GIVING NEW MEANING TO TEAM-BUILDING

COLLABORATIVE DELIVERY MODEL PAID OFF WHEN FOOTBALL'S 49ERS DECIDED TO OPEN ITS STADIUM A YEAR EARLY

BY NADINE M. POETZ IN SANTA CLARA

For five uneasy years, the team responsible for building the San Francisco 49ers’ $1.2-billion new home had hung together through three work hangovers, a recession and a regrouping caused by a new relocation 45 miles to the south—from San Francisco’s Candlestick Point to Silicon Valley’s Santa Clara. Then, early last fall, things changed. Suddenly, the snail’s pace became a race.

Based on an early opportunity to secure financing, the 49ers and the Santa Clara Stadium Authority, which will own the New Santa Clara Stadium, decided to accelerate the opening by one year. They are putting all the stops to finish in time for the 2014 season of the National Football League.

“It was like drug racers warming up their tires with slant burns before the starting line before the race begins,” says Jon D. Magnusson, president and CEO of project structural engineer Magnuson Klemencic Associates (MKI), Seattle. “Then, all of a sudden, it was go, go, go.”

Plans by the Los Angeles office of HNTB Architecture, who call for a nearly 60,000-sq-ft facility with 68,000 permanent seats, including 65 suites, and the ability to expand to 75,000 for the NFL Super Bowl. For construction, the stadium authority named the 49ers’ Stadium Development Co. (StadCo), Santa Clara, its agent. StadCo will lease the facility under a long-term agreement. Major financing is from a group of banks led by Goldman Sachs.

The project has at least two claims to fame: The 49ers team is the first sports franchise—and perhaps the first developer—to use a hybrid, collaborative project delivery model that combines the best features of delivery systems, including integrated project delivery.

“We landed on this delivery system in 2005 after looking at prior stadium projects with cost overruns and disputes,” says Wayne Sacre, CEO of SME Steel, West Jordan, Utah, which is the lead firm for the jobsite contractor, the SME/Herschfeld Joint Venture.

The new delivery model, which Magnusson dubbed integrated bridging design-build (IBDB), is an enhancement of bridging design-build. A big difference is that the bridging architect and, in this case, the structural engineer that first work for the owner/developer become designers-of-record in the design-build phase.

“For this project, in a seismic zone, the need for certainty of the structural engineer from start to finish is paramount,” says Jeffrey R. Appelbaum, managing director of Project Management Consultants, Cleveland. PCC crafted the delivery model for the 49ers based on an earlier bridging design-build models developed for other sports venues.

In terms of earthquake resistance and design flexibility, over conventional braced frames or shear wall structures (see sidebar, p. 36). “This is the most extensive use of BRBs on any sports facility, to my knowledge,” says Wayne Sacre, CEO of SME Steel, West Jordan, Utah, which is the lead firm for the jobsite contractor, the SME/Herschfeld Joint Venture.

The “integrated” IBDB means the prescriptive design-build contractor is brought in at the project’s onset to help with estimates and constructibility under a preconstruction services contract. The owner has the option to hire a different design-build contractor if it is not satisfied with its agreed-upon guaranteed maximum price (GMP) or for any reason. Major subcontractors are also brought in early to assist with design.

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The 49ers hired the local Turner/Devcon Joint Venture (TDJV) for preconstruction services one month before it hired HNTB. But the Santa Clara-based 49ers and Devcon Construction Co., Milpitas, Calif., go way back. The 49ers first engaged Devcon, which is well established in the Santa Clara area, for preconstruction services in mid-1997, when San Fran-
BUCKLING-RESTRAINED BRACES ARE A BIG PLUS

During the conceptual and schematic design phases for the San Francisco 49ers' stadium, the structural engineer developed a matrix of 66 structural-system scenarios. Then, the design and construction team evaluated each for schematic and cost. This team ultimately selected a steel frame, with composite metal decking and structural prestressed concrete slabs and floors. Buckling-restrained braces (BFRB) resist earthquake loads.

"A BFRB works like an ordinary steel brace but performs better under seismic loads due to friction of the brace with 'confined' tension and compression capacity," says Brian A. Dickson, principal with the stadium's structural engineer, Magnuson-Klemencic Associates, Seattle.

A BFRB system weighs significantly less steel than an equivalent moment-resisting frame. An equivalent concrete shear-wall system would weigh six times more. Compared to other systems, the lighter system and the better seismic performance result in savings in foundations. "We estimated foundation costs to be 20% less than if a concrete shear-wall system were used," says Dickson.

Each of the 529 BFRBs has a steel core surrounded by concrete masonry encased in a steel tube. The high-performance braces are on every level of the new Levi's Stadium, which varies in height from four to eight stories. The BFRBs range in weight from 2,000 to 13.3 tons and are up to two feet in diameter near the base, where seismic forces will be greater. Architects prefer BFRBs to shear walls because they interfere less with the architecture, particularly the floor layouts. They also allow a more open look, especially inside. And they are no more difficult to erect than conventional braces.

Begun on July 30, steel erection for the 1.6-million-square-foot project is 77% complete.

In March 2006, the San Francisco office of Turner Construction Co. was selected as the general contractor for sports construction experience. The site switch and modest redesign happened in 2006. Dickson rejoined the joint venture as the design-build contractor earlier this year after a GMP had been established. TDV's $534-million design-build contract is actually with the stadium authority. HNTB and MCA were transferred to TDV in June.

