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Thanks to Shockey thin-brick panels, parking garage facade in lockstep with Annapolis detail

PHOTOS: Von Marsh, Concrete Products

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HEAD OF THE CLASS

TWO-BUILDINGS-IN-ONE, TOTAL-PRECAST DESIGN HELPS ILLINOIS COLLEGE REALIZE COST SAVINGS WHILE RACKING UP LEED POINTS

By Steven Prokopy

For most of the nation’s colleges and universities, funding for new construction is in short supply, while the often student-driven demand for greener building is high. North Central College (NCC) in Naperville, Ill., found a way to address both challenges and possibly serve as an example for other educational institutions.

NCC needed both a new dorm and a new field house, so architect Tom Buchar, AIA, NCARB, Tom Buchar & Associates, Inc. of Joliet, proposed a precast concrete design for a 198,000-sq.-ft. residential/recreational center, scheduled for completion in September. The four-story building (with 12-ft.-high ceilings) would house a 265-bed (159-room) dormitory surrounding a 62,000-sq.-ft. field house at a cost of about $20 million.

The rectangular-shaped, first-of-its-kind dorm structure features bio-based foam to insulate the precast dormitory wall, floor and ceiling members, while the enclosed field house has 50-ft.-tall precast sandwich panel walls and 180-ft.-span roof trusses for an open-spaced 200-meter indoor track, activity courts, and a suspended walking track.

Naperville’s Dukane Precast, Inc. is supplying all of the precast components for the project, including panels forming underground tanks to retain storm water, or water tapped from 650-ft.-deep geothermal wells. At 65 wells, NCC has one of the largest geothermal installations in the Midwest. With a projected 41 credit points, the facility likely will qualify for a U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) Gold rating for new construction.

“With 100 percent of the precast fabricated less than 15 miles from the job site and the foundation ready mixed produced within 50 miles, the material used for this project was well under the
Clockwise from above, steel inbeds were located in the poured-in-place foundations for future precast wall placement. A Double-Wall floor panel is lifted to the fourth floor, where workers connect it to wall panels with both welding and grouting procedures. A stair tower rises above the first floor of dormitories.

Dorm rooms surround the enclosed 62,000-sq.-ft. field house, built with 48- to 50-ft.-tall wall panels and 180-ft.-span roof trusses.

Rather than buy plastic form liners that might get two or three uses, Dukane Precast opted to make four concrete master panels (two brick and two stone) from the plastic liners, oil the concrete panels, and fabricate rubber molds of each of the four to use as master form liners. The liquid rubber material (far right) is self leveling and yielded liners good for more than 100 pours.
Top, this total precast building system shows part of the 50-ft.-tall field house panels. The floor and ceiling panels are 10-in. double- wythe units, and 8-in. Double-Wall panels comprise the interior dorm and exterior walls. Beam penetrations accommodate mechanical and fire protection.

500 miles LEED requires for it to be considered regionally produced,” explains Brian Bock, vice president-sales marketing for Dukane Precast. “Using so much precast also made it possible for us to finish the job in the 11-month window.”

By building a single structure, the school already saves money by requiring only one exterior façade and one heating and cooling system for both facilities. Each dorm room is a cube with five of six sides made of precast—only the wall facing the hallway consists of metal studs and fire-rated drywall. The wall and ceiling precast Double-Wall sandwich panels have a smooth, paintable finish; floors are covered in tile. The Double-Wall panels feature two, 2½-in. concrete faces on either side of a 3-in. layer of insulating foam.

Form liners were used during casting on the exterior wall panels to create the look of hand-laid brick with stone details at window headers and building corners, matching closely the look of Merner Field House, a brick building located next door to the Res/Rec Center. Dorm rooms surround the field house on three sides, leaving the front of the building open for bike parking and a future enclosed connection to Merner.

The wall panels feature embedded cut-outs made during casting for outlets and conduits for electric cables; floor panels contain tubing for radiant heating, an option Dukane offers for Double-Wall product.

The spacious recreation center is surrounded by 50-ft.-tall, 12-in.-thick, 12-ft.-wide prestressed sandwich panels and is spanned by 180-ft.-long steel trusses spaced six feet apart. Other Dukane-supplied precast components include stairs, stair landings, elevator shafts, columns and beams.

Twelve-inch-thick sandwich panels also were used to form two underground storm water retention tanks—one adjacent to the building and a second under a nearby site to be covered by a tennis court. Measuring about 60- x 200- x 12-ft.-deep, the tanks were made of Double-Wall side panels minus the standard foam insulation filling. Instead, the void and other wall cavities were filled with a filigree floor, as concrete was site-poured over the top. The panels were used as a stay-in-place form for the concrete tank thus produced.
An important green element to the NCC structure is the mix design. Vacuum-saturated slag aggregate from Lafarge’s East Chicago grinding facility was used as a substitute for virgin limestone. In the Dukane plant, the 6,000-psi (2,500 psi at eight hours) self-compacting concrete mix consists of 60 percent slag aggregate, with fly ash replacing 30 percent of the cement. Overall, the precast panels are made with roughly 40 percent recycled materials. The slag aggregate results in lower-density concrete (125 pcf). The lower weight allows for more panels per trailer and decreased shipping costs. A lightweight structure also means a savings in foundation construction.

By using total precast construction, the project generated very little waste material. At about the 75 percent-complete timeframe, crews were only on their fourth Dumpster at the project site. Dukane committed to diverting at least 75 percent of construction waste through recycling.

As students’ safety is a major concern for university leaders, they soon can boast of a new campus facility featuring fire-resistant exterior walls that also can sustain an F5 tornado (261- to 318-mph winds).