

Beyond the Classroom

The National Student Steel Bridge Competition celebrates 15 years of collegiate ingenuity.

BY LENA SINGER

MONTHS OF PLANNING, HUNDREDS OF HOURS OF PRACTICE, AND THOUSANDS OF DOLLARS IN SPONSORSHIPS: In its 15 years, the National Student Steel Bridge Competition (SSBC) has grown from a modest contest among civil engineering schools to something more along the lines of a major college sporting event.

But more is at stake for the student competitors than just a national title. For those who are future civil engineers, it is one of the first times their abilities as designers will be tested in a practical and public setting.

“It’s gotten much more professional,” said Frank Hatfield, Professor Emeritus of Civil and Environmental Engineering at Michigan State University. “The students are more intensely competitive. They want to win.”

Hatfield helped organize the first regional student steel bridge competition at Lawrence University in 1987, where three Midwestern schools competed. Currently there are 18 regional competitions, and this year’s national competition, held in May in Salt Lake City, included 45 teams from universities across North America, including Canada and Hawaii.

Nathan Langdon, captain of the University of California, Berkeley, team said they spent about 800 hours working on its bridge and practicing construction in the weeks leading up to the competition.

“To me, this experience goes beyond anything in the classroom—you’re working with students who want to do this, and who want to be the best bridge designers in the world,” Langdon said. “The people you’re working with on these teams are the people you’ll be working with for the rest of your life.”

Most of the teams competing at the national level begin preparing for the competition as many as eight months in advance. The teams, the majority of which are formed from university chapters of the American Society of Civil Engineers, are given identical construction scenarios and site plans that are created each year. From there, detailed rules describe what is appropriate for nearly every aspect of the bridges’ design and construction.

The bridges must be designed entirely in structural steel and with only members and fasteners. Maximums and minimums are prescribed for each bridge’s envelope, vehicle passageway, and decking dimensions. Limits for acceptable sway and vertical deflection are outlined, and specific construction safety guidelines are defined. During the competition, failure to comply with any of these specifications can result in penalty points added to a team’s final score. Scores are calculated in terms of dollar amounts, with the least expensive named champion. In all, the rules for the 2006 competition amounted to 31 pages.

Hatfield is head of the rules committee. “We fight it, but every year the rules get longer,” he said. The rules change yearly, in part,



University of California, Davis students assemble parts of their bridge during a practice run.



Students from the University of Illinois, Chicago put the finishing touches on their bridge during the competition.

to ensure the bridge designs are original. They also change as judges witness how the old rules have been interpreted. "Every year, a school comes up with a strategy that couldn't possibly be done on a real construction project, and we want to keep it realistic," he said.

Bridges are assessed in the categories of stiffness, lightness, efficiency, economy, aesthetics, and construction speed. The standards—strength, durability, constructability, usability, functionality, and safety—used in calculating the scores reflect the same standards applied to the design and construction of bridges in the real world.

The competition in Salt Lake City opened with judging for aesthetics. The students assembled their bridges and each one was judged for balance, proportion, elegance, and finish. The school's name had to be permanently affixed to the bridge, and a poster describing the overall design had to be displayed. Several bridges featured schools' names in steel letters welded to members. Many were painted in school colors, while others were galvanized. Judges do not consider workmanship, since, according to the rules, some schools received professional assistance in the fabrication of their bridges, the only assistance students may accept.

Several team captains said local structural steel fabricators had lent shop space and tools for their teams to fabricate their bridges. Others said they used their universities' facilities. A few teams had bridges constructed entirely of donated materials, while others spent as much as \$6,000 on materials. Teams raised money to construct their bridges—as well for transportation to the competition—through corporate, local business, and university sponsorships, as well as through fundraising activities.

When aesthetics judging came to a close, the teams disassembled their bridges in preparation for the overall bridge competition on Saturday and the arguably most competitive event: construction. Many teams practiced assembling and reassembling their bridges in Salt Lake City's public plazas and parking garages the night before.

