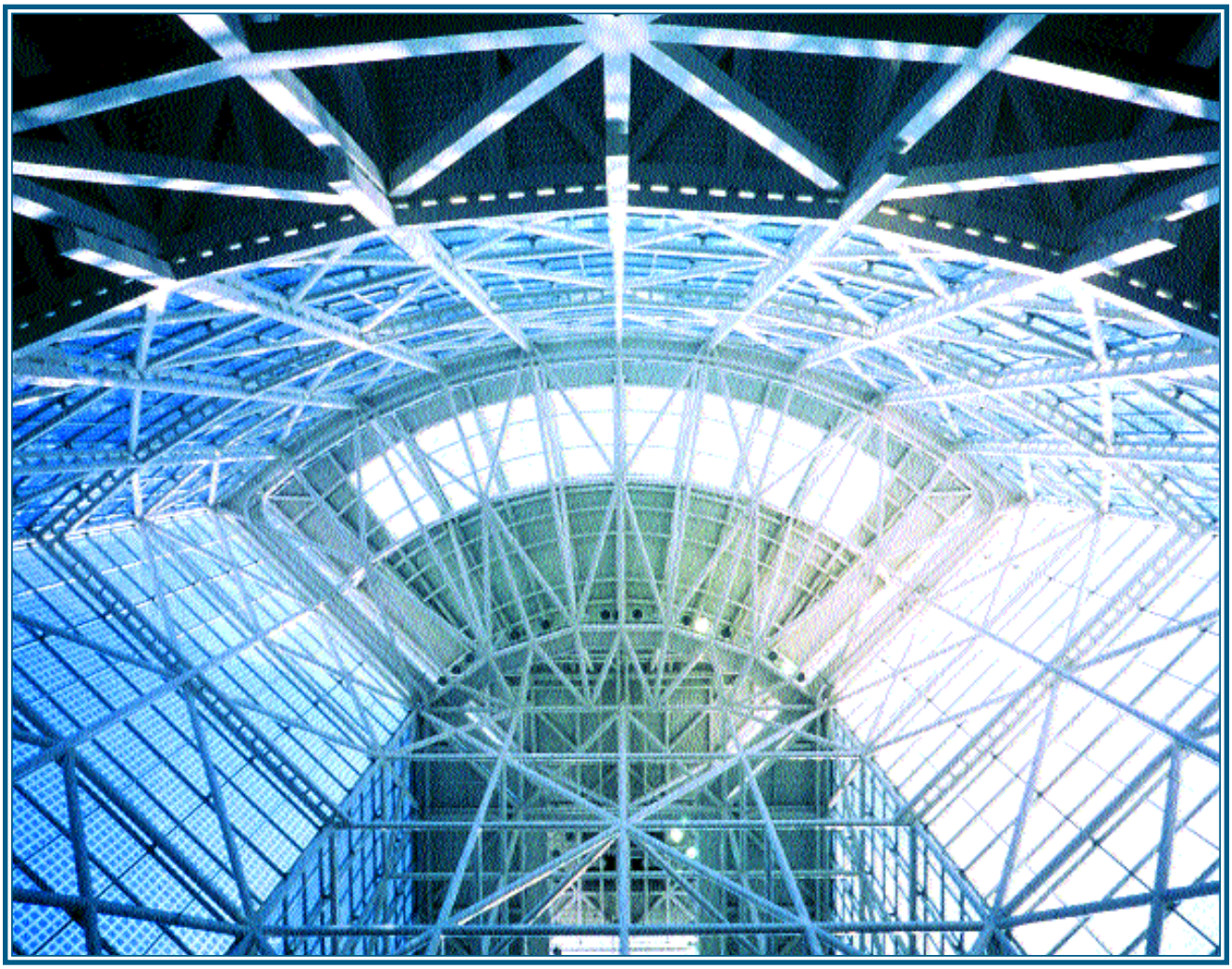
Los Angeles Convention Center Addition

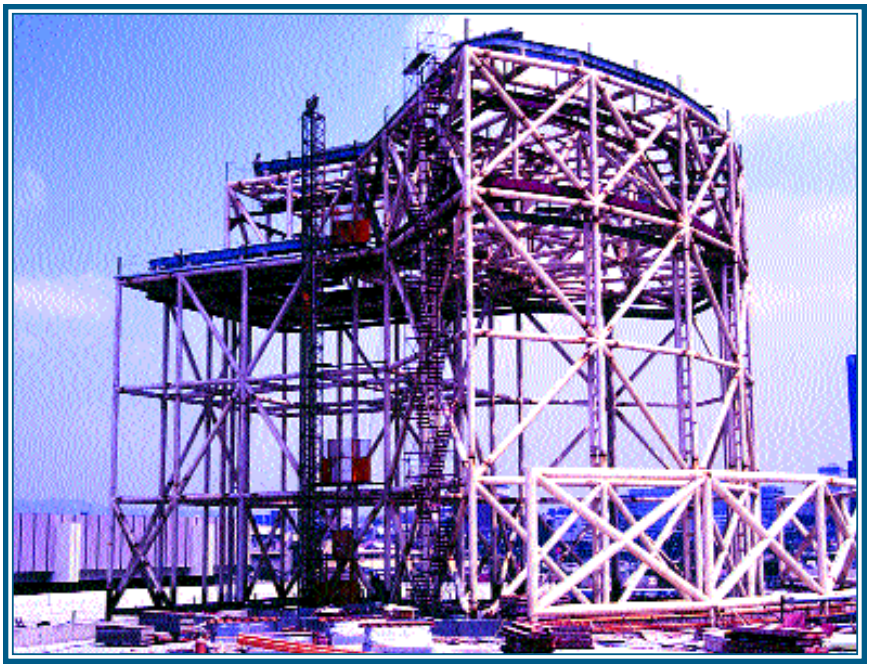
For the booming convention and meeting industry, bigger is almost always better. And adding 350,000 sq. ft. of exhibition space and 125,000 sq. ft. of meeting rooms to the Los Angeles Convention Center created the largest exhibit space on the west coast.

The expanded center serves as a striking visual entry to downtown Los Angeles with two soaring, skirted entry pavilions joined by a covered walkway, all glazed in teal-colored glass with white framing. Loading docks and exhibition space are concealed behind a curved teal wall, while the translucent entry pavilions welcome pedestrians on the opposite side. The city's skyscrapers, palms and mountains serve as pieces of urban art framed by the building's glass.

Glass was an integral architectural element in the building's design. Daylight streams through ceramic-fitted glass panels in the entry lobbies and through pyramidal skylights along the length of the concourse. The framing systems and walls were painted white to reflect the light into the building's interior, creating a "joyful" building.



While the architecture is striking, the engineering for the project is best described as complex. Because of the vast expanses of space required for a convention center—the South Exhibit Hall features a 230' x 960' x 40'-high column-free expanse—and Seismic Zone IV requirements, the seismic structural elements assist in the definition of the interior space.



