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October 2015



BUILT TO ENDURE

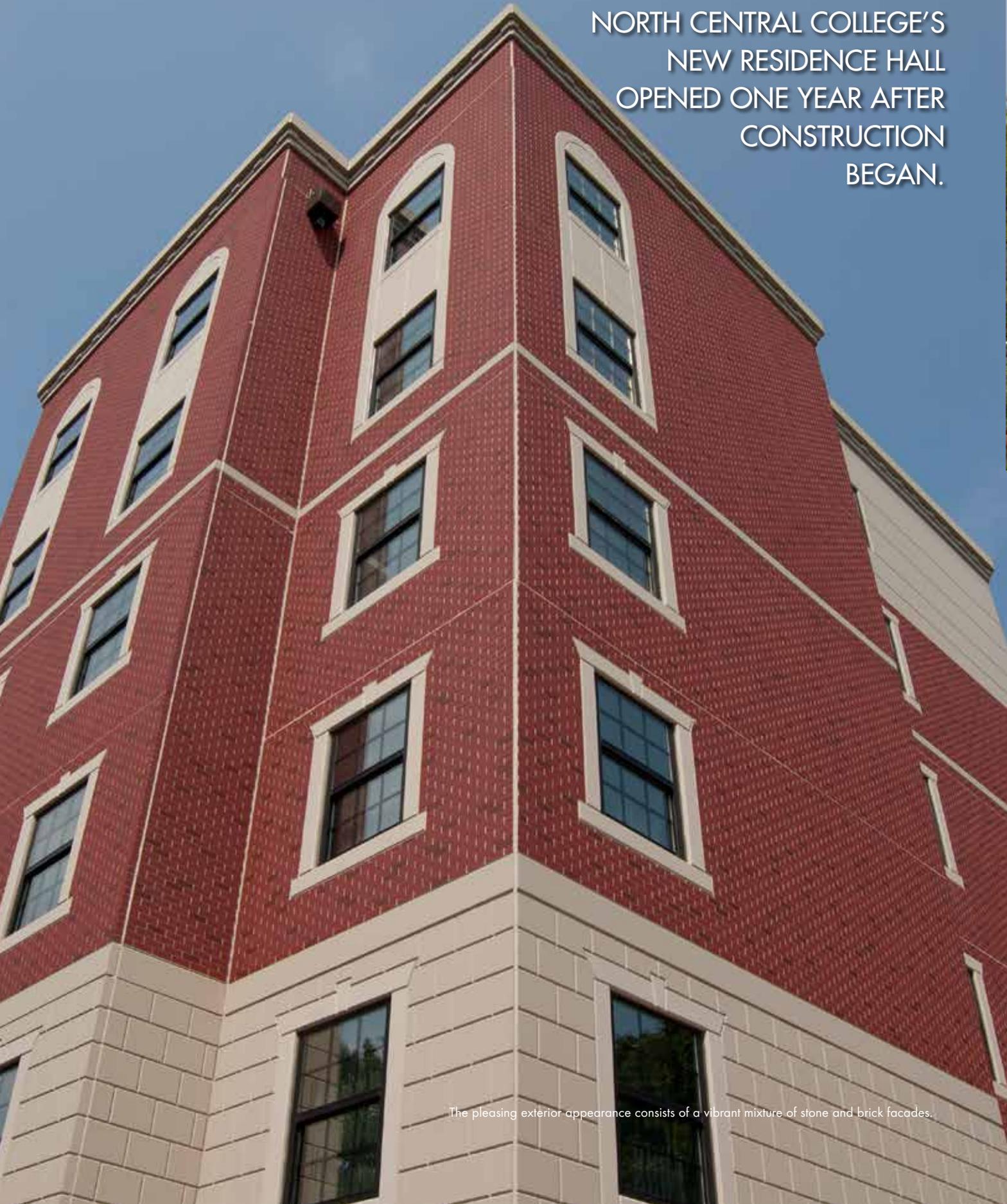
**North Central College's
Unique Residence Halls
12-Month Schedule Met**

INSIDE: See Features on Safety from Extreme Weather Conditions!

