The Big House has become the Big BRICK House, securing its status as the most important icon on the Ann Arbor campus for another century. After nearly a decade of talking, planning, fundraising and construction, the expansion and renovation of University of Michigan Stadium is nearing completion.

Originally built in 1927, Michigan Stadium has undergone many expansions, but the current project is surely the largest in terms of architectural design and functionality. The low steel bowl has been partially enclosed by towering masonry structures along the east and west elevations. Brick arcade walls 400' long run from north to south, approximately following the sidelines from end zone to end zone, featuring arches reminiscent of the Roman Colosseum. At each end of the wall there is a 100' tall tower housing stairways and elevators. Both the north and south ends of the Stadium remain open, allowing for future expansion opportunities.

The story here is the brick. The project’s intent is to improve the visitor’s experience by increasing and improving seating, widening aisles, updating existing and increasing the number of restrooms and concession areas, adding gift shops, providing permanent EMS and police offices, a new press box and adding means of vertical circulation. However, it is the 1.2 million brick that has caught everyone’s attention!
Stadium Blend, created by The Belden Brick Company specifically for this project, consists of three colors and two textures of brick. Dave Lacovic of The Belden Brick Sales Co in Fraser, MI can’t even begin to estimate how many hours he spent on this project. From early discussions of brick selection through managing the brick order, this has been a monumental task, but a most rewarding experience.

Upon selecting an area of existing brick that architects found most appealing, Belden set out to match it. Lacovic says it takes a lot of experience to be able to envision a blend of colors and textures on a large scale. Finding the right balance of light and dark, while taking into consideration color ranges within one brick and combining them with other brick takes a keen eye along with trial and error. The Masonry Designer program feature on beldenbrick.com is a good place to begin.

Building sample panels, initially of 15-20 units, helped to narrow color selection. Later, panels of 100 to 150 brick were employed for creating the correct blend. The final blend consists mainly of a wire-cut, red flashed to brown range, with a smaller portion of a sanded, extruded medium red with gold/orange/tan light flashes. Finally, the smallest percentage is a sanded, extruded deep red range, which is also used by itself as the accent color.

Lacovic says that the University decided to use the same brick blend for the Al Glick Field House, the football program’s indoor practice facility. Adding a few units, ensures a good price and visually ties the two buildings together at the same time.

With Belden’s computer tracking of the blend, the University will be able to go back and order it again and again, now that the formula is set. Belden’s blend is always computerized to ensure that it is always aesthetically laid in order. The brick are palletized so bricklayers can efficiently take the next brick from the stack and lay it.

“The architects excelled at using the modularity of brick (3½" x 2½" x 7½") in aesthetically pleasing ways,” explains Lacovic, “and Belden is great at making almost anything happen.”

Adornment

Brick, with natural Indiana limestone accents, adorn the entire facade of the stadium complex. Primarily a steel-framed structure, the north end zone buildings are loadbearing CMU. Inside, areas including concession stands, restrooms and concourses are adorned with cost effective Trenwyth’s Trendstone Plus burnished architectural concrete masonry units. A filled and polished product, faces are ground to expose the aggregate, the pores filled with a cementitious grout, then polished smooth and a clear satin gloss acrylic applied to accentuate the natural beauty of the aggregates and provide moisture resistance. This finish also provides a wall surface with a high degree of graffiti-resistance.

Collaborative Synergy

Architects from HNTB, project managers from Barton Malow, mason contractors Baker Construction, Boettcher Masonry and Leidal & Hart, Belden Brick plant supervisor Jeff McIntire and John Albright, manager of Belden’s architectural shape design department, communicated about what was possible and alternatives, if necessary.

“Along the top of arcade walls, brick is corbelled. We brought Dan Zechmeister from the Masonry Institute of Michigan (MIM) and folks from the Brick Industry Association (BIA) into the discussions about weight and size limitations of corbelling, both what is possible realistically and what is allowed by Code and making modifications like recessing the core, allowing more mass on the front of the brick,” shares Lacovic.

