

www.PCIMidwest.org fall 15

# **Precast Concrete Gets High Marks for Schools**

According to the National Center for Education Statistics (NCES), total enrollment in public and private elementary and secondary schools grew rapidly during the 1950s and 1960s, reaching a peak year in 1971. Between 1971 and 1984, total elementary and secondary school enrollment decreased every year, reflecting the decline in the size of the school-age population over that period. After these years of decline, enrollment in elementary and secondary schools started increasing

in the fall of 1985, began hitting new record levels in the mid-1990s, and continued to reach new record levels every year through 2006. However, a pattern of annual enrollment increases is projected to begin with a slight increase in the fall of 2015 and continue at least through fall 2023.

In addition to this real and forecasted enrollment growth, the NCES also reported in a 2014 study that "Based on survey responses, 53 percent of public schools needed to spend money on repairs, renovations, and modernizations to put the school's onsite buildings in good overall condition. The total amount needed was estimated to be approximately \$197 billion, and the average dollar amount for schools needing to spend money was about \$4.5 million per school."

As a result, school districts nationwide need to expand learning facilities and improve current structures. Often, these needs must be met rapidly, as



Mike Johnsrud, Executive Director

Phone: 952-806-9997

Fax: 952-806-9998

budget and approval processes don't take into account that school doors must open when the school bell rings each fall — or summer. Being one-month late is not an option.

To meet this fast-track need while providing a variety of other key benefits, more schools are being designed with precast concrete structural and envelope systems to meet the high performance demands of K-12 public and charter schools. When these components are joined in a total precast concrete system, the synergy produces unmatched advantages — in total cost effectiveness, reduced construction time and improved quality and durability. A school building designed from the start with a total precast system provides the best design possible.





## **About PCI Midwest**

PCI Midwest serves Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota and Western Wisconsin. Formerly the Midwest Precast Association, the organization was first incorporated in 2003. Its mission is to promote the use of precast/prestressed concrete, to further educate the construction industry about precast/prestressed concrete, and to expand and nurture relationships between industry-related individuals and companies.

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#### **Contact PCI Midwest**

PCI Midwest PO Box 386324 - Bloomington, MN 55438 www.pcimidwest.org 952-806-9997 (Phone) 952-806-9998 (Fax)

Mike Johnsrud, President and Executive Director mike@pcimidwest.org 612-760-6101 (Cell)

Margaret Mills, Administrative Assistant margaret@pcimidwest.org 651-423-4737 (Office)

### Bishop Garrigan High School

The \$3 million addition for the Bishop Garrigan High School in Algona, lowa was completed in August 2015. The 18,000 SF addition added a gymnasium, additional class and office space, two new locker rooms and a new entry onto the existing school. The new gymnasium will have seating for 1,000 people.

For this project, Wells Concrete placed 36 pieces for a total of 13,885 SF that included up to 13' wide x 32'-8" tall panels, weighing approximately 47,500 pounds. The panels are a 6"-4"-3" wythe configuration with an R-value of 20.8 and the building size was 102'-6" x 110'. The panels are load bearing, supporting long span 110' roof joists. All required electical

conduit and boxes were cast into the wall during the production process.

The owner and architects were looking for a high contrast look, therefore an orange acid etch finish with dark water wash accent bands was provided. The black granite aggregate contrasted nicely with the orange matrix so when the matrix was washed away you get the desired high contrast look.

Bishop Garrigan Schools is a Catholic

school in Algona, a small town in a rural area of northern lowa. It serves Preschool through 12th grade on two separated campuses. Bishop Garrigan High School serves 172 coed students in grades 9-12. The school belongs to the National Catholic Educational Association.



www.wellsconcrete.com



### Lexington Middle School / Orthman Community YMCA

In 2007, community leaders in Lexington, Nebraska met with the idea of developing a community recreation center. After a number of years of research, they decided to mimic a somewhat new but highly successful model of incorporating a joint use facility shared between the YMCA and the existing middle school. This astute collaboration yielded a state of the art facility addition. The bulk of the addition is a three court gymnasium that features a suspended walking track encircling the gym. There is also a large second floor wellness center that includes cardio and weight training. The middle school addition is highlighted by a commons area embraces the original building's Neo-Classical facade, effectively joining the old with the new.