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BUILT TO ENDURE

NORTH CENTRAL COLLEGE'S
NEW RESIDENCE HALL
OPENED ONE YEAR AFTER
CONSTRUCTION
BEGAN.



The pleasing exterior appearance consists of a vibrant mixture of stone and brick facades.



Text by **Sherry A. Boyd** • Photography by **Brian T. Bock**

SEVERAL INNOVATIONS IN PRECAST CONSTRUCTION DEVELOPED BY DUKANE PRECAST ENABLED NORTH CENTRAL COLLEGE IN NAPERVILLE, ILL., TO MEET AN IMPORTANT CONSTRUCTION TIMELINE AND ADDRESS THE COLLEGE'S GOALS FOR RESILIENCE, SUSTAINABILITY AND ENERGY PERFORMANCE.

The five-story, 229-bed residence hall at North Central College, Naperville, Ill., was constructed to provide suite-style living accommodations. It opened during September 2015. The hall replaces beds lost when an older '60s era residence hall was demolished and a second building was transitioned from student housing to faculty offices to make way for the new \$60 million state-of-the-art science center being built on the 65-acre campus. Due to closure of the half-century old residence hall, it became important to complete the new residence hall for the start of the 2015 academic year. As a result, Dukane Precast employed several innovations to address the tight timeline and meet project requirements.

According to Mike Hudson, vice president for business operations, three things weigh heavily into all design and construction decisions on the North Central College campus: resilience, sustainability and energy performance. A previously completed 400-bed combination residential hall and recreation center facility that opened in 2009 had proven popular for students because of its modern amenities and thermal comforts. The unique LEED Silver certified residential and recreational building also was developed to provide an indoor track and

field competition venue that has already hosted one NCAA Division III National Championship meet.

During construction, it set a new standard for sustainability features, including radiant heat, high-efficiency air conditioning, heat recovery ventilators, a domestic hot water waste heat recovery system, a white membrane roof to reduce heat island effect, low-flow plumbing fixtures, low-VOC materials, extensive use of recycled materials and a large geothermal installation. This “res/rec” building was constructed with precast double wall, double floor and conventional sandwich panels, as well as precast concrete columns, beams, stairs, landings, elevator shafts and water retention storage tanks. This approach has influenced the College’s newest residence hall.

The College set the goal to incorporate all of the same green building criteria found in the residence hall/recreation center into the 2015 project. However, while utilizing the most up-to-date building technology, the building team also had to address an aggressive building schedule.

PRECAST CONSTRUCTION

Dukane Precast manufactured all of the precast wall, floor, stair and other specialized products used in this project in their



The first wythe of the insulated precast sandwich panel is turned upside down and then married to the second wythe using the innovative vacuum flipping table.



The fully insulated wall and floor panels were erected in a multi-phase operation, allowing timely access to be scheduled for other trades.



Following the layouts on the architectural and engineering drawings that are specific to every panel, workers place the plastic formliner on the rotating steel tables prior to concrete placement.

Aurora and Naperville facilities. This provided for a very short trucking distance to the downtown Naperville college campus. Precast erection was completed in phases vertically in five main stages, allowing the other subcontractors to successfully stage their operations to accelerate the completion of the structure to hit the mandated deadline.

Brian T. Bock, vice-president of sales and marketing for Dukane Precast explains how the sandwich panels are constructed, “The unique *double-wall* system wall panels and floor panels are produced with a form finish on both sides of the insulated precast concrete sandwich panels. The panels consist of two high-strength concrete wythes surrounding an insulating foam inner core. Each concrete wythe is poured separately on individual steel tables that circulate from station to station through the carousel plant. In a two-step process, the two wythes are connected in a very sophisticated manner, showcasing the latest advancements in the production of precast panels.”

