Campus Stadium Presents Construction Challenges

BY KIMBERLY KAYLER

HOPES ARE HIGH THAT THE Louisville Arena will increase the recognition of the Louisville, KY, area as a hot destination.

The waterfront sports and entertainment arena, scheduled to open next year, is intended to serve as a catalyst for economic development that will have a ripple effect throughout the region. Once completed, the complex – on the riverfront next to the Second Street Bridge between Main Street and River Road – will include hotel and retail space and a parking garage.

PC Sports LLC of San Antonio, TX, was hired by the Louisville Arena Authority to oversee the project, including design and construction of the state-of-the-art, multi-purpose sports and entertainment arena.

The project has 721,762 square feet of floor space, and the seven-story arena can seat up to 22,000 fans. The four-story parking structure has 760 spaces. PC Sports also will coordinate development of a flagship hotel and an on-site restaurant.

The arena is scheduled to open in 2010, with the primary tenant being the University of Louisville's men's and women's basketball teams.

With the new arena and parking garage going up simultaneously, and a schedule being of the utmost importance, post-tensioning was the ideal construction method. Why? According to Neel Khosa of Amsysco Inc., the firm hired to handle all post-tensioning for the arena and parking garage, post-tensioning was selected for its superior durability, quick construction time and capability to enable a design that offers better lighting, which enhances safety.

Unbonded post-tensioning was used in both structures, with

While the arena didn't need post-tensioning for its floor structure, it was necessary to have a column-free area to accommodate a practice court.

the arena containing post-tensioning girders on several levels due to long spans, transfer conditions, and the significant load and deflection requirements in certain areas. A one-way beam-and-slab system was used in the parking structure, which is attached to the arena.

Various parts of the project — the parking garage, the arena and the loading docks — used post-tensioning for different but distinct reasons.

In the case of the parking garage, the underground facility has some special circumstances. Roger Wade, a Structural Engineer with Qk4, said post-tensioning was used because the owner wanted a long-span structure to accommodate two parking bays and a drive aisle between columns.

Also, it was necessary to keep the depth on the parking garage as shallow as possible. The site is two blocks from the Ohio River; consequently, the water table is very high. The lowest part of the garage is near the normal water table. Having the shallowest structure possible reduced costs, and helped avoid damp conditions.

An advantage of using post-tensioned concrete on the garage was increasing the speed of construction. Using precast would have involved loading and unloading slabs from the city streets. Post-tensioned slabs can be done on-site, and as one slab is finished, it is easy to move on to the next. Other advantages included the reduction in material by using shallow depth members and decreased cracking.

"The arena didn't need post-tensioning for its typical floor structure, but it was necessary to have a column-free area to accommodate a practice court," said Bart Miller, P.E., Senior Associate with Walter P. Moore, structural engineer. (The practice court is located below the arena seating and runs parallel to the main court.)

Additionally, the facility features a curved window wall that required floors to cantilever up to 17 feet from the structural frame to reach the back of the glass. The structure was designed using stringent deflection limits around the curved window to prevent the concrete from transferring loads to steel supporting the window.

Also, two escalators outside the arena yet still within the building lobby rise 50 feet and apply a 10-ton load to the end of the supporting structure, which cantilevers 16 feet from the arena structural frame – all of which was coordinated with Otis.

Although chosen primarily for design-build reasons, post-tensioning has had side benefits. "We saved concrete and we saved formwork," said Mike Clay, Principal with Populous, the architect. "We really used post-tensioning from a structural standpoint for our spans, deflections and loads. Everything else is an additional advantage."

The project was started in late 2008 and is scheduled to open in late 2010.

Other members of the design and construction team, in addition to Amsysco, Populous, Walter P. Moore and Qk4, include ClasSickle Inc. (associate structural engineer) M.A. Mortenson Co. (construction manager) and F.A. Wilhelm Construction (general contractor).

Kimberly Kayler can be reached at kkayler@constructivecommunication.com.

PT