



Teamwork Focus

IN MINNESOTA STATE MANKATO PRECAST PROGRAM

— Marty McIntyre
PCI Foundation

A highlight of the Precast Studio program at Minnesota State at Mankato was the tour of the Vikings Stadium as it was under construction. Students are able to learn about structure and scale by seeing erection of precast members. Photo courtesy Mohamed F. Diab.

As design/build methods have gained a foothold in the construction industry, schools of architecture, engineering, and construction management have looked to foster partnerships between disciplines and schools. These interdepartmental programs allow professors to look at new ways to teach their assigned subjects. They also provide students with an opportunity to learn in a cooperative environment that mimics some of the work-world relationships they will need to develop after graduation.

For the precast concrete industry, the idea of design-build is a natural. Because precast concrete is an engineered product designed specifically for each structure, there have always been elements of partnership in precast concrete projects. One program receiving a grant from the PCI Foundation and capitalizing on that partnership is the Precast Program at Minnesota State University, Mankato, a collaboration between the Construction Management and Civil Engineering programs that has just finished the second year of a 4-year grant from the PCI Foundation.

While each program has its own classes and focus, they come together for multiple tours and guest speakers, as well as for a Building Information and Modeling (BIM) course housed in the Construction Management department. Both programs work with staff from Wells Concrete in Wells, Minn., to ensure that students have an opportunity to learn from projects currently underway by studying precast design, learning about how BIM is used for the project, seeing the fabrication process, learning from staff working on the project, and seeing the project erected.

CLASSROOM WORK AND REAL-WORLD EXPERIENCE

What does this mean for the future of design-build projects? Students leaving the Minnesota State Mankato program feel ready to step into positions with a variety of employers, including the precast industry, contractors, owners, and engineering firms. And they come prepared to work together. "One of the other aspects in our precast concrete design class is that we are interested in giving them a 'real-world' experience," says engineering Professor Farhad Reza. "The Wells Concrete engineers shared an interesting precast project with the students. This fall, the students were given a wall and column layout and then had to learn to design all the structural aspects to it."

The students had to design several types of precast components, including double tees, hollow-core floors, inverted T beams, and prestressed columns. In addition to presenting information as a guest lecture on the project, the Wells Concrete engineer made himself available to students throughout the semester.

On the construction management side of the program, the precast concrete work is taught through a Risk Management course. Students in the program research how building products are affected in several risk areas. For example, some students looked at how cold weather affects building construction and how a customer building a project might consider the building material and method as part of its building plan.

For the risk-management class, the students are able to ride along virtually with Wells on an actual project to see how a typical project unfolds. "We take a project through estimating, sales,

design, BIM, and 3D drawings. After that, we have them out to see production, quality management, inspection, the field process, and all while talking risk management. It's been very helpful for students to see the project all the way through," says Gregg Jacobson, Wells vice president and general manager.

Having the focus on risk mitigation is a good idea from the precast concrete perspective. "Housing the precast in the risk mitigation program at the Construction Management school has worked out very well," says Dan Jutunen, president and CEO of Wells Concrete. "Most of the Construction Management students will be hired by contractors, and every contractor we work with is looking carefully at risk mitigation.

JOBSITE TOURS

As part of the precast program, learning is not limited to the classes students take. All of the students from both programs are invited on tours. "We may have only 12 or 15 students in a class, but when we took the Viking Stadium site tour, we ended up bringing a bus for 55 students and faculty," says Jacobson.

Students from both groups and other classes take part in plant and jobsite tours throughout the program. The students get a lot out of the precast plant and jobsite tours because they are prepared for them prior to ever stepping foot outside the classroom. "For plant visits, we start by talking about planning. We don't just go in and look at the operation," says Mohamed Diab, associate professor of Construction Management. "We are always interested in how everyone works with the owners. The students need to know about how decisions are made.

BIG BEAM COMPETITION

Another way that the professors enhance the experience for the engineering students is through the Precast/Prestressed Concrete Institute (PCI) "Big Beam" competition. One or two teams of engineering students work in conjunction with the Wells Concrete plant and must design, fabricate, and break a precast beam to specifications that are changed each year. This is where many of the students get to see the work that they have previously done put into action: fabricating the product and seeing how what they designed holds up under stress.

The students' response to the Big Beam competition is very positive. They noted learning about design beyond the equations on the screen and starting to understand what it means to the final product, as well as learning how to work as a team. "The biggest thing that I learned from

Big Beam is that one must always consider practical restrictions, beyond those that are accounted for in design calculations, when determining the dimensions of a prestressed, precast member. It helps to ensure an efficient and feasible product from paper to product," says student Alex Fiebiger.



Students from Minnesota State at Mankato have an opportunity to visit Wells Concrete and see how prestressing plays a roll in the fabrication of precast/prestressed products. Photo courtesy Mohamed F. Diab.

PROGRAM SUCCESS

The program has been a success with the students. Many of the students who finished have been hired by engineering firms, the Minnesota Department of Transportation, and contractors. Several have had internships at Wells Concrete, and Wells has even hired two students from the program.

The first student Wells hired was Chase Radue, who is now a field engineer. "The civil engineering program at Minnesota State Mankato may not be big, but it provides big-time opportunities thanks to the support from companies like Wells Concrete and organizations such as PCI Foundation," says Radue.

Minnesota State University Mankato Precast Program

	Civil Engineering (CIVE)	Construction Management (CM)
Fall Courses and Activities	Prestressed Concrete Design Course: Students independently designed structural components for the Microsource Plant in Shakopee, Minn., based on layout information from drawings provided by Wells Concrete.	
	Field Trips: Several field and plant trips involving both CIVE and CM students and faculty were organized by Wells Concrete.	
	Student Scholarships: PCI Foundation Scholarships of \$2,500 each were awarded.	
Spring Courses and Activities	Big Beam Competition: The program includes participation of a team in the PCI Big Beam competition.	Risk Management: This class provides an overview of risk management.
	Building Information and Modeling: Students in this class learned how to create and use BIM in the construction industry.	
	PCI Convention & National Bridge Conference, March 1-5, 2016.	