

SCHOOLS BUILD ON PRECAST **Curriculum**

Unity Christian and The Summit Country Day champion 21st century learning in schools built with durable, expeditious, and cost-effective precast concrete systems

— **Monica Schultes**

Using a design-build delivery system, the new Unity Christian High School was completed in 18 months during a harsh Michigan winter. All photos: Craig Van Wieren, Modern[edge]studios.



It doesn't take an honor student to see that a high school needs to be both a safe haven and an inspiring space, and that it has to withstand the daily wear and tear of hundreds of teenagers. Not only is the design and construction a challenge, but factor in zero public funding for parochial schools and the (lack of) budget is an obstacle all on its own.

Private schools have the onus to raise money for new or renovated school projects through a capital campaign, but they do have the luxury of setting some of their own rules. These owners can forgo the traditional design-bid-build constraints that are required for public schools. Parochial schools also foster long-term relationships in the community that can maximize their construction dollars. From financial endowments to donations of time and materials, many private institutions have the resources to embark on grand construction projects that had been put on hold during the recession.

In addition to sidestepping the traditional bidding process, nonsecular academies can also think outside of the box for their design and construction goals, leading to more creative uses of precast concrete than in traditional public schools. The two projects presented here selected precast concrete systems for their durability, speed of construction, and cost-effectiveness.

UNITY CHRISTIAN HIGH SCHOOL

The Eastern Ottawa Christian Schools serve Ottawa County in western Michigan with a Christian education committed to increasing faith, educational excellence, hospitality, and service. Planning for a new high school began before many of the enrolling students were even born. The entire Unity Project was a 17-year process that started in the late 1990s. Phase I, fundraising for the purchase of land, was completed in 2003.

As a private school, all funds needed to be raised from private donors and families that support Unity Christian High School through tuition payments and donations. Early budgeting estimated \$30 million for the project, but the fundraising committee did not think that was going to be feasible. The planning committee was asked to look at different approaches to the building, including reducing the square footage as well as alternative materials and methods of construction.

RECONFIGURED DESIGN GOALS

Kerkstra Precast, GMB Architecture, and Lakewood Construction all support the Unity School system. With their input, the project was reconfigured, square footage reduced, a precast concrete bearing structure implemented, and the project budget was reduced to \$23.5 million.

The original design was for a 200,000-ft², traditional brick and block masonry high school estimated to cost \$30 million. The redesign scaled down the size of the project and turned to a total-precast concrete system. Precast concrete offered the superior fire protection and high sound transmission coefficient (STC) ratings specified by the school, with a significant cost savings and compressed schedule.

Kerkstra showed the team several completed projects that had used a formliner. They selected a texture that simulated wood panels. "Precast concrete was a key component in meeting the goals of the project; not only for its physical properties, but also for its aesthetic capabilities," says Lynn Bolek, senior project manager

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One of the building's most unique design elements is the application of the wood grain formliner. The insulated precast concrete wall panels are load-bearing with a barn board finish selected to give the concrete a modern appeal and feeling of warmth. Photos: Craig Van Wieren, Modern[edge] studios.

with Kerkstra Precast. "The wood grain texture featured throughout the building was created with a highly reusable elastomeric formliner from Architectural Polymers. The barn board finish was selected to give the concrete a modern appeal and feeling of warmth."

The insulated precast concrete wall panels serve multiple purposes as they bear the gravity and lateral loads imposed on the structure. Another bonus is that maintenance is minimal compared to wood. The concrete was standard gray and the panels were stained on site. That gave the warm finish that emulated wood so closely. Some panels with light and medium sandblast finishes were finished at the plant.

THINKING OUTSIDE THE BOX

"The biggest obstacle in the beginning was to coordinate the mechanical/electrical contractors to lay out the conduit and boxes so that Kerkstra Precast could include them in the shop drawings and cast them into the panels," says Marcel VanderLaan, project manager with Lakewood Construction. "Some finagling had to be done to avoid the internal prestressing strand and embedded connection hardware."

