

COMPANY

Consigli Construction Co., Inc.

LOCATION

Boston, Massachusetts, United States

SOFTWARE

Autodesk® Revit® Architecture
Autodesk® Navisworks® Manage
Autodesk® BIM 360™ Field

Time for school

Consigli Construction Co., Inc. uses Autodesk BIM solutions to deliver a residence hall on time

The BIM process contributed immense value. We completed the project on schedule and half a percent under budget. BIM helped make that possible by preventing delays and costly issues.

— **Howard Hobbs**
 Project Manager
 Consigli Construction Co., Inc.



Image courtesy of Consigli Construction Co., Inc.

Project summary

Framingham State University (Framingham) offers undergraduate and graduate programs on a traditional New England campus just 20 miles outside of Boston, Massachusetts. Well regarded for its academic programs, the university is a popular choice for students seeking a quality public education. To accommodate increasing enrollment, Framingham decided to build North Hall, a new 125,000-square-foot, 410-bed residence hall. The university had three key construction goals: open on time, stay on budget, and minimize disruption to campus activities during construction.

Framingham turned to Consigli Construction Co., Inc. (Consigli) to deliver the project using a “construction manager at risk” mode of project delivery. The firm relied on Autodesk® Building Information Modeling (BIM) solutions, including Autodesk® Revit® Architecture and Autodesk® Navisworks® Manage software, to help them meet the university’s objectives. Consigli also used solutions from Autodesk® BIM 360™ Field to take the advantages of BIM into the field. “BIM allows us to plan everything using intelligent models,” says Howard Hobbs, a project manager with Consigli. “I cannot praise the benefits of working from models enough. BIM allowed us to anticipate, plan, and coordinate every aspect of the project in advance.”

The challenge

As construction manager at risk, Consigli committed to complete the project within budget and on schedule. The firm needed to proactively track how the design impacted the budget, and help the design team make materials choices that would not add excess cost or introduce constructability concerns. Given that Framingham had based some admissions decisions on the assumption the new hall would open on time, the schedule was even more important to the overall success of the project than budget.

“The stakes were high on this project,” says Hobbs. “With enrollment booming, the clock was ticking to have the 410 beds in the new building available for the fall 2011 semester. The project required extensive coordination of the MEP and structural systems. We saw the BIM process helping us to advance the project on schedule while preventing the kinds of issues that can slow work in the field.”

The North Hall is conveniently located near existing facilities on Framingham’s campus. While its location will be an asset over the life of the building, the site presented construction challenges. Consigli had to make sure the building process would not inconvenience students, faculty, or nearby residents.

BIM helped us to advance the project schedule

Maura Sullivan, virtual construction specialist for Consigli, explains: “Logistically, the project presented a number of space challenges of concern to students, the university, and the community. We believed that BIM could help us to solve the space challenge, and communicate our plans using 3D flyovers and walk-throughs.”

The solution

Consigli joined the project in the late stages of the design process. The team began by analyzing building models developed in Autodesk Revit Architecture software by the project architects, Pfeufer/Richardson Architects P.C. By analyzing the models, Consigli was able to quickly understand materials and construction techniques required to realize the design. They looked for opportunities to reduce costs and streamline the construction process without significant alterations to the design.

Originally conceived as a conventional block and plank structure, Consigli saw an opportunity to reduce costs by modifying the design slightly. “We recognized that a steel frame with pre-cast planks would give both cost and constructability benefits,” says Hobbs. “BIM makes it easier to view and compare differences in structural systems. The material takeoff tool helps us to track how different options can impact cost estimates.”

“Ultimately, the designers and the owners make design decisions,” adds Sullivan. “As a construction firm, we use models to drive conversations around choices that could enhance the project. Revit Architecture models make it easier for designers and owners to visualize how our insights could make their project more efficient.”

Everything in its place

Consigli did more than model North Hall. The firm created a model of the whole building site in Autodesk Revit Architecture, including everything from material storage areas to scaffolding and pathways. By sharing the model with the reviewers from the university and people living in a residential area near the site, Consigli was better able to reassure all concerned that the construction process would not be unduly burdensome.

“People could more easily see they could have safe passage around the construction site for the duration of the project,” says Hobbs. “No one wants a big construction site near their home, but neighbors could visualize in 3D the ways we were working to accommodate their concerns. University officials had a better understanding of where we were putting everything, right down to the dumpsters.”

The site model proved useful for Consigli too. Loading the model into Autodesk Navisworks Manage software allowed the firm to sequence the construction process. They synchronized the construction sequencing in Navisworks with the construction schedule the firm maintained in Primavera® software. The result: a 4D schedule that linked activities to the project model. In sequencing the main phases of the construction process, the team better understood when materials needed to arrive. They also were able to evaluate options for leave-outs in the façade.

“The façade is conventional brick masonry backed by dense glass sheeting wall,” says Sullivan. “With leave-outs, you construct most of the façade while leaving areas open to allow a crane to deliver materials to floors under construction. Construction activities and weather both have an impact on how large leave-outs should be and when they need to be closed. Navisworks helped us plan for more efficient leave-outs and link them to the construction schedule.”

