



PARTNER'S GUIDE

2018 – 2019

PCI

FOUNDATION



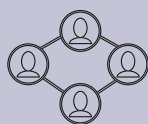


MESSAGE

FROM THE CHAIRMAN

Key to Keeping the PCI Foundation Programs Strong is Partner Involvement from Day One

Early on in PCI Foundation's history working with schools of architecture, engineering, and construction management, it became apparent that for the programs we were working on to be meaningful to our industry, we needed to have not only a financial stake in the program, but a voice in the planning and a hand in the execution. Without that local involvement, the PCI Foundation programs are good, but with the local partner, they become something more.



Key to every program is the focus on partnership



Curriculum needs of university must be met



Key areas of study include architecture, engineering, and construction management

Students may be in school to study their subject. And we should expect them to remember the theories they learn, the concepts that are important to design, and the materials they study. However, students really remember the people who make a difference in their education—the ones who create memorable experiences, who take an interest in their work, and who open new doors for exploration.

The local partner is the one who makes the PCI Foundation programs memorable—who brings in a "petting zoo" of products or brings the students to the plant; who sits for an hour and helps define a project; who gives students the chance to tackle concrete "hands on" for the first time. This opens new doors for the students.

For some, the PCI Foundation program has been the first opportunity for the student to travel to a convention or even be the first time leaving his or her home state or first trip on an airplane. And you, as the local partner, are the face of that.

Inside this guide you will find some ideas on how to make a program stronger and use the PCI Foundation resources to help make lasting memories for all the students you will work with as the local partner.

From a producer standpoint, partnering with schools and the PCI Foundation has been a worthwhile endeavor for Gate. The relationships with the schools, the professors, and the students that are achieved through these programs, have given us new ideas, research partnerships, and access to young designers that we would not have had otherwise.

Dean Gwin
Gate Precast
PCI Foundation Chairman

What Do Partners Typically Do?

Just as each school approaches its curriculum in its own way, the relationship between the partner and the school takes on its own approach - depending on what will work for the school and the partner.

The "Granddaddy" of the precast education programs, The Spancrete Studio at the University of Wisconsin Milwaukee, has operated continuously since 2006. The same professional from Spancrete, Clinton Krell, has overseen the program even though his role at Spancrete has changed. He moved from engineering to sales.

Students at UW know that they can call Clinton in as a consulting engineer on their architectural project and immediately get help on any tricky precast concrete issue.

Here are some other ways that partners have worked with schools on their precast programs.

Meet One-on-One with Students Jason Lien or Roksana Taghizadeh from Encon United spent quantity and quality time with students at the University of Colorado Denver. Not only do Jason and Roksana provide multiple lectures to give students a working knowledge of precast, they also sit in the classroom and conducts one-on-one desk critiques that further broaden students technical abilities to design in precast.

Adopt a Student A member of the PCI West chapter adopts at least one studio student from the University of Southern California program. The company invites its adopted student to the plant to meet and share precast concrete experiences.

Open Office Hours Gage Brothers in Sioux Falls, SD opens up its plant on Friday afternoons to students taking part in the Precast Studio. The students are working on a small project to be built in partnership with a rural town. Students can come in and have their questions answered and learn more about the building process during these times.

Hands-on Demonstrations Ray Clark of US Formliner spent time in the classroom teaching students about mold making and helped them understand how custom molds translate to one-of-a-kind pieces. From there, students better understood mirror images, and how shapes and forms can fit together in their designs. Metromont and Tindall invite Clemson students out for a one-day plant tour on alternating years. At both plants, students are provided the opportunity to conduct a panel/forming exercise that gives them an opportunity to better understand the fabrication process.

Supporting Student Designs The focus on the studio at the University of Michigan is digital fabrication. Students visited Kerkstra Precast in Grandville, MI, to get ideas on current manufacturing processes. Then, representatives of Kerkstra and International Precast Solutions in River Rouge, MI, helped evaluate student projects during the midterm and final reviews.

Real Products for Real Projects When the Washington University students in St. Louis, MO, participated in the 2017 Solar Decathlon, their project included precast concrete from several precast plants, including Dukane Precast, Gate Precast, St. Louis Prestress, Ductal / Lafarge Holcim North America, Enterprise Precast and Thermomass.

