

Lafayette College takes the crown, and two new awards are introduced at this year's National Student Steel Bridge Competition at the University of Illinois at Urbana-Champaign.

Reigning in Champaign

BY TASHA O'BERSKI



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THE STUDENT STEEL BRIDGE TEAM from Lafayette College in Easton, Penn., were crowned champions in the 2018 ASCE/AISC National Student Steel Bridge Competition (NSSBC) hosted by the University of Illinois at Urbana-Champaign this past Memorial Day weekend.

This is the first time the college has captured the national title in the competition's 27-year history. California Polytechnic State University, San Luis Obispo, received second place overall and École de technologie supérieure, who came in first the past two years, took home third this time around. The competition showcases students' skills in civil engineering, innovation and teamwork.

"While we knew that we had a contender this year, we also knew that we needed to be nearly perfect in order to beat the other top teams, who brought incredibly well-engineered bridges," said Steve Kurtz, associate professor with Lafayette College's department of civil and environmental engineering and the steel bridge team's faculty advisor. "Many of our alumni can relate to the teams that we narrowly defeated. They



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did great engineering work but just came up a bit short, often due to a small dimensional penalty or a few bolt drops.”

Travis Shoemaker, captain of Lafayette College’s nine-member steel bridge team—all of whom are civil engineering seniors and graduated a week before the competition—explained his team’s strategy.

“Our most basic principle is that every decision must be an engineered decision,” he said. “We have a system for estimating total costs, which we began to employ in August, and we conducted hundreds of FEM-based case studies and parametric studies. From there, our strategy developed in terms of bridge style and construction method.”

“We do not have a preconceived strategy; strategy is the result of analysis. Our eventual design concept was a tied-arch bridge.

Because this was quite unexpected, every member of the team conducted analytical studies in attempts to disprove the concept. After rigorous scrutiny, the concept was adopted. And after regionals, we focused on developing our construction tools. From our construction experience in the fall, we knew that our tool strategy would focus on getting the constructed portion stable as quickly as possible, while minimizing running distance.”

Shoemaker said the team’s original design was a truss bridge, which was fabricated and completed in time for Lafayette’s rivalry football game against Lehigh University as part of the bridge team’s tradition to present its preliminary design to bridge team alumni. In addition, the team used its bridge from last year’s competition to practice timed construction for several weeks with two different design concepts. Based on this experience, they redesigned their

bridge into a tied-arch concept, and the final bridge was fabricated in about six weeks.

Forty-two university and college teams competed in this year's national competition, narrowed down from 230 teams that participated in 18 regional competitions throughout the spring. Three teams—University of District of Columbia – Van Ness Campus,

University of New Brunswick and Universidad Panamericana—made the national cut for the first time.

Throughout the academic year, student teams devote countless hours designing, fabricating and constructing their own one-tenth scale-model steel bridges under a set of rules reflecting real-life structural specifications and construction regulations. To achieve



photos in this spread by T. Bart Quimby



success in the competition, students must be able to apply engineering concepts and effectively work together to assemble their bridge under the pressure of the clock. Bridge rankings are based on



Force of Nature

Not even a hurricane could keep the University of Puerto Rico, Mayagüez (UPRM) bridge team from making it to the National Student Steel Bridge Competition.

The team started designing its bridge as soon as the rules were posted on NSSBC's website. From late August through mid-September, it was business as usual, with the team holding routine meetings to refine the bridge's design. But then Hurricane Maria struck, and for nearly a month the students weren't able to contact one another.

"We didn't know if they were safe or if there was any way they could get to Mayagüez (our college town, located on the west coast of the island) because of the gasoline shortage and the blocked roads due to debris," recalled Sofia D. Boscio López, a civil engineering student and member of the UPRM bridge team. "In addition, not having electricity for almost a month-and-a-half, until classes began on October 30, was one of the most difficult things our team—and the whole island—could experience at that time."

From there, it was a chain reaction of difficulty for all aspects of the project, and everyone on the island was forced to deal with the aftereffects of the hurricane in their own way. It was more difficult to secure sponsors, potential materials for the bridge at locations all over the island were rusty due to flooding and having materials shipped from elsewhere was an issue due to harbor limitations, which prioritized primary resources for recovery.

So, the team worked with what they had, harvesting components from past bridges and combining them with whatever new materials they were able to secure.

"We called our bridge 'Frankenstein,'" laughed López. "For a certain amount of time, we were in survival mode."

Fortunately, federal and military help arrived, the island worked through its recovery efforts, the bridge's design was finalized in mid-November—a first for the school's bridge team, despite the setbacks—and construction commenced in late November and continued through December. Still, the effects of Maria weren't quite over.

"We had two days where we started working and suddenly, power outages occurred throughout Puerto Rico," said López. "We worked nonstop Christmas break through to the new year, trying to take advantage of all the days before classes started again. In the assembly phase, we had practically no time because the construction phase was finalized in February and our regional competition was less than a month away. And since our bridge used old parts from past bridges, the connections were rusty and difficult to manage in the assembly tests."

But the team persevered and advanced to the national competition, where they came in eighth place overall (out of 42 teams) and also won the Robert E. Shaw, Jr., Spirit of the Competition Award.

"Winning the award was a surprise, especially because of the hard year we've experienced with the natural disaster," said López. "We were extremely honored and grateful. Even with the difficulties the hurricane caused, we still managed to build a great bridge and can perhaps bring some hope to people on our island."

Perhaps the team's most important takeaway was the experience itself and the inspiration it provided for next year's competition.

"We had the opportunity to see many great bridges and fast assemblies," commented López. "This motivated us to keep thinking outside the box and create new things for future competitions. We've learned so much in this turbulent but amazing year, and we are ready to start preparing for next year and all the possible obstacles it may bring."

—Geoff Weisenberger



University of Illinois



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the categories of construction speed, stiffness, lightness, economy, display and efficiency. The team with the best combined rankings across all categories takes the crown.

This year, AISC also presented two new awards at the national competition. The Robert E. Shaw, Jr., Spirit of the Competition Award, which recognizes outstanding team comradery, professionalism, positive work ethic and respect for competition peers, was given to the University of Puerto Rico Mayagüez (UPRM), who also placed eighth overall (see sidebar on previous page).

“I was impressed by the number of teams that could have won the Shaw Award,” said Christina Harber, SE, PE, AISC’s director of education. “The winner was selected by judges’ votes, and almost half of the 42 teams did something to receive at least one vote. UPRM had some great competition, which further speaks to how much they deserved the award.”

The Frank J. Hatfield Ingenuity Award, which recognizes the team that showed the most engineering ingenuity in the design and construction of their bridge—within the competition rules, of course—was given to the University of Texas San Antonio (USTA).

“The method we used was to elevate the bridge during construction with temporary stilts,” explained Mason Richardson, president of USTA’s ASCE Student Chapter, a member of the school’s bridge team and next year’s team captain. “We incorporated these legs as lateral supports by making them members of the bridge. While other teams were devising elaborate methods to speed up build times, we just used a very practical approach that turned out to be very effective. With the bridge elevated, it allowed to us to build with ease and got us the fastest time in UTSA’s history.”

“The level of competition was high,” said Harber. “It was an exciting event filled with emotion, creativity and enthusiasm. And there were many displays of sportsmanship and learning. There is no substitute for the hands-on learning and knowledge gain that happens from this competition. Congratulations to all of the teams that qualified for nationals! It was evident that these students put many hours into the competition, and they should all be very proud.”

The full results, photos and more information about the competition can be found at www.nssbc.info. Next year’s NSSBC will be held at the University of Texas at El Paso, May 24-25. ■