

## Innovative Precast Solutions for School Buildings

Insulated sandwich panels provide far more than thermal efficiency

**W**hen used for construction of educational facilities, precast concrete offers exceptional benefits. In addition to versatile design and finish options, it resists the effects of fire, wind, and impact; deters mold growth; and keeps looking great despite the day-in, day-out activities of the students themselves. As schedules and budget cuts continue to impact school construction, administrators have increasingly looked to precast concrete for fast-track construction and minimal maintenance, energy, and life-cycle costs.

For at least 50 years, concrete sandwich panels—building elements with a continuous insulation layer between two

layers of concrete—have been used for building cladding. In recent years, a number of precast concrete suppliers have used carbon fiber grids to connect the two layers of concrete through the insulation layer.

High Concrete Group LLC, Denver, PA, and Metromont Corporation, Hiram, GA, recently supplied precast concrete components, including sandwich panels with carbon fiber grids, for two major school projects:

- The Heights, a residential facility at Montclair State University, Montclair, NJ; and
- Tucker High School, a multi-level high school in Tucker, GA.



The façade of The Heights residential facility at Montclair State University features two precast concrete mixtures in buff and white colors. The lower level was designed to resemble limestone and the upper levels were detailed to achieve the look of stucco



During construction of the new Tucker High School, the existing school remained in service, leaving minimal staging area and requiring just-in-time delivery and erection of precast components

## The Heights

The Heights, a 567,000 ft<sup>2</sup> (53,000 m<sup>2</sup>) residential and dining facility, consists of two complexes providing housing for nearly 2000 students. Each complex in the \$211 million project includes four residential towers connected by a two-story common area.

The project was developed with the goal of compelling commuter students to switch to on-campus living. To ensure that the building provided a comfortable living environment, the residence halls are enclosed with 175,000 ft<sup>2</sup> (16,000 m<sup>2</sup>) of 11 in. (280 mm) thick CarbonCast® Insulated Architectural Cladding panels (visit [www.altusprecast.com](http://www.altusprecast.com) for more information) fabricated by High Concrete Group LLC at its Denver, PA, and Springboro, OH, plants. These load-bearing precast sandwich panels are comprised of 5 in. (127 mm) inner and 3 in. (76 mm) outer concrete layers connected by C-GRID® epoxy-coated carbon fiber grids through a 3 in. layer of extruded polystyrene foam.

The grids allow fabrication of panels with edge-to-edge continuous insulation with minimal thermal bridging. The insulation and connector system give the panels a thermal resistance (*R*-value) of 15°F hr ft<sup>2</sup>/Btu (2.6 m<sup>2</sup>K/W), meeting the ASHRAE-90.1 requirements for a mass wall with continuous insulation.

Campus officials wanted to replicate the aesthetic of the white stucco walls and low-pitched tile roofs of the Spanish Mission-style buildings first constructed when the institution was founded as the New Jersey State Normal School in 1908, so the new facility includes buff concrete elements at the lower level (mimicking limestone) and white concrete elements over the upper five to eight floors (mimicking

stucco). Panels have bay window projections, bullnoses, and numerous reveals for added interest.

High Concrete ensured forming and cost efficiencies by working with the design team to obtain repeating modules in the façade and other precast elements. Other efficiencies were gained by designing the cladding panels as load-bearing elements with painted, hard-troweled interior finishes, eliminating perimeter columns and drywall (and associated maintenance). Even more savings were achieved by painting the soffits of the building's hollow-core floor panels, eliminating the need for hung ceilings. High Concrete also worked closely with the architect to create an L-shaped eyebrow parapet alternative to the originally planned mansard roof. It's estimated that this saved about \$3 million for the project.

These efficiencies were amplified because the precast system eliminated weather delays and allowed the project to be completed well ahead of the contractual completion date.

## Tucker High School

Tucker High School is a \$66 million, 340,000 ft<sup>2</sup> (31,000 m<sup>2</sup>) multi-level facility for 1800 students. The school district's building program required the new construction be executed around existing buildings to accommodate ongoing school activities without interruption, so the new structure was built in two phases.

A track crane on each of the two building sites lifted the precast panels into place. To minimize downtime and accelerate erection, the buildings were constructed story by story, with each crane erecting two wings at the same time by alternating between them.

It took Metromont Corporation only 52 days to fabricate and install 1144 panels (about 210,000 ft<sup>2</sup> [19,000 m<sup>2</sup>]) of the CarbonCast High Performance Insulated Wall Panel system. The 10 in. (254 mm) thick panels are comprised of two 3 in. (76 mm) thick concrete layers connected by C-GRID elements through 4 in. (101 mm) of expanded

### Project credits

#### The Heights, Montclair State University

**Owner:** The Capstone Companies, Birmingham, AL  
**Architect/Engineer:** PS&S Architecture P.C., Warren, NJ  
**Design/Build Contractor:** Terminal Construction Corporation, Woodridge, NJ

#### Tucker High School

**Owner:** Tucker School District, Tucker, GA  
**Architect:** Milton Pate Architects, Inc., Tucker, GA  
**Engineer:** Bennett & Pless, Inc., Atlanta, GA  
**General Contractor:** Turner Construction Company, Atlanta, GA



The precast panels on Tucker High School incorporated integral architectural finishes, including thin-set brick and exposed concrete to emulate limestone

mixture made with white cement and a small amount of pigment. The school's interior walls have a smooth troweled, painted finish for a clean, seamless look that can withstand high-energy students.

## Getting the Jobs Done with High Marks

The Heights is registered for LEED Silver Certification. Tucker High School was awarded first place in the low-rise building category by the ACI Georgia Chapter in both 2010 and 2011 (for each phase). It was also the recipient of "Best All Precast Solution" award by the Precast/Prestressed Concrete Institute (PCI) in 2011.

Selected for reader interest by the editors.

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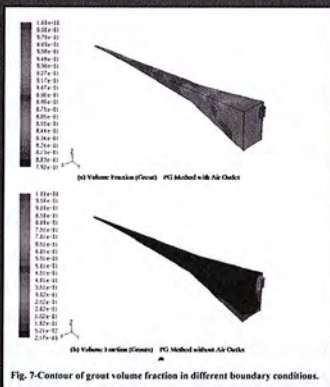
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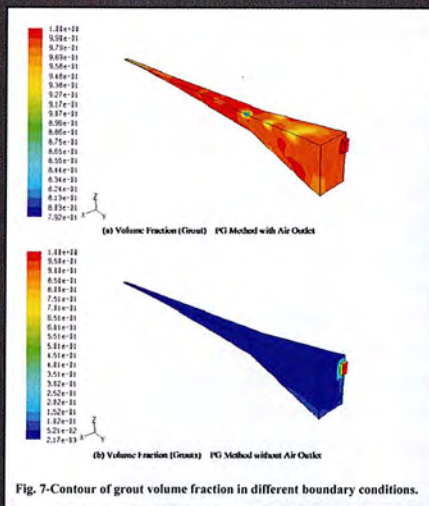
polystyrene (EPS) insulation. The rated  $R$ -value for the panels is  $19^{\circ}\text{F hr ft}^2/\text{Btu}$  ( $3.3 \text{ m}^2\text{K}/\text{W}$ ), exceeding the energy standard requirement by 30%.

The exterior finish of the panels features a thin brick veneer complemented by lightly sandblasted areas that mimic limestone. To create the limestone appearance, the facing layer was cast using a standard architectural concrete

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