On to OREGON!

BY GEOFF WEISENBERGER

Oregon State University welcomed 43 bridge teams to the unusually sunny Pacific Northwest as the host of this year's National Student Steel Bridge Competition.

ON SATURDAY of this past Memorial Day weekend, the Tennis Complex at Oregon State University (OSU) in Corvallis was temporarily transformed into a different type of athletic facility.

The nets were taken down and the rubber courts were covered with plywood adorned with tape representing rivers and footings. The sport of the day? Building bridges.

OSU played host to the National Student Steel Bridge Competition (NSSBC) where 43 teams—narrowed down from 227—from around the U.S. and the world met to put their bridge designs to the test against the rest of the best. Teams make it to nationals by being one of the top two or three finishers in 18 regional competitions around the country (international teams are assigned to one of these regions). The bridges, which must be 20 ft long and made entirely of steel, compete in six categories: display, construction speed, stiffness (a combination of lateral and vertical loading tests), economy, efficiency and lightness. A team's scores in each category are then translated into their overall score, which is measured in cost (the lowest cost wins).

Which way to the competition?

Preparation typically starts during the fall semester and can involve thousands of hours for design, fabrication and practice assembly. The latter often takes place right up to the last minute, as several teams were spotted practicing their bridge assembly late Friday night in a hotel parking lot.

"One year, I got some noise complaints and had to come out of my hotel room and tell a bunch of students to keep it down," recalled John Parucki, the competition's longtime head judge. "Not because they were partying but because they were practicing in the hall."

Derailed

But no matter how long or hard a team practices, anything can happen—including the worst.

Unfortunately, the University of Akron team learned this the hard way, as their bridge was lost in transit between Akron and Corvallis. Teams choose how to transport their bridges from their school, and some make a road trip out of it and drive their bridge themselves while others rely on shipping companies. Akron chose the latter, and their bridge was on a train that derailed en route to Oregon. They were actually able to track it to Salem—just an hour from Corvallis—but unfortunately weren't able to gain access to the storage facility.

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The Kennesaw State University team, leaning over the river.

The University of Florida team slid their bridge using channels.

The College of New Jersey team members look on as the judges inspect their bridge.

North Carolina State's bungee cord-enabled bridge.

AISC president Charlie Carter and vice president Larry Kruth do some heavy lifting.

"It was supposed to arrive on Wednesday, but then we were told that it wouldn't arrive until next Tuesday, which is obviously too late," said David Roke, the Akron team's faculty advisor. "I estimate we put 3,000 to 4,000 total labor hours into our bridge. Everyone here has been very supportive, but it's obviously extremely disappointing."

Comeback Kids

Another team, Michigan Technological University (MTU), bounced back from a disaster of their own at last year's competition. Coming into the 2016 nationals as one of the teams to watch, everything went well until their bridge collapsed when the final 25-lb angle was being loaded during the vertical loading test. The culprit was a design flaw that wasn't exposed during the regional competition but became the bridge's literal downfall at nationals, as the loading location is determined randomly by the roll of a six-sided die. But the team was determined to bounce back this year, and that's just what they did.

"When we returned home after the competition, the bridge was analyzed to further determine its mode of failure," explained Greg Naghtin, the team's captain. "We based this year's design around that mode of failure, attempting to ensure that we would not have a repeat. After winning regionals again this year, our primary goal for nationals was to do anything better than last year. We surpassed our expectations, ending up in the top 10 for a majority of the subcategories and in the top 15 overall. As a team, we could not be more pleased with how we were able to bounce back and actually turn last year's detriment into an asset."

Up and Coming

Like any other tournament, NSSBC is a mixture of traditional powerhouses, rising stars and first-timers. While many teams are veterans at the national level, this year's competition was the first time on the national stage for Christian Brothers University in Memphis. The team placed third in their region this year and last year, and thanks to their dedication and hard work—and a little luck—earned a trip to Corvallis.

"We were invited due to the fact that a higher-placing team did not attend the mandatory regional business meeting, so we decided to take this miracle of an opportunity," said Christine Moore, the team's captain, noting that in addition to giving it their all at the national competition, another goal was to learn from other teams and incorporate some of their ideas and innovations in the future.

"One of my teammates met with a team yesterday that only had six bolts for their entire bridge, as it was mostly constructed with slotted connections," she explained. "Another team member approached me with the idea of using a person's foot as a footing for one of the bridge's legs to rest on. These are the kinds of ideas we are taking back to Memphis."

Moore commented that another takeaway for the team was the difference in pace between the regional and national competitions, noting that judges at the latter were more amenable to allowing teams to build at top speed.

"The judges here were more geared toward going with the spirit of the rule book rather than following it to the letter," she

▼ The University of New Orleans team, back at nationals.

