Stacked Up: 185 Berry Street at China Basin

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Building Design and Construction

Since the first application of base isolators some 23 years ago on a legal services center in Rancho Cucamonga, Calif., the technology has become a popular seismic design approach throughout the West Coast. The technique is fairly simple: construct the building atop a series of elastomeric bearings or sliding friction plates, thereby separating the structure from its base and the unstable ground.

Until recently, base isolation applications have largely been limited to separating structures from the ground. All that changed four years ago when San Francisco-based real estate company McCarthy Cook commissioned a Building Team to design and construct a two-story addition atop its three-story office building at 185 Berry Street in the city's China Basin district.

Construction could not disrupt the activities in the nearly fully leased building below, where tenants included several University of California, San Francisco, bioscience laboratories. That caveat all but eliminated the possibility of applying conventional seismic construction methods, says John Sumnicht, SE, principal with engineer Simpson Gumpertz & Heger, which teamed with the local offices of architect HOK and contractor Hathaway Dinwiddie Construction on the 150,000-sf addition.

"Conventional upgrade approaches would have involved the addition of new reinforced concrete shear walls throughout the structure," says Sumnicht. "That would have been highly disruptive to the bioscience laboratories operated by UCSF."

To minimize disruption, the project team devised a solution that involved constructing the two-story, steel-frame addition on seismic isolation bearings over the roof of the existing concrete-frame structure. Instead of having the existing building and the addition work as a single monolithic reinforced structure, this approach separated the two, with the new structure acting as a giant mass damper.

"During strong earthquake shaking, the new stories would tend to move to counteract and dampen the motions of the existing building and actually reduce the amount of earthquake force and displacement demand on the existing structure," says Sumnicht. This scheme not only permitted the new space to be constructed without requiring structural upgrades, it also improved the seismic performance capability of the existing building and obviated the need for an intrusive seismic retrofit of the occupied building below.

This structural approach had never been used before in the U.S., so the project team had to work closely with the city's Building Inspection Department on a peer-reviewed performance-based design. Using a highly detailed analytical model of the structure that represented the nonlinear characteristics of the existing building, the seismic isolators, the addition, and the existing foundation piles beneath the structure, the team was able to demonstrate that the existing structure would perform as well as would be expected of a new code-conforming building of similar size and occupancy. After 21 months of intense analysis and review, the city gave the green light.

In all, the project employs 87 seismic isolation bearings, including 33 lead-rubber bearings and 54 elastomeric slider bearings. Of particular concern, says Sumnicht, was isolating the relatively light steel superstructure while keeping the isolators stable at a displacement of +/- 45.5 inches, which was 1.5 times the code-required maximum displacement of +/- 30 inches. This called for an isolation system that consisted of 45-inch-diameter lead-rubber bearings and a new elastomeric-based sliding system that provided +/- 30 inches of displacement. The additional +/- 15 inches of displacement required was accommodated in the 24-inch diameter elastomeric bearings. — *Dave Barista, Managing Editor*

PROJECT SUMMARY

San Francisco, Calif.

Special Recognition

185 Berry Street at China Basin

Building Team

Submitting firm: Simpson Gumpertz & Heger (structural engineer)

Owner: McCarthy Cook

Architect, MEP engineer: HOK

General contractor: Hathaway Dinwiddie Construction