BRIERLEY ASSOCIATES
Creating Space Underground

IN DEPTH
September 2018

# 706 Mission Street San Francisco, CA

*Deep Support of Excavation, Underpinning, Micropiles and BIM Aided Design*

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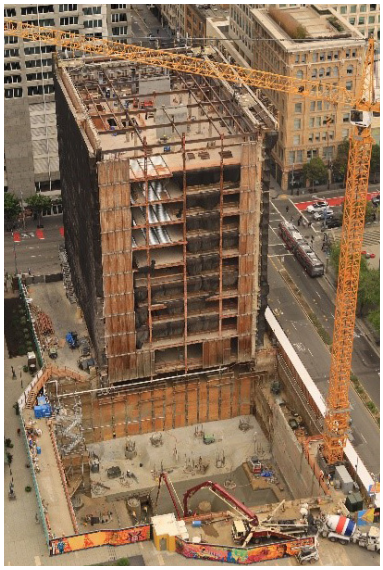
Development in downtown San Francisco continues with taller structures and deeper more complicated basement excavations. Tight urban sites in the city pose several challenges ranging from existing underground utilities, adjoining structures and difficult geotechnical conditions. Brierley Associates teamed with Malcolm Drilling Company to deliver design-build micropile foundations and temporary support of excavation and underpinning systems for the 706 Mission project, a new 480-ft tall, 43-story residential high-rise tower that is currently under construction.



San Francisco's Mexican Museum is relocating to 706 Mission and will occupy the lower four floors of the building once it is complete in 2019. The new tower is being integrated with the adjacent 1903-vintage, 10-story Aronson Building, which survived the 1906 earthquake and fire and the 1989 Loma Prieta earthquake, and is undergoing a seismic retrofit as part of this project. In addition to the Aronson Building to the east, the project site is constrained by the 36-story Park Central hotel to the north, the existing three-story deep Jessie Square garage to the west, and the busy Mission Street corridor to the south. Protection of these adjacent structures, underground utilities and improvements during the excavation of the new 706 Mission basement was of paramount importance. One protective measure at the onset of design was the development of Building Information Models (BIM) by Brierley for the existing utilities under Mission Street and the Aronson Building substructure to assure a conflict-free and coordinated design.

Brierley Associates designed the temporary support of excavation system for the approximately 45-foot deep basement excavation and the temporary underpinning for the Aronson Building. The work was complicated by the fact that a majority of the site was occupied by an existing reinforced concrete basement structure. Portions of three of the existing basement walls were required to be left in place while the structure's interior slabs and walls were gutted. Temporary support of excavation elements included tiebacks to restrain the existing basement walls, tied-back soldier piles and wood lagging with deep soil mixing between the solider piles to improve stand-up time in the potentially unstable dune sand and marsh deposits that were exposed during excavation.

The Aronson Building temporary underpinning system consisted of heavy structural steel load transfer frames supported on tied-back slant drilled piles. The staged underpinning scheme permitted the support elements to be installed adjacent to the Aronson Building's existing shallow spread footings without disturbance. The existing footings had to be removed completely to create space for new structure construction. The transfer frames included jacking details that allowed them to be preloaded to reduce building settlement. As noted earlier, the Aronson Building is undergoing a seismic retrofit, which includes two new shear walls. The shear wall's deep foundation, designed by Brierley, consisted of high-capacity micropiles installed in a low-overhead condition underneath the existing building.

Brierley Associates also supported Webcor Builders, the project's general contractor, with additional construction engineering services. Brierley solved the challenge posed by the extremely limited footprint available for the project's tower crane foundation using a heavy steel grillage supported on four drilled piers installed immediately adjacent to the new basement excavation, and designed a jacking system to preload a new truss that was installed inside the Aronson Building.