Mike Harman, president of Leidal & Hart, had design development meetings with the architect to work out details about the design layout, flashing details, bond patterns, corbels and darts. Zechmeister reviewed details and made recommendations during this process as well. “The design had some very sophisticated details and we worked with HNTB on making adjustments that would lessen complications during construction and reduce potential aesthetic problems,” Harman explains. He also worked with Structural Design Inc (SDI) on reengineering the arches along the arcade walls in order to shorten schedule and simplify the construction. His firm was constantly in contact with Boettcher’s as they each had an arcade wall to construct.

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Andy Greco, PE and principal with SDI, was responsible for engineering all the brick façades and the structures of the new end zone buildings. He describes this as a dream job. “The layering of brick shifted from in- and out-of-plane. The recesses and where the coursing patterns changed all needed to be designed for tolerances, for example. With 1.2 million brick, it is a long process! The masons approached the project with a lot of innovation and skill; they did a fantastic job.”
The Big BRICK House

International Masonry Institute (IMI) quality assurance consultant, Skip DiGiovanni, was also on site observing and offering his expertise to the masonry crews. “It’s always comforting to have someone looking over your shoulder,” affirms Ed Boettcher, president of Boettcher Masonry.

“At times it may have seemed like too many cooks were in the kitchen, but everyone was really bending over to make sure everything was completed properly and on time. The communication was great. That’s the biggest part of a job like this.”

With more than 60 special shapes specified and over a million brick required, representatives from the University, HNTB, Barton Malow project manager Sean Hollister and Lacovic paid a visit to the Belden Brick plant early in the process to verify logistics of the order. In return, McIntire and Albright made the trip from Sugar Creek, OH to Ann Arbor on two occasions to actually see the job site and assess the situation in person. For the most part, shapes were not unusual and could be extruded just as opposed to hand made. Although the manufacturing process was not complex, getting the order right was. The concern was more about functionality of the brick and minimizing obstacles to workmanship during construction. Things like bed depths, false joints, uniform joints and discerning how blends would look in respect to various shapes were issues that Albright helped work through on his visits. “If we could make a brick a bit narrower for some applications or tapered in another area, we could reduce labor onsite. Bricklayers would have less cutting to do and could spend their shift laying brick that was made to fit,” Albright explained. With 36 years at Belden, Albright has extensive experience in getting it right.

**Panels of 100 to 150 brick were employed for creating the correct blend**

**Capitalizing on Time and Talent**

The project had to be fast tracked in terms of how the building was designed and the materials procured. The first year was very aggressive, explains Hollister. There were nine bid packages and the second included the procurement of all the brick. It had to be handled early, so all the clay could be mined from the same area at the same time and baked together to ensure the most consistency of color and texture possible. Because of the scope and timeline required, Barton Malow made the decision to purchase the brick in total, rather than have the mason contractors each place their own orders.

The timeline also separated the masonry construction portion, worth about $15 million, into four different contracts. Hollister said that they were not opposed to using the same contractor for the entire job, but it worked out to have three in terms of schedule, cost and workmanship. “I felt we were able to capitalize on quality. Each company was able to provide their best manpower and technicians,” he said.

The first masonry contract was let to Baker Construction for the north end zone buildings which needed to be opened in time for the 2008 football season. Two arcade walls and four towers were let in two packages to Boettcher Masonry and Leidal & Hart Mason Contractors. The east wall and four towers needed to be enclosed by the beginning of the ‘09 season. The project, including the west arcade wall, will be complete before the first kick-off of 2010.

Even broken down into smaller segments, the complexity and challenges of a job this large remain. Tony Coppola, project manager for Leidal and Hart, shares that his company alone spent a full 12 months in preconstruction planning. Construction for Leidal and Hart has taken 80,000 man hours, divided among 40 masons and 30 laborers.

