AT THE MOVIES

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The construction of a multi-screen theater in Anaheim, CA required careful design, timing and coordination—and the innovative use of structural steel.

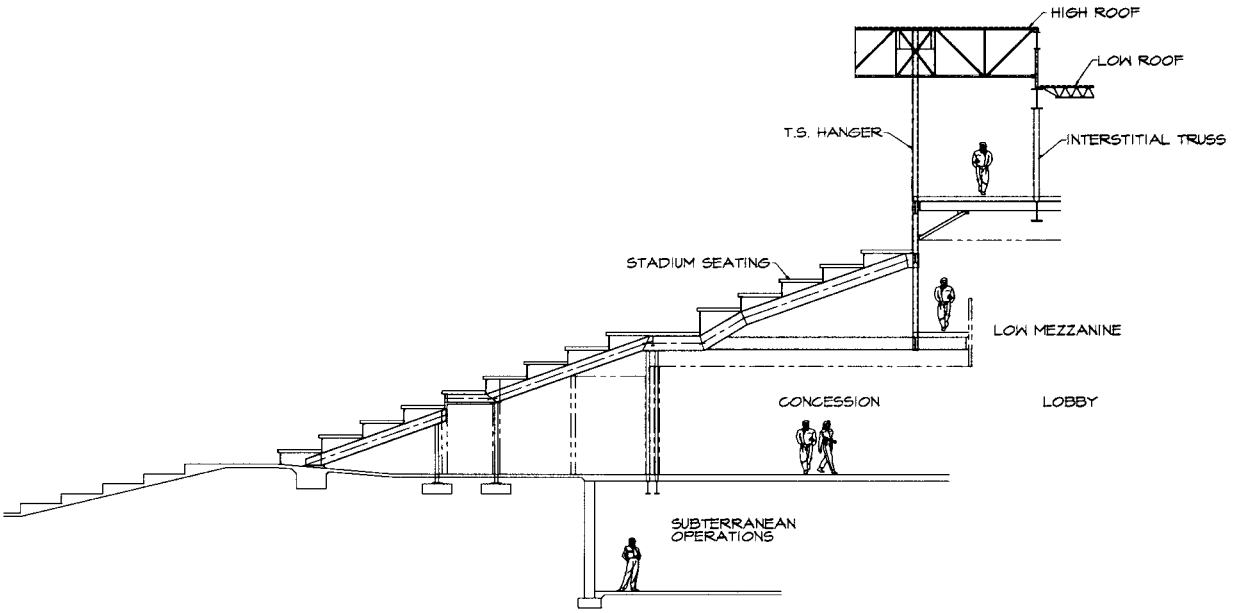
The AMC Theatre in Anaheim, CA, was designed to incorporate 14 movie auditoriums with seating for 3,012 guests, with successful integration into the Downtown Disney entertainment experience. The project encompassed 61,000 square feet and was constructed with a total construction budget of $15 million.

This project faced several unique challenges. First, property-line configuration and simultaneous construction on adjacent properties resulted in a compact construction site. Second, the design and construction of the theater was to reflect the high-impact materials associated with the Downtown Disney project, while staying within the budget constraints associated with a successful cinema project. The theater needed to accommodate support services and staff via subterranean construction, which was a variance to normal operations criteria. Individual auditoriums required full stadium seating for the best possible movie-going experience. A column-free lobby and concession area were necessary despite the integration of two separate mezzanines and two theaters of stadium seating over the lobby. Finally, an exposed structural steel entry feature was to be designed to present a significant architectural statement and reflect the image and purpose of the primary structure.

One of the structural challenges revolved around the column-free lobby. Typical steel solutions include incorporation of conventional long-span design, but the architectural configuration of the lobby and stadium seating precluded simple resolution. A roof discontinuity, two mezzanines, and auditorium stadium seating located over the lobby complicated the framing.

SEATING SOLUTIONS

Numerous solutions were considered, including multiple long-span steel members at various levels to carry



Section through the theater area. Stadium-style seating is supported by broken-back steel stringers (members that are "kinked") to maximize the headroom under the seats. The low mezzanine level is supported by hangers from roof trusses above. The roof trusses, in turn, are supported by a one-story interstitial truss at the projection booth level.

their respective gravity loads. The costs, difficulty of construction sequencing, and column locations that impacted subterranean levels made this option unavailable.

The chosen option was to support the seating by suspending it from the roof structure, which in turn was supported by a 104' steel interstitial truss. The top chord of the truss was incorporated into the roof system, and the bottom chord was incorporated into the high-projection mezzanine. The truss was located so as not to interfere with projection operations. In addition, the truss web members were designed to transfer tributary lateral loads to the lateral system.

Due to tight construction conditions, there was no staging area available to construct the truss at the site. The steel subcontractor chose to shop-fabricate the truss and transport it 30 miles under special permit. The permitted travel time was 4:00 a.m., which allowed only a narrow window for erection because the crane had to be located on a neighboring construction site. The erection, crane dismantle, and field-welding of the end-web members had to occur within a narrow window.

At the request of the owner, stadium seating was incorporated into all auditoriums. Framing was accomplished with a complex incorporation of broken-back stringers supporting steel-plate fabricated risers with metal deck and concrete infill. Broken-back stringers were required to increase usable square footage under the stadium seating.

The ribs of the entry dome consist of double-channel sections that reduce member depths and provide visual interest.

GRAND ENTRANCE

Structural steel was chosen as the appropriate structural system for the entry feature to make a statement of permanence and elegance. A wooden feature would not have met the building's fire rating, and a concrete design would not have been compatible with the long-span roof. The span of the entry feature was to be 80', with cantilevered eyebrows of 15' on two sides, for a total diameter of 110'.

The architect was concerned that conventional framing schemes would generate member sections too large for the desired elegant, open feel. By using a dome structure, designers were able to limit member profiles and let the entire space be the focus instead of large individual members. For greater visual interest and detail, tandem or multiple members were used instead of larger single members.

At the dome rib, double channels were used to satisfy the architect's visual intent and allow the wedge-shaped panels to be shop fabricated. Erection was accomplished by supporting the compression ring on scaffolding and individually erecting the dome panels.

Due to seismic considerations, the initial column design produced large members that would not satisfy the architect's visual criteria. Using four columns at each column cluster instead of a single, large column achieved the desired look. To meet strength and drift criteria, the columns were attached as a group with web plates to emulate a vertical vierendeel truss. The web plates were designed for the shear flow necessary to achieve the desired stiffness. The shear plates were concealed behind architectural fenestrations and light fixtures so as not to compromise the architectural intent of four slender columns grouped together.

The structural system of the AMC 14 in Anaheim satisfied the client's intent and was well-integrated into the Downtown Disney environment. Creative solutions in structural steel were instrumental to the project's success.

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