To meet the unique design envisioned

by the architect, both the contractor and architect recommended using precast exterior walls and structure to the owners. According to architect Bryan Solko "precast offered no limitations in the design" and "its use was critical in meeting the budget and time constraints of the project." Insulated load-bearing precast wall panels that incorporated an integral buff color and rustication joints were used to create the gymnasium box. Precast columns, inverted tee beams and hollowcore were also

incorporated in the structure.

Fund raising is currently underway for Phase II which will feature a large natatorium. For that addition, the architect has once again determined that precast insulated wall panels will be the obvious choice to meet the design criteria.



www.concreteindustries.com



Owner: **Lexington Public Schools/Lexington YMCA** • Architect: **BVH Architects - Lincoln** Engineer: **R.O. Youker** • Construction Manager: **Paulsen, Inc.** • Location: **Lexington, NE** 

### Adams Freeman School Gym Addition

This public school gymnasium addition features precast concrete insulated wall panels. The precast exterior and interior was chosen based on cost savings and accelerated schedule capabilities that would allow fast track construction going through the Midwest winter.

The exterior of the building consists of thin brick with three separate patterns. There are soldier courses, running bond and a herringbone pattern incorporated into the exterior while the interior was power troweled to be site painted.

There is also an ornamental grey acid etched band that adorns the mid span of the precast.



www.coreslab.com



### Dakota Prairie Elementary School

The initial idea on this project was to use precast wall panels on the gym box and along some repeating portions of the classroom wings. But once the economic and overall benefits of precast were recognized, the exterior walls all became precast with exception of some mechanical penthouses.

The exterior precast used three different colors. Color (1) was cast onto a wood-grain form liner and left smooth as cast. Color (2) was cast on a horizontal fluted liner with an acid etch finish. Color (3) was acid etch flat panel. The interior back side of wall panels were left smooth gray painted for the interior wall finish.

Les Rowland, Project Architect with designArc, LLC stated "The Dakota Prairie Elementary School showcases some fundamental advantages of using precast. The use of precast allowed for a well-insulated exterior load-bearing envelope and the fast erection of precast enabled the building to be enclosed in a quick manner. The use of precast also allowed for the provision

of varying textures to create interesting patterns of sunlight and shadow of a different look to the conventional masonry wall. Overall, I view the project a great success and a great example of the versatility of precast. The School District wanted a building that was different than other schools

in this region. I believe precast was the product that allowed us to provide such a different look of interest."



www.gagebrothers.com



Architects: designArc teamed with Cannon Moss Brygger Architects • Engineer: Banner • Contractor: Mills Construction • Location: Brookings, SD • Photo credit: Gage Brothers

# **United South Central School**

A new United South Central School in Wells, Minnesota was completed in September 2014. The 155,000-square-foot pre K-12 school replaces the former school, portions of which were originally built in 1933. Construction on the \$28.8 million school facility began in May 2013.

Located on a 66-acre site, the school features a bus garage and athletic facilities (including practice fields), a track, a football stadium, baseball and softball fields, a playground and tennis courts. The K-12 school will serve approximately 625 students.

The school houses two gyms, a high school gym with two regulation basketball courts and an elementary gym with one regulation basketball court. There is also a precast concrete etching of the school's team name, the Rebels, and Mascot in the high school gym.

The school includes a large commons area bordered on the right by 45 classrooms and on the left by gyms, shops, music rooms and the auditorium. Students eat in the common area, and concessions are sold there during sporting events. To display the rough cut and beautiful side of a total precast project, the school's commons area shows exposed aggregate and exposed columns, beams and tees.

