

Building Concrete Community

Students in South Dakota State University's Precast Studio cast projects and install them in communities, learning interpersonal skills that aid professionalism.

— Craig A. Shutt

Third-year architecture students in the precast concrete studio at South Dakota State University (SDSU) learn both theoretical and practical applications of the material's benefits, as they cast components they have designed. The finished products are installed in local communities, giving students an opportunity to learn how to look at projects from the client's point of view—and negotiate to achieve their design plans.

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"Our goal was to get our students into the communities and teach them to cast precast concrete projects for the town's betterment," explains Brian T. Rex, associate professor and department head. The program is called

"Building Concrete Community" and is the foundation for the school's precast concrete instruction encouraged by the school's partnership with the PCI Foundation. The program operates in conjunction with the construction-management and structural-engineering departments. It includes several smaller, one-credit classes on various topics as well as the larger two-credit class that develops community projects.

The program also receives extensive support from local PCI member company Gage Brothers as well as four Sioux Falls-based architectural firms: Koch Hazard Architects, Architecture Inc., TSP, and Perspective Inc. In addition to the PCI Foundation funding, the four companies pledged \$34,000 to the program over a 10-year period. "They really put skin in the game for us," Rex says.

The architecture curriculum, founded in 2010, is the first and only degree-offering program in the state and the first new school of architecture in the region in the last 100 years. Students hail from 24 cities in South Dakota, six states, and several countries. The demand for architecture graduates is significant, Rex notes, as nearly three-

quarters of architects practicing in the state are nearing retirement age.

"The PCI Foundation Trustees were impressed with the partnership between a school of architecture and a school of construction management," says Thomas J. D'Arcy, PCI Foundation chairman. "We also liked the 'hands-on' approach to learning. The trustees applaud the effort to provide students with a unique learning experience that may include getting their hands dirty."

Gage Offers Support

The precast curriculum began in 2012, although planning began much earlier. "We've had the support of Gage Brothers and its president, Tom Kelley, for a long time, and we often would visit their plant and get their input for any precast concrete programs we ran," Rex explains. "Tom Kelley has been a big supporter and is a real leader in the state, so the university encouraged us to work closely with Gage Brothers when we could. When they proposed the studio concept, it made sense to us."

"The program is working great on many fronts, from jobsite tours to question-and-answer sessions on se-



Students in the precast concrete studio courses at South Dakota State University take their academic discussions into the field at nearby Gage Brothers Concrete Products. They see how precast concrete components are fabricated and watch as their own designs come to life.

nior precast building design projects," says Kelley. "The big fun is all of the hands-on opportunities available, such as the students building forms and panels for the community-service projects." The students also visit the plant as well as fabricate and finish panels.

"These students have experienced the entire process: designing panels, drawing tickets, building forms, fabricating pieces, finishing panels, and erecting the finished product. Our engineers and manufacturing personnel have enjoyed the interaction as much as the students have. It has truly been a very fun adventure and results in these young professionals entering the market with a better understanding and comfort level with precast concrete. That's a good thing for everyone."

Precast concrete provides a natural course of study for the school, Rex notes. "Precast concrete makes so much sense here, in this climate and with our nonmetropolitan areas," he says. "Getting skilled workers here when towns of 20,000 people are 1 ½ hours apart can be a challenge. And the more architects can specify prefabrication in a plant, the better they like it. Furthermore, the short construction season makes an all weather system, like precast, the best option.

Precast concrete structures built in these towns have been extensive but utilitarian, he notes. Often, he can't convince students that an architectural precast concrete project, especially one with embedded thin brick or form-liners, is actually precast concrete.

That is changing as more students take the courses and become acquainted with precast concrete's potential. Input from Gage Brothers includes plant tours, advice with projects, casting of designed components, and other activities. For example each year, Gage Brothers hires a bus to take 70+ architecture students to Minneapolis to provide a tour of the city's notable precast concrete structures.

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Students designed and constructed a six-panel precast concrete monument along the banks of the Missouri River in Mobridge, S.D., to serve as the focal point for a gathering spot.

"No one comes out of our architecture school without knowing ways to build with precast concrete pretty well," Rex says. "Local firms love it, because we use a lot of precast concrete in this area."

Other departments also benefit, as the school works in conjunction with the construction-management department, where students take the smaller, one-credit courses. "Those students are more focused on the management part of their discipline, so they're less inclined to get their hands dirty," Rex says. "But we offer them the opportunities if they're interested." Mechanical-engineering students jumped at the chance to work with the program, he notes, running tests on the student's precast concrete components and checking slump tests. "I never know what connections will develop."

