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Baseball Park in Nation's Capital Is on Its Way to Break the Speed

Team uses design-build with design-assist and a 3D steel model to finish in 23 months

By Nadine M. Post

With only 23 months to complete all the bases, the team building the 85%-complete D.C. Major League baseball park is getting very close to hitting construction's equivalent of a grand slam off a 100-mph pitch. If it opens April 1 as planned, the $611-million for the Washington Nationals will break the speed record for major-league ballpark construction.

Thornton Tomasetti, Inc.
Job cut into discrete design and construction sequences, beginning on right field side, to save six months.

"We're probably pushing the limits of fast track," says Rick "Buck" Buckovich, senior project manager for structural steel and precast for Clark/Hunt/Smoot (CHS). The Bethesda, Md.-based design-build joint venture is led by Clark Construction Group and includes Hunt Construction Group and Smoot Construction.

Despite fast-track's drawbacks, which include redoing some work, "we felt we could do [this job] from the day we signed the contract," says Ron Strompf, CHS's senior project superintendent.

The job is not only breaking records, it is making them. The 41,000-seat ballpark is likely to garner the distinction of being the first major league sports facility to achieve certification from the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system.

Design-build, with preconstruction services and design-assist from major subcontractors, allowed CHS to break the ballpark into nine discrete, sequenced segments for purposes of both design and construction. The strategy saved six months in construction, say CHS executives. "It's not unique to break a building into segments but it is unusual to design to those segments in the construction sequence and manage to start construction earlier," says Alan Petrasek, a CHS project executive.

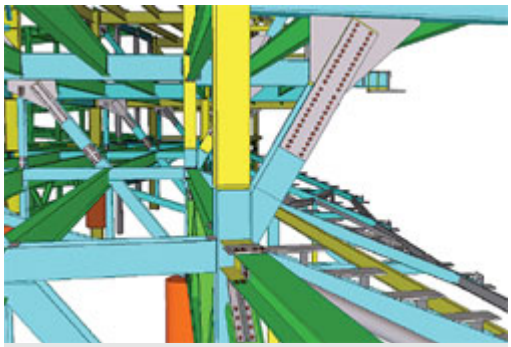
That put stress on the architect. “We were in schematics and they were building it, which is not an optimum arrangement,” says Susan Klumpp, project manager for the local joint venture architect HOK/Devrouax & Purnell Architects (HOK/DP). “It was really a hold-ontoyour-hat pace,” she says. Even in the interior fit-out stage, “it’s still tough,” she adds.

But because of CHS’s strategy, steel fabrication and erection took a year less than is customary, says Don Banker, president and CEO of Banker Steel Co. LLC, Lynchburg, Va. “Clark did a great job ‘policing’ the collaborative process,” says Banker, who explains he has seen the strategy fail with other design-build contractors because of weak leadership. “Thanks to Buck, everyone had their marching orders when they left the meetings,”
says Banker.

The design-assist process “brought everybody’s issues to the table in real time,” adds Mark J. Tamaro, project manager for the local structural engineer, Restl/Thornton Tomasetti Joint Venture. “We could use the contractors’ skills to optimize system selection based on schedule instead of speculating or making assumptions about construction.”


Ballpark is the first in the major leagues designed to conserve energy.

Key to the process were weekly structural design meetings, which started in the preconstruction phase. Everyone from the steel detailer to structural precaster R.W. Sidley, Thompson, Ohio, put their heads together at the meetings to determine the best way to expedite the schedule while keeping within the budget. “It was great,” says Versie Stephenson, structural coordinator for HOK/PD. “Usually, we get through CDs before the subs are on board,” he says.


Mountain Enterprises, Inc.


Digital model helped save two months.

A 3D digital model for the structural steel helped the team, cutting two months off the project’s timeline and decrease structural requests for information to about 10% of what is usual, according to team leaders. “The bottom line is that the job could not have been completed for the 2008 season using traditional methods,” says Matthew T. Haas, a CHS project executive.

Thornton Tomasetti pioneered the use of a digital model on Chicago’s Soldier Field football stadium, which opened in 2003. The ballpark job, TT’s second building information model (BIM) for a sports job, was a much better experience because all team members supported its use, says the engineer.

Using the model at the design-assist meetings, the team worked out complex geometries of exposed connections to satisfy the architect’s aesthetic requirements and the engineer’s safety requirements. The steel detailer’s favorite part of the work was talking directly to the architect, something that rarely happens. “We had long meetings about [variations in] slab thickness” and its impact on the position of the steel supports, says steel detailer John Shaw, president of Sharpsville, Md.-based Mountain Enterprises.

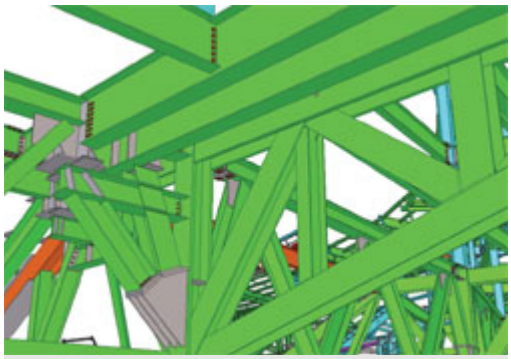
Beginning

Ballpark design started in May 2005 for owner D.C. Sports & Entertainment Commission. CHS, which was selected in August 2005 for preconstruction work, signed its contract with DCSEC in March 2006 after submitting a $344-million guaranteed maximum price in late January 2006. That was at the end of schematic design and nine months earlier than anticipated, says CHS.

