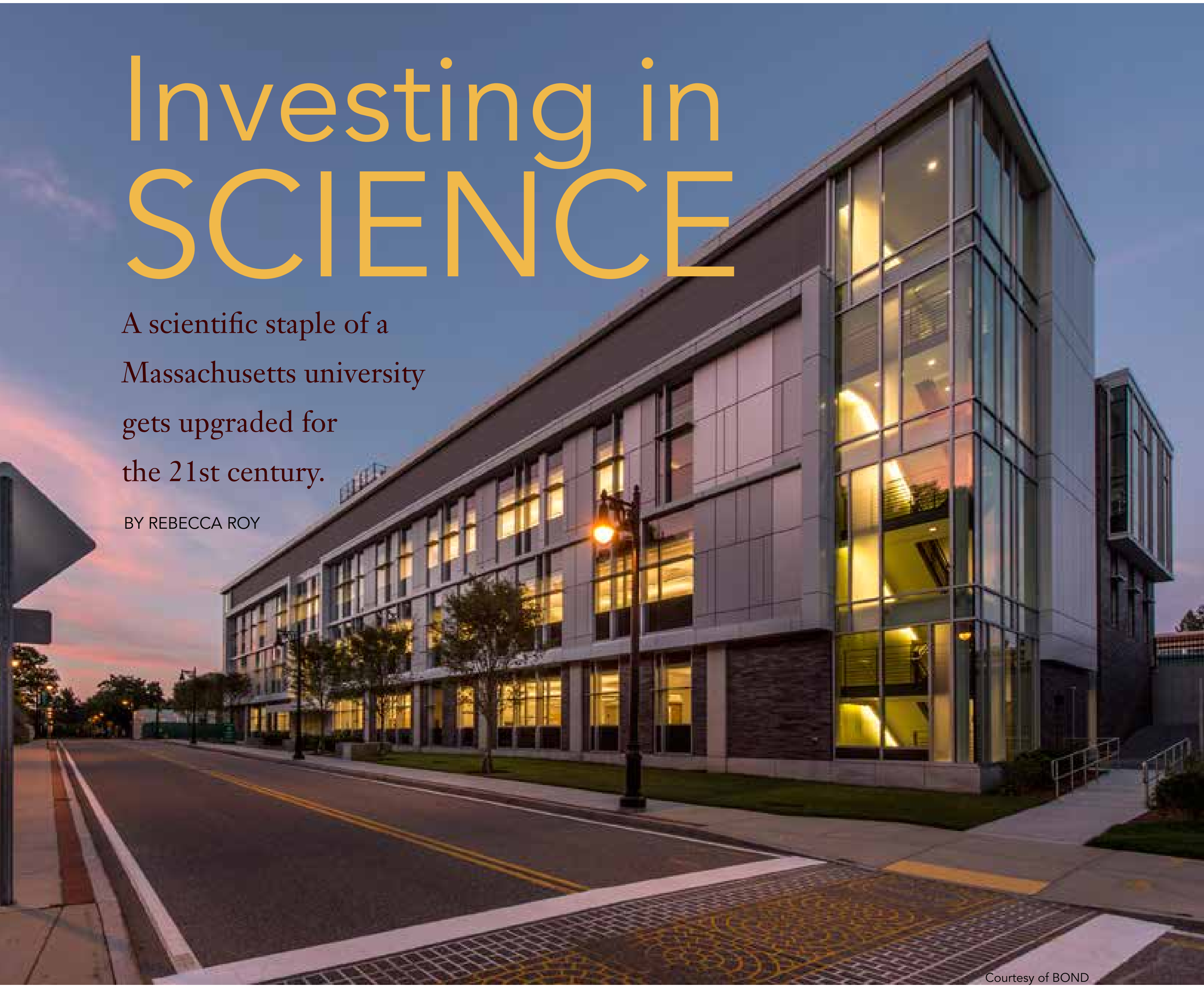
Investing in SCIENCE

A scientific staple of a Massachusetts university gets upgraded for the 21st century.