Shares "Real World" Project Information Gregg Jacobson from Wells Concrete not only spends time lecturing and working with construction management and engineering students at Minnesota State at Mankato, he helps provide context by sharing an actual project. This includes drawings, piece tickets, experience in the plant, and the erection process. The students have a chance to experience the project process from initial plans to finished build out.

Professor Gil Snyder (left) works with Spancrete's Clinton Krell on the UW Spancrete Studio.



Creates Research Partnerships When working with a school, there are often partnerships formed that go beyond the studio program. At the University of Texas at Arlington, Gate Precast has forged a relationship with the college that includes research.

Super Size Tours When the students from the studio at the Rhode Island School of Design travel to visit Blakeslee Prestress in Branford, CT, they add students from required courses earlier in the sequence so about 50 students attend the tour. This gives some great basic background on precast design to all the architecture students, not just the few reached as part of the sponsored studio.

Scale Model Teaching Structure Molin Concrete Products supplied the University of Minnesota Duluth with a **scaled precast structure panel** with various connections for permanent installation in the teaching lab as a demonstration tool.

Bring a "Petting Zoo" or Demo Heidi Ziemann of JVI brings her connections "petting zoo" with samples of JVI and other suppliers connections so students can see in person how connections work.



Playing to Your Strengths is Key

Every program is different, in part because they each use the strength of the program, the professor, and the partner

There have been 24 schools that have worked with the PCI Foundation to develop new precast concrete curriculum since 2007. In each program, it was important to meet the needs of both the school and the local industry, as well as the curricular needs of the program. Here are a few examples of recent programs to give you some ideas about what a curriculum grant might look like.

North Carolina State: Architecture and Engineering

How something is made can impact how it's designed—a principle Assistant Professor of Architecture Dana Gulling impresses upon students in her studios, where young architects learn to bridge technology and design as they innovate ideas for new structures.

For Greg Lucier, research assistant professor in Civil, Construction, and Environmental Engineering, understanding the broader impact of production details in building materials is key to the research he and his students perform as they test structures at full scale in the Constructed Facilities Lab (CFL).

These two disciplines—architecture and civil engineering—while tangential, often did not overlap in the courses at NC State until recently, when Gulling and Lucier teamed up to create an interdisciplinary endeavor that blended the studio learning environment with structural engineering.

The studio was sponsored by the Precast/Prestressed Concrete Institute Foundation (PCI Foundation), which provides grants to educational institutions like NC State in order to better familiarize students with precast concrete as a structural and architectural material. Peter Finsen, a member of PCI Foundation's Board of Trustees, kicked off the studio with an introductory lecture. "Civil engineering typically teaches a prestressed concrete course, and [those students] are more familiar with it than architecture students," said Finsen. "But it's a great experience that provides foundation in the industry."

Creations in Concrete, a new ARC 503/CE 675 studio that started in Spring of 2017, brought together architecture and civil engineering students to study precast concrete.

WHAT DO
YOU NEED
TO KNOW?

PROGRAM EXAMPLES

"I think precast, probably more than any other building system, requires a close link between design, fabrication, and construction," Lucier explained. "Those disciplines have to be viewed holistically. With other types of construction, you can do the design and not worry about who's going to build it, or vice-versa. But with precast, some of the things that make it very unique can also make it unforgiving."

That link between design and practice made precast an optimal subject material for a studio that sought to fuse the worlds of civil engineering and architecture, worlds traditionally, but perhaps not deliberately, kept separate from one another despite their natural synergy. "Before integrated practices came up, you would get to a certain point in design development and then send it off to the structural engineer," Gulling said. But recent innovations in materials like precast have taken a process that was previously linear and created an opportunity for collaboration.

During the studio, nine architecture students and four civil engineering students collaborated on three projects that investigated precedent, component design and fabrication, and full building design concepts. Activities within the studio ran the gamut from reviewing case studies, to touring manufacturing facilities, to attending the PCI trade conference in Cleveland, OH, to even working hands-on in the Materials Lab with US Formliner, a company that graciously provided rubber for molds which the students could cast on their own.