Bolek agrees. "The coordination of electrical boxes that are cast into precast panels is always challenging because there is no real way to keep a product of that size from floating during the concrete pour. You can tie it to the truss framing, but some do shift during production and some have to be patched at the jobsite. We always recommend having a large cover plate to account for that, and to limit the amount of patching."

In addition to the load-bearing wall panels, prestressed hollow-core slab was used for the floors and ceilings in the classrooms. These precast concrete walls and floors provide further protection against fire and also perform well in noisy environments due to their high STC ratings.

UNITY CHRISTIAN HIGH SCHOOL

LOCATION
Hudsonville, Mich.

PROJECT TYPE
K-12 school

SIZE
152,246 ft²

COST
\$23.5 million

DESIGNER
GMB Architecture & Engineering,
Grand Rapids, Mich.

OWNER
Unity Christian Schools

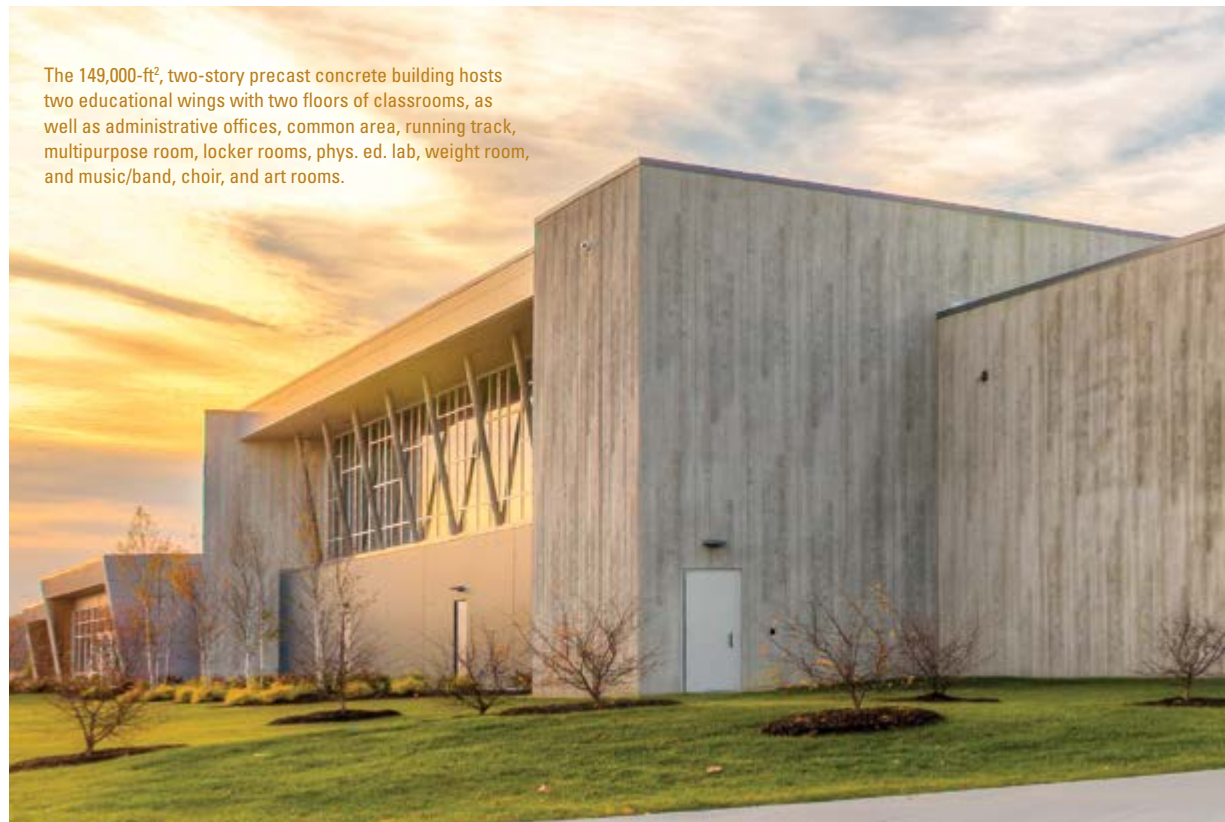
STRUCTURAL ENGINEER
GMB Architecture & Engineering,
Grand Rapids, Mich.