BY REBECCA ROY



Courtesy of BOND

Rebecca Roy (rroy@bondbrothers.com) is BOND's marketing manager.

DESPITE WINTER'S NEGATIVE CONNOTATIONS for northern construction projects, the season actually proved to be a boon for an ongoing project at Fitchburg State University in Fitchburg, Mass.

The school's 45,000-sq.-ft Condike Science Center required modernization to better meet the demands of current science program curricula, which have expanded and evolved to the point where the building is no longer able to support them. The expanded building is the first new academic facility on the Fitchburg State campus since 1963. The 50,000-sq.-ft, three-story addition, with a mechanical penthouse at its roof level, more than doubles the building's area and includes biology and chemistry teaching and research laboratories, classrooms and support functions, and is being built on the site of the campus' former Parkinson Gymnasium, which was in turn demolished.

The project team has completed the first phase of the two-phase project this past spring, thanks in part to its structural steel components, which allowed staff to work through the winter months with little impediment.

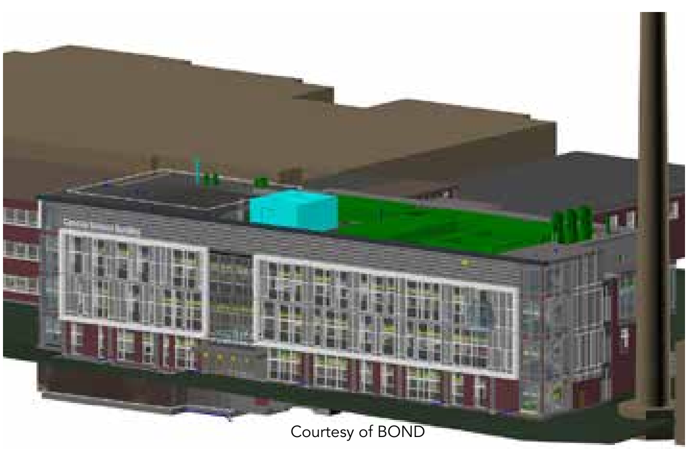

Courtesy of BOND

◀ The new 50,000-sq.-ft addition to Fitchburg State University's Condike Science Center.

▲ The crane was essentially backed out of the building footprint as construction progressed.

▶ Bracing for the north-facing side of the building.

▼ A rendering of the completed addition.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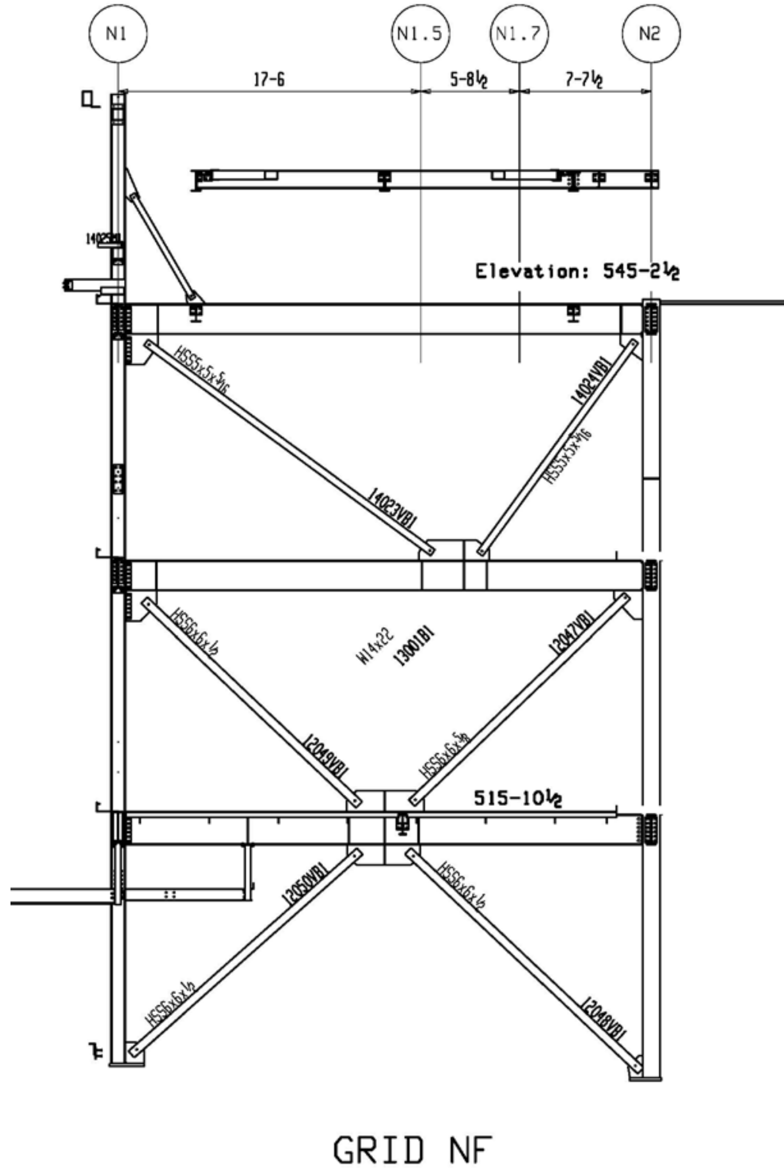


