

The Next Level

BY DYLAN S. RICHARD, P.E.

A renovation to Oklahoma State’s football stadium brings the facility up a tier.

A MAMMOTH STEEL HORSESHOE HAS TAKEN SHAPE in Stillwater on the Oklahoma State University campus. On September 5, this revered structure—the newly renovated Boone Pickens Stadium—will play host to OSU’s 2009 home opener and usher in a new era of Cowboy football. After nearly a decade of planning, a \$250 million budget, seven years of design and construction, and 10,000 tons of steel, the new version of the stadium will be game-ready for the team and the approximately 60,000 fans that come to each home game in the fall.

In Phases

The impetus behind the expansion, the Next Level Campaign, was divided into three phases over a seven-year period. Phase 1 laid the groundwork from 2003-2004 with the retrofit, restoration, and expansion of the stadium’s south grandstands. The original structure contained concession and restroom buildings at the Plaza (ground) Level only, forcing patrons in the upper half of the seating bowl to endure a long walk down winding ramps to get to basic amenities

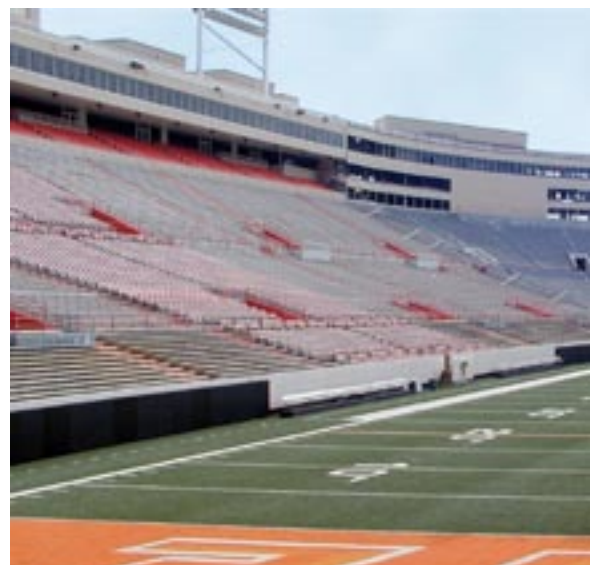
such as restrooms or concession stands. A new elevated Mezzanine Level with full amenities was added inside the existing steel framed structure, allowing the Ground Level concession and restroom buildings to be replaced with two-story concession and restroom buildings serving both concourses. A new structure built behind the grandstand provides elevator and escalator access to the new concourses and adds new Arena, Lower Club, Upper Club, Suite, and Upper Concourse Levels. A press box and three new light towers topped off the Phase 1 structure. From 2005-2006, the Phase 2 construction mirrored the south grandstand retrofit, restoration, and expansion (minus the press box) to the field’s north side.

Completing the Horseshoe

The final portion of the Next Level Campaign was the Phase 3 west end-zone construction that began in 2007. The west end-zone’s primary purpose was to complete the horseshoe by linking the south and north grandstands, but it resulted in much more: over one million sq. ft of programmed space. Using more than half of the



Courtesy Oklahoma State University



The Boone Pickens Stadium expansion used 10,000 tons of structural steel.
MODERN STEEL CONSTRUCTION AUGUST 2009



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SPARKS Sports, a division of Crafton Tull Sparks



The cantilever emerges over the existing south grandstand.

The renovated stadium is scheduled to open this fall—and should look something like this, only filled with tens of thousands of fired-up Cowboys fans.

overall project steel tonnage of 10,000, the west end-zone structure provides a continuous seating bowl between the existing south and north grandstands and continuous Plaza, Mezzanine, Arena, Lower Club, Upper Club, Suite, and Upper Concourse Levels. A substantial portion of the Phase 3 square footage is occupied by a new Field (basement) Level below the entire west end-zone.

Modern and Robust

Steel was chosen as the primary framing type for the Boone Pickens Stadium expansion in order to bring the design team's vision of a modern, robust structure to reality. In the key areas where steel was used, the overall weight of the structure was minimized, the existing facility was easily retrofitted, the new cantilevers were made possible, the new structure expansion joints were minimized, and the new-to-existing structure expansion joints made the stadium one.