"We'll be here until it gets dark," said Jessica Revell, while she and the rest of the University of California, Davis team practiced constructing their bridge in an empty skating rink. UC, Davis was this year's returning champion. During practice, the team constructed its 252-lb bridge in four minutes and 46 seconds, their fastest time yet. During the competition, the team would finish, with penalty seconds added for construction violations, in seven minutes and 47 seconds.

"It's a weird combination of engineering and athletics," said Nathan Bechle, co-captain of the University of Wisconsin's team, of the bridge competition. Wisconsin placed third in the overall competition. State University of New York (SUNY) Institute of Technology placed second, while North Dakota State University came in first.

Wisconsin was among the teams that clearly reflect the competition's move toward more intense athleticism. According to Bechle, Wisconsin held time trials before the regional competition to determine its fastest builders. With the construction team assembled, the students divided the construction of their bridge into ten phases and timed each one to make the overall process as quick and error-free as possible. The team's final time at the

2006 Participants

Forty-five schools participated in the ASCE/AISC National Student Steel Bridge Competition in Salt Lake City, hosted by the University of Utah, May 26-27.

Arkansas State University	Michigan State University
University of British Columbia	University of Missouri, Kansas City
University of California, Berkeley	New Jersey Institute of Technology
University of California, Davis	New York City College of Technology
University of California, San Diego	North Dakota State University
California Polytechnic, San Luis Obispo	University of North Florida
California State University, Chico	Ohio State University
Clemson University	Old Dominion University
Colorado School of Mines	Oregon Institute of Technology
University of Connecticut	University of Southern Illinois, Carbondale
University of Delaware	Southern Polytechnic State University
Ecole de Technologie Supérieur	SUNY College of Technology, Canton
Georgia Institute of Technology	Tennessee Technological University
Gonzaga University	University of Texas at Austin
University of Hawaii	Texas A&M University, College Station
Hudson Valley Community College	Texas A&M University, Kingsville
University of Idaho	University of Utah
University of Illinois, Chicago	Utah State University
Kansas State University	Virginia Tech
Lafayette College	University of Wisconsin, Madison
Lakehead University	Youngstown State University
Lawrence Technological Institute	
Louisiana State University	
University of Maine	



The overall national winner was the team from North Dakota State University, shown from left to right: Prof. Magdy Abdelrahman (advisor), David Adams, Brian Lintgen, Ben Kuisle, Nathan Hoffmann, Michael Lawrence, Scott Harpole, and Eric Fosmo.

2006 Winners

The top three winners of the following six categories the students competed in are as follows:

Construction Speed

1. SUNY College of Technology, Canton
2. California Polytechnic, San Luis Obispo
3. Clemson University

Lightness

1. Gonzaga University
2. North Dakota State University
3. Lakehead University

Aesthetics

1. Lakehead University
2. University of Wisconsin, Madison
3. Lawrence Technological University

Stiffness

1. Hudson Valley Community College
2. SUNY College of Technology, Canton
3. Clemson University

Economy

1. California Polytechnic- San Luis Obispo
2. Clemson University
3. University of Wisconsin, Madison

Efficiency

1. North Dakota State University
2. SUNY College of Technology, Canton
3. Lakehead University

The top three national winners overall are:

1. North Dakota State University
2. SUNY College of Technology, Canton
3. University of Wisconsin, Madison

competition, including penalty seconds, was tallied as four minutes and 77 seconds.

While mistakes during the competition's construction component can drag down a team's overall score, errors made during the months of engineering and fabrication can eventually take a team out of the competition altogether. After a team's bridge is constructed, it is tested for sway and vertical deflection under 2,500 lb of total load. If a bridge fails at any time during testing, the team is automatically disqualified.

Following testing, each bridge is weighed on a set of four scales. After that, teams disassemble their bridges and wait for the final scores to be calculated. Many start thinking about next year's design before the competition is even over.

"We'll start the design for next year's bridge on the plane home," said Olivia Gaunter of Southern Polytechnic State University in Marietta, Ga.

The 2006 National Student Steel Bridge Competition was sponsored by the American Institute of Steel Construction and the American Society of Civil Engineers. Co-sponsors included the American Iron and Steel Institute, the James F. Lincoln Arc Welding Foundation, the National Steel Bridge Alliance, and Nucor Corporation. **MSC**

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