There is also a large auditorium that seats a maximum capacity of 602, with floor and balcony seating. In addition to the other new things at the school, there is a weight room that has public access, and a computer-aided design lab for students. The precaster also placed a 63,000 lb. spandrel with the school name cast in for a beautiful display for those that enter the school.

An extremely unique feature of the school is that part of the former Metrodome will live in the new

football stadium, which will use seats from the former home of the Vikings and Twins. The district built the facility following the passage of a referendum by taxpayers to fund the construction. But with a tight budget, local businesses chipped in to give the stadium a bit of extra special flair with the purchase of 840 Metrodome seats for \$40 each. The precaster was one of the businesses that contributed to the football stadium by donating the precast structure.

The new school is a total precast project. Architects had originally designed the school to only include precast for the walls, but the precaster was able to show the value of using precast for the roof and floor system, which convinced the architects to change their drawings.

The precaster placed 722 pieces including:

- 86,421 SF of insulated wall panels
- 4,220 SF of solid wall panels
- 1,247 LF of columns
- 1.098 LF of beams
- 26,984 SF of 42" double tees
- 67,358 SF of 24" double tees
- 675 SF of 20" double tees
- 14,000 SF of hollow core



www.wellsconcrete.com





### **Chanhassen High School**

The Chanhassen High School in Chaska, MN featured many precast components. The project, in total, is 405,000 square feet in size. Precast Concrete, a popular structural choice for education facilities, helped fit the budget for the project and was critical in allowing construction during winter conditions. In addition to the over 170,000 sq. ft. of hollow core decking, the precaster also supplied structural wall panels for the project. The large structural wall panels helped to form

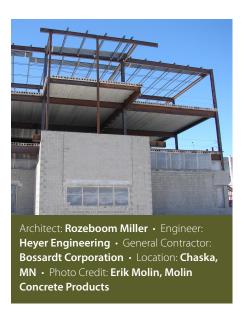
the new auditorium for the school and were finished off with a brick facade. The wall panels provided a shell for the building during winter construction. Precast stadia pieces were also utilized to provide "stadium style" seating for some of the classrooms.

#### Products Used:

- Hollow Core Plank: 171,680 Sq. Ft
- Structural Wall Panels: 40,440 Sq. Ft.
- Prestressed Stadia: 250 LF



www.molin.com



### Learn & Earn Half Day Seminars Learn precast and earn continuing education credits!



#### **NEW!** Lateral Loads and **Precast Concrete Design -**

Part II. This half-day seminar is dedicated to the design of precast and prestressed concrete buildings for lateral loads generated by wind and earthquake ground motion provisions. The seminar provides an overview of lateral force resisting systems for precast and prestressed concrete structures. The seminar includes the calculation of member forces for a typical five-story office building located in the Midwest. Design procedures and calculations for typical members in the building are presented.



#### **Lateral Loads and Precast** Concrete Design - Part I.

This half-day seminar is dedicated to the design of precast and prestressed concrete buildings for lateral loads generated by wind and earthquake ground motions. The seminar provides an overview of lateral load determination for precast concrete buildings, including both architectural and structural precast concrete. The seminar includes a brief history of wind and seismic lateral loads in building codes in the United States in conformance with IBC 2009, ASCE 7-05, and ACI 318-08. Numerical examples are presented for a typical fivestory office building located in the Midwest.



### **Total Precast Concrete**

**Design.** Learn the advantages of a total precast building system during this half-day seminar. Strategies such as increased efficiency and shorter construction schedules of "dual use" structural and exterior cladding systems will be presented, as well as guidelines for the design and detailing of architecturally finished exterior walls, concrete tees, hollowcore plank, and precast concrete stairs. Integration of HVAC systems, building code requirements, and total precast's potential contribution toward LEED certification will also be discussed



#### **Designing Precast Concrete Parking**

**Structures.** Learn how to design and detail precast concrete parking structures during this half-day seminar. Advantages such as decreased construction time, efficiencies of combining a variety of exterior finishes with exposed structural members, and precast concrete's potential contribution toward LEED certification will be discussed. Integration of HVAC systems, building code requirements, long-term durability, ramp and vehicle circulation types, safety, and maintenance issues will also be presented.

