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Rendered Obsolete

Drawing Boards, Blueprints Step Into The Digital Age Software Spots Costly Construction Problems Before They Happen

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Today's complex building projects offer almost no margin for error. An errant swing of the hammer, two or three critical missing pieces and one small miscalculation can all conspire to derail developments, costing millions of dollars in delays and change orders.

That's why David Stodden spends his time eliminating unnecessary hammer swings, estimating precisely how much building material is needed, and double- and triple-checking critical computations.

Stodden, estimator and director of virtual construction for North Reading-based Columbia Construction, is part of a growing niche in local architecture and contracting firms. Sophisticated, three-dimensional building information modeling (BIM) software is slowly replacing the venerable pencil and t-square.

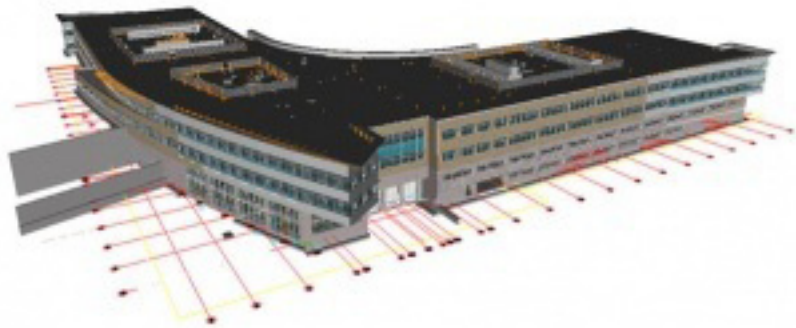
More importantly, the technology is also replacing your father's bulky and oft-misinterpreted blueprints with full-scale buildings - all without ever stepping foot on a construction site.

No More Widget Counting

Contractors can now estimate materials amounts, organize data and combine architectural models with mechanical models, allowing workers to virtually build the job before they start hammering nails. This allows subcontractors to spend their valuable pre-construction time eliminating problems that may arise in the field - plumbing systems interfering with electrical systems, for example - instead of "counting widgets," according to Stodden.

"It certainly cuts down the unknowns in a project, like tricky areas of a building that are mechanically congested with a lot of parts and pieces and different systems," Stodden told

Contributed photo



Digital rendering technology helped Waltham's 175 Wyman St. achieve tighter tolerances

Banker & Tradesman. "Now we can coordinate systems and understand how they will all fit into a building. Sprinkler lines, plumbing work, duct work - it can all be fabricated and put together in the shop rather than figuring all that out in the field. You're not standing at a site saying, 'now what do we do?'"

The systems aren't cheap, but their value lies in eliminating the waste associated with trial and error in the field.

The steel hangers that hold the 25-foot exterior wall panels in place at Waltham's 175 Wyman St., a project recently completed by Columbia, had only a quarter-inch margin for error. Designing the hangers with BIM software allowed for such accuracy that the hangers, which would normally be welded and installed in the field, were done in-shop, saving an estimated \$275,000 on the steel job alone, according to project architect Marc Margulies, principal of Margulies Perruzzi Architects. Margulies said he has used 3-D modeling for the last four years.

For all its perks, BIM has its drawbacks. Designers often need to input highly specific dimensions and other measurements to maximize cost and materials estimates. For some hard-liners, that level of detail can sometimes obscure the purity of the overall design, according to Richard Bertman, principal at CBT Architects.

Bertman said BIM's true strengths lie in coordinating construction with subcontractors.

"Generally we start a BIM model and then we get our subcontractors to put in their structures, and the mechanicals go in," he said. "Then the model goes to the builder, and the builder can use this as a model for what they're going to build, including the schedule of what comes first and what comes next in construction. It points out all the conflicts, so you can adjust and change things."

Sounds Like Progress

By his own estimation, it has taken Stodden four years to master the complex software, and he's still learning. But he said every time he uses the system, he finds different ways it can help on the job.

Margulies acknowledged the difficulty of learning BIM software, both on the designer's end and for contractors themselves. But he said construction companies are investing more in training their workers to use digital plans. BIM is the next big step in architecture and design, Margulies said, and its associated on-site cost savings help make the upfront acquisition costs of the software and related licenses, "not unmanageable."

"The days of walking around with a blueprint [are] almost over," Margulies said. "This is changing the entire real estate profession, and the thing that's changing it is that this software and others that relate to it are being used by contractors, subcontractors, and building owners as well. It doesn't design anything for you, but it's a magnificent tool and a great aid at quality and cost control."

But advances in technology aren't just changing the way a building looks and is constructed - they are also altering the way it sounds.

"Auralization," a method of mapping out a structure's acoustics, utilizes the same three-dimensional modeling concepts used by architects, but with added details about the acoustical properties of a room - its sound reflective or absorptive materials, for instance. Cambridge-based Acentech is one company that has made a niche for itself by modeling the auditory qualities of its clients' spaces.

According to Benjamin Markham, senior consultant in acoustics at Acentech, auralization creates a rendering for the ears of what a space will sound like before it's built. A room can be conducive to public speaking, for example, but not for a crowd of people all talking to each other while a band is playing.

Recent Acentech clients include the Massachusetts Institute of Technology's new Sloan School of Business, Markham said.

Acentech's general goal is to make the space sound good for all uses - an important trait, as users increasingly show off new spaces to past and potentially future investors at fundraising galas and other events.