The job went into high gear over Labor Day weekend in 2011. When the 49ers' MacNell gathered his team to consider whether an early completion was doable, within a few days, the members of the building team, who had been working together on and off for five years, decided they could get the job done, but it would mean pulling all the stops.

To reengage this team, among other tactics, phased and streamlined the design schedule, "stacking it" over construction. "We shortened design by seven months and went out to bid seven months earlier," says Harvey.

Speeding things up was not easy, adds David J. Masel, TDV's general superintendent and acknowledged mastermind of the "resh" strategy. "We had to take into account all contingencies. We didn't have the design or drawings, so we plugged into historical data onto scopes of work," says Masel. Buy-in from all of the design and construction team members—from individuals, not just the firms—was essential for the accelerated plan to work, says Jack W. Hill, StadCo's project executive. Hill, an owner's representative based in Dallas, joined the team over Labor Day weekend.

BD&H allowed the team to quickly devise a phased permitting plan and site utilization and staging plans. The full-time cooperation allowed HNTB to get commitments from MKA on a phased delivery of documents for structural packages and on a greater overlap of design and construction than is typical, says Hill.

"We have shown that it is possible to do it with our resources and our expertise, and we are happy with the results," says HNTB's vice president-director of sport architecture. "Our clients believe in our expertise and the results that we can provide," he adds. "That is not the case here. This has been a great process."

In the accelerated scheme, structural steel was on the critical path. TDV's first asked MKA what could be done to get the basic steel design in a huge hangar by early late November. "Then, we worked with our estimators to make sure the right allowances were in the estimate," says Robert L. Bayhoom, TDV's co-director and a Turner construction executive.

As a result, in the middle of design development, MKA moved into construction documents. "We had to consider the structure set and its MKA go or we would not be able to coordinate the mill orders," says Dickson. HNTB "fixed" the structure, as if it were an existing building, much earlier than is typical, adds Larson Nichols, HNTB's vice president.

The strategy worked. "We got our first design development package to key structural steel and vertical transportation in November 2012," says Harvey. After design development, the new schedule eliminated a two-month "pencils down" period for the design team to see the joint venture could create the GMP. It is also stating four months off the original 26-month construction schedule.

TDV's contract calls for substantial completion in the outer. COMING UP LIKE ROSES

After these photos were shot, stadium construction—construction of the stadium started in April. The first steel went up in late April. Steel erection is currently 77% complete, with a topping-out schedule set for December. To keep working through the design-build contractor split the stadium into four vertical quadrants instead of moving around the oval. Work on each is concurrent.

PHOTO: FLEXIBLE OPENING DAY; THE STRUCTURAL "SKULL" of the stadium will be installed early as an FF&E was on existing frame. 

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A year ago, the team had a meeting with the city to develop a multiple drawing-package review strategy for phased permitting of the steel structure, the foundations and the concrete. To expedite the steel permit, MKA proposed combining a peer review of the structure, which the city wanted, with plan checking. For this, the city agreed to defer the structural reviewer John A. Martin Associates (JAMA), Los Angeles, as part of the building department.

"We also did a courtesy review," says Sheila Lee, building official for the Santa Clara Planning & Inspection Dept. "This is a very challenging project for any department because of the size and tight time line. We don't compromise anything."

MKA split the structure into eight plan-check packages, submitting them in stages from Nov. 4 to Feb. 17. While JAMA reviewed one package, MKA continued to engineer others. This strategy saved a minimum of two months over a more traditional two-step foundation-and-structure review process, says Brian A. Dickson, an MKA principal.

To speed work, TDY's Maxed split the building into four quadrants and constructed them concurrently instead of using more traditional, "stuck-up" oval sequencing. Crews used four drill rigs for the mega east piles, for example. Workers are erecting steel with four crawler cranes, one for each quadrant.

TDY is using building information modeling for interference checking. To date, there are 402 requests for information, instead of three or four times that amount, thanks to BIM, says Harvey.

BIM also was used to locate and build the deep utilities below the slab-on-grade so they could be built ahead of piles instead of after them. Crews worked 24-hour shifts from May 1 to May 15. That move cuts the time in half for the deep utilities work, says Harvey.

TDY had field-level electrical rooms, made of cementitious mastery units, built out of sequence. That move allowed the electrical switch gear, transformers and panels to arrive early so the electricians could streamline the electrical rough-in and distribution. These rooms would fall under normal field- and drywall construction, after fairproofing and potentially crisscross delays in construction, says Harvey.

Crews have been installing sleeves, block-out and inserts in the coxal decks on swing shifts. The area is true for slab-on-metal deck piers. This tactic allows for continuous steel erection during the day.

On June 1, more than one month after construction started, ENTRB and MKA were officially assigned to TDY. Because of the acceleration, WSP Hick + Kurtz, the bridging mechanical-electrical-plumbing engineer, did not get transferred to the design-build team. To expedite the work, the team made a decision to bring in a design-build mechanical contractor.

Work started on April 23 and is speeding along. Steel erection began on July 30 and is 55% complete. Topping out is expected in December. On Sept. 4, tower crane started lifting in escalators. "To see escalators actually set at this stage is phenomenal," says ENTRB's Dickson.

On Oct. 26, crews installed the first piece of structural precast concrete for the seating area and risers. The project is on course for substantial completion on Aug. 31, 2014. That's one month ahead of even the accelerated schedule, says Harvey.

The IBRD and acceleration strategies have worked out so far, says the 4yers' MacNeil. "We are pleased with the design-build team," he adds.

But with only 22% of the project complete, the tree is far from over. "We haven't deployed the parachute yet," says MKA's Magnussen.

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