

# Going NATIONAL

BY VICTORIA CSERVENYAK

Over the past quarter-century, the National Student Steel Bridge Competition has evolved from a small academic competition in Michigan to a national showcase of skill and ingenuity that preps students for real-world bridge design.

**IN 1993, DON SEPULVEDA** was ready to drop out of school—until he joined his university’s steel bridge building team, that is.

“I was a full-time student with a family and I was on the verge of burning out,” he reflected. “Being on the bridge team [at California State University, Northridge], I saw a purpose and it kept me going. It led to meeting and networking with people, and that led to where I’m at today in my career.”

It also led to meeting his wife, Karen, at a regional student steel bridge building competition.

Twenty years later and halfway across the country, Emily Bajwa was a senior in high school and didn’t know what she wanted to study or where she wanted to attend college. Her cousin, who was on the steel bridge team at the University of Akron, invited her to participate in activities with the team. The experience inspired her to study engineering at Purdue University and join its bridge team, where she presided over hosting the national competition in 2010, one of her favorite and proudest memories at Purdue.

For the past 25 years, the National Student Steel Bridge Competition (NSSBC) has not only emboldened students like Don and Emily and countless others in their studies, but has also offered them the opportunity to use their shop skills to design, fabricate and erect one-tenth-scale bridges, as well as

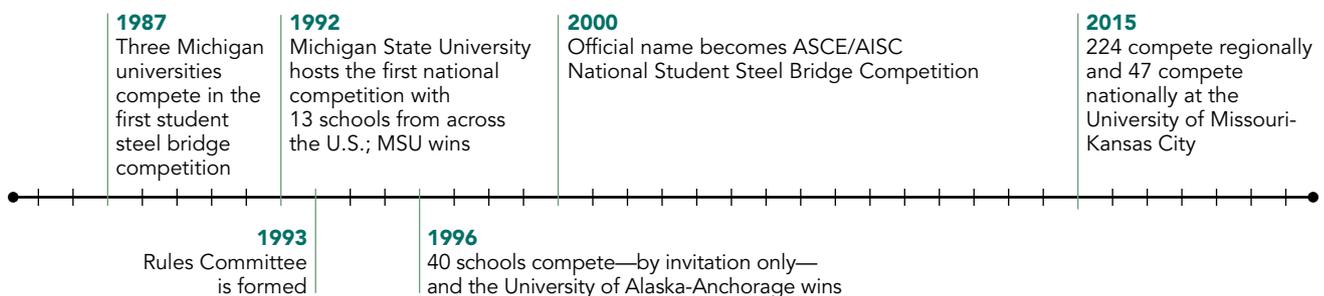
develop professional connections. But when the competition was first introduced, no one knew it would be more than a one-time event.

## Starting Simply

NSSBC’s origins date back to 1987 when Bob Shaw, former AISC university programs director, created a small educational competition for civil engineering students in Michigan. Students were given a problem to solve—to build a bridge across a river—an almost identical format to today’s competition, which is modified yearly to include different construction constraints, member sizes and weight limits.

Shaw said he chose bridges instead of buildings because “bridges are always exciting. It’s something close to the ground and that was manageable and something that created a real scenario possibility. I wanted to have a competition that actually taught the students something and gave them hands-on experience.”

So, Shaw set up a pilot competition and three teams enlisted: Lawrence Technological University (LTU), Michigan Technological University and Wayne State University. Local Michigan fabricators sponsored and volunteered at the competition, which was held in LTU’s parking lot in March of 1987.





- ▲ Trucks used for load testing were built by Bob Shaw.
- Early competitions took place outdoors, with little regard for safety since there weren't official rules.
- ▼ Wayne State University using ropes to move their bridge (1987).



- ▲ Michigan Technological University load tests their bridge with their team members (1987).
- ◀ Lawrence Technological University (1987).

“The highlight of the competition was the erection scheme that was used by LTU that basically had students crawling down on a 6-in.-deep member to the very end and reaching across the ‘river’ to receive the piece from the other end, while being counterbalanced by another student sitting on the end of the beam,” Shaw laughed. “It was worrisome and it was scary, but it was very, very entertaining.”

