

At the Top of THEIR GAME

BY TASHA WEISS



The University of California, Davis improves upon last year's third-place performance to take the top spot at this year's National Student Steel Bridge Competition.

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THE UNIVERSITY OF AKRON'S athletic teams are known as the Zips. And engineering students from all over the country certainly brought some zip of their own to the school over Memorial Day weekend, as Akron played host to the 23rd annual ASCE/AISC National Student Steel Bridge Competition (NSSBC).

After finishing third in the competition last year, the University of California, Davis (UC Davis) elevated its game and earned the overall title at this year's competition, which took place in Akron's John S. Knight Center. For the third consecutive year, second place went to the Massachusetts Institute of Technology. The University of California, Berkeley took third place this year (this is the exact reverse order of the top three overall winners last year.)

For the 600 students from 47 participating colleges and universities—narrowed down from 18 regional competitions throughout the spring—the goal was to design, fabricate and construct their own one-tenth-scale steel bridge in the shortest time and under specific building constraints. The competition is an exciting visual display of students' structural design and analysis skills at work. Not only does it give them the opportunity to further expand upon their technical knowledge learned in the classroom, but it also provides them valuable experience in practical areas like communication, teamwork and project management.

▲ This year's competition, hosted by the University of Akron, took place at Akron's John S. Knight Center.

And each year, the NSSBC Rules Committee creates a new set of rules that reflect real-life structural specifications and construction regulations. This year, students were challenged with designing a steel bridge that was to replace an 80-year-old deteriorated timber trestle. The bridge had to span a 17-ft-wide river but not exceed 19 ft overall. And in order to accommodate extreme high water, the maximum construction depth below the bridge deck was to be no more than 9 in. Working within this particular constraint resulted in a wide variety of bridge designs.

Tasha Weiss (weiss@aisc.org) is Modern Steel's associate editor.



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- Spanning the 17-ft-wide "river."
- ▼ Loading up during the stiffness competition, which involves the incremental addition of 2,500 lb.



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Making the Podium

While every team dreams of putting up the best overall performance, the competition's six categories provide opportunities for victory as well. The top three winners in each category of the 2014 competition were:

Construction Speed

1. Clemson University
2. New Mexico Institute of Mining and Technology
3. University of Missouri Science and Technology

Economy

1. Clemson University
2. University of Missouri Science and Technology
3. New Mexico Institute of Mining and Technology

Stiffness

1. University of Hawaii at Manoa
2. Lafayette College
3. University of Florida

Display

1. Youngstown State University
2. Lakehead University
3. Georgia Institute of Technology

Lightness

1. University of California, Davis
2. California Polytechnic State University, San Luis Obispo
3. University of California, Berkeley

Efficiency

1. University of California, Davis
2. University of Florida
3. University of Wisconsin Madison

The complete rankings, overall and by category, are available at www.nssbc.info. More photos from this year's competition can be found on AISC's Facebook page (www.facebook.com/AISCdotORG) in the NSSBC 2014 photo album.

- ▼ Cal Poly's team, working against the clock.

- ▼ UC Davis, the overall winners.



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▲ Judging the lateral stiffness, with 50 lb of weight applied.



▲ Each bridge must meet specific requirements, such as limiting below-deck construction to only 9 in., but each has its own style.

While rules and specifications change from year to year, the competition's categories tend to stay the same: construction speed, stiffness, lightness, economy, display and efficiency. The teams with the best combined rankings across all categories earn the top overall spots. This is the second time UC Davis has won the national championship in the competition's history; their first win was in 2005.

"We were thrilled to come in first place," said Quincy Dahm, one of the team captains of the 20-member UC Davis steel bridge team. "It had been too long since our last victory, and we wanted to leave a mark this year. A few people were determined to make that happen and that's what drove us to success—a lot of hours from a handful of students."

Dahm also credited the team's win to their bridge's extremely lightweight design. At 79 lb, the bridge was 12 lb lighter than the second lightest bridge, which allowed them to sit back at sixth and ninth place for stiffness and construction economy, respectively. Of course, those categories required plenty of effort as well. "We practiced building the bridge nearly every day, and fabrication demanded precision to keep deflection under control," he said. "If we slacked at all in any area, I doubt we would have gotten first place."

"It has been a challenging year, and the student team worked extremely hard since the very beginning," added Dawn Cheng, Ph.D., faculty advisor for the UC Davis steel bridge team and associate professor in UC Davis' Department of Civil and Environmental Engineering. "This well-deserved achievement takes dedication, hard work and perfection in engineering and leadership skills. Winning is not the final goal of the competition; being part of such a great lifetime experience is what matters."

Throughout the academic year, student teams work for months perfecting the design, fabrication and construction of their bridges. To reach the national event, each team must place among the top schools in one of the regional competitions. This year, approximately 200 college and university teams from around the U.S., Canada and Mexico participated in the regional competitions.

"It's exciting to watch the next generation of structural engineers come together and work with such passion and enthusiasm," said Nancy Gavlin, AISC's director of education. "The competition poses real-world challenges that the students face with ingenuity and professionalism."

There is also a significant amount of preparation for the host school, and AISC provides financial and advisory assistance

throughout the process. According to Gavlin, planning consists of registering hundreds of competitors, fundraising, providing meals and making housing arrangements for all competitors for the two-day event, finding and training more than 100 event volunteers, arranging a judges' lunch meeting for 60 people, organizing the display competition for almost 50 bridges, hosting a captains' meeting for 100 people, laying out the competition boundary lines, organizing the logistics for the 12-hour main bridge competition day itself—which consists of five simultaneously operating build stations, nine load stations, a weigh station and a scoring station—coordinating and helping to develop the loading and displacement measuring devices and then topping it all off with a banquet for 750 people.

"We worked very closely with Nancy and with John Parucki, the national head judge, and they visited UA several times over the months leading up to the competition," said David Roke, Ph.D., assistant professor at the University of Akron and faculty advisor for both the 2014 NSSBC Hosting Committee and the school's steel bridge team. "The breadth and depth of what they asked for and helped us to arrange was staggering; there is so much to consider, from the fine details like a specific loading procedure to the broader task of arranging the flow of the competition itself."

"Advising the student steel bridge team was actually a very fun experience for me," Roke continued. "It's something that I wish I had been involved with as an undergraduate student, so I'm more than happy to be involved now as a faculty advisor. The best part about it is the interaction with the students. They put in a lot of time outside of the classroom to apply concepts they learned in class, extend their knowledge beyond what is taught and work together to solve complex engineering problems. The steel bridge competition is an excellent training ground for tomorrow's engineers, and I'm proud to be a small part of it here at UA." ■

Next year's NSSBC will be held May 22-23 at the University of Missouri-Kansas City. To learn more about the competition, visit www.aisc.org/nssbc or www.nssbc.info. NSSBC is sponsored by AISC in cooperation with the American Society of Civil Engineers and is cosponsored by Bentley, DS SolidWorks, Nucor, the American Iron and Steel Institute, the National Steel Bridge Alliance, the James F. Lincoln Arc Welding Foundation, the Canadian Institute of Steel Construction, the Steel Structures Education Foundation and the American Galvanizers Association.