

CONVENTION CENTERS

NEW SEISMIC SYSTEM BRACES UNUSUALLY TALL CONVENTION HALL

With the redundancy of a belt and suspenders, a patent-pending girder system braces an unusually tall addition to the San Francisco's convention center and shaved an estimated \$2 million in steel cost from the project. But overall costs at Moscone West keep rising, partly because of city-requested changes to floor layouts.

Even with just three floors, the 115-ft-tall project stands as tall as a nearby 10-story building, and contains so much steel with 16,500 tons, that eleventh-hour changes to floor layouts resulted in coordination problems for Moscone West's seven steel producers. So far, construction costs are at \$174 million, plus \$5 million in change orders for general contractor Hunt Construction Group Inc., Indianapolis, which bid \$169 million.

Overall costs remain "comparable" to those of other convention centers in dense downtowns, says Ray Fong, project manager in the city's Dept. of Public Works, who intends to hold total costs to \$182 million. He says tinkering with the design during construction will help capture more business, beginning with the first booking in August 2003.

Now half-finished, Moscone West will add 775,000 sq. ft. to the 1.2 million sq. ft. across the street in Moscone North and South. Though marketed mostly for meetings rather than exhibits, Moscone West will hold exhibits up to 27 ft. high within floor-to-floor heights of 38 ft. The columns, although tall, must support spans as large as 210 ft. in the third floor ballroom, designed for 7,000 people.

"It's pretty gutsy to go more than one level with a convention center" says Kevin Hart, vice president in the local office of Gensler, part of a three-firm venture that designed Moscone West. You have very heavy floor loadings and very heavy exit loadings," he adds, pointing to stairwells as wide as 22 ft.

Last minute changes to stairwells made for problems coordinating steel production in the U.S., Canada and Taiwan. We're currently about 23 days behind schedule due to early changes in the project" says Tim Smith, Hunt's onsite project manager. Hunt's contract calls for substantial completion by next Jan. 23 to avoid daily penalties of \$50,000.00. Delays unrelated to floor layout changes also hurt. Unable to get rolled steel for columns specified as W36x798 jumbos, Hunt spent seven months obtaining built-up sections. Steel fabricator and erector Herrick Corp., Pleasanton, Calif., did "phenomenal" work under its \$27 million contract, Smith says.

Significant steel fabrication went into 360 spans with the "coupled girder moment resisting system" says Raj Sahai, a principal at local Structural Design Engineers. But the system that he and a partner devised saved \$2 million on the steel, Sahai claims.

Designed to keep the building functioning as a shelter after a magnitude 8.2 earthquake, the system resembles a cross between a Vierendeel truss, which lacks diagonals, and an eccentrically braced frame, which uses diagonals as sacrificial elements. But instead of using stubby diagonals, which sometimes make floors uneven after a quake, Structural Design Engineers used stubby sacrificial columns welded to girders as long as 30 ft. The resulting 9 ft. deep system reduced unbraced lengths of story high columns to under 28 ft., saving more than 100 lb. Per linear ft. in some columns, Sahai says. Between floors, diagonal friction dampers link coupled girders, to limit sidesway to 1% of the story height.

Sahai credits Gensler's team with taking a chance. "They really let us experiment with an idea that's never been done before," he says.