In less than a year, 18 luxury suites and 648 seats were to be added at the north end zone of West Virginia University’s Mountaineer Stadium in time for the team’s opening game on September 4, 2004.

The project design team initially chose concrete for the expansion. However, during the bidding process, the eventual general contractor, March-Westin Company, suggested to the owner that a steel option should be investigated because of the tight schedule, difficulties facing winter construction, and the possible costs savings of steel versus concrete. March-Westin was the successful bidder on the original design, but after receiving the contract they worked with Allegheny Design Services and AISC-member fabricator Contracting Engineering Consultants (CEC) to investigate the steel option. By early November, they submitted a proposal for the steel-framed option that gave the owner a 5% total project savings. The steel option also lowered the risk of schedule overruns with winter construction and a December 1, 2003 start-of-construction date. The owner accepted, and March-Westin, Allegheny and CEC worked as a team to design and build the project.

“We like to bring the fabricator and the engineer on at the same time,” said Jamie Ridgeway, project manager for March-Westin. “We do it all the time on projects, because it can save time and money.”

The transition from concrete to steel went smoothly, said structural engineer David R. Simpson, P.E. “We worked directly for March-Westin while maintaining coordination with HOK and Thornton-Tomasetti. To complete the design in a three-month period, we had to feed information to the fabricator as we were going along so that they could meet the mill schedules to order steel—while maintaining communication with HOK and their architectural requirements—and while communicating with Thornton-Tomasetti to determine what...
The Peddinghaus Beam Drill Line BDL 760 used on this project is a compact structural drilling machine suited for short or long production runs of sections 30” wide or less. It is a computer-numERICally controlled (CNC) machine—and fabrication information could be directly imported into the machine from Xsteel, the detailing software program used for the WVU project. The combined use of Xsteel and the BDL 760 saved as many as three weeks from the project schedule. “The Peddinghaus machine is pretty impressive,” said Tanner Johnson, project detailer for fabricator Contracting Engineering Consultants. “Depending on the difficulty of the pieces that we have to run, and how much work gets done to them, with some projects we can squeeze in as many as 45 tons a day. It’ll chew up beams and columns as fast as you can keep it running. It’s a great piece of machinery.” The drill line’s carbide marking system, Signoscript, is used for fast part identification.

Project Timeline

October 2003: March-Westin wins the bid for the project; organizes a team to consider design in structural steel.

November, 2003: March-Westin submits a proposal for the steel-framed option that offers the owner a 5% total project savings.

December 1, 2003: Construction begins.

December 2, 2003: Structural steel detailing begins.

January 22, 2004: Detailing and shop-drawing approval process is complete.

March 1, 2004: The first load of structural steel is shipped to the job site.

March 22, 2004: Foundations are complete.

May 20, 2004: Structural steel erection complete.

September 4, 2004: Kick-off!
window-operating system. The driving frequencies of excited football fans in the stadium also were taken into consideration. For the cantilevers, Simpson designed a bolted moment connection with 1½” ASTM A325N bolts, for ease of erection.

“As opposed to concrete, the appearance as you’re walking underneath the cantilevered sections is really impressive,” Johnson said. “Especially to see those W27×94 beams that are cantilevered out with bolts on them.”

An error in the soils report was discovered, and the expected differential settlement was increased from 1” to 2”-3”. The solution was to temporarily brace the frame with cables and install the angle knee bracing after most of the dead loads were applied. Under temporary bracing, the frames were allowed to rotate at the beam-column connections during settlement. After an approximately 1.5” settlement and no sign of significant further settlement, the knee braces were secured, thus greatly reducing any residual stresses.

At the ends of the building, where it joins the existing stadium, considerations were made to provide underpinning to the existing stadium structure. Due to soil conditions, it was not advisable or economical to use soil nailing for this area. This led to the use of the super-structure as support for the 20’-high retaining walls. HSS 8×8s were used to direct the top-of-wall reactions into the Thornton-Tomasetti-designed foundations.

The project contained 325 tons of structural steel members. A spray-applied fire-protective vermiculite coating was used on the interior structural members of the steel frame. The exterior steel was coated with a Tnemec SSPC-SP6 system, with zinc-rich shop-applied primer and a two-coat system of field-applied paint.

Gene Martin, P.E., is a regional engineer for the Upper Midwest Region for AISC Marketing, LLC. David R. Simpson, P.E., is president of Allegheny Design Services.