Based on CHS's guaranteed maximum price, the District of Columbia funded the project in February 2006. The ballpark's revenue bonds, secured by sales tax from the ballpark, other tax revenue and the team's annual rent, were sold in May 2006. Altogether, the district borrowed $534.8 million.

DCSEC took control of the site in March 2006. That also marked the beginning of demolition work on existing buildings and remediation of the brownfield site, near the Anacostia River. Some 337,000 tons of contaminated soil have been removed.

Workers began excavation on May 4, 2006, just a couple of days after the Lerner Group bought the team from the owners of major league baseball. Steel erection started on Oct. 5, 2006 one day early. Steel was topped out in July. The guaranteed maximum price has now grown to $388 million because of changes made by the team but the job is on budget and on schedule for its completion in April, say CHS executives.



Mountain Enterprises, Inc.

The joint design decisions resulted in a hybrid frame structural concrete on the lower third because there was no lead time and concrete and other materials were readily available, and structural steel above because of the longer lead time and speed of erection. The main concourse level is the transition floor, with steel columns encased in concrete.

Steel had to be designed early to ensure mill order.

To keep to the schedule, it was critical to claim a place in line for mill rollings eight months in advance of the start of steel erection that was set for Oct. 6, 2006. To expedite construction, DCSEC authorized and paid for the steel mill reservation in January 2006. Also, CHS started preconstruction meetings with the design team and major subcontractors in late 2005.

Creating a digital model for the structural steel made the mill reservation tonnage less of a rough estimate. "We possibly could have done the estimate without the model but it would have been highly inaccurate," says Tamaro.

For the reservation, the engineer designed the first of seven major sectors of steel. It then extrapolated the total tonnage. That was risky, considering ballparks are asymmetrical. "We went back and forth" with Mountain Enterprises during the process, says Tamaro.

The pressure to reserve the mill forced the architect to lock the geometry of the ballpark six months earlier than usual. The engineer needed the information to create the model, says HOK/DP's Stephenson.

On Feb. 2, 2006, Banker received a fax from the structural engineer with the total tonnage of 8,000 tons. Banker made the mill reservation soon thereafter.

Because design was not complete, Banker's price was based on unit prices and quantities rather than a hard bid. As the design progressed, the numbers were converted to a contract value.

"We were partially at risk and [that's why we] wanted a seat at the table, to make sure the design matched up with the unit price values," says Banker. "Banker and Clark stuck their necks out," adds Tamaro. "That was pretty gutsy. It was a tough time."

It turns out the estimate was pretty good. At the end of the project there is no leftover material, says Banker. "During the course of the project there were materials that were extra due to changing conditions, but it was all consumed by job completion," he says.

The next pressure after the mill reservation was the five mill orders. The engineer designed each sector, following the construction sequence from the right field side and moving clockwise.

At a certain stage of detail to meet the mill order schedule, each sector model would go to the fabricator for the release of the mill order. Then, the model went to the steel detailer, who checked all the positions of the steel and detailed the connections, finishing the model. Finally, the model moved to the fabricator for production.

"Typically, we get all the drawings at once and [still] create similar sectors," says Banker. "The problem with that is we've waited six months to a year to get the whole design, plus there is no opportunity during design for input from the fabricator and erector."

Ballpark, 85% complete, is on time and budget.

Paper shop drawings were produced from the model. Many of them were reviewed by the engineer before it issued final paper design documents. Almost like as-built drawings, the paper documents were intended to match the model, not the other way around. The unitprice arrangement reduced the reliance on paper documents, says Tamaro. "The final model allowed everyone to know exactly what the steel quantities were," he says.

During this time, construction was proceeding in a "wedding cake" sequence. Foundations and concrete framing progressed around the bowl segment by segment, followed by a level of steel framing that was followed by precast seating. The pattern continued until the building topped out. The trades led each other around the bowl by as much as a dozen bays or bents to as few as two.

To maintain schedule, steel erection had to be completed by July. The goal was to get all elements, including precast seating risers, installed so the field area could be cleared of cranes in time to excavate for drainage systems. Sod installation had to be completed by November.

The baseball team made changes last March, including calling for a more elaborate scoreboard. The change almost threw a wrench in the works, says CHS. To expedite the process, the structural engineer worked with the fabricator to redesign the scoreboard using steel sections and shapes already owned by the project. Scoreboard erection had to be resequenced by Banker, CHS and Bosworth Steel Erectors Inc., Dallas, “to make it the last pick on the job,” says Tamaro.

The sod now is in but the schedule remains. Electricians are running cable, plumbers are hooking up concessions, washrooms and more, and workers are installing about 1,800 seats each week. In addition, perimeter sitework is ongoing, as well as glazing and interior finish work.

There are currently 1,185 requests for information on the project. CHS officials say 10,000 requests would be more typical for a project of this magnitude. In addition, there are no major outstanding change orders or claims, CHS reports. “I’m nervous but I know we are going to make it,” says CHS’s Strompf. “We’ve developed a head of steam and nothing can stop us.”