### **Learn & Earn Box Lunches**

PCI Midwest provides continuing education programs on a variety of topics. These programs are easily tailored to conference room or classroom lunch programs. Architects and engineers can learn about precast concrete hollow-core floors and walls, architectural precast concrete, precast parking structures, glass fiber reinforced concrete, high performance precast concrete and much, much more. Contact mike@pcimidwest.org to request a program for you or your company.

The following programs are prepared and ready for presentation. Please allow a minimum of two- to three-weeks from the date of your submission to the date of your requested presentation.

**Discover High Performance Precast** (Credits: 1.0) Recent code changes, increasing sustainability requirements, and a challenging economy are just some of the factors increasing demand for high-performance structures. However, high performance is not business-as-usual. The concept of 'high-performance' encompasses sustainability; however, it goes beyond a 'this-or-that' approach by requiring optimization of all relevant attributes for a project on a life cycle basis. This presentation will explain what high performance structures are, and how precast concrete can help you achieve your high performance project goals. The presentation also covers the basics of precast concrete, its applications, finishes, etc.

#### Artist's Palette: The Aesthetic Versatility of Precast

**Concrete** (Credits: 1.0) The aesthetics of a structure are very important, as it is what most people identify with. High performance materials should provide aesthetic versatility in order to efficiently meet a structure's architectural requirements. Precast concrete provides incredible aesthetic versatility from providing multiple colors and textures, to developing shapes, forms and very ornate details. Precast can also simulate or be veneered with natural materials providing all of their beauty, but with the added speed, durability, many other benefits of precast. This presentation will provide an overview of the many finishes available with precast concrete, along with methodologies for achieving them. We will also discuss combining multiple finishes into single panels, veneers and embedded materials, selection of mix designs, approaches to achieving colors, proper specification, and procedures to ensure expectations are aligned.



#### **High Performance Precast Concrete Envelope Systems**

(Credits: 1.0) A structure's envelope has considerable impact on its overall performance, as highlighted by recent code changes. The envelope not only serves as a barrier between the outside environment and conditioned space, but also as a part of the aesthetic expression for the structure. It must also serve as a protective shield against environmental forces. High-performance building envelopes can help reduce the overall energy consumption of a structure throughout the structure's life, and maintain and protect its interior environment and occupants. This presentation addresses what high performance building envelopes are, as well as key elements to their performance. It will discuss how to use precast concrete wall systems to meet the latest code requirements such as continuous insulation and air barriers, and include topics such as moisture management, thermal mass effect and how to calculate effective R-values, integration with other building systems, and more. This session will also touch on the idea of resilience. A structure must be able to resist environmental forces, such as high winds and earthquakes in order to protect life and fulfill its intended purpose. Case studies are used to highlight information presented.

**Designing Precast Concrete School Buildings** (Credits: 1.0) After attending this presentation, participants will be able to: Discuss how different Precast/Prestressed components are used in school designs Use the aesthetic features of precast to create structures to meet the unique needs of schools Understand the Precast design process

#### **Designing with Precast/Prestressed Hollow-Core Concrete**

(Credits: 1.0) This course instructs participants about hollow-core products and how to design and build utilizing hollow-core floors and walls. Participants also learn about the inherent fire resistance of hollow-core, a major life-safety consideration. After this program, participants will be able to: Identify the different precast, prestressed hollow-core concrete systems Explain the benefits of using precast, prestressed hollow-core concrete Discuss the benefits of using hollow-core concrete with owners and other designers.

**Parking Garage Design and Construction** (Credits: 1.0) In this course, participants are instructed in improving security and lighting in parking structures and the inherent safety issues. They are also instructed in architectural treatment options for

facades which can make garages more aesthetically pleasing. Participants will also discuss ways to avoid parking structure leakage. From this course, they will be able to use a construction procedure to avoid this leakage.