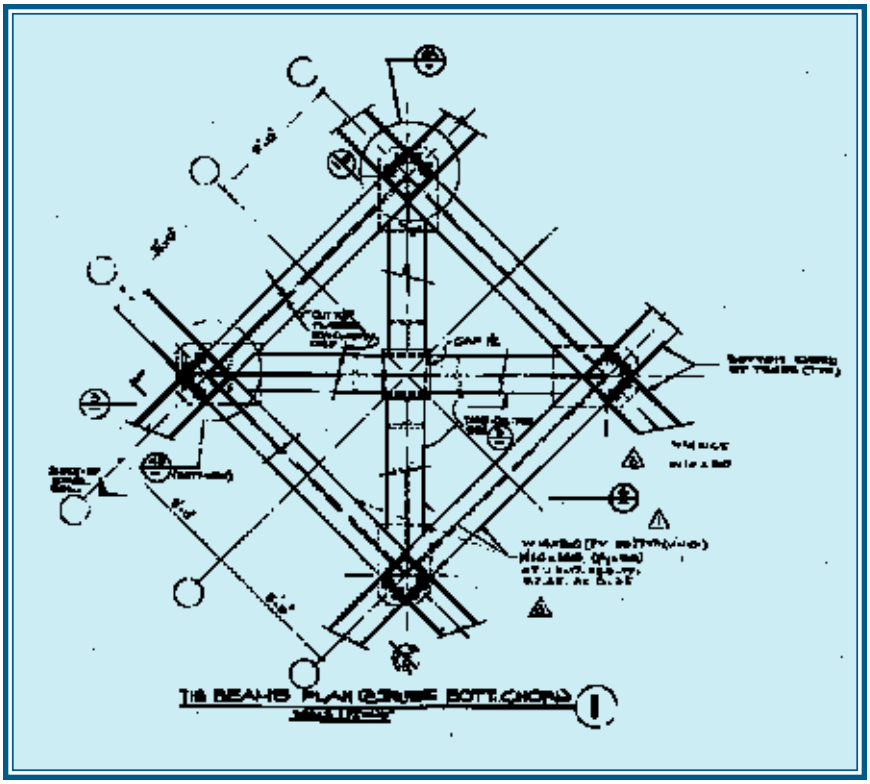
In order to meet the column-free space requirements, structural steel members were chosen for the roof system. Steel provided the lightest possible structure to

provide an efficient structural system to resist lateral loads.

The uninterrupted open space requirement dictated the use of "star" columns spaced at 240' on center. The columns consist of four 14" wide flange sections welded together around a 16" square central tube and encased in concrete. Each "star" column supports a pair of 20'-deep transverse primary trusses and a pair of 20'-deep longitudinal secondary trusses. The transverse trusses span 240' and the longitudinal trusses span either 60' or 120'. There also are 10'-deep longitudinal trusses at 30' on center spanning either 60' or 120' between the transverse primary trusses. Between these shallower secondary trusses are 14" wide flange purlins at 10' on center.

The Exhibit Hall's lateral system is a steel diagonally braced frame. The 60'-high frame is constructed of 20'-high segments. In 22 perimeter locations, each of the segments is braced for a total of 66 chevron frames. Bracing also is provided in some interior areas, such as between the exhibit space and the end of the hall.

Although the Exhibit Hall floor and the parking level below are cast-in-place concrete, the steel columns continue from the roof through the concrete levels to the foundation. This design was utilized to simplify the coordination between the concrete and steel structures, and to allow for the erection of the structural steel portions prior to the concrete construction.

