



Pacific Place

San Francisco, California



The Pacific Place project is a major reconstruction and seismic upgrade of a Category I historic building. When built in 1908, it was the largest concrete office building in the country. The structure is a ten story non-ductile concrete frame, 192' by 144' in plan. To convert the existing floor plan, with its 16' by 16' column grid, to "prime" retail space, the developer proposed a bold scheme to remove most of the columns and open up the floor plan. This led to a dramatic and difficult project in which the lower four stories were completely demolished and three floors were reconstructed in their place. This work occurred while the upper five stories remained. Of the original 86 interior columns, 74 were removed (86%), while 12 were strengthened and only 15 columns were added.

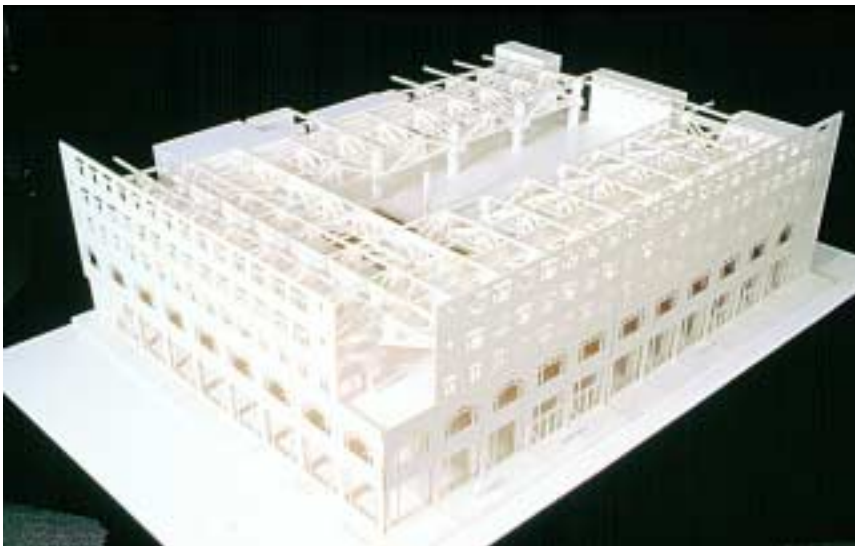
The greatest challenge of the project was to devise a structure within the existing structure to transfer loads from the existing upper five floors to the new lower floors, without shoring. This integrated approach proved cost effective. As such, the success of this job depended on the engineer dictating the construction sequence. The design used pre-loading of the truss network to eliminate deflections at load transfer and protect the existing brittle structure.



Construction Sequence

After the construction of a new foundation system of drilled piers, the contractor erected new columns up through the existing floors and strengthened the existing columns that remained. New floors were then built between the existing framing. Below the 5th floor, each column was sandwiched between two new trusses. Each truss is connected to half of a steel jacket, so that with the trusses in place, a complete steel wrap surrounds the column. Once the contractor placed the new framing within the original framing, trusses were pre-loaded by jacking them against the columns they would carry. When the contractor had the truss network completely stressed to carry 100% of the supported load, the trusses were locked off. At this point, the original framing was demolished from the 5th floor down and the reconstruction was completed.





Seismic Upgrade

The seismic upgrade portion of the project consists of concrete shearwalls mixed with steel braced frames. Steven Tipping + Associates performed a complete pushover analysis to do the capacity design. Many collapse mechanisms were studied using combinations of upper and lower bound values for material and soil strengths under multiple loading patterns to cover the range of failure modes and produce good ductile detailing. To improve performance by effectively increasing the ductility of the braced frames, inexpensive friction dampers were added which utilize sandwiched brass shims, pre-tensioned bolts, and slotted holes.

This project is exceptional in its scope and technical difficulty. In its finished state, people can walk under the exposed network of supporting trusses, see suspended ends of removed columns, and understand how the structure works. It is an outstanding example of exposed structure in a dramatic commercial space and a credit to the work of engineers and builders.

Pacific Place, San Francisco

Owner: Pacific Resources
PCX Development, Inc., San
Francisco, CA

Architect: Gensler, San
Francisco, CA

Structural Engineer:
Stephen Tipping +
Associates, Berkeley, CA

Steel Fabricator: W & W
Steel Co., Oklahoma City, OK
(AISC member)

General Contractor: Plant
Construction, San
Francisco, CA