CONTRACTOR
Lakewood Construction, Holland, Mich.

PCI-CERTIFIED PRECASTER
Kerkstra Precast, Grandville, Mich.

PRECAST COMPONENTS
Hollow-core slab, interior and exterior wall panels, knee walls, spandrel panels, beams, columns, stairs, solid slabs

The 149,000-ft², two-story precast concrete building hosts two educational wings with two floors of classrooms, as well as administrative offices, common area, running track, multipurpose room, locker rooms, phys. ed. lab, weight room, and music/band, choir, and art rooms.



TIMING IS EVERYTHING

Because the project needed to be completed by the start of the new school year, the schedule was a major concern to everyone on the project team. This meant the project delivery system had to be design-build with open lines of communication across the project team.

“Given the speed of precast construction, we were confident that we could start construction in the spring of 2014 and have it ready in time for school to start in August of 2015,” says VanderLaan. The aggressive 15-month schedule also contributed to cost savings as the project was accelerated. “We only had three to four months of erection versus 12 to 14 months of masonry installation on site.” The timing was serendipitous for this project, “because not six months later the market took an upturn and the pent-up demand for precast and general construction took off. The schedule would not have been met and costs would have been 20% higher,” says VanderLaan.

FIRST DAY OF SCHOOL

A groundbreaking ceremony was held in May 2014 and students walked into classes for the first time in the new school

in August 2015. While site prep was occurring and footings were being placed, Kerkstra fabricated more than 3700 pieces of hollow-core slab, interior and exterior wall panels, columns, beams, and precast concrete stairs. The first panels arrived on site on June 30, 2014. Pioneer Construction erected the precast concrete walls and the structural steel, which streamlined the coordination between the two materials and simplified the enclosure process.

With the exception of a final panel, which remained out for a portion of the project to allow larger equipment access into the building, the last panel was put into place in late October, allowing for enclosure in November of 2014. VanderLaan recalls, “That winter was brutally cold with tons of snow. Our operations would have been shut down had it been block/brick, or else we would have had to spend millions to tent and heat the job. It worked out great to have the precast for the schedule.”

VanderLaan adds that “on a traditional project, while you are doing site work you can’t do any masonry work. You have to wait for all these steps to be done, but while we were doing site work the precaster was busy fabricating all these panels. Boom! There would be 80 linear feet of walls up in a day.”



'Precast was a great investment for the school.'

GIVING BACK AS PART OF THE COMMUNITY

Kerkstra Precast is a second generation, family-owned business that encourages community involvement and instills a culture of volunteerism. Bolek says that "employees receive a paid day of service where they can volunteer with the group of their choice, whether it is a food bank, local school, or Habitat for Humanity. That culture permeates throughout the company and this project exemplifies that community involvement."

"Precast was a great investment for the school," says VanderLaan. "There was a significant cost reduction thanks to the commitment of the Kerkstra family to make this project move forward. Project cost for this building, factoring in many gifts-in-kind from supporters and bidders, allowed this school to be built of durable, lasting materials with a great performance and design for less than \$140 per square foot."

The design-build team on the Unity Christian High School proved that you can design and build a new, state-of-the-art facility in 18 months. They worked together to create a structure that communicates a strong, durable environment and sets a tone for safe school culture and innovative learning.

