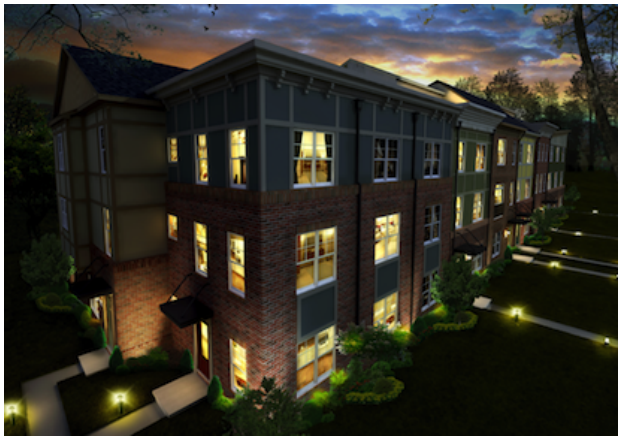
Professional Builder

Technology Report: Building Better With BIM

Beazer, Oakwood, and Winchester are among the home builders utilizing building information modeling technology to gain efficiencies in the tough housing market.

Jeff Yoders, Contributing Editor



April 18, 2011

Last year, when we published our first "BIM for Builders" report (Professional Builder, March 2010, page 30), most small- and mid-sized builders were only dipping their toes into the technology of 3D parametric modeling, also known as building information modeling (BIM). Since then, the continued difficult economic environment has brought more converts to BIM technology as builders look for ways to maximize efficiencies and profit.

BIM is a digital prototyping technology that allows tolerances and other information to be added to individual objects within a 3D computer model of a new home. Aside from changing design, it also allows builders to discover clashes and other construction errors early in the design process rather than in the field.

In this follow-up report to our March 2010 story on BIM adoption, we talk with three mid- and large-sized home builders that are finding significant gains in efficiencies with BIM.

CUSTOM HOMES IN A PRODUCTION ENVIRONMENT

Since 1979, Winchester Homes has built more than 18,000 homes in the Washington, D.C., area. Over the years, the company's niche has expanded from that of an upscale home builder to include mid-market and active-adult homes. It's three brands include Camberley Homes, which offers custom luxury homes to an upscale clientele, with homes up to $2 million; Winchester's Artistry Collection, aimed at the active-adult market; and Winchester Homes, which offers single-family attached and detached homes in the $500,000 and up range.

"We are truly a production home builder, and we were getting plan sets that were 3 inches thick," says Alan Shapiro, president of Winchester. "Now, thanks to BIM, we get one house-specific set that is tailored to that particular house."

Shapiro says that Winchester's BIM workflow uses Vertex BD CAD design software and combines the best of both the custom and production home worlds.

"You have to start with the house," he says, "but a buyer can go anywhere he or she wants within our catalog from there. Once we close out the 60-day selection period with the customer, we then apply our production home-building experience and are able to deliver the home that way. We're able to offer the flexibility of a custom home builder at the cost of a production home."

CAD systems integrator CG Visions provides Winchester with its Vertex BD CAD software solution. CG also occasionally acts as a design assistant on Winchester's designs. The firm's technology has opened up a wide range of planning and operational efficiencies for Winchester, according to Shapiro.

"Using the software, we are able to get a house-specific set of modeled drawings," he says. "What comes out of the Vertex 3D model then saves time in doing a full rendering. CG Visions takes our BIM output and provides an Adobe Photoshop shell to it to provide quality renderings to our customers so they know exactly what they're getting."
Using Vertex BD's hosted plan-set document repository, Winchester Homes can update all of its plans from a central location. Each project's automated bill of materials is also stored and updated from a single location enterprise-wide. This also allows all of the builder's trade partners to access single-version-of-the-truth document sets 24/7.

Shapiro says that with Winchester's previous CAD system, which the company abandoned three years ago, it used to take 200 or more days to develop a new house. With CG Visions' support of the Vertex platform, Winchester's design and start processes take anywhere from 13 to 16 weeks.