Despite how amusing watching the students compete was, the safety issues, hours spent on erection, multiple builders and hundreds of pieces per bridge provoked Shaw to wonder how and if the competition could run at a larger scale.

But over the next few years, the students promptly learned more efficient construction techniques as other universities joined Michigan’s competition and launched their own regional competitions throughout the country.

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▲ Clemson University uses colored beams to differentiate their bridge from their competition (2013).

◀ The Texas A&M team, sporting cowboy hats (2000).



➤ A bridge fails at the 2000 NSSBC at Texas A&M University.

▼ All schools' names are required to be visible on their bridge.



## Across the Country

In 1992, Michigan State University (MSU) challenged all interested bridge teams to compete in the first national competition, with 13 teams signing up. The bridges were cumbersome, with a “fast” bridge taking more than 30 minutes to erect (for perspective, the University of Florida’s winning bridge last year took less than five minutes). Frank Hatfield, MSU’s bridge team advisor since 1988 and rules committee chair since 1993, said, “In 1992 the winning bridge weighed nearly half a ton. Last year’s winner: 85 pounds.”

In 1996, due to the large number of teams, the competition took on a by-invitation-only format, with 40 of the top teams from the regional conferences advancing. In 2000, the competition was officially dubbed the ASCE/AISC National Student Steel Bridge Competition (NSSBC) and still maintains the same name and structure.

Each year, with more than 200 teams competing regionally and less than 50 qualifying for NSSBC, teams must be resourceful. Every team starts preparing in the beginning of the school year, spending up to 40 hours a week on their bridge before the regional competitions commence in March.

Bridge development emulates a professional project, with the students being part of a project team and having to develop solutions from start to finish. The students receive a request for proposal (the problem statement) then design, fabricate, load

test, practice construction of, select builders for and compete to build the bridge in the competition. For students that are new to the bridge building team, it’s also their first experience applying their skills outside of the classroom, balancing a budget and schedule, attaining funding and managing a project.

“Working as a team and making technical decisions—maintaining an environment where the best ideas come forward—is probably the most difficult part,” said Gary Fry, Texas A&M University’s student bridge team advisor.

## Do You Even Weld, Bro?

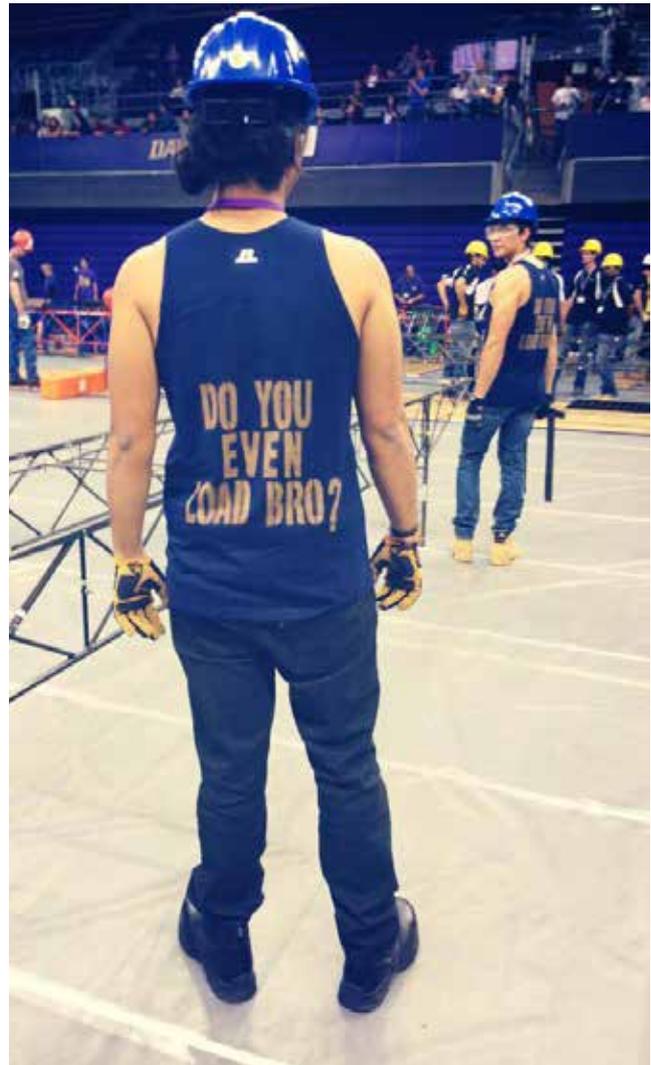
As bridge technology evolves, so does the various teams’ creativity. While there’s no award for team spirit, campy costumes and sprightly shirts have become the unofficial dress code at the national competition, and fervent family and fans, the accessory.