"If you can erect structural steel, that allows more flexibility with weather and allows construction to be less impacted overall," said Mike Dumaresq, construction manager BOND's project manager for the building.

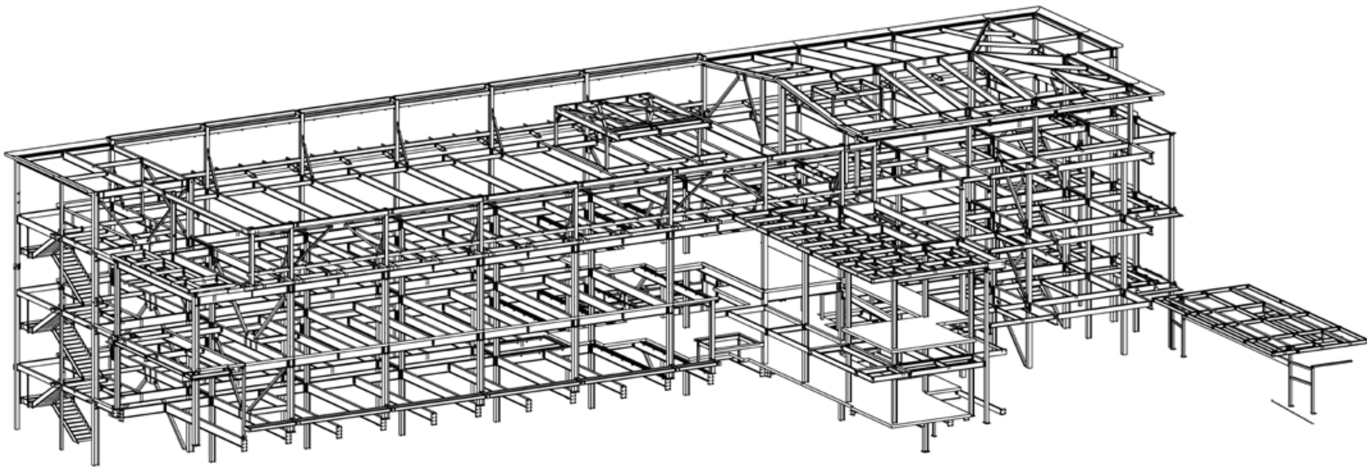
Completing the first phase of this $57 million project, which began in 2011, BOND faced extraordinarily difficult site conditions in installing the expanded footprint of the building, yet still finished early and under budget. For this addition, BOND worked with structural engineer Lim Consultants and steel fabricator Capone Iron to develop a vertical erection sequencing plan that required placing the steel erection crane within the building footprint for all but the final vertical sequence; the crane was essentially backed out of the footprint as construction progressed.