Community Projects Develop

Classwork for the two-credit course includes creating a speculative 60,000-square-foot office building that helps students work out complexity of designs on paper and see the benefits precast concrete offers. The community projects begin in the students' first year, when they perform a study on possible precast concrete structures to create. In year two, they look at how to develop the project and select a community to work with. In year three, they design and cast the project.

"The students follow the project all the way through to completion," Rex says. Due to fallout or transfer of students along the way, about 30 students will have been with the project from its beginning. Classes are held in four-hour blocks twice a week. "That allows us to hold their attention for a long time, get into a project, and clean it up each time."

The program's first project consisted of a branding sign created from six precast concrete panels designed to serve as the focal point for a new gathering place along the banks of the Missouri River in Mobridge, S.Dak. It includes a galvanized frame and creates a landmark to help define the town's relationship to the river. Students also were each assigned to re-design a nearby building to show the community what could be developed further.

It offered a great experience for professors and students alike, Rex says. The school worked with the local Hutterite community, a religious group that volunteered to help with site construction. "They can make anything," he says. "This was the first project they did with us, and it went great. It was me, the students and two Hutterites—speaking low German—when the trucks rolled up with 32,000 pounds of precast concrete, clips for assembly, and shop drawings. We called Gage Brothers several times for consultation, but we got the panels constructed quickly."

Student Evaluation

Ethan Millar took part in the first SDSU studio as a third-year architecture student and worked with the town of Moberge to develop the park enhancements along the Missouri River. He also attended the 2014 PCI Convention in Dallas and helped create a poster in the show hall that promoted the studio's work.

"The studio is a break from how the other classes are set up," he says. "Focusing on one material for a semester allows us to more fully understand precast concrete and its properties, which can then lead to experimentation with the material."

The hands-on approach was a significant difference from other classes, he adds. "Actually being able to carry out the project from design to construction and installing the precast onsite along with the rest of the project was my favorite memory."

The program will aid his professional career, he notes. "Understanding precast concrete will unquestionably help me. Precast concrete is used in a wide array of projects, and already having an understanding of precast will help me in the design process."

The project gained a lot of attention. "We initially went to Moberge and presented our ideas," he says. "That primed the pump, and we now have a waiting list of seven or eight towns that want us to present concepts to them for what the students can do."

Learning Lessons

Encouraged, the students created a more ambitious plan for The Kansas Mall in Huron, S.D. Students presented 11 concepts to improve the unattended, city-owned park property. A budget of \$82,500 was created from a combination of grant funds, city dollars, corporate donations, and fund-raising efforts. But before the project could be produced, political issues derailed it.

"It was a great lesson for students in having to deal with larger city councils and various agendas," he says. "But it was tough to handle having the plan fall apart." The class created



Presentations by students include input from industry professionals, including staff at Gage Brothers as well as employees at four local architectural firms who support the programs.

a fast-track project and returned to Moberge, which welcomed an addition to its earlier project.

This year, students are working with officials in Webster to create a new gateway to the town's football stadium on the outskirts of town in a small valley that provides low visibility, with no parking nearby. The project consists of a 4.5-foot-deep, 60-foot-long AASHTO girder with aesthetic touches to form a focal point for entering the stadium. The beam will be cast in February and erected in May—and already has received city council approval. The program is being directed by Assistant Professor Frederico Garcia Lammers.

Webster's project was a great learning process, he notes. "The students were very excited about a design for downtown Webster. The city leaders very politely explained what they needed instead of that. They did a really good job of opening the students' eyes to how to adapt their plans to fit the client's true needs."

Next year's project, in Volga, also is progressing, with the most likely candidate being an architectural wall to replicate the look of a historic railroad depot that was demolished. "We're working with them now," Rex says. "We have our favorite project, and they have their favorite. We're letting the students negotiate with the town to decide what will be built. It's fun to watch them figure it out."

Planning for the Future

The school has major plans for the future, as it moved into a new Architecture, Math & Engineering building this fall. It provides a 135-by-35-foot space for equipment that will include casting beds now being planned. Those will take their lead from Gage Brothers, which also is moving into a new facility and having new form tables constructed. "We've been invited to watch those being installed, and we plan to take notes and build our own tilting beds based on theirs."

Currently, Gage Brothers casts components for the school from the students' construction—if they meet Gage's requirements. "They won't cast in our forms unless we've followed their specs precisely, and they critique what we did and where we went wrong. It's a good lesson for students to see how precise the business can be."

The school already has a crane that can erect components, he notes, so creating casting beds will give students a more in-depth knowledge of the industry. "Once we have all of our pieces in place, we will be talking with the PCI Foundation about what additional support they can give us," he says. "We want to grow our program and ensure the students are receiving the most well-rounded education about precast concrete possible." 