

# BIM Crosses Boundaries at Seattle-Area High Rise

By Sheila Bacon

While the use of building information modeling (BIM) software is quickly becoming commonplace among design architects, many structural engineers are hesitant to tackle three-dimensional representation of large, complex projects.

But one Seattle-area structural engineering firm is embracing BIM without reservation. Bellevue, Washington-based Cary Kopczynski & Co. (CKC) is using the 3-D modeling approach in the design of the 20-story Hyatt Hotel tower in downtown Bellevue – the first time the company has ever used BIM on any of its projects.

The project's architect and general contractor are using BIM software as well, creating a collaboration that has been highly valuable on a project with a detailed design and a number of complicated connections.

The new, cast-in-place concrete hotel tower will accompany an existing 25-story hotel tower built in 1989 in a complex that also includes a 21-story office tower, a six-story office building, a 1,500-car subterranean parking garage and a 15,000 square foot domed atrium that will become the new hotel's lobby. The 60,000 square foot hotel addition also includes at-grade retail, a ballroom and a 1,000-car parking garage.

The new tower connects to the existing tower at its atrium and five levels of below-grade parking, and will share an existing heating and cooling room that currently serves the entire complex. Considerable pre-planning efforts are underway to coordinate the location of a future performance hall, designed and built by a different project team, that will also share connectivity at the parking garage level and be located literally inches away from the new tower.

## Benefits and Drawbacks

Incorporation of new software that all but replaces the standard computer aided drafting (CAD) system has not been accepted without reservation in the AEC community. While architects are quickly embracing the technology as a way to present the work product in an easy-to-understand format to owners and developers who are usually not trained in reading plans, many structural engineers do not see an immediate need to make the switch. Their clients are largely architects and contractors – folks who are already used to visualizing projects from two dimensional drawings.

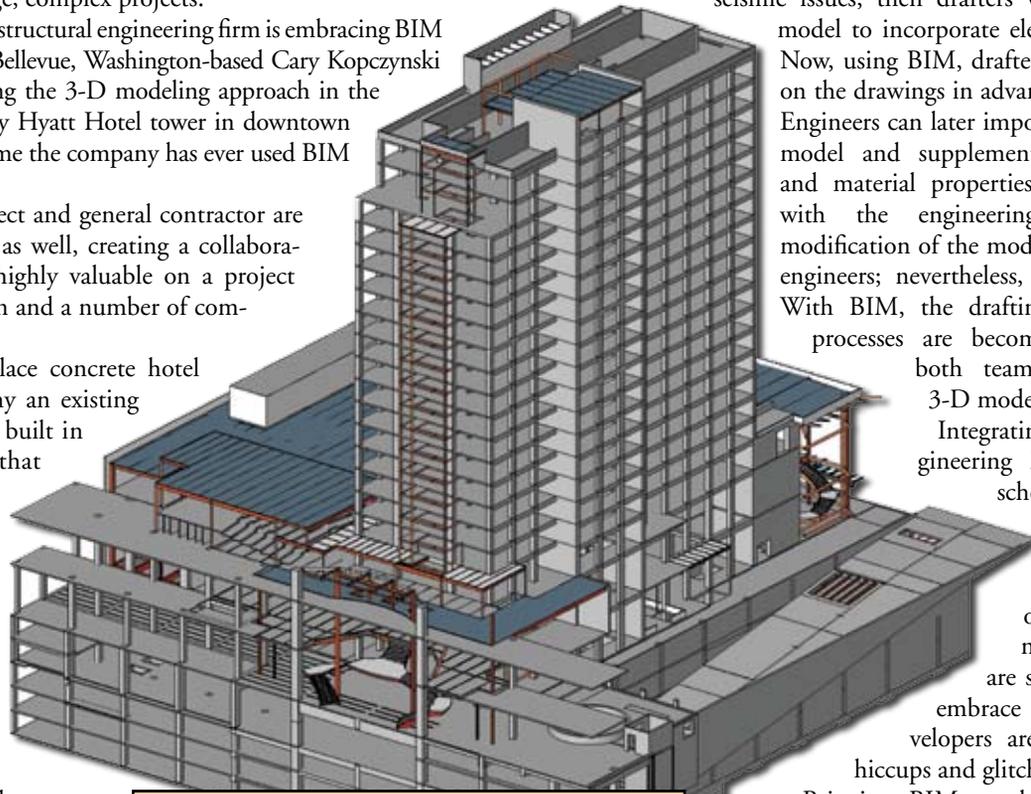
But there are ways structural engineering firms can streamline efforts and eliminate errors by using BIM. Before BIM, engineers would build 3-D models of the project before even considering loads and seismic issues; then drafters would build a 2-D model to incorporate elevations and details. Now, using BIM, drafters can start working on the drawings in advance of the engineers. Engineers can later import the drafter's BIM model and supplement it with member and material properties before proceeding with the engineering analysis. Some modification of the model is required by the engineers; nevertheless, time is still saved. With BIM, the drafting and engineering processes are becoming integrated, as both teams share the same 3-D model.