The Unity Christian High School was conceived as a way to provide a safe haven for the local community within a thermally efficient, durable, functional, and attractive structure. All told, the financial support from the community when all phases were complete totaled \$30 million. The entire project consists of 100 acres, which include soccer fields, tennis courts, baseball and softball diamonds, and a cross-country course.

"After the success of this project, I think more schools will consider precast concrete in the future. We are currently talking to another school in the design phase and they were inspired by the appearance and achievement of UCHS," says Bolek. "In the past, precast floor systems were common (double tees or hollow-core plank), but the wall systems are starting to be more appealing to schools and we will start seeing more of that in the future."

THE SUMMIT COUNTRY DAY SCHOOL ADDITION

LOCATION

Cincinnati, Ohio

PROJECT TYPE

K-12 school

SIZE

11,000 ft² addition; 80,000 ft² renovation including new science labs

COST

\$9 million

DESIGNER

SHP Leading Design, Cincinnati, Ohio

OWNER

The Summit Country Day School, Cincinnati, Ohio

STRUCTURAL ENGINEER

THP Limited Inc., Cincinnati, Ohio

CONTRACTOR

HGC Construction, Cincinnati, Ohio

PCI-CERTIFIED PRECASTER

Gate Precast, Winchester, Ky.

PRECAST SPECIALTY ENGINEER

Ericksen Roed & Associates, Saint Paul, Minn.

PCI-CERTIFIED ERECTOR

E.E. Marr, Baltimore, Md.

PRECAST COMPONENTS

Insulated wall panels, load-bearing walls, beams, columns, hollow-core slab



Precast concrete far exceeded expectations in producing an extraordinary level of detail in the panel profile. Photo: Gate Precast Company.

THE SUMMIT COUNTRY DAY SCHOOL ADDITION, CINCINNATI, OHIO

You can't help but be motivated when you work with a school whose mission is to challenge every student to develop spiritually, academically, physically, socially, and artistically, and to become people of character who value and improve the world they inherit. The Summit Country Day School graduates 100% of its senior class and has a 100% college acceptance rate.

Founded in 1890, The Summit Country Day School is an independent Catholic coeducational college-preparatory school, whose campus covers 24 acres in Cincinnati's Hyde Park neighborhood, with an additional 16-acre athletic complex. They assembled an inspired team that would make them whole again after a partial collapse of a portion of the school in 2004.

The school needed more space because of growing enrollment in the Upper School. In addition to the seven classroom labs, the expansion gave the school room for a lab dedicated to independent study in the sciences. The Summit's new Science Research Institute also holds classes in this space. The need for top-tier facilities to support that program also necessitated building the five-story east wing.

Richard Thomas, vice president of architecture at SHP Leading Design, explains the firm's relationship with the school. "SHP had been working together [with the school] since 2004 when we were brought on board to resolve the collapse of a portion of the structure. In addition to remedying the collapse, we worked with them on smaller projects around campus."

The addition was the final result of putting back what had fallen down. Because of the collapse and other safety concerns, The Summit discourages construction while students are present on campus, leading the design team to face the self-imposed challenge of how to complete the entire \$9-million project during a single summer.

TEAM BUILDING

Thomas proposed that, "given enough time and the right team, the project could be planned and executed over the course of the summer." In essence, the five-story, 10,000-ft² addition had to be built in a 10-and-a-half-week period. "I wasn't sure at the very start how we were going to do it, but felt with the right team the challenge could be met," recalls Thomas.

The team was assembled: HGC Construction, THP Limited, and key subcontractor trades. "The school gave us free rein to bring on the best of the best who were willing to commit to the project's tight parameters," says Thomas. The integrated project delivery streamlined



Precast concrete panels in the addition reflect the stately architecture of the original, including matching the brick circa 1890. Photo: Gate Precast Company.

the process. Without the collaboration of the architect, contractor, engineer, owner, and precaster in tandem combination with three-dimensional modeling, the results would not have been possible.