Just prior to the placement of concrete into the form, the radiant tubing is placed at the designated locations within each individual floor panel. Since these floors do not require a topping in the field, the placement of the radiant tubes in the factory deliver a significant time and money savings to the building client.

Floor panels and interior wall panels receive a steel form finish on both wythes, while the exterior wall panels receive *smooth interior finishes* and *brick/stone exterior finishes* utilizing high-quality



Wall panels are lined up in the storage yard in preparation for delivery to the project site at North Central College.

form liner sheets and reveal strips. The 10-inch-thick exterior walls utilize 4 inches of polyisocyanurate foam insulation that delivers a high R-value (R-24) envelope. When it is combined with the 10-inch-thick floor slabs and 12-inch-thick roof slabs (R-36), the total precast shell ensures exceptional air-tightness, structural superiority and thermal comfort.

Of special note, during manufacturing the roofing membrane was cast into the upper wythe of each individual precast concrete roof panel. On-site, each roof panel was placed next to the one placed before it during the erection process and the roofing membrane was efficiently seamed to provide a continuous seal for the entire roof.

Bock reports, “Precast erection for the building started in mid-February and was completed in mid-June. A total of approximately 1,000 precast pieces were installed throughout the winter and spring during challenging weather conditions commonly seen in the Chicago area. Typical precast installation techniques consisting of welding connections, grouting, and caulking were performed on a very timely basis. Additional precast products provided included; retaining walls, stairs, landings and parapets.”

OUTCOMES

This approach eliminated the coordination for multiple trades to come to site for framing and glazing windows, which can delay schedules, but it is important to note that changing the way the multi-unit building was constructed delivered many other ben-

efits beyond accelerating the schedule. Because Dukane Precast constructed completed double-wall panels at the plant with the 275 energy-efficient aluminum windows already installed, work could commence during the coldest of the winter months. By working on the precast panels on the shop floor, the process was far more efficient, faster and safer for workers than having building trades above the ground on scaffolding. Away from harsh winter weather, quality was superior in a clean, climate-controlled environment. For example, window caulking was not subjected to extreme temperatures.

Jobsite waste was minimized and the interior side of the panels provides a refined final finish texture resembling dry wall, but far more durable.

SUMMARY

Bock says, “Dukane Precast was honored to be working on a residence hall for North Central College again. The result of our collaboration with the building team showcases how resilient, sustainable and cost effective precast construction can be for multi-unit, multistory construction. The techniques used here can be successfully applied for residence halls, apartments, condominiums, townhouses and even senior centers and hotels. At Dukane, we’ve shown the year-round advantages of precast construction cast inside and moving from plant to site as a total modular unit with windows and frames in place. This is on the cutting edge and the way of the future.”



The new building is situated and designed to afford expansive views of Benedetti-Wehrli stadium at the south end of the facility, historic downtown Naperville to the west and the College's main campus to the north and east. It was designed to provide a mix of options for students that include spacious, single-occupant bedrooms grouped in four-bedroom suites with two baths and common living areas along with two-bedroom suites with more economical double occupancy bedrooms and also some single occupant efficiency apartments.

The aggressive schedule and present day economics influenced decisions to choose precast concrete. The recently completed residence hall, dubbed "New Hall" at North Central College, is ready for 229 students as of September 2015, adding to the unique mix of innovative housing options available at the historic College. [ch](#)

Top left: The installation of radiant tubing in the floor panels and windows in the wall panels was done at the factory. This significantly helped speed up the completion of construction activities on site.

Bottom left: View of the grand southwest entrance to the new residence hall.



PROJECT TEAM

Owner's Project Manger:
US Equities Realty, LLC CBRE

Architect:
Buchar, Mitchell, Bajt Architect, Inc.

MEP Engineering:
Ketchmark & Associates

General Contractor:
Bulley & Andrews LLC

Precast Concrete:
Dukane Precast

Civil Engineering:
CEMCON Ltd

Landscape Architect:
Hitchcock Design Group

Structural Engineering:
Larsen Engineering

Technology:
Advanced Data Technology