Perhaps the most impactful part of the studio, however, came from the time the students spent in the CFL, constructing and testing full-sized precast concrete panels as part of their final project: conceptual designs for a cidery in Upstate New York. Such a building appealed to Gulling and Lucier because the combination of small spaces nestled within large spaces offered an ideal challenge. And it helped that the site was accessible by the students, some of whom made the journey over Spring Break to assess it after attending the PCI Conference.

Written by Meghan Palmer. Published in Designlife Magazine in November 2017.

Students from architecture and engineering schools come together to learn mold fabrication from Ray Clark.



Clemson University: Architecture and Engineering

The PCI Foundation made its first grant to Clemson University in 2014 to begin a new program called Precast Performative Morphologies. This application of digital design solutions to precast & prestressed concrete for innovative and sustainable design in architecture is proposed as a four-year project of integrated and collaborative design studios, seminars, and courses for graduate and undergraduate architecture students at Clemson University Architecture programs.

The students start by studying buildings designed by architect Tadao Ando and converting his simple concrete designs into precast concrete designs.

Next, the students complete an exercise in the use of molds and textures in an exercise involving mathematics and tessellations toward the design of a total precast solution. The general objectives in the course are to introduce students to use and applications of precast concrete in architecture; to learn about computational design in the context of prefabricated components; and to conduct research in morphology applied to architectural design.

The last part of the semester is used on designing a small project in precast concrete. In recent years, the students have worked with KCCT Architects in Washington, DC, and the U.S. State Department to design an Embassy project using precast concrete.

"Working with KCCT Architects and the State Department on a real world project such as the Embassy in Rio de Janeiro, with the support of the PCI Foundation, helped me and my partner Taylor to bring our building to the next level and has impressed during interviews and given me a great experience to talk about," says Page Cross, who was part of the 2018 studio.

Part of the program at Clemson includes some work with engineering students who work in collaboration with the architecture students as they design their projects.

One of the benefits this program has had is its proximity to two high-quality precast plants and an active Precast/Prestressed Concrete Institute Region (Georgia/ Carolinas PCI) which have worked closely with the students both in and out of the classroom. Students not only have their projects reviewed by precast professionals, but get out of the classroom to visit the plants and spend time in the plant doing hands-on work, visiting jobsites, and local architects, and attending the PCI Convention to present a poster.

Building on the the success of the Clemson University program, the PCI Foundation trustees invited Dr. Barrios to submit a proposal to a continuation grant for his program. It was accepted early in 2018 and the classes will carry on through 2021.

University of Minnesota at Duluth: Engineering and Business Administration

For the University of Minnesota Duluth, the focus will be on resilient precast. Ben Dymond of the Department of Civil Engineering will coordinate the program in conjunction with the Department of Civil Engineering, the Department of Mechanical and Industrial Engineering, and the Master of Business Administration program. John Saccoman of Molin Concrete Products will be the industry champion for the program. This multidisciplinary educational program aims to combine the traditional approach to concrete engineering education with cutting-edge knowledge related to resiliency and business management. Traditionally, engineers learn the basics of concrete design, while possibly discussing precast concrete, but they fail to investigate why to choose precast concrete or how does resilient precast concrete fit into an organizational dynamic. This program will address those questions and others while challenging students to push the envelope of resiliency in precast concrete.

The program will include new content in four courses taken during a student's junior and senior years. Once a student completes the courses they will have a special certificate on their transcript noting the special interest of the student in resiliency and precast concrete design. All students in the department will now be exposed to some precast concrete curriculum.

CE 4126 DESIGN OF CONCRETE STRUCTURES

The current course will add 50% precast content. The course is currently an elective but will become a required course and there will be about 30-40 students per class.

- Molin has supplied a scaled precast structure panel with various connections for permanent installation in the teaching lab as a demonstration tool
- Will include a precast plant tour and jobsite tour
- Students will learn about the differences between cast in-place and precast
- Students will learn how to erect precast
- Will shift in-class parking garage project from cast-in-place to precast

Clemson students travel to Washington, DC, to meet with the State Department to review Embassy designs.



Molin Concrete created a scale demo that helps students see how precast products come together.