Despite the team members’ visual expression, bridge designs are unadorned except for the required school name and the occasional use of colored beams. Teams are judged in six categories— aesthetics, lightness, stiffness, construction economy, speed of erection and structural efficiency—as well as overall performance, with penalties resulting in additional cost, time or weight. And if a bridge collapses, the team is automatically disqualified.

“The first time my bridge failed, we were loading it up and we were watching it get close to breaking and we actually had to stop loading,” recalled Sepulveda. “That led a lot to my un-



- ▲ Don Sepulveda inspecting the University of California, Berkeley’s bridge at the 2013 NSSBC.
- Apparently they do load, because the University of California, Berkeley team won that year (2013).
- ▼ Larry Kruth, rules committee member (left) and Frank Hatfield, rules committee chair (right) at the 2015 competition.



derstanding of the mechanics of it all.” Now, not only are there fewer failures, but the number of builders, time and weight have also been reduced as students incorporate contemporary construction methods and technology advancements into their projects and bestow them to the next generation.

Sepulveda explained that connections at the competition have also evolved since he was a student, noting that while bolts, nuts and plates were the norm then, today’s competitors use dovetails and slotted joints and often devise sophisticated connections that are intricately machined.

Even creativity in the application of tools has expanded. While several teams do their own welding in advance, power tools and welding are prohibited during the competition; only hand tools are accepted as long as they fit into a certain dimension. Students have created piers, employed gadgets to align a portion of the bridge while they’re bolting and even used counterweights to not be charged for another builder (which affects their score).

Hatfield believes part of the competition’s progress is a consequence of students’ having a better grasp of the behavior of compression members. “This is evidenced by the increased use of alloy steels, built-up members and compression members with integral balancing,” he said.

### Crossing the Bridge into the Workforce

Employers respect potential hires’ experience with the competition and students list their role with their school’s bridge team on their résumé, which sometimes leads directly to interviews and employment.

Fry said that team membership prepares students for their first job after graduation because it demonstrates that they know how to communicate, stay focused on technical logic and decision-making and be a positive member of a design team.

Six years after meeting a Bechtel executive—the company where she dreamed of launching her career during her time on the bridge team—Bajwa now works there as a contracts professional. She said the competition not only gave her the opportunity to network with industry leaders, but also dexterity as a future project manager and team member.

### Divining the Future

Today, students from all 50 states, Canada, China, Mexico and Puerto Rico have participated in regional competitions, with many making it to nationals. The future of the competition is already expanding its global reach, with Iran, Japan and Poland now hosting their own competitions and several other countries inquiring how they can participate.

Twenty-four years after first joining the bridge team, Sepulveda is still immersed in the competition—first as a regional conference head judge, then as a national competition judge and for the past decade as a rules committee member. He continues to volunteer not only because of the competition’s personal impact, but also in the interest of seeing it continue to expand.

“The students are our future,” he said. “By seeing their activities and the energy that they bring to this competition, it makes us confident that our future is in good hands.” ■

*This year’s NSSBC will take place at Brigham Young University in Provo, Utah, May 27–28. For more information, visit [www.aisc.org/nssbc](http://www.aisc.org/nssbc).*