Shapiro says the big savings come from construction errors caught during the design phase. More accurate drawings for houses also lessen the time a design takes to get to market. Shapiro says Winchester's use of virtual prototyping has resulted in much lower mock-up and in-the-field prototype costs. The company's library of Vertex BD smart BIM objects has also grown exponentially.

Thanks, in part, to Winchester's customization offerings, Shapiro says his firm will sell more than 300 homes in 2011, up from 230 in 2010. And he plans to utilize

BIM technology to further enhance operations.

“Eventually, we want to be able to automatically go to our ERP system to create purchase orders and make sure we don’t have to do anything manually,” says Shapiro. “We have the technology for that. We have everything in place, we just haven’t gotten there yet. It’s an objective we want to get completed in the next couple of years.”

OAKWOOD HOMES’ THREE-MAN BIM TEAM

In 2010, veteran 3D modeler Oakwood Homes, which sells new homes in the Denver and Colorado Springs markets, closed 351 homes, moving to the number-three position among Denver-area home builders. The company is planning to close more than 400 homes this year.

Oakwood’s recent success can be attributed, in part, to its integration of BIM technology. The company’s design staff consists entirely of its president, Don Carpenter, one CAD operator, and a graphics specialist. The builder is able to sell and build upwards of 400 homes a year with this small, in-house design team, thanks to its CAD and home-plan workflow technology platform built on several applications: Blackpoint, a design product of Simpad Inc.; structural design and integrated component manufacturing from MiTek’s Sapphire Structure and Oakwood’s own production plant; and workflow management from the back-office task management program Kova. This set up allows the builder to offer its customers virtually any option they want on any Oakwood home.

“Three years ago, we surveyed the competitive landscape and realized that we could clearly differentiate in a crowded market by offering a level of customization that our competitors couldn’t match,” says Carpenter. “Our competition was making homes simpler and cheaper by restricting options. We saw an opportunity to move to a greater value home by offering what our competitors had discontinued: customizability.”

Oakwood offers any option from its entire line of homes on any home, even if, for instance, specifying custom walls requires a structural change. To be able to offer this level of customization, Oakwood changed its design software from a 3D-assisted CAD program to AutoCAD Architecture and Blackpoint — a suite of solutions that offers home-plan, CAD-software, and document-workflow-management capabilities through proprietary modules such as Blackpoint Product Development Manager, Blackpoint Options Manager, and Blackpoint Materials Manager.

Using Blackpoint enables “live” custom changes to Oakwood’s base home plans in 3D during the sales process, including changes to the very structure of the yet-to-be-built home. Those structural changes flow directly to Oakwood’s in-house component manufacturing plant, Precision Framing Systems, which manufactures all of Oakwood’s roof and floor trusses and panelized wall systems under clean, secure factory conditions in its Denver-area plant.

“We push all of those files into Sapphire Structure,” says Carpenter. “From there you can move a panel stud or make your changes. When you’re dealing with complicated options there are multiple components that intersect with each other. We typically have 30 to 50 structural options that are pre-planned. The ability of Blackpoint to then create a site-specific plan for whatever the buyers ordered is huge. That’s where the savings are.”

Precision Framing Systems uses Sapphire Structure to automate its entire component manufacturing process. Each option a buyer selects is lifted from the documents created in Blackpoint and is pre-loaded into Precision Framing’s computers. When a price changes for a building material, the builder simply updates costs in Sapphire Structure and each project budget is adjusted accordingly.

Carpenter says the ability to see a custom job in 3D before it’s built is a key driver of efficiency gains. Oakwood’s staff is constantly reviewing every stick and block in Sapphire 3D before they roll out the final plan. HVAC interferences, proper head heights, and other sticking points have all been checked and adjusted before ground has been broken. Oakwood was able to eliminate variance purchase orders using Blackpoint, saving around $1,200 a start.

“A lot of it is eliminating construction errors off your documents,” says Carpenter. “When you’re dealing with complicated options there are multiple options that intersect with each other, and you will have some problems. The buyer can physically see it, too. We have a 3D walkthrough of the house where we can show all four sides of the house based off the options that are selected during sales. All of our 3D graphics and marketing collateral are taken from Blackpoint and Sapphire.”