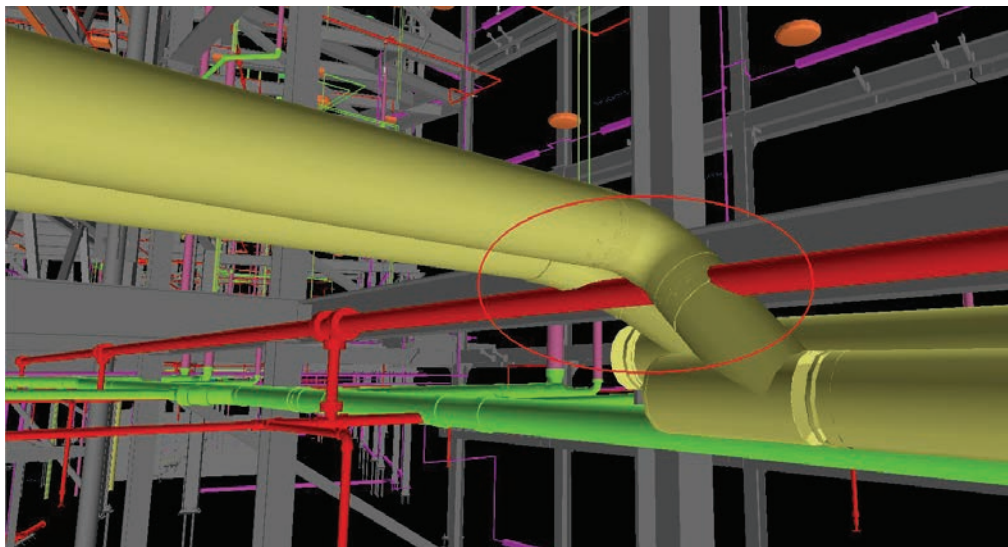


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Virtual Construction Specialist
Consigli Construction Co., Inc.



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Minimizing interferences

To help coordinate the project, Consigli again turned to Autodesk Navisworks Manage software. The firm required its subcontractors to use model-based processes to manage their construction tasks. This allowed the firm to use BIM to help coordinate construction and address interferences before construction began.

North Hall's design helped make the clash detection process more efficient because most floors shared similar layouts and building systems requirements. Rather than tackling clashes for the whole building at once, the firm coordinated two floors at a time. After aggregating floor models provided by the subcontractors within Navisworks Manage, Consigli ran clash detection tools within the software. The team identified about 100 interferences on the first two floors. Working collaboratively with the subcontractors, the architect, and the project engineers, they

addressed each clash and applied the corrections to other floors, when applicable.

"Identifying the interferences for the first two floors made it easier to address similar issues on other floors," says Sullivan. "When we coordinated the other floors, we only identified about two clashes per floor. The process went very quickly. During construction, the effort paid off. Only one notable clash surfaced in the field, and it was easily fixed."

Consigli's manager for MEP services, Ed Dubois, notes that Navisworks has had an enormous effect on the way the firm coordinates projects, especially with regards to mechanical, electrical, and plumbing (MEP). He says, "Using 3D models has made coordination simpler. Showing subcontractors where they may need to relocate systems is easier in 3D, compared to the traditional 2D process. Everyone sees issues—and how they can be corrected—more clearly."

Into the field

The advantages of BIM did not stop at the door of the North Hall project office. Using the Autodesk BIM 360 Field cloud-based service, Consigli took BIM into the field. BIM 360 Field allowed Consigli to review project progress during construction on Apple® iPad® mobile digital devices. Consigli's project management team and the architects walked the project site and generated punch lists of outstanding items.

"The old way of doing punch lists was very inefficient," says Andy Deschenes, BIM manager for Consigli. "You carried around a roll of drawings, marked it up, and then entered everything into a spreadsheet. Even using a laptop was a pain. Navisworks and BIM 360 Field completely transform the process. It's much faster and clearer. You can even take pictures of punch list items and link them to the issue in BIM 360 Field."

Expanding BIM in the field

While Consigli only used BIM 360 Field for punch lists on the Framingham project, the firm has since expanded its use of BIM in the field on more recent projects. Now, Consigli synchronizes BIM 360 Field with the Navisworks model on users' iPads. For punch lists, they simply drop a virtual pushpin on the exact location of the item in the model and document what needs to be done. Beyond punch lists, Navisworks and BIM 360 Field are enhancing the commissioning process for equipment within buildings. BIM 360 Field walks users through each step of that process. When the item is commissioned, Consigli links all the information about the equipment, such as maintenance schedules, manuals, and warranties, to its location within Navisworks.

"Commissioning used to mean turning on the equipment and handing over box after box of manuals to the owner," says Deschenes. "The process is much more effective with BIM 360 Field and Navisworks. There's less risk of missing an important step. At handover, the owner can get a model with all the associated equipment information. Linking equipment information to the model makes maintenance over the entire lifecycle of the building easier."

