

The

Builder

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3D Modeling was used extensively in creating Kansas City's Sprint Center, which will open later this year. Officials hope the \$276 million arena - which is already slated to host the Big 12 Conference basketball tournament beginning in 2008 - will lure a National Hockey League or National Basketball Association team to the area.

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Reducing Risks

3D Technology Is The Seat Belt Of Modern Construction

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The argument in favor of using virtual 3D modeling as a way to reduce risk for the construction community seems as simple as the reasons to use seat belts. When seat belts became popular in the 1960s, insurance companies offered discounts to encourage their use to reduce the cost of losses in a crash.

Today, a similar technological leap presents itself in the construction arena. With the advent of 3D modeling and virtual "clash detection," the project team can catch potential conflicts sooner and cheaper, with more cooperation from subcontractors. A 3D model offers more specific design information than 2D drawings. Given that the world is 3D and not 2D, how can that

additional specificity be a bad thing for project liability?

Despite the obvious benefits of "clash detection," some designers and constructors are leery of moving into 3D modeling because they sense other impediments in the allocation of risk. Most of those skeptics don't realize that the risks are no greater (and sometimes smaller) in the 3D world than in the traditional 2D world.

Consider these facts. First, the 2D world is hardly free from risk. Decades worth of construction litigation have proven this point. Second, the use of 3D virtual modeling for fabrication and construction is nothing new. Engineered projects (think process-piping plants) have been using 3D modeling for decades and subs have been adding the third dimension in shop drawings - such as spool drawings - for a long time. Those projects aren't less complex or risk free.

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Third, as a practical matter, the use of 3D modeling fosters a broader collaborative effort, especially when the contractor is invited into the process early. Design reviews and clash-review meetings bring everyone into the same room, working to solve a problem. This significantly reduces everyone's risk.

IN CHARGE

A concern from the design side is whether the architect-of-record or design-builder remains in "responsible charge" of design, as required by many state laws. That's based on the faulty assumption that the line between design and construction is blurred using 3D design, including fears that someone other than project leaders can change the model without their knowledge or approval.

That issue can easily be addressed by adopting a protocol where all changes to the model must come from the designated team leaders. They need to establish tight access controls and an audit trail of additions to the model that clearly identifies the source and date of all changes.

It is overly simplistic to assume that a single, "master" model for projects exists. In fact, each construction discipline maintains a model for its area of responsibility and the project leaders then use an integrated model that refers to the 3D models for structural steel or mechanical and architectural components.

The integrated model can be distributed to all parties to detect clashes, but the only place where design changes can be made is in the models of individual disciplines, not the integrated model. When a clash is detected, a joint decision is made about what needs to be adjusted to address the problem. The architect moves a wall, the structural engineer changes a beam and the MEP designer adjusts ductwork.

Another assumption is that 3D modeling compels the project team to include more detail than in a traditional approach, thereby causing designers to move into a "means and methods" arena, for which the contractor – not the architect – should be responsible. That concern can be alleviated by everyone acknowledging that the design team is creating no more than a design-intent model. This has less detail than the construction-intent model, which results from incorporating the contractor's shop drawings and submittals into the design-intent model.

DIFFERENCES

The difference in those two levels or detail in an integrated model can be clarified by describing in the project specifications, on a discipline-by-discipline basis, the level of detail designers are responsible for and the level of detail for which the contractor and its subs are responsible.

We need look no further than the American Institute of Steel Construction's Code of Standard Practice for Steel Buildings and Bridges for a clear delineation between the structural engineer's deliverables – specific information about the connections the fabricator must detail – and the fabricator's deliverables – connections based on that information. Although this delineation may have been lacking in many traditional projects, 3D modeling does not prevent project leaders from clearly establishing who owes exactly which deliverables at what level of detail.

Some designers might also be concerned that 3D modeling compels them to coordinate construction, which is the contractor's responsibility. This concern, however, confuses two concepts. The contractor must coordinate its subs, but the architect must coordinate the various disciplines in the project design so it can be built. Surely, there is no cheaper or more thorough process to check constructability than doing a clash check to determine if two or more objects will have a hard dash, literally taking up the same space

in 3D coordinates, or a soft dash, where distances between two objects are not large enough.

