The David Brower Center / Oxford Plaza Housing

San Diego, CA

Team

Owner:
Equity Community Builders
San Francisco, CA

Architect:
WRT/Solomon ETC, San Francisco, CA

Engineer:
Tipping Mar and Associates, Berkeley, CA

General Contractor:
Cahill Contractors, San Francisco, CA

Reinforcing Bar Fabricator:
Pacific Coast Steel, Fairfield, CA

Total Project Cost:
$74 million

Total Project Size:
44,097 sq ft (4-stories)

Photography:
Tipping Mar and Associates

STRUCTURAL FRAMING SYSTEM

The David Brower Center / Oxford Plaza project is a four-story office building and conference center, a multi-unit residential building, ground floor retail space, and an underground parking garage.

The David Brower Center office structure forms the northern boundary of the complex. Oxford Plaza is a multiunit residential building situated directly to the south and supported on a second-story post-tensioned podium slab over ground floor retail space. The single-level, below-grade garage covers the entire site and is composed of a concrete mat slab two feet to two-and-a-half feet thick, shotcrete walls, and a mild-reinforced first floor slab.

The David Brower Center incorporates a dual seismic-force resisting system, with two centrally located C-shaped cores acting in conjunction with two transverse moment frames at the ends of the building. The frames are located outboard of the central core walls to control torsional response. In the longitudinal direction, the core walls resist the entire seismic load. The gravity system consists of concrete columns supporting nine-inch post-tensioned slabs, Longitudinal bays are spaced at 27 feet. Along the short axis, two 16-foot bays flank a central 28-foot bay.

UNIQUE STRUCTURAL AND/OR ARCHITECTURAL DESIGN FEATURES

Post-tensioned concrete shear-wall cores are a key innovation employed in the Brower Center lateral system. These cores combine mild reinforcement, designed to yield and dissipate seismic energy, with high-strength unbonded tendons, which supply an elastic restoring force. The combined action of these two types of reinforcement exhibits highly ductile seismic response along with recentering behavior. The elimination of residual seismic drift is a key component of the "green" design criteria for this LEED Platinum design, greatly enhancing the functional survivability of the structure subsequent to a major earthquake.

A similar concept was used in designing the two post-tensioned moment frames, located toward the ends of the elongated building. These frames reduce the demand on the core system along the north-south axis and help control building torsion. The moment-frame joints are detailed to hinge at the column face; when laterally displaced, these joints tend to recenter and close owing to the clamping force generated by the unbonded axial tendons located in the frame beams.

REASONS FOR CHOOSING REINFORCED CONCRETE

Structural concrete was a natural choice for this project becasue of the extensive below-grade construction, concrete's beneficial thermal mass durability.

As cement production is a major source of greenhouse-gas emissions, designing concrete mixes with the lowest possible cement content was a high priority. Use of ground blast-furnace slag was key in reducing co-emissions by about 1,000,000 lb., compared to conventional mix designs. Cement replacement ratios up to 70 percent were employed. The most common concrete mixes were 50 percent slag, with cement contents of only 212 lbs/cy for typical 3,000 psi designs.

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