Integrating BIM into an engineering house of designers schooled in the ways of CAD does have its challenges.

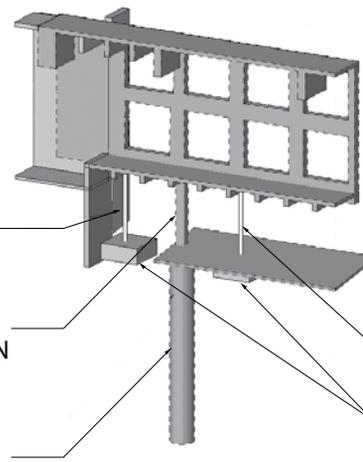
Since the technology is still relatively new, project teams are still learning how to embrace it, and software developers are still working out hiccups and glitches.

Bringing BIM on board requires considerable training effort, since the skill set is different from that needed to operate commonly used drafting programs. CKC realized that a few weeks of training was not, as they had assumed, enough to get their drafters up to speed. The learning curve and associated costs were steep, and additional training was necessary. Eventually a dedicated room for training purposes was needed, and BIM trainers were brought into the office three times a week for four months.

*continued on next page*



*This three-dimensional image shows how the new hotel tower interfaces with the existing surrounding structure. Courtesy of Cary Kopczynski and Co.*



*New construction had to be coordinated around the generator room, which could not be moved or decommissioned. The project team found a workable solution to this challenging issue once a 3-D image was created. Courtesy of Cary Kopczynski and Co.*

(N) TEMPORARY SHORE

(N) HSS14x12x1/2 SHORING COLUMN

(N) 36" DIA SHORING PILE

(N) TEMPORARY SHORE

(N) TEMPORARY FOOTING

In addition to significant software costs, new hardware was also required. CKC invested in two 24-inch screens at each BIM station, replacing the one 20-inch screen used before at CAD stations. Now, drafters can view the overall plan on one screen while zeroing in on a particular plan detail on the other.

Even with the implementation of 3-D software in the office, many project components, such as floor models, still require 2-D drawings. Moving back and forth between 3-D and 2-D drawings has been more challenging than expected. Line weights, which often represent specific components in plans, do not transfer from the BIM drawings to the 2-D drawings correctly requiring considerable efforts to correct. Sharing drawings among the design team also has not been as easy as simply attaching a file to an email document.

## Challenging Connections

The number of complex connections required to connect the new Hyatt Hotel tower at the parking and atrium levels, as well as to future construction on the site, made the use of BIM even that much more appropriate. While traditional 2-D drawings could have been used, conveying those connections would have required much more effort.

The location of the existing office/hotel complex's emergency generator room had designers concerned long before drawings were finalized. Its above-ground location adjacent to the existing hotel placed it immediately in the path of the new tower. To build the tower as planned, excavation and shoring below the site would be required, followed by construction to enclose it on all four sides. Demolishing the mechanical room and rebuilding it was not an option, as it provided heating and cooling to the entire existing three-building complex.

Designers tossed around dozens of ideas before isolating the detail and studying the plan using BIM. Once designers and builders could see the generator room and its surroundings in 3-D, a workable shoring system that would be used during construction quickly materialized.

