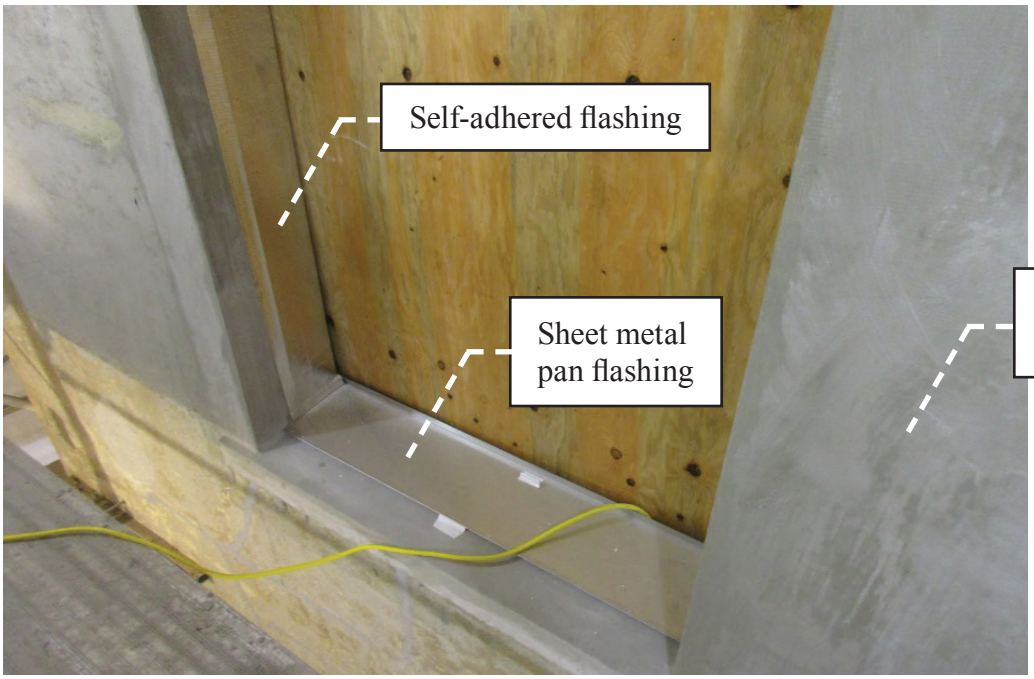

PHOTO 10: *TAFS II, self-adhered flashing and stainless steel sill pans set in fully restored window rough opening.*

The rough openings were stripped in with self-adhered flashing and finished with Sikaquick VOH, applied over stainless steel anchors and self-furing lath. We integrated the new windows with the coating by stripping in the window rough openings with the TAFS II base coat followed by stainless steel sill pans and self-adhered flashing prior to new window installation. (Photo 10). After window installation was complete, we installed perimeter sealant joints between the painted wood brick molds or sill pan and TAFS II base coat.

PHOTO 11: *TAFS II adhesion test in progress.*

Testing During Construction

We performed adhesion tests of the Sikagard 550W and TAFS II coating systems in general compliance with ASTM D7234-12: Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-off Adhesion Testers. We performed 50 adhesion tests on the Sikagard 550W coating and 24 adhesion tests on the TAFS II coating (Photo 11). We administered tests on an array of different substrates that varied in the amount of substrate preparation to determine the appropriate amount of surface preparation required. Variations in the substrate included percentage of existing coating remaining, soundness of concrete, and primed or unprimed surface. The appropriate amount of surface preparation was selected by determining which surfaces achieve coating adhesion at a strength equal to or greater than the manufacturer's requirements. We performed sealant adhesion tests on each substrate and water tested two windows and the surrounding wall.

SPECIAL FEATURES OF PROJECT

The poor condition of the concrete substrate and the numerous voids necessitated a change in approach during construction. While we had drawings showing the addition of the shear walls during the seismic retrofit and had conducted an investigation at one-swing stage drop, the team was surprised by the magnitude of the poor quality substrate. By working closely with the general contractor and subcontractors, we were able to substitute a more robust coating system that could perform over the wide range of surface defects and framing conditions enountered. In switching to TAFS II, we reduced the number of cracks requiring repair by changing the lower limit of crack repair from 1/32 inch wide to 1/16 inch wide. The total coating system thickness increased from 16 mils to 94 mils, minimizing the amount of swale repair and existing coating removal and resulting in reduced repair costs for a more aesthetically pleasing finish. In addition, TAFS II is fully reinforced, and it is offered in multiple textured finish options that allowed us to more closely match the original wall finishes.

The work at PG&E's Annex Building has presented many challenges to what at first might have seemed like a fairly conventional concrete repair and window replacement project. Through a thoughtful blend of traditional repair methods and customized solutions, the project team helped deliver solutions that should help preserve this important San Francisco landmark for many years to come.