OHIO STADIUM PRESS BOX

Towers above the Rest

Jack Krebs, P.E., and Ken Shanta, P.E.

top: View showing ten of the thirteen frames erected.
bottom: Four southerly frames. Note floor-to-floor truss at suite level.

Its rabid fans affectionately refer to it with a nickname, "The Shoe." It is listed on the National Register of Historic Buildings. Ohio Stadium, the horseshoe-shaped Columbus home of the Ohio State University Buckeyes football team, has been an enduring symbol of major college football since originally constructed in 1922.

During its 80-year history, Ohio Stadium has undergone several modifications—most notably, the addition of an enclosed pressbox structure in 1949 and the addition of a video-based scoreboard in 1984. By 1995, the University realized that it needed to transform the facility into one that could accommodate the needs of a 21st century sports fan.

Ohio State University opted to renovate and expand the existing 90,000-seat stadium to avoid the substantial cost (estimated between $300 to $400 million) of constructing a brand new football facility of comparable size.

But satisfying the enthusiastic fans who want to watch football without interruption and maintaining the character of a storied history was going to be tricky, especially in the middle of a major renovation. The University stressed two points to the project team. First, any design must complement the existing structure without infringing on the stadium's widely admired architectural character. Second, use of the facility for football must not be impacted by the construction work.

The Osborn Engineering Company of Cleveland, OH, was selected as the lead design firm to implement the University's grand visions. Osborn, in affiliation with HNTB of Kansas City, MO, Design Group Inc. of Columbus and a host of other sub-consultants began the formidable task of upgrading the facility. The cost of the three-year renovation and expansion project is estimated to be $187 million. The entire cost of the project was self-funded exclusively by the University's Athletic Department.

The scope of this project included, among other items, the lowering of the playing field below the surrounding

Pre-assembled bent frame being lifted into position.

First erected frame on south end.

Typical frame as seen from the upper concourse.

ground watertable elevation, the addition of several thousand new seats, the addition of double deck suites and the addition of a state-of-the-art press box facility.

The new pressbox structure is located atop the new enlarged seat deck on the west side of the facility. In a word, the new structure is "huge." The press box comprises three levels: an open-air camera deck level, a suite level and a press level. The camera deck space is tucked below the enclosed structure and measures 120' long with ample room for the numerous network camera stations that typically are employed at a Buckeye football game. The suite level includes 24 individual, class 'A' finished spaces, and one large suite intended for use by the University's Board of Trustees. Situated above the suite level is the press level. The press level incorporates multi-terraced landings for the various radio, television, and working press corps that report on this high profile Big Ten college football team. The new pressbox is approximately 490' long, 70' tall, and 60' wide. The structure will surely be a dominant presence to any player on the field because the rooftop elevation towers 180' above the lowered playing surface. The overall height of the pressbox is among the highest of any collegiate football facility.

The pressbox's primary structural system is a triangular-shaped steel-framed bent. The frame includes Grade 50 built-up 36" deep plate girders with $1^1/_2$"x15" flanges, and standard W27x84 and W36x135 wide flange sections. A pair of columns supports the bent frame; the column closest to the playing field is a W36x230 member, while a W30x191 was utilized for the rear column. The 36" deep plate girder is the backbone of the frame. It supports a 260 kip tensile load, in addition to a 455 kip-ft end moment at the W30 column. The spliced plate girder connection utilized 38 1"-diameter A490 SC bolts and field welded flanges with partial penetration welds. The frames are located approximately 40' on center.Combinations of bolted and welded connections were utilized. The uniquely designed frame made it possible to support a 34' cantilevered roof, as well as two floor levels that cantilever as much as 25' beyond the front column. The built-up roof plate girder at the connection to the front column is 5'-9" deep, and tapers to 15" at the tip. A 5" thick concrete slab on composite metal deck was utilized as the slab system for all levels. The floor-to-floor cantilevered trusses, made of W24x94 and W27x84 top and bottom chords with W8x31 welded diagonals, are rigidly attached to the front columns with six $^3/_4$" diameter A325 SC bolts and full depth penetration flange welds on both the top and bottom chords. The trusses were concealed within partition walls separating adjacent suite spaces. For lateral stability, the frames utilize perpendicular bracing elements. The lateral bracing includes 8'-0" and 9'-0" deep trusses made with W12 top and bottom chords with double angle diagonals connected through welded gusset plates. W24 beams with eight 1" diameter A325 SC bolts and a $3/4$" thick moment end plates were also used to provide lateral support. The rear half of the roof structure incorporates curved W12 purlins that are connected to a full depth stiffened roof truss top chord panel points, thus providing a pleasing contour to an otherwise bulky frame. The structure also offers connection points for an elaborate fall restraint and window washing system. Attachment of the system to the roof and underside of several support members will allow for the safe operation by maintenance personnel.

One of the more significant challenges facing the design team and the contractors was not to impact the football season with the construction work. Osborn Engineering was directed to phase the renovation and expansion activities over a three-year construction period in such a manner that the available spectator seat count was never

Existing press box demolition delays erection of center frames.

Partially-enclosed press box as viewed from the east.

lowered at any time. Such restrictions gave the press box project an added challenge—how to complete a game-day ready pressbox prior to the first game of the 2001 season in September 2001 while beginning it after the completion of the 2000 football season in November 2000.

Adherence to such a restrictive timetable was the responsibility of the both the construction manager, Turner Construction Inc., and the structural steel contractor, Kokosing / P.J. Dick (A Joint Venture). Beginning construction of this type in November is a risky proposition in Columbus because the majority of the work is done in the midst of a cold, often harsh, and highly unpredictable midwestern winter. In order to minimize the weather-induced risks inherent with winter construction, the contractor decided to assemble the entire primary bent, including the frame, cantilevered roof girder, and cantilevered floor-to-floor truss on the ground. Once assembled, the bents were lifted into place with a Manitowoc 888 (240) ton crane. Each bent as lifted weighed approximately 30 tons. The remaining steel framing was then infilled between the bents in a conventional manner. The total weight of structural steel used in the pressbox structure was approximately 1,000 tons. A total of 13 bents comprise the main structural framing system. The contractor strategically erected the bents and the associated floor system members in a sequence that provided lateral stability to the adjacent frames. Construction phasing requirements on the project dictated that the erection of the infill floor framing members be delayed to allow for installation of the precast concrete seat decks located below the pressbox structure. The precast tread and riser pieces were lowered via overhead crane between the bents and the lateral bracing system.

Another construction phasing issue was the removal of the existing pressbox after the 2000 season. This necessitated the delay in erection of several bents within the middle third of the new structure. The demolition contractor, O'Rourke Demolition, was responsible for coordinating their scope of work with the structural steel contractor to avoid any conflict between the two parties. The volume of space within the new structure is approximately seven times that of the existing pressbox. When completed, the enormous size of the pressbox will certainly provide a dramatic visual impact on players, spectators and the press corps alike.

There are significant engineering and construction challenges inherent to any project of this magnitude. However, the unique construction phasing requirements for this renovation and expansion project mandated that the work not affect the football game-day experience. This restriction added a level of complexity not normally encountered in the design and construction of such projects. Likewise, the preservation of the aesthetic characteristics of an 80 year-old structure in the midst of such a massive expansion project contributed to the complexity of this project. Buckeye football fans can only hope that their team can replicate success of this project on the playing field every autumn.

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