



Facing to the east, a view across Interstate 670. Photo by Assassi Productions, courtesy of HNTB Architecture.

Building a Ballroom in the Sky

By Brent Bonham, P.E., S.E.

The Grand Ballroom at the Kansas City Convention Center was presented an Outstanding Project Award in the 2007 NCSEA Excellence in Structural Engineering Awards Program.

Expanding a convention center in a dense urban area can present a variety of challenges, but rarely does it require securing “air rights,” as the Grand Ballroom at the Kansas City Convention Center did. The City of Kansas City, Mo., and HNTB Architecture Inc. had to acquire these rights from the Missouri Department of Transportation and the Federal Highway Administration so that the ballroom – nearly the size of a football field – could be constructed over Interstate 670, an eight-lane highway with three ramp lanes that carry motorists through downtown Kansas City, Mo.

The City initiated the renovation and expansion of the Kansas City Convention Center to make the facility more competitive. Outdated and lacking amenities today’s convention goes demand, the existing facility could not keep pace with newer competitors and was losing business as a result.

The massive renovation and expansion features a new ballroom that is the sixth largest facility of its kind in the country, offering guests the ultimate in flexibility and state-of-the-art amenities. HNTB led both the overall project design and planning team, as well as the architecture, structural engineering, interior design and highway infrastructure.

The challenges of spanning an interstate, together with the specialized requirements inherent to convention centers, led to the development of a unique set of structural performance criteria. They included:

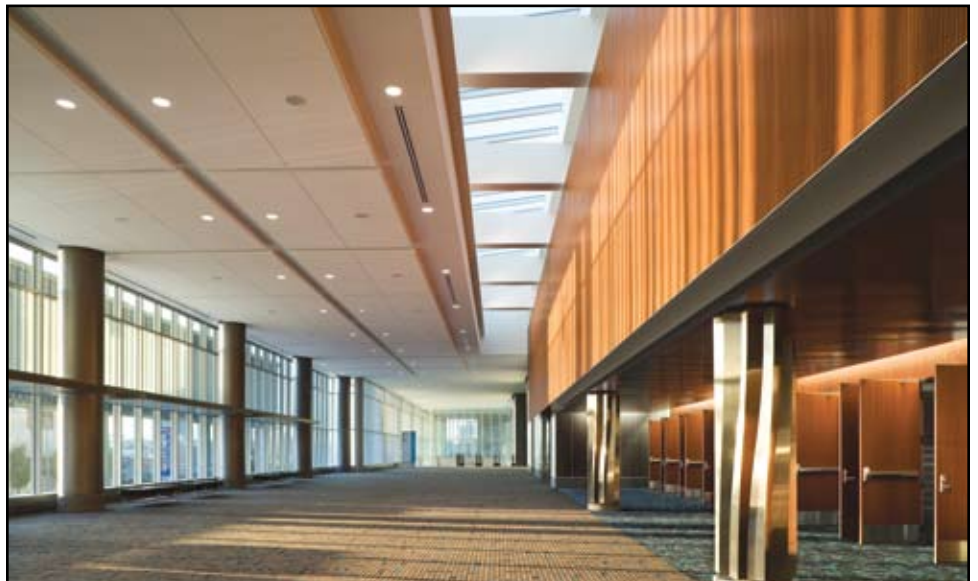
- A long-span floor the size of a city block that would:
 - Span the interstate and transfer loads from the long-span roof above,
 - Resist vibrations caused by dancing, and
 - Support the 60-ton capacity cranes erecting the roof.

- Columns capable of withstanding vehicular impact.
- Anti-terrorism/force protection and resistance to progressive collapse.
- Three-hour fire protection for the floor system.
- Ornate ceiling, lighting, rigging and operable partitions suspended from the long-span roof.
- A construction sequence coordinated with traffic control.
- Replacement of two adjacent city street bridges.
- Increased durability and service life.
- A Leadership in Energy and Environmental Design (LEED®) Silver rating.