**Precast Housing Structures** (Credits: 1.0) In this program, participants will discuss precast, prestressed concrete in the housing market. Precast, prestressed concrete provides long clear spans, shallow cross sections, high load capacities, high durability, compatibility with block, steel and cast-in-place concrete, and attractive appearance. Also learn how owners and residents benefit from low maintenance, two- or four-hour fire ratings, lower fire insurance rates, and strong acoustical control. After this program, participants will be able to: Identify the different precast concrete systems used in housing Explain the benefits of using precast concrete in housing structures Utilize precast concrete structures to benefit clients with fire suppression and environmental issues.

#### Precast Industrial Structures Design & Construction

(Credits: 1.0) Box lunch attendees will learn the key benefits of precast, prestressed components and see the advantages of an integrated design approach.

Precast Stadiums Design & Construction (Credits: 1.0) Box lunch attendees will learn how working with your precast, prestressed specialist at the earliest stages of design can mean a winning combination of advantages for your next stadium. These include flexibility of design, including long spans; high quality of manufactured products; versatility; high-performance, durable materials; and speed of construction because precast components can be erected quickly once they arrive at the site. After attending this program, participants will be able to: Identify the different precast, prestressed concrete systems used in stadium designs Explain the benefits of using precast, prestressed concrete in stadiums Discuss the benefits of PCI-certified precast producers

Precast/Prestressed Concrete 101 (Credits: 1.50) Participants will explore building design solutions using precast and prestressed concrete products. They will learn what precast, prestressed concrete products are, how they are manufactured, including structural theory of prestressing, and quality assurance procedures. They will learn about the industry certification program (PCI) of plants, people and performance. Participants will explore numerous examples of architectural and structural concrete solutions for numerous building markets. They will explore a variety of architectural finishes and how each is created in terms of color, form and texture. They will explore common structural solutions using prestressed concrete products and explore integrated solutions; realizing the full potential of loadbearing architectural precast units. The session will end with an overview of industry support available to the design community, including published and electronic media and a question and answer session.

**Precast/Prestressed Plant Tour** (Credits: 2.0) Attendees will observe firsthand how designs and engineering



details are executed in the precast manufacturing process. They will also observe the entire precast and prestressed manufacturing process from engineering and connections, forms set-up, casting and finishing. Attendees will gain a better understanding of precast and prestressed capabilities and related quality issues. Attendees will learn how precast fits within the entire building system and how to specify precast concrete accurately and safely.

#### **Sustainable Building Design Using Precast Concrete**

(Credits: 1.0 After this presentation, participants will understand the following concepts: (1) The key to sustainable building lies in long-life, adaptable, low-energy design. (2) The earth's resources are best conserved if the service life of a building is prolonged. (3) Using precast concrete in buildings conserves energy and resources during and after construction because of the following characteristics of precast concrete: (a) The materials used in precast buildings are natural, renewable, and locally available. (b) Water and materials used in precast buildings are often recyclable and recycled. (c) Indoor and outdoor air quality are improved in precast buildings because less (or no) VOC-based preservatives and paints are required, and because of the thermal mass qualities of precast concrete.

**Total Precast Structures** (Credits: 1.0) After this program, participants will be more familiar with what a total precast concrete structure is, how a total percast structure can benefit a project, and what components are used to construct a total precast structure. Participants will also learn how to manage a successful project.

#### **Architectural Precast Production & Application**

(Credits: 1.0) In this program, students will learn about the practical application of a wide variety of architectural precast solutions. The discussion will include design choices and cost considerations.

### **Associate Members**

#### **Architectural Polymers, Inc.,**

1220 Little Gap Road Palmerton, PA 18071 610-824-3322 www.apformliner.com Marshall Walters marshall@apformliner.com

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#### e.Construct.USA, LLC

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#### **Insteel Wire Products**

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### Structural Engineering Associates, Inc.

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Dan Beskar 952-905-0085 daniel.a.beskar@grace.com

# **Producer Members**

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