Deschenes explains how BIM 360 Field and Navisworks continue to deliver value over the life of a building: "For instance, say there's an issue with a leak. A maintenance person can click on the location of the leak in the model and see that the problem is likely to be a nearby valve. They can click on the exact valve specifications and arrive to the location with all the parts needed to repair or replace the valve."

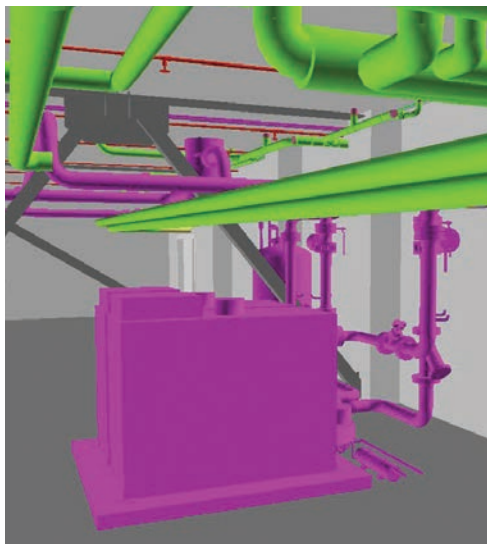


Image courtesy of Consigli Construction Co., Inc.

BIM facilitates proactive site planning and project coordination

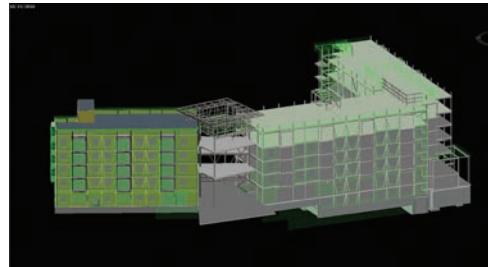
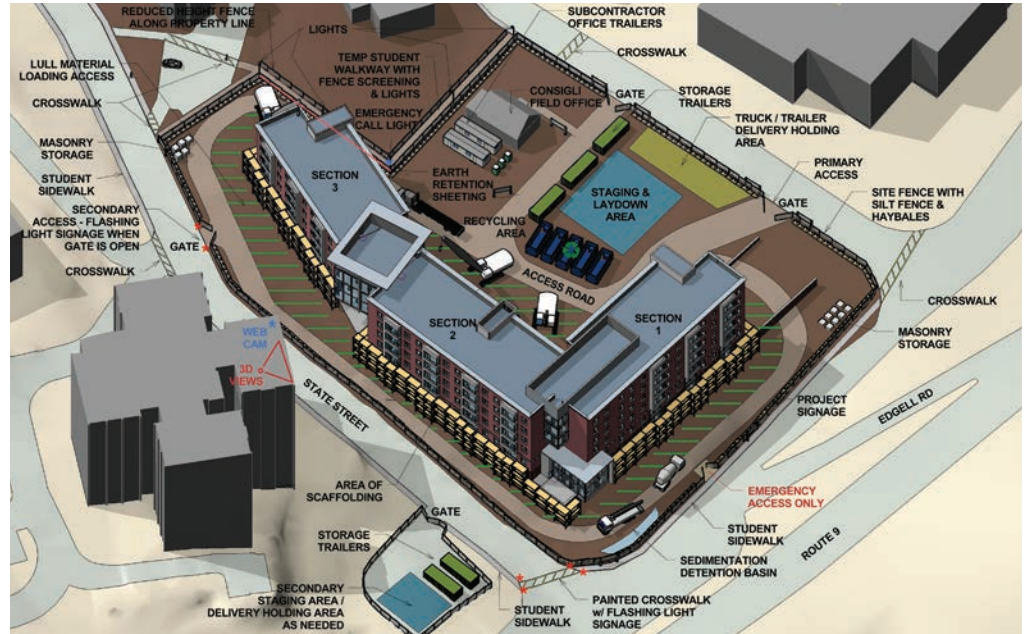
Winning the next project

BIM has not only made it easier for Consigli to execute projects—it also helps the firm win work. When Consigli meets with potential clients, it showcases its BIM capabilities using model-based proposals. The firm takes prospects on a virtual tour of how its team uses 3D to help review, coordinate, schedule, and hand over projects.

“Increasingly, clients expect contractors to use 3D tools,” says Hobbs. “Our presentations show that our culture is infused with BIM. Before they ever sign a contract, clients see we’re thinking about more than how we can build a project. We’re envisioning how we’re going to finish the building they want. There’s no question that BIM opens doors and helps win work.”

The result

Consigli completed the North Hall project and handed over the building to the university well before the opening of the 2011 fall semester. Today, students are enjoying their new residence hall at Framingham. “The North Hall project was a success in every respect,” says Hobbs. “It’s a great addition to the heart of the campus. The BIM process contributed immense value. We completed the project on schedule and half a percent under budget. BIM helped make that possible by preventing delays and costly issues.”



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