In a 3D model, the contractor remains as responsible for shop drawings and submittals as it was in the traditional 2D project. In addition, the parties should acknowledge that the contractor still handles dimensions and quantity takeoffs. That rule should apply even if the contractor uses takeoffs prepared by the designers' software programs. Use of such takeoffs is done at the contractor's own risk, standard procedure for items like door schedules. In contrast, current software packages may not be robust enough to calculate cast-in-place concrete quantities. There is no reason for those practices to change simply because the project is being 3D modeled.

LIABILITY PROTECTION

Another concern of the design team is how its liability protection may be diminished with 3D modeling. One doctrine that prescribes a designer's duties to third parties is the "economic-loss doctrine," which bars third-party claims for economic loss in the absence of physical injury, but the analysis should not change using a 3D model.

In either situation, the question is how foreseeable is it that someone will rely on the designer's work. That analysis should

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The Sprint Center in Kansas City begins to take shape with the help of Building Information Modeling.

Safety News

JSA Programs Among Safety Forum Topics

Those not found wearing a hard hat on a consistent basis on a Weis Builders jobsite could find themselves wearing a pink hard hat. It's just one of the many ways Builders Association members have of making sure a seemingly simple - but often forgotten - safety measure is followed.

Seventeen safety professionals gathered for the Builders Association Contractor Safety Forum Feb. 7 at the Chicagoland Construction Safety Council in Hillside. Bob Smith of The Levy Company led the discussions, which approached the following topics:

- When is an extension cord no longer usable?
- What does the Occupational Safety and Health Administration (OSHA) want out of a Job Safety Analysis Program?
- What can be done in a situation where there are two substance abuse programs on the same jobsite?

Smith and Michael Weidmaier of Hayes Industries underlined the importance of an effective Job Safety Analysis program. Smith suggested that every job have site-specific safety plans and an analysis of each potential hazard on a site.

"Once you identify a hazard, you have to tell people how to work within those hazards," Smith said. "The lines of communication have to be open. You have to sit down and evaluate each (hazard)."

A question by Peter Kleczynski of Airtite Contractors prompted a discussion on what OSHA inspectors look for when it comes to broken casing on extension cords. Peter Cole of DLZ Industrial talked about different union workers on a jobsite being under different substance abuse policies. The consensus of the safety professionals was that the more a group is tested, the safer things will be a jobsite.

"As a subcontractor, I love it when a General (Contractor) says 'I'm gonna test everybody,'" Smith said. "It makes things easier on everybody and it makes for a safer environment."

The assembled professionals also discussed the importance of continuity when it comes to wearing hard hats on a jobsite, the advantages of having workers perform more than one task during a single work day and the upcoming signing of the Builders Association/OSHA Partnership. To date, 20 companies participate in the partnership.



Michael Weidmaier of Hayes Industries makes a point about job safety analysis programs during the Builders Association Contractor Safety Forum Feb. 7 at the Chicagoland Construction Safety Council. Seventeen professionals attended.

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be no different whether the 2D plans are copied and distributed to someone on the project than if a 3D model is made available to the same person.

What if there's a glitch in the 3D modeling software where the integration of individual discipline models is still a relatively new technology? The project owner should bear the risk of those glitches, provided the participants are adhering to the protocol. After all, the owner hopes to benefit from the lower costs of 3D modeling.

If an owner is unwilling to take that risk, the project team leaders must weigh the risks of a software glitch against the existing risks that designers could fail to coordinate drawings. From a practical standpoint, the risk of making a drafting mistake in carrying a change from one 2D drawing to another is greater than the risk of glitches in the model-integration software going undetected until too late. With 3D models, risks are reduced that the design of a specific component is unexpectedly different than the typical design because the virtual model can readily replicate the typical without taking countless drafting hours to do it.

When all of these issues are analyzed, the perceived legal risks in using 3D modeling melt away and are outweighed by the obvious benefits of clash detection and greater project collaboration. It should be only a matter of time before insurers offer discounts to encourage clients to wear the clash-detection "seat belts" of 3D modeling. Ultimately, the question will morph into whether team leaders actually increase risks by not using 3D modeling, much like not using seat belts.

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