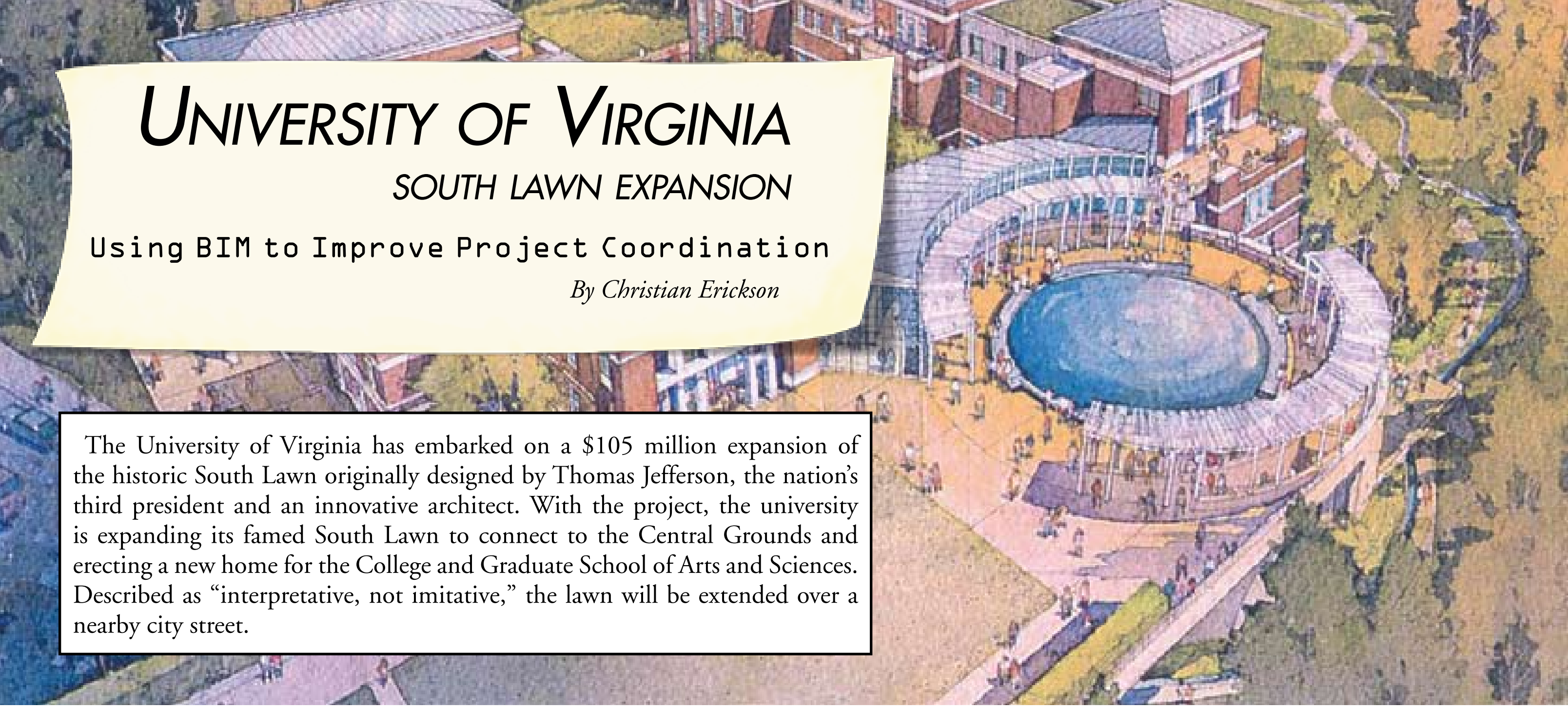


University of Virginia

South Lawn Expansion

Using BIM to Improve Project Coordination

By Christian Erickson

The University of Virginia has embarked on a $105 million expansion of the historic South Lawn originally designed by Thomas Jefferson, the nation's third president and an innovative architect. With the project, the university is expanding its famed South Lawn to connect to the Central Grounds and erecting a new home for the College and Graduate School of Arts and Sciences. Described as "interpretative, not imitative," the lawn will be extended over a nearby city street.

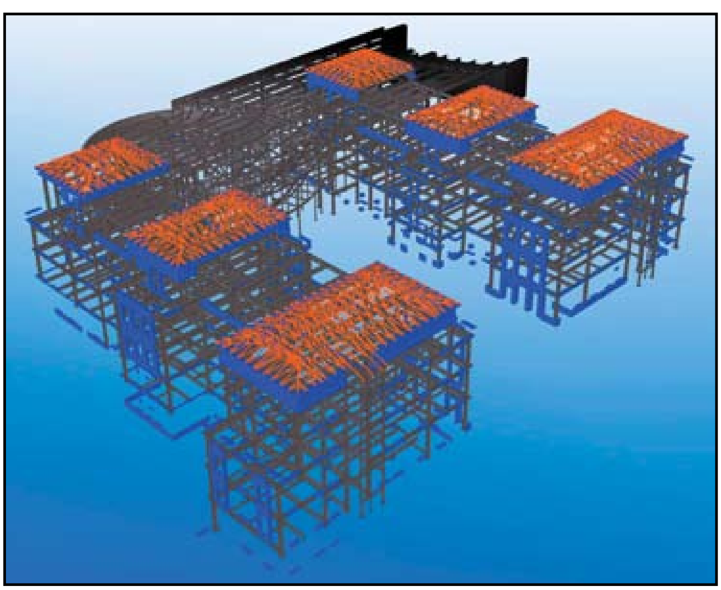
This rendering shows how the University of Virginia South Lawn will look after a $105 million expansion of the historic grounds.

