Reinventing 690 Market Street

Historic Structure Reclaimed, Vertically Expanded

By Navin R. Amin, S.E. and Vivian L.K. Wan, S.E.

This transformation of an historic office building into a modern residential tower is a testament to the engineer's key role in revitalizing the urban landscape.

690 Market Street dates back to 1890. Originally an 8-story tower built as the headquarters for the San Francisco Chronicle newspaper, it was designed by architects Burnham and Root in the "Chicago School" style that was gaining prominence. At the time, it was considered one of the world's most innovative buildings. It was the West Coast's first steel-frame skyscraper, with a tower that boasted the world's largest clock.

The building withstood the 1906 earthquake but suffered 2 major fires. The clock tower was destroyed, not to be replaced. The building underwent several alterations and expansions, including a 16-story annex in 1905. The Chronicle eventually relocated its headquarters, and the building was "modernized" in the 1960s; the architecturally rich bay windows were destroyed and the remaining façade was masked with a metal and marble cladding.

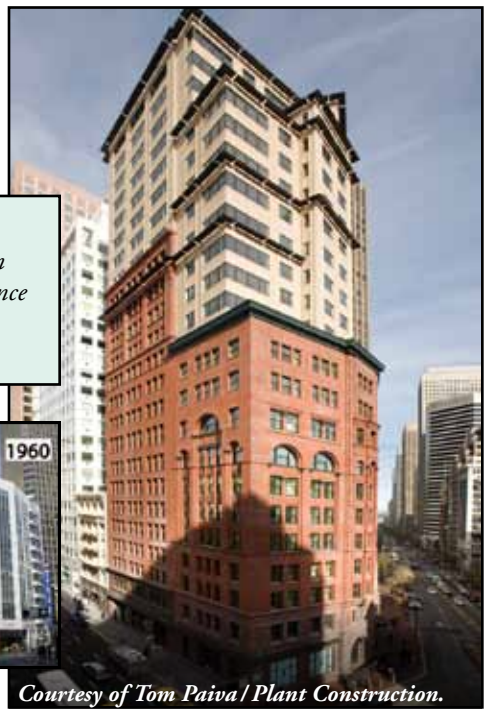
In 2004, new owners received approval to expand the building to 24 stories and used this opportunity to restore the façade, including re-construction of the original bay windows. The resulting 24-story, 258,000 square foot building contains 44 private and 57 fractional residences.

The complexities of this assignment were considerable. The site, at the intersection of the City's main boulevard and two other major streets, was extremely constricted. In addition, an underground transit tunnel lay beneath the building. Temporary shoring, demolition, and initial design were performed with limited information and no available structural drawings.

Since the building had undergone multiple expansions over the years, the resulting structural components were of various materials (cast iron columns, hollow clay tile floors, unreinforced masonry, steel moment frames, wind gussets and riveted joints). The foundations had various elevations, again with different components: steel grillages, cast iron columns, and brick piers over piles and pile caps.

The structural design team found creative solutions to the various design challenges. The new building has an eccentric core and irregular floor plans; in order to reduce torsional irregularity, it was necessary to optimize stiffness distribution of the combined structural systems. For the new structure, a lateral load resisting system combining shotcrete walls, SMRF and SCBF was devised, and a new foundation was added. The design met the 1997 Uniform Building Code (UBC).

Middlebrook + Louie was presented an NCSEA Outstanding Project Award for The Ritz Carlton Club & Residences in the 2009 NCSEA Excellence in Structural Engineering Awards Program (Category – New Buildings $30M to $100M).



Courtesy of Tom Paiva / Plant Construction.

New floor systems and lateral framing were added in core areas. New slabs were tied to existing slabs to form a complete diaphragm. Existing slabs were connected to new shotcrete walls to transfer lateral forces. A non-typical steel braced frame connection detail was designed to accommodate the building's relatively small core bay.

Shotcrete walls were applied to the unreinforced masonry perimeter walls, providing out-of-plane resistance and forming part of the lateral resisting system. The minimal application of 10-inch shotcrete to support these walls was very cost-effective. Various analyses were performed, evaluating the impact of the wall stiffness on the overall building performance during earthquakes.

Several features of the original structural system (perimeter masonry walls, perimeter bay floor framings and slabs) were to be retained in the new design. Great effort was taken to integrate these existing materials, minimize demolition complications and accommodate construction sequencing. For example, new concrete encasements augmented existing cast iron columns and brick piers at lower levels, to support additional floor loads.

A new 5-foot mat foundation integrated various pre-existing foundation elements, and supports the additional gravity loads and overturning moments associated with the vertical expansion. Since the new building has multiple setbacks, transfer girders consisting of double and triple beams support the transfer columns. Special details connect these girders to the concrete-encased cast iron columns. Given the complexity of this project, the outcome was highly successful. Even with complications during demolition and analysis phases, the project was built on schedule. The structural design was also a large factor in achieving budget goals, which are critical to housing projects.

The use of shotcrete walls directly benefited the owner in 2 ways: sellable space was maximized and, since potential falling hazards from the exterior were reduced, the insurability of the building was enhanced.

The new building is clearly in sync with the historic nature of the environs, including Lotta's Fountain, an iconic San Francisco sculpture at the site where the city annually commemorates the 1906 earthquake.

The owner is touting the building as "an historic skyscraper reincarnated." One major architecture critic stated that the team "seized a once-in-a-career opportunity to make things right on a historic corner of San Francisco."▪

Navin Amin began his structural design career in Chicago, working with the late Fazlur Khan on Sears Tower and other notable buildings. He joined Middlebrook + Louie Structural Engineers in 1997 as a Principal.

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