1st on the Block

A San Diego condominium project sets a structural precedent in a high-profile part of town.

BY ROBERT PYLE, P.E.

SEEMINGLY OVERNIGHT, DOWNTOWN SAN DIEGO'S once-quiet, industrial East Village has transformed into a bustling urban mixed-use neighborhood, thanks largely to the opening of Petco Park, home of the San Diego Padres, in 2004. Since then, competition has been fierce among residential developers in the area who are anxious to complete projects as quickly as possible.

And speed of construction is what paved the way for the 76-unit Nexus condominium building to become the first steel multi-story residential project constructed in downtown San Diego since the 1980s. This speed was due in part to the "one-stop-shop" nature of the project's eSteel design-build team, an Albuquerque-based collaborative partnership of structural engineering firm Chavez-Grieves Consulting Engineers, Inc., steel fabricator AmFab, Inc., and steel detailer dtl's, Inc. In all, 2,000 tons of structural steel was used on the project, which includes eight floors of steel-framed above-grade residential and mixed-use space, and three floors of below-grade steel-framed parking.

A New Approach

eSteel consulted the rest of the project team on a number of framing solutions before selecting a buckling-restrained braced frame

Above, left: Nexus is the first steel multi-story residential building to be constructed in downtown San Diego since the 1980s.

Below, left: The eight-story project, which includes three floors of underground parking, used 2,000 tons of structural steel.

Right: The project was the first in San Diego to use a buckling-restrained braced frame system.

Photos: KMA Architecture and Engineering

(BRBF) system. A buckling-restraint brace (BRB) acts like a large shock absorber, with a central plate or cruciform cross-section stretching in tension and shortening in compression. In contrast, a typical special concentrically braced frame (SCBF) has diagonal braces that stretch in tension but buckle in compression, which is not as ideal due to the buckled behavior. The BRB works without global buckling because the central plate is grouted solid—but free to elongate and shorten—inside a larger restraining tube.

Because this was the first time the BRBF system had been used in San Diego, the city's planning department was concerned that it was not recognized in the locally enforced UBC code. The department informed the design team that there would be a 90-day review period with no guarantee that they would approve the BRBF system, since it would set a precedent in town.

A workshop was set up between city officials and the eSteel team with support from AISC and Dr. Chia Ming Uang from University of California at San Diego. Dr. Uang has tested the largest buckling BRBs in the U.S. to date, and the samples for this project were loaded up to 1,200 kips. The workshop involved discussion of the specific design of the structure, review of the requirements included for the BRBF system in the 2005 AISC *Seismic Provisions*, and review of Dr. Uang's test results. It paid off for the design team, as the building department approved the plans two weeks after it took place.

Tight Site

On a job site with no lay-down area, everything had to be organized so that steel could be erected directly off of the trucks. The project involved significant early coordination between the structural and mechanical teams to ensure proper fit-up. Several openings were left in the framework so that building systems could be easily transported through the beams and properly placed. Approximately three or four beams per floor, used for shoring, were removed once the concrete floors cured, to raise the ceilings in certain areas.

Steel was also used for Nexus' balconies; all exterior steel was galvanized. The balconies were dropped down in thickness from 2 in. to 3 in. so that the floor slab could be cut into and sloped to allow for drainage. MSC

Painted galvanized steel was used for Nexus' balconies.

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