Execution

For the South Lawn project, there are more than 500 shop drawings for steel, precast concrete elements and roof trusses. Relying on hundreds of printed pages, with plans, elevations and sections to figure out coordination issues, would have been an almost insurmountable task. Having the project information in a single computer model to review at once, or output to a Microsoft Excel spreadsheet, is saving considerable time and reducing frustration during construction.

Barton Malow, a construction management and general contracting firm based in Southfield, Mich., employed Building Information Modeling (BIM) to step beyond the traditional 2D-based information exchange. Barton Malow team members and the company's subcontractors relied on the accessibility and visual nature of data presented, stored and reported from the BIM system, which was used to support structural steel and precast design and construction as well as coordinate between structural systems and the mechanical system.

By employing BIM tools, the firm incorporated time-sensitive data into the model to manage a variety of project information in a 3D context, including spreadsheets and schedules, and create actionable analysis and deliverables (such as drawings and reports) beyond basic 3D visualizations.



This Tekla Structures model shows the steel frame of a building that will be built during the University of Virginia South Lawn expansion.

BIM helped everyone on the project manage and understand complexity, which is not limited to large projects; small and mid-sized projects can have any number of complex installations, as well. Those complex portions of a project require that everyone recognizes how the parts integrate. At a deeper level, BIM helps general contractors and subcontractors understand design, detailing and fabrication risks.

Intricate Details

The South Lawn project includes a steel frame building with a masonry and architectural precast concrete skin. Some of the precast pieces are large, 20,000-pound spandrels, while others are commonplace sills, and the building's façade does not repeat itself very often. Consequently, the façade represented a unique challenge because solutions to any problems could not be applied across the entire building. As a result, coordinating these pieces with the steel frame might have been a daunting task.

BIM allowed everyone on the project to visualize the coordination better than if they had employed the traditional 2D process. Barton Malow could focus on one particular area, turn it around as needed and concentrate on problem-solving. If an issue arose, they took a 3D snapshot and sent it to the design team for further discussion, to make sure that everyone was in agreement. On top of that, the team could also color-code the model; for example, they could view the steel submittal register in 3D, which provided a better understanding of the schedule risk that they faced.

The Shockey Precast Group, which handled the precast concrete work for the South Lawn project, is one of the first fabricators to recognize BIM's value. Interestingly, the contract documents required that subcontractors provide a BIM model. Perhaps it is not surprising, given the industry's expected trajectory, but it may be odd to some that the need for BIM integration was spelled out in the contract documents.

Focus on Precast

Early in the precast modeling phase, the construction manager met with the precast fabricator. Rather than pulling out separate hard-copy steel and precast drawings to check for any issues, the teams reviewed

The complexity of the steel-frame building's façade represented a unique challenge, but BIM allowed the project's participants to coordinate any changes in tandem.

the composite steel and precast model. In a short time, the group resolved issues that might have otherwise taken days, if they had relied on paper documents.

After receiving the 3D model from the steel subcontractor, Shockey Precast used it as a basis for modeling and aligning their precast elements. The precast group shared their progress with Barton Malow every two weeks, by uploading the updated model to the latter's website. Clash detection and scheduling is just the tip of the BIM iceberg; in fact, general contractors are already seeing the benefits of using and sharing more information from the construction team. Eventually, precasters and other specialty subcontractors will be creating and exchanging this kind of information on a regular basis.

With the South Lawn project, the mechanical contractor could not model in 3D and instead created shop drawings in an older 2D drafting program, relying on a third-party program to convert them to 3D. The first 3D mechanical models revealed design issues between the steel and mechanical systems. It is unlikely that these issues would have been found so quickly without the use of BIM. Since the group caught the issues so early, they resolved the problems before the submittal review, which ultimately led to more accurate shop drawings and a quicker and smoother mechanical installation.

As a result, the precast and mechanical systems were erected quickly and without problems. The BIM coordination clearly worked, and should become the standard for the precast design and detailing process. Any would-be issues were resolved ahead of time, which meant that the general contractor and subcontractors were not faced with field conflicts that easily could have led to costly delays and rework.

Conclusion

One of the most important features of BIM is the increased ability to visualize how parts of a building interact; but BIM is more than just a 3D coordination tool. It can be used to visualize all sorts of information - from Request for Information (RFI) logs to fabrication status to change order tracking. BIM can help save money, and there seems to be little doubt among the many people involved in the South Lawn project that BIM is the way to go.

A single model, for example, can now carry out and manage construction projects from conceptual design to pre-construction planning, and on through site management. Users can also efficiently manage a variety of project information in a 3D context, including spreadsheets, schedules and punch lists, and create actionable analyses and deliverables, like drawings and reports, beyond basic 3D visualizations. With BIM tools, users can create, store and manage scheduled tasks and link those tasks to their corresponding elements. This helps create customizable model views and comprehensive 4D simulations of how the project is proceeding.▪

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The South Lawn project includes a steel frame building with a masonry and architectural precast concrete skin. Here, the building's steel frame rises over the South Lawn.