



Tight tolerances met for Lucas Oil Stadium



USI's Michael Baden (left) and Jason Deiwert.

The new 63,000-plus-seat Lucas Oil Stadium in downtown Indianapolis is designed for multi-purpose use, thanks largely to a first-of-its-kind retractable roof. Aside from NFL football, Lucas Oil was also designed to accommodate the NCAA Final Four, the Super Bowl, concerts, conventions and various other events.

Lucas Oil is the first to use a "SuperFrame Structural System" with a moving two-panel design whereby the roof is supported by five rails. With this design, long, narrow panels stack over the building and do not overhang or shadow the façade.

Tolerances were extremely tight on the roof, necessitated by the multi-purpose concept of a stadium that will host both open-air football and indoor events such as basketball.

USI Consultants relied heavily upon the accuracy and productivity of a Topcon GTS-233W total station to meet the tight roof tolerances. Tim Brown, project manager for USI Consultants, notes just how tightly the roof engineer, Houston-based Walter P. Moore, dictated the tolerances on the retractable roof structure: within an eighth of an inch, or about as close to "zero tolerance" as realistically possible.

Company: USI Consultants

Location: Indianapolis, Indiana

Project: Lucas Oil Stadium

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Scope: Stadium covers 1.8 million square feet total. Roof is a moving two-panel design supported by five rails providing 176,400 square feet of opening when open. Cable drum drives mounted to transporters operate two 600-by-175-foot bi-parting panels. Roof is 270 feet high. A pair of 760-foot-long steel SuperFrames supports the roof with the help of five peaked, three-span transverse trusses spaced 144 feet apart.

Topcon Products:

GTS-233W Total Station

Topcon Dealer:

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AT WORK

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'It is easy to level and fast to set up with the laser plummet. Its Bluetooth feature allows for a cable-free environment to work in.' – Tim Brown, project manager, USI



USI Consultants relied heavily upon the accuracy of the Topcon GTS-233W total station for the Lucas Oil Stadium project.

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Brown points out that the wireless GTS-233W has some user-friendly features that greatly improved productivity on this project. "It is easy to level, and fast to set up with the laser plummet," he says. "Its Bluetooth feature allows for a cable-free environment to work in. The Bluetooth range is about 25 feet, allowing you to move about the instrument or even back to your truck without losing the connection.

"If you have to go back to the truck to read your plans, you can take your controller with you to aid in additional computations. There are also no cables to lose or get broken. The instrument itself has a simple keyboard without a lot of menus—this means fewer keystrokes."

When surveying the retractable roof, Jason Deiwert, crew chief, carried a reflector up a stairwell that goes to the seventh and top level in the southwest end of the stadium and Michael Baden, instrument operator, carried a Topcon GTS-233W total station.

Then, having gone to opposite sides of the transverse trusses via catwalks, the crew put in a control line across each transverse truss to

check the alignment of the panels at each truss. Brown reports that, because the roof operates with multiple motors and they all have to be running at the same speed, USI Consultants put a line across each truss so that the panels could be monitored during movement.

The surveyors also aligned the railing system. Using a control traverse that was set around the base of the structure, the crew set the alignment on the ground. After the alignment was checked on the ground, the crew transferred it up at both ends with the use of the GTS-233W. After alignment was established at a given level, the crew moved its instruments up to the top and verified the alignment from up above.

In addition to the roof, USI Consultants surveyed the concrete walls and floors as each of the seven levels were constructed. The plumbness of the south walls was also checked prior to installation of large glass panels. USI Consultants set control lines for the luxury suites and press box for drywall and plumbing contractors, as well as surveying the field and goalposts.

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