A Memorial Bridge

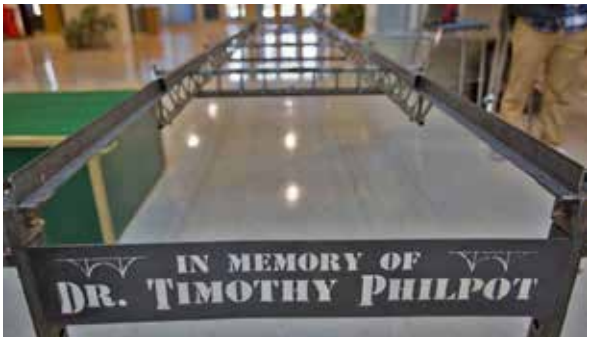
The Missouri University of Science and Technology's (Missouri S&T) steel bridge team is one of those that narrowly missed making it to this year's national competition, finishing third at regionals—just one spot away from a trip to Corvallis.

In January, the team was devastated by the sudden passing of their faculty advisor, Timothy Philpot. Throughout his tenure at Missouri S&T, Philpot taught several structural engineering courses and was also known for his development of MecMovies, a digital teaching tool that presents engineering concepts that can be difficult to illustrate with static images alone.

The team's advisor since 2010, Philpot always provided thoughtful design and fabrication critiques. He developed a close relationship with team members and had many of them in his classes.

"He would always help us with any questions we ever had and would come to our regional competition," recalled Jonathan Kuchem, the 2017 team's project manager. "One of my own and the team's best memories was that every fall, he would have the team over to play volleyball and have a bonfire. As a teacher, he was one of the best I'd ever had. He explained everything so clearly and gave lots of examples and real-world applications. His kindness and willingness to help others made him one of the most beloved professors in the civil department."

To express their appreciation for Philpot's many contributions, the team hosted a campus-wide celebration of his life this past spring, where they revealed that their 2017 steel bridge would be dedicated in his honor. While they didn't qualify for nationals, the team of 25 put together their best score in four years at regionals—something that they feel would have made Philpot proud—and expects big things of themselves at next year's competition.



◀ Michigan Tech. Last year: disqualification. This year: top-15 finish.

▼ Overall winners École de Technologie Supérieure.

University of Illinois: ready to build—and also host next year's NSSBC.

Back-to-Back Bridge Bigshots

For the second year in a row, École de Technologie Supérieure (ÉTS) took home the overall title. The team's victory was spurred by their top-three finish in four of the six categories.

For team captain Marie-Pier Diotte, winning even one competition, let alone two, seemed like a long shot when she started classes at ÉTS.

"Four years ago, when I started as a member of the ÉTS team, we could not believe we could compete with the best universities in the United States," she said. "After winning twice in a row, we know that the third time will be even more difficult than past competitions. For this reason, we keep our heads cold and our feet on the pitch to be part of the best team next year. But it is certain that we will be working hard, starting right after this year's competition, to achieve this feat."

To see the full rankings for each category, visit **www.nssbc.info** or **www.aisc.org/nssbc**.

SD School of Mines carefully lowers their bridge.

The Christian Brothers University build team.

California State University, Northridge, in action.

Georgia Tech teammates meeting in the middle.

said. "In other words, we could pretty much run full sprint as long as we were careful. The judges here seemed to want to inspire creativity as long as everyone was safe. Once we saw that other teams were actually running, we decided to as well. It paid off, as our final time was almost two minutes faster than our regional time."

Another team, the University of New Orleans (UNO), found themselves back in the competition following a bit of a dry spell, having last been at nationals in 2009. After their showing in last year's regional competition—where the bridge weighed 480 lb and took seven hours to assemble (they actually had to finish it outside of the competition venue)—the team was determined to make vast improvements in terms of construction time.

"After last year, our main goal was to construct the bridge in twenty minutes or less and once we knew we had that down, every other success was just icing on the cake," said Matt Thomas of the UNO team. "As soon as the regional competition was over, we started brainstorming ideas for new types of connections that could go together quickly and be strong, using as few bolts as possible. No one on the team had taken a structural design class yet, so we were designing by intuition alone. This year's bridge ended up being structurally sound and it passed the calculations we performed in class."

Ongoing Improvement

The mindset of constant improvement resulted not only in better build times for some teams but also in interesting ways to launch bridges over the river. While many teams constructed their bridges from both sides and met in the middle, several others built their bridges entirely on one side, then launched them over the water to land them on the footings on the opposite side. Multiple teams used channels, placed on the ground, to slide their bridge across. The University of Florida was one such team and used only two builders. Others used various methods to "unfold" their bridges over the water. North Carolina State's system employed bungee cords while South Dakota School of Mines used a crane mechanism resembling a fishing pole to gently place the far supports of their bridge.

Besides the theme of building a better bridge, the competition was just plain fun, a reward at the end of the academic year that let competitors experience another campus while at the same time giving the host school the opportunity to open its doors to students from around the world.

"We were so pleased to have the opportunity to host NSSBC and show off our campus and the School of Civil and Construction Engineering," said OSU professor Judy Liu. "We were fortunate to have excellent student directors—Chelsea Farnsworth and Oscar Gayet—leading a hard-working team of student volunteers."

"After so much planning and preparation, it was rewarding to have it all come together, see all of the innovative bridge designs and cheer on all the teams. We hope everyone enjoyed the competition as much as we did!" ■