**Site Orchestration**

The Big House, Michigan Stadium, sits at the corner of Stadium Boulevard and Main Street. Crisler Arena basketball facility is just steps from the southeast corner of the stadium. All staging areas have been confined to portions of the parking lots to the north and northeast. As a result, coordination of people and materials is
crucial. Brick delivery was discussed in preplanning meetings. Was it worth the time and cost savings to have the brick unloaded from the flatbed truck by hand? Was there room to have a boom crane to do it? It was decided that a truck mounted forklift would be the most efficient option. It had to be planned in advance, because there was no time or space to waste once the job had begun. During construction, brick, CMU and other materials were delivered to the site on an as needed basis. There was no room for storage. Brick was manufactured in Sugar Creek and kept there, 260 miles and 4½ hours away, until the masons were ready for it. Lacovic found it easiest to keep an email chain going, which included the dispatcher, in order to keep things written down and moving quickly. Mortar and grout had to be mixed at the staging areas and transported to bricklayer work areas by forklift. While working on the arcade walls, end zone buildings and towers, bricklayers and laborers traveled around the perimeter of the building, rather than cutting through it. Communication and coordination were, again, crucial to daily productivity.

Arcade walls and towers are fully scaffolded with hydraulic lift scaffolding which remains in place until that portion of the job is complete. It is quicker, more economical and more efficient to scaffold everything at once than to erect, take down and move over and over throughout the project.

The west arcade wall will be among the last pieces finished because it requires a permit from the city to close one lane of traffic on Main Street which cannot be accommodated until spring. All masonry work must be complete in time for the street to reopen to full capacity before Ann Arbor’s Art Fair in July.

Football Saturdays
As if the size and scale of the project weren’t enough, the project has taken several years and has overlapped two football seasons. Boettcher explained that every Thursday of a home game week, all crews had to clean up the job site, remove materials and equipment, board up unfinished openings with Michigan blue plywood and secure scaffolding so it wasn’t accessible to the 108,000 visitors who would descend on Saturday afternoon.

Monday morning, the crews would return and set up, almost as if it were the first day on the job.

Boettcher and Coppola agree that football weeks were tense. “We would start a particular portion and know that we had to have it finished by Thursday,” Coppola explained. “We had to be sure we weren’t biting off more than we could chew, but we also needed to be sure we were meeting construction schedule requirements.” That often meant having multiple crews on multiple activities at one time.

And, ultimately, those Thursday afternoon clean-ups were about more than looks and convenience. They were about safety. Barton Malow’s Hollister would walk the site with senior project manager Neal Morton, University representatives, as well as the fire marshals and OSHA representatives to make sure the site was safe for 108,000 visitors once everyone had finished. Four 10-hour work days per week throughout the fall were added obstacles, but also another opportunity to step back and review the work so far. It turned out to be another level of quality control that helped keep the project on track.

On Time, On Budget
By the week of the Ohio State game, the last of the season, Hollister says, of the $227 million project, they had been doing approximately $4 million of work per month almost without a hiccup. All deadlines are hard deadlines. Critical milestone activities were set to meet the University’s calendar. “We’ve met all schedule obligations and we’ve been on budget.”

A tremendous amount of time was spent on the front end of the project so that nothing would be missed. Even with procuring the brick, scheduling deliveries and meeting deadlines, Hollister thinks the coordination of the steel and masonry may have been the most challenging aspect of the masonry project. Like everything else, it was the collaboration and communication that made it a success. “The architect and structural engineer worked with the steel erectors and mason contractors to make sure everything was adequate. Mason contractors were responsible for making final adjustments of the angles and final welds to make their mortar lines just so. That eliminated the need to rip out and cut down areas that weren’t right,” explains Hollister.

When it was all said and done, Boettcher explains, “It was very challenging and it could be intimidating to walk onto that job site, but it went smoothly. We were ahead of schedule and had an accurate take-off. Decisions were made in a timely manner and there was great communication between all parties.”

Coppola concurs and adds, “We relish in the challenges.”

Elizabeth Young is managing editor for *MasonryEdge* The StoryPole magazine. Previously, she was with Raspberry Publications, Kreber Graphics, and Wayne Products. Young is a member of the Construction Writers Association and US Green Building Council Detroit Chapter. She holds a Bachelor of Science and Master of Arts in English Education from The Ohio State University. eyoung@bsyoung.com 614.886.6995