The project team employed several innovative techniques to meet the criteria.

Two structural systems were selected for the floor. First, composite precast/prestressed I-girders support areas of the facility with less stringent load and performance requirements. Second, 16-foot-deep continuous-span steel trusses and composite steel beams support the ballroom and public space floors, which require greater load capacity and a much higher performance level. One-way steel trusses support the long-span roof. The dual approach resulted in substantial savings in superstructure cost and allowed the project to employ multiple fabricators. This led to an earlier start for the superstructure erection, an earlier turnover to the finish contractors, and consequently an earlier completion date.

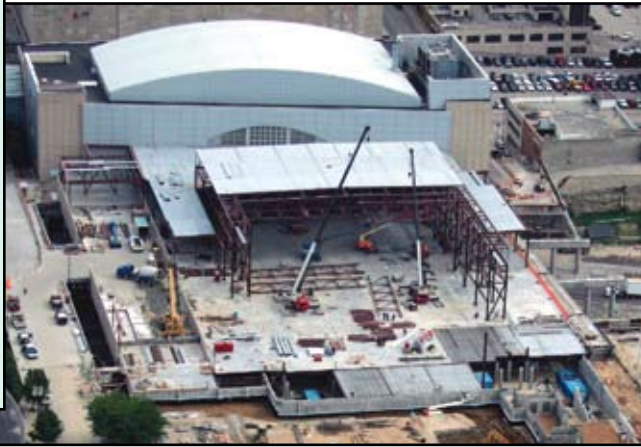
A skewed column-grid system dictated by the lanes of the interstate below was married with a modular grid system for the building



Interior space, entrance to the Grand Ballroom. Photo by Assassi Productions, courtesy of HNTB Architecture.

Project Team

- **Structural engineer:** HNTB Architecture's structural group with Tapan Am Associates and KHEG.
- **Architect:** HNTB Architecture with BNIM Architects, International Architects Atelier and Junk Architects.
- **Program manager:** McCown-Gordon-Konrath
- **General contractors:** Clarkson Construction (superstructure)
- **Steel:** PKM and AFCO
- **Precast:** IPC and Coreslab



During construction of the roof. Courtesy of Clarkson Construction.

above to simplify the design, fabrication and installation of the superstructure.

Prestressed concrete soffit panels were attached to the bottom of steel trusses, providing fire and force protection for the steel structure, a safe working platform, an accessible interstitial space, durability, and mass and damping to resist floor vibrations. The latter was incorporated into the design to reduce the overall steel floor truss costs.

As a result of extensive collaboration with the project team, the 20-month expansion project finished under budget and two weeks early. The grand ballroom opened in April

2007 to rave reviews from stakeholders, end users and the media, with *Convene* magazine naming it one of the country's "Top 10 High-Tech Convention Centers." The new 46,500-square-foot facility now features:

- A 38-foot-high curtainwall and clerestories with controls to adjust natural lighting levels.
- One of the country's largest, most sophisticated Digital Addressable Lighting Interface (DALI) and liquid crystal display projection systems.
- The ability to erect stages and rigging anywhere in the ballroom.

- Operable walls that separate the ballroom into three smaller rooms, or connect it to the lobby.

Building the ballroom over an existing interstate was an innovative approach that helped to seal the convention center's role as an anchor of the city's \$5 billion downtown revitalization project. With the allure of new attractions, such as the Sprint Center arena and a nine-block entertainment district, the Kansas City Convention Center has seen a 40

percent increase in bookings compared with preconstruction numbers. ■

Brent Bonham, P.E., S.E., is the Structural Engineering Quality Manager for HNTB Architecture. During his 10 years with HNTB, he has served as the structural engineering project manager for many convention center and sports projects, including the Kansas City Convention Center Grand Ballroom and the ongoing Las Vegas Convention Center renovations and expansion. Brent may be reached at bbonham@hntb.com.

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