CE 4128 PRESTRESSED CONCRETE STRUCTURES

Currently this course focuses on the ACI318 Code and will now include new course material using the *PCI Design Handbook* and other PCI reference materials while student takes on a semester-long design project. This class will also incorporate a plant tour and jobsite visit focused on prestressed concrete. Additionally it will:

- Introduce students to Concise Beam design software (used by Molin);
- Incorporate a design project where students compete in the annual Big Beam Competition, and
- Winning class teams (2) will go on to compete in the contest and work with Molin (or other precaster) to fabricate their design.

BUS 2400 FUNDAMENTALS OF ORGANIZATIONAL MANAGEMENT

This course presents students with a broad introduction to management processes and the complex world of managing in today's business environment. Topics include what managers do and skills they must possess to achieve organizational objectives, the management functions of planning, organizing, leading, and controlling and organizational dynamics such as globalization, social responsibility and change. Completion of the course will yield insight into the project organization and management side of precast

concrete and resiliency. Students who complete this course will also be exposed to several "non-engineering" skills (e.g., the management functions of planning, organizing or leading) which can be used in their resiliency capstone design course when working as a team and used when entering the workforce as young professionals.

CE 4255 SENIOR DESIGN CAPSTONE

Finally, an engineering capstone course will be the first course taught at the university with the option to focus on resilient precast. Typically a senior design student takes information learned along the way in other courses and brings it all together for one project. This unique curriculum will be co-taught by Mary Christiansen and Alison Hoxie. Students will work with a professor or Molin mentor on their project that may involve research and analysis of resiliency in precast concrete.

South Dakota State University: Architecture

The architecture school at South Dakota State University (SDSU) is a relatively new one—and the approach the school takes to teaching architecture is unique one that gives students a hands-on, community-based learning experience..

SDSU is a land grant university in a state with very few architects compared to other parts of the country. The learning model they embrace is an integrated and hands-on approach that makes the PCI Studio an excellent fit within their curriculum. The architecture school started in 2009, so it is one of the newest programs in the United States. The school has partnered with Gage Brothers in Sioux Falls, SD.

As freshmen, students start out studying a town-mapping it and making a scale model. They learn how people use the community so as their architecture skills grow they can understand how to use them to improve the community through flow and aesthetic.

The first year the school worked with the PCI Foundation, the students designed and built a micro-park, a gathering center for a small rural community, Mobridge, SD. Previously, the patch of land was completely bare and was unused for most of the year.

Students got to work designing and with the help of their local partner the students actually designed, fabricated, and built the project. Their work including working with the community to ensure client satisfaction.

The hands-on approach has meant that many people in various departments at Gage Brothers spend time with the students including the engineering department, project management, sales department, and President Tom Kelley.

"The students want to do all the shop drawings, and do the piece drawings for us," says Kelley. "They have worked quite a bit with our engineering department and they have engineered the whole structure."

One of the benefits of working with this studio was understanding how the students view concrete at the beginning of the semester and how that changes after studying the topic. "At the beginning of the semester I was a little surprised. Being architectural students I thought they would push the envelope a little further," says Kelley. "But initially they designed straight, flat plains, because that is what their idea of concrete is. And we really

SDSU students meet with architects and town officials to discuss the project that will be built in the community.



SDSU students took part in building the structure that they designed..



worked with them during those initial meetings to teach them that while what they were asking was possible, we really wanted them to dig deeper and think outside the box. And then, once we sort of gave them permission, they went the other way. And then we had to reel them back a little bit. So we learned that their first impression of concrete is not that it is a flexible and dynamic material—through the studio they learn that it really is."

Which Class Gets the Grant?

Each college or university is accredited by a specific body (for example, schools of architecture are reviewed by the National Architectural Accrediting Board NAAB). Under NAAB, accredited degree programs must demonstrate that each graduate possesses the knowledge and skills defined by specific student performance criteria. This means that even when the class is about precast concrete, it still must find a way to meet this criteria depending on how it fits within the school's curriculum path.