Approximately 500 tons of wide-flange and HSS steel was used for the framing system (common shapes were W21x50 and W12x72) and steel had to be delivered to the site in more than 30 subsequences due to limited laydown space.

"We only shipped as much steel as was required for each day," said Gary Capone, executive vice president of Capone Iron. "The sequences had to be carefully choreographed and delivered due to the site logistics and constraints. Plus, school was in session all around us, so erecting steel was done carefully and, as always, safely. There was simply no shakeout room."

The new addition, which is seismically separated from the existing building, occupies a footprint approximately 220 ft by 70 ft with two 31.5-ft outer classroom bays flanking the central corridor, plus a "tee" connector to the existing building. The partial basement is founded on a 30-in.-thick reinforced concrete mat to distribute the bearing loads and resist the uplift from the area's high water table. Spread footings support the columns at the area outside the basement.

Both levels, the main roof and a 65-ft by 70-ft hip-roofed mechanical penthouse are framed with structural steel wide-flange sections. The floor and roof beams are designed as



An isometric view of the steel framing system.

Courtesy of BOND

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composite deck (3 in. of deck topped with 3.5 in. of concrete), which was selected in part to reduce the transmission of noise and vibration to sensitive scientific instruments housed in the laboratory spaces.

Lateral stability is provided by braced frames in the short direction and moment frames in the long direction. At the perimeter of the main roof portion that isn't occupied by the penthouse, a screen wall extends approximately 21 ft above the slab level. The main building columns continue up to the top elevation of the screen, with diagonal HSS kickers from about 8 ft above the slab down to the roof level to resist wind forces. HSS8x8s span between columns as top and bottom rails for the perforated metal screen. Additional HSS, projecting out from the tops of the columns and from the slab edge at the roof level support, are used to support architectural façade features.

One of the key structural challenges was marrying the existing concrete-framed building and its 12-ft floor-to-floor heights, to a new steel building that used 14-ft, 8-in. heights in order to accommodate the ductwork required for a modern lab facility (as well as to achieve the architect's desired ceiling height). The solution was to align the second floors of both buildings and provide ramps at the first and third floors to maintain accessibility.

Working on a topographically challenging site in the midst of an active campus was a significant challenge. To control quality throughout the construction process, BOND integrated its iPad-based QA/QC BIM 360 program with its on-site staff. The company started with an anchor bolt survey to ensure there were no surprises when the first columns arrived. It also used BIM 360 to track structural steel installations, confirming that steel was plumb, bolts were torqued, weld inspections were completed, steel deck was screwed, laps were correct and shear studs satisfied weld requirements. The team also used BIM to study the existing building's envelope, as well as to model all MEP transition points between the existing building and the new expansion—a process that expedited the on-site erection and installation of the building systems.

The second phase of the project, renovating the existing building, kicked off this past June, with steel erection beginning in December. Structural steel modifications to the 50-year-old structure allowed exterior walls to be opened up and created a new entrance with a cantilevered canopy, which ties the new and old buildings together seamlessly. While the original building is being renovated, all science classes are being conducted in the addition for the 2013-2014 school year. Second-phase construction is expected to be completed this June.

Overall, the new Condike Science Building, which is expected to meet LEED Silver requirements, is designed to emphasize "shared science" program components that encourage the collaborative approach characteristics of current science instruction. And it's not just for students majoring in the sciences. Every student on campus stands to benefit from the new building, given that a laboratory science course is mandatory in order to graduate. ■

Owner

Fitchburg State University, Division of Capital Asset Management, Fitchburg, Mass.

Construction Manager

BOND, Boston

Architect

CBT Architects, Boston

Structural Engineer

Lim Consultants, Inc., Malden, Mass.

Steel Fabricator and Detailer

Capone Iron Corporation, Rowley, Mass.
(AISC Member/AISC Certified Fabricator)