The original south and north grandstands contained traditional 2-ft 3-in. tread depths with mostly bench seating and limited chair back seating. New Club Level seating was added to the existing grandstands by replacing the top ten rows with nine 2-ft 9-in. rows for club seats. The existing treads and risers were composed of

a relatively light system of steel channels, angles, form deck, and concrete treads. To minimize the impact to the existing foundations, designers chose an equally light system of 5/16-in. steel bent plate treads and risers for the new club seats. Results of extensive field surveys of the existing steel rakers let the fabricator provide units that matched up with the existing steel supports and followed the 18- to 20-ft articulating steel column grid (the spacing from grid to grid was around 19 ft, 6 in.). The steel bent plate tread-and-riser units were then set and seal welded to each other and protected with a Neogard roller-applied urethane traffic-coating system.

The new Mezzanine Level immediately above the Plaza (ground) Level services the upper grandstands and accesses 21 new two-story concession and restroom buildings. At the existing grandstands, 14 of the concession and restroom buildings were constructed within the existing web of steel framing. A new steel-framed floor, optimized with W16 and W18 beams, was installed to create the Mezzanine Level concourse and Roof Level of the concession and restroom buildings. The steel framing was conveniently attached to the existing steel frame with shear tab steel connections and allowed for nominal strengthening of the existing foundations below. Addition-



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The Phase 3 west end-zone portion, nearing completion.

Pre-Game Story

The original Lewis Field was constructed in the 1920s with steel-framed grandstands and had a total seating capacity of 13,000. With the playing field oriented east-west, the grandstands were built on the north and south sides of the field to block the prevailing winds. A pair of expansion projects in the 1940s brought the stadium's capacity to 39,000 and added a press box in time for the 1950 season. In 1971, seating capacity was increased to 50,000 by removing the running track around the playing field to make way for 20 new rows of seating. The press box was replaced and lights were added for night games and practices in the 1980s.

In January 2001, OSU decided it was time to turn its attention to the 80-year-old football stadium. From 2000 to 2002, a master plan was developed to transform the aging two-sided facility into a single horseshoe-shaped football palace. In 2003, the Next Level Campaign was approved. OSU alumnus T. Boone Pickens helped set it into motion with a \$70-million donation, an act OSU recognized by renaming Lewis Field as Boone Pickens Stadium. In 2006, Pickens made an additional \$165 million donation to help the Next Level Campaign maintain its momentum.

ally, several steel braces were relocated and several steel columns and beams strengthened to create a brace-free concourse to service the second floor of the concession and restroom buildings and the existing upper vomitories leading to the seating bowl.

At 500 ft long, the new Phase 1 and 2 steel structures would ordinarily require a single expansion joint near the midpoint. The design team was able to eliminate any

expansion joints in these steel structures by locating a single anchor brace at the center of the 500-ft (east-west) direction. The anchor braces allow the structures to expand and contract away from and toward the center of the building during temperature differentials. The short (north-south) direction of these structures are stabilized with six traditional brace-frames made of WF (enclosed) and HSS (exposed) sections

in a variety of single-brace and chevron-brace configurations.

The Suite Level was designed to get fans as close to the field as possible while providing overhead cover for the new Club Level seating on the existing grandstands directly below it. The design team used trussed 48-in. plate-girders at the Suite and Upper Concourse Levels to cantilever the suites 30 ft over the existing grandstand structures. In addition to allowing the cantilevered suites to function, the plate-girders were very beneficial in limiting floor vibrations and were able to accommodate approximately 240 penetrations for distribution of piping, wiring, and heating ducts within limited ceiling space.

Seamless Integration

The existing south and north grandstands were joined to four new steel structures to create the completed horseshoe-shaped stadium. During Phases 1 and 2, the existing grandstands were joined to new steel structures at the Mezzanine and Club Levels. The expansion joints were achieved with a variety of cantilevered steel beams and miscellaneous steel framing. The massive west end-zone structure was joined to the existing grandstands to complete the 10,000-ton horseshoe in Phase 3.

At the Top of its Game

Through its Next Level Campaign, Oklahoma State University successfully brought the outdated Lewis Field into the 21st century. Boone Pickens Stadium melds OSU's commitment to tradition and quality into a point of pride for the campus. The designers used innovation and steel to replenish and renew portions of the outdated and aging stadium and connect it with new structures to form a single sports venue that's a level above its former self. **MSC**

Architect

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Structural Engineer

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Steel Fabricator

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Steel Erector

Bennett Steel Inc., Sapulpa, Okla. (AISC/TAUC Member)

Steel Detailer

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General Contractor

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