The design of the project's parking ramps, difficult elements to convey in any structure, was also simplified with the use of BIM. The three-dimensional view of the ramps' overhead beams and transfer girders helped designers determine necessary clearances, which, if measured incorrectly, could result in costly and time consuming redesigns.

BIM software has also helped the future performance hall's design team coordinate foundation and underground designs with the Hyatt Hotel plans. The performance hall's location adjacent to the new hotel means the two structures will be sharing considerable information. BIM has helped both of the projects' respective architects avoid future structural conflicts by identifying common foundation footings and other shared elements.

*The complexity of the long-span steel truss framing system in the concrete tower is detailed in this image. Courtesy of Cary Kopczynski and Co.*



## Builder on Board

In addition to the architect and structural engineer, the Hyatt Hotel project's general contractor is also using BIM software as they construct the new tower, an effort just as revolutionary as the engineer's use of the new technology. The use of BIM by the project's three main team members helped quell the fears of a highly involved owner, who expressed concern over the amount of intertwined structure in the project.

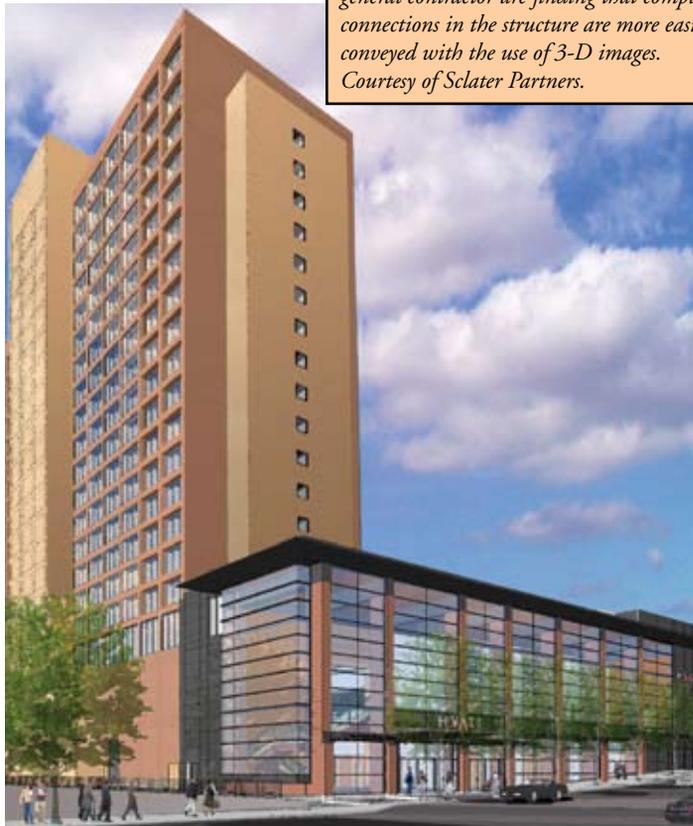
Project team meetings involving BIM drawings have helped convey some of the Hyatt's more complicated design elements, facilitating understanding and smoothing out the learning curve across the board.

The builder also benefits. GLY, the Bellevue, Washington-based general contractor, is using BIM drawings to perform clash detection between mechanical and electrical shop drawings. This will allow builders to find conflicts on paper, eliminating major reworks in the field.

Since GLY performs much of its own concrete work, and will be doing so on the Hyatt expansion, they will use BIM to produce lift drawings and slab edge coordination drawings to assist with its concrete construction efforts.

Despite the additional costs and learning curves associated with the use of BIM software on the new Hyatt Hotel tower project, structural engineers involved in the project are convinced the benefits outweigh the drawbacks.

*The architect, structural engineer and general contractor are finding that complex connections in the structure are more easily conveyed with the use of 3-D images. Courtesy of Sclater Partners.*



Completion of the new Hyatt Hotel tower is expected in late 2009. ■

*Sheila Bacon is a Seattle-based writer for the architecture/engineering/construction industry. She can be reached at [sheila@sheilabacon.com](mailto:sheila@sheilabacon.com).*