This is one of the reasons that the grants for PCI Foundation are a unique proposition. Each school interprets the accreditation requirements in a certain way and students must follow the path to achieve the end result. Additionally, various professors may have focused their interests or research on topics within that path such as safety, resilience, fabrication, connections, enclosures, or other topic where precast/prestressed concrete may prove an appropriate teaching tool.

Making contact with the school to offer plant tours, lectures, big beam team sponsorships, and other support is a great way to get to know the school and the interests of the professors who teach there to best understand how a precast program might work with that school.

The Perfect Match: Precaster Seeks Professor Willing to Engage In Experiential Learning

What should you look for in a partner when you are putting together a program that depends on the school/business relationship to succeed?

Faculty Champion with Staying Power and Curiosity

You need to identify a professor/faculty that wants to be a champion for a precast program. Not only in including it as part his or her curriculum, but someone who will engage with the industry and create opportunities for the students to learn in the field by experiences.

Typically a good candidate is a full-time faculty member as any part-time or visiting professor might not have a permanent appointment for a long-term commitment, although there are exceptions. A young tenure-track professor will bring ideas and energy, but also a tenured professor might bring authority and experience to build a legacy. Sometimes, a program will have a mix of both.

School Administration is On Board

Administration support: this is a must, because the administration sets the overall agenda of what is important to the department/school. While bringing funds is a key to get programs started, it is crucial to have the administration's commitment to the long-term continuance of a precast program. "In our case at Clemson I could not have asked for better support from our administration at all levels," says Carlos Barrios of Clemson University.

Willingness to Become Engaged with the Precast Industry

A Curriculum Development Grant from the PCI Foundation offers opportunities beyond the classroom. A professor who is interested in seeking opportunities to research precast topics, attend PCI meetings, and otherwise be engaged with the overall industry beyond the classroom, is the best fit. When this level of engagement is present, the programs are vastly more successful.

Invites the Industry Partner Before Semester

The teamwork that is required for a successful program does not happen with one partner

making the plans and the other waiting for an invitation to come in. Rather, both partners meet prior to the start of the semester to map out what the program will look like, when the students will need contact with the industry, and how the precaster can be involved. This is also a great time for the precaster partner to use his or her connections to invite others who can add to the student experience into the classroom—such as form fabricators, connection suppliers, or admixture companies.

Commitment to Sharing

The PCI Foundation is always looking for feedback on its programs. Whether it is asking students to fill out a survey at the end of the semester or having a professor share his experience in an article in *Ascent Magazine* or being part of the poster session at the PCI Convention. We place a high value on sharing what works, and what doesn't work. "I think all the activities that the PCI Foundation sponsor really help bring together resources and tools to support our work. Since I started this program, things continue to improve. Events like professors seminar, student's posters, publications, precast in a box, and many others are fundamental for our success," says Carlos Barrios of Clemson University.

Proximity

Travel to and from the plant is a key to making a curriculum development grant work. So proximity can play a role in the success of a program. It can be useful in helping get students to the plant—but many schools and plants have found ways to work with commutes as long as a few hours. Proper planning for the commute is important to making it work.

Communication

If the professor isn't a great communicator, she should at least be a good communicator. Look for someone who makes it easy to stay in touch and seeks out ways to keep the industry involved.



Getting Started: How to Find Your Partner

Without a match.com for university partners, it is up to the precast industry partner to make their own match by getting out and making connections

Nothing beats face to face meeting when finding the perfect partner to work with on a PCI Foundation grant. First, target one or two schools that are in your area. Look up the dean of the school of architecture, engineering or construction management and call to ask for an appointment.

Once there, focus on ways that you can partner with the school to enhance experiential learning for students, such as:

- Student tours through the plant
- Lectures on precast/prestressed materials and design
- Project tours
- Sending a professor to the PCI Convention
- Having students participate in the Big Beam Competition
- Sending a professor to the PCI Foundation Professors Seminar, or
- Hands on workshops where students can gain understanding of the material

Ask for recommendations of classes where precast would be a good fit with the curriculum or faculty that might be interested in teaching precast. Where the class fits into the school depends on how the particular program is set up, and areas of interest for the professors.

Marty McIntyre is always available to help you through this process. Be sure to ask if you have questions. (708) 386-3715 or info@pci-foundation.org.