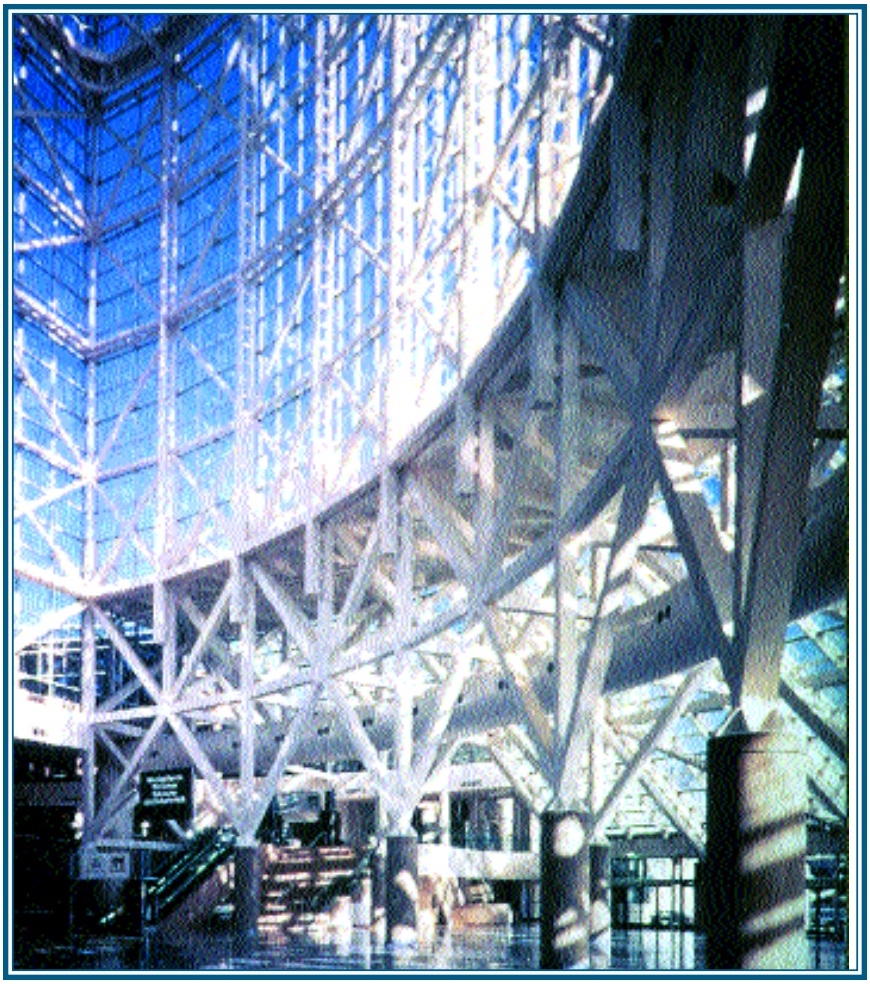


The Entry Pavilions feature exposed steel supporting large expanses of glass. The pavilion structures were constructed of welded steel pipe sections to form a three-dimensional space frame, which was designed for lateral forces caused by wind and seismic activity. The glass panels required strict lateral deflection criteria in the design of the pipe space frames. The Entry Pavilions feature a 160'-high clear space, the equivalent of a 10-story building. Further complicating the design is the unusual shape of the Pavilions: One side of each Pavilion is circular, while the other side connects to a rectangular shape. In addition, the base of the structure flares outwards, requiring sloping members.

Tracking down the gravity and lateral load paths of these complex three-dimensional truss frames required computer software not readily available off-the-

Judges Comments

Structural steel design at its ultimate. The designers put tremendous thought into the connections and joints to achieve the desired architectural requirements. Good work by the designers, detailers and erectors.



shelf. Instead, two R&D staff members from the structural engineer developed a proprietary software system exclusively for modeling, analysis, design and drafting of space frame structures. Initially named SPACE, the same software system was utilized for the structural analysis and design of the Biosphere II space frame in Arizona.

The steel pipe space frame sections consist of 12"-diameter pipe sections to create a completely uniform design—but with varying wall thickness from 7/8" to 3/" (x-x strong to standard pipe) because of varying load conditions. The pipe are connected with T, K and Y connections, which necessitated special welding requirements and details. Up to 14 pipes emanate from a single node and, in several locations where long spans were required, double tubes connected with perpendicular tubular spacers—similar to a truss—were designed.

The two Entry Pavilions are connected by the Meeting Room Bridge, which utilizes concrete shear walls with a steel-framed upper story. Because the vertical space was very limited and column-free space was required, portions of the Bridge were designed using single-story-high trusses with the bottom chord supporting the floor and the top chord supporting the roof.

Project Team

Structural Engineer:
John A. Martin & Associates, Inc., Los Angeles

Architect:
Gruen Associates/Pei Cobb Freed & Partners

Associated Architects:
The Tanzmann Associates; Edward C. Barker Associates; Escudero; Fribourg Associations; Stuart Ahn & Associates

General Contractor:
George Hyman Construction Co./M.A. Mortinson Co.