The team identified possible systems that could facilitate the schedule, and precast concrete quickly rose to the top of the list. In addition to the time crunch, the expansion was designed to mimic the existing building, which was constructed in 1890.

"From the start, our approach to building the east wing was to honor and respect the traditions of The Summit as reflected by the architecture of the Upper School," says Thomas. "The original architecture is grand, stately, and dominant relative to its surroundings, and yet very approachable. We wanted the architecture of the new construction to continue to reflect those traits."

Gate Precast was selected as the precast concrete fabricator to find a way to develop a total-precast concrete system. They collaborated with Thomas and the rest of the project team. Many designers don't realize how many of these iterative processes are completed upfront. Thomas recalls, "There was a great deal of conversation and that just



The addition to The Summit Country Day School restored a portion of the structure that had collapsed. The total-precast concrete structure was erected in 22 days. Photo: Joe Harrison, JH Photography Inc.

doesn't happen overnight." The collaboration also helped maintain the budget by limiting the piece count. The first iteration consisted of 119 precast concrete pieces. "We whittled that down to less than half of that," explains Thomas.

The team worked with Gate Precast through an exhaustive sample process. Brick on the original building was matched with thin brick embedded in the precast concrete wall panels. Then decisions were made to emulate the ancillary materials. "There were mansard roofs, dormers, detailed windows, dimensional stone—all with multiple material and finish selections. White cement mix was used to emulate limestone for the water table, trim elements, and cornices," says Thomas.

The multistory panels minimize the jointed system and help the new addition blend seamlessly into the older structure. The use of all precast concrete components provided column-free space for design flexibility and future reuse.

SUMMER VACATION

Usually a project of this size could take up to 12 months, but The Summit wanted the project completed without any disruption and altered the school calendar to allow for a longer summer construction period. The team spent more than a year planning a way to build the project in the time allowed.

The precast concrete panels arrived in the typical just-in-time delivery. "There was no laydown area on campus, so it had to be done that way. No panel sat more than two hours once it arrived at the site,"

Thomas says. Careful planning and sequencing enabled the entire facility to be erected in 22 days.

The private Catholic school did not have to deal with competitive bidding. As a private institution, the school was not bound by traditional public bidding requirements, freeing it up to select on a qualification-based model with a focus not only on cost competitiveness (from prequalified subcontractor teams), but the ability to commit to the schedule. The only requirement was to get it done within budget and within the time frame.

The design team determined that precast concrete was the best solution, but the team still had to determine who provided the best value and could meet the extremely aggressive schedule demands.

Thomas noted that while the first cost of the design was higher than other systems, the speed of installation more than made up the difference. It resulted in a cost-effective solution that met the owner's durability, schedule, aesthetic, and performance criteria in the context of the original architecture. "The intricate design of the existing facility could not have been recreated for the same dollars and certainly in the same time frame by any other construction approach," Thomas says. "Gate Precast's capabilities in design and fabrication far exceeded expectations in producing an extraordinary level of detail in the panel profile and panel performance."

The project resulted in Summit adding a five-story, 11,000-ft² east wing on the main building that provides a large library reading room, more classroom space, room for the business office on the first floor, an art studio, and a covered walkway between the main building and the Lower School. The project also created state-of-the-art science labs on the first and second floors of the west wing and main building, and renovated a science lab, administrative offices, and health clinic in the Middle School.

Both Unity Christian High School and The Summit Country Day School experienced the benefits of the accelerated construction schedule and comparative cost reduction provided by the use of total-precaster concrete systems. These schools were able to provide an improved educational environment for their students with projects completed in a matter of weeks, allowing the interiors to be completed and ready for the use of faculty and students by the critical first day of school. Neither project would have resulted in the same level of success without the team collaboration and cooperation that is a hallmark of all precast concrete projects. The lessons provided by these examples can be applied to improve countless other projects through the integration of precast concrete.