The third leg of Oakwood’s BIM stool is Kova, a document management program that automates most of the builder’s on-site documentation. Kova creates purchase orders and schedules directly from information in the customer contract — the same way that Blackpoint identifies wall and truss options directly from the contract. Oakwood does not yet have the functionality to automatically create a set of construction documents from the contract, although that’s a goal. Right now, Carpenter says, it takes about 45 minutes to create a site-specific set of drawings by re-entering information from the contract into Kova. Carpenter says he eventually wants to eliminate human error by having that information go directly from the contract to Kova.

Since it began using Blackpoint three years ago, Oakwood’s library of custom BIM objects has become a robust depository of hundreds of walls, trusses, porches, framing systems, and other home components. Carpenter says he feels Oakwood can create up to 500 site-specific plans a year with its existing staff thanks to using its Blackpoint/Sapphire Structure/Kova workflow that eliminates the need to draw every plan by hand.

BEAZER HOMES STANDARDIZES WITH REVIT

Using Autodesk Revit, Atlanta-based Beazer Homes now models all of its homes in full 3D instead of approximating its designs with 2D drawings. After using AutoCAD Architectural Desktop on some designs for a number of years, Beazer made the switch to Revit three years ago and has been using it as its main design platform since.

“We have always worked to standardize processes, but now that we have a 3D model that represents construction documents, acts as a base for material takeoffs, and as a check for structural, mechanical, and plumbing systems coordination, it is imperative that we standardize how those models are built,” says Bobby Jones, software manager at Beazer. “We don’t have any empirical data showing increased sales, but we thought it was important enough to pursue, even during the worst of the recession. A 3D rendering of every elevation for every home Beazer offers is created with Autodesk 3ds Max for our Web site.”

Jones says Revit was the right solution for Beazer because it could be successfully implemented without laying out a lot of cash for proprietary customizations or third-party add-ons. In-house, between its design, production, engineering, estimating, and support teams, Beazer employs a little more than 30 employees

third-party add-ons. In-house, between its design, production, engineering, estimating, and support teams, Beazer employs a little more than 30 employees working with Revit. In outsource firms, Beazer has just under 30 partners devoted to 3D design and construction document creation. Jones says he knows that the savings from Beazer's use of BIM are there, he just can't yet quantify them.

"We know that our construction document sets are much more accurate and show much more detail than ever before. We can more easily identify potential construction issues in the model before a house is built and solve them by changing the model and documenting it right during the design development phase — eliminating expensive, time-wasting field RFIs," says Jones. "What we found is that a large portion of time saved with obtaining material quantities is not in the tabulating of the data, which Revit does very well, but in the automation of formatting the data and pushing it into the backend systems that use it. So our goals for this coming year are to pull additional material categories from the model and automate the process of pushing it to our backend systems."

Since the beginning of its shift to Revit, Beazer has created more than 1,300 Revit families for its building components. Having that library has significantly impacted Beazer's design time and allowed the firm to get designs finished more quickly without having to remodel commonly used elements.

One way Beazer uses Revit for sales is to accurately show standard features in its homes to potential customers. Rick Gibbs, senior graphics specialist at Beazer, was able to take an Autodesk Revit model that was used to create construction documents and pull its parametric building information into Autodesk 3ds Max, an animation and 3D rendering program. Using 3ds Max, he was able to pull the house apart and show additional construction details and materials that the division wanted to highlight to potential customers. The final rendered image was placed on a marketing brochure to hand out in community sales offices (see above).

5 Ways Builders Can Benefit From BIM

- Customization — Builders can offer the design flexibility and options of a custom home at the cost of a product home.
- Clash detection — Using a 3D model, builders can check for structural, mechanical, and plumbing system clashes and design errors upfront, eliminating costly construction changes on site.
- Staff efficiencies — For instance, Oakwood Homes sells nearly 400 homes annually with a design department of just three people (one being the company president).
- Site-specific plans — Once the base BIM models are created for each home a builder offers, creating fully detailed, site-specific plans is a simply process, providing accurate material counts and design specifications.
- Marketing — Using BIM, builders can create robust, detailed 3D renderings and walkthroughs on the fly to better market homes and keep customers updated on their home.