

FEATURED EDITORIAL:

Technology Corner: Crystal Clear: BIM Modelling Software in Action

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\$11,000,000,000.00 It's a big figure. And even more so when you convert it from the Greenback to Aussie dollars at present exchange rates.

\$12,500,000,000.00

And what will it buy you? Well, about 73 acres of Las Vegas Strip, complete with a 61-story, 4,000-room gaming resort; three luxury non-gaming hotels; two large multi-residential towers; approximately 2,400 condominiums; and 'Crystals', a massive retail and entertainment district.

A joint venture between MGM Mirage and Dubai World, the development is called CityCenter and is the most expensive, privately-funded development in the history of the western hemisphere.

It raises an interesting question of how you facilitate and manage the design and construction of such a mammoth project. The complexities of projects with far fewer zeroes attached to their stats and price tags can offer appalling headaches from logistical and organisational perspectives, so how do you handle a project that's, proportionally, so much larger?

Well it would seem a large part of the answer is Building Information Modelling (BIM); an object-oriented style of 3D architectural design. BIM software enables the data for your various building components to be imported directly into your project's design files, presenting 3D models of those components in-place within the design. It also allows you to attach detailed imagery and information to designs – which then become immediately accessible and available to everyone involved in the building process. Logistically this can offer projects massive savings in time, and as a result costs, as it updates and informs the entire building team on the latest design changes.

On CityCenter, BIM was particularly essential to the highly-complex roof structure of the Crystals mall. Featuring no less than 16 interlocking roofs (9 planner and 7 curved), its construction required extensive collaboration between architect, engineer and detailer, as the geometry of the roofs could not be defined by traditional 2D documentation. The modelling and detailing for the roof structure was undertaken in Australia by BDS Vircon using Tekla Structures.

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The BIM software was then used for: advanced material quantities, sequence break-ups, fabrication scheduling, the locations for truss splices, erection planning (including temporary prop-ups). All of which allowed the project to be planned based on the actual steelwork to be constructed, which in turn allowed the builders to be far more confident when it came to visualising how each component would fit, than they would be with just nominal schematic information for reference.

The architects provided 3D reference files for the roof skin, and these were used to ensure that not only the primary steelwork, but also the connection plates and bolts, would not penetrate the roof skin; preventing any on site clashes and the need for costly rectification. These files were also used to set-out the necessary curved bent-plate roof edge plates on the perimeter steelwork of the roof. Three engineers also moved to Brisbane to work more closely with the BDS Vircon modellers to solve design and connection issues directly in the model.

The complex, interlocking planner and curved roofs meant that the connection design could not be done by traditional methods. So the BIM software model became a collaboration tool for the project team via phone calls and WebEx meetings, and enabled the engineer to understand the actual geometry of the steelwork members so that he could evolve the unique connection designs required for the five hundred-odd individual connections.

In consultation with the detailers' geometry constraints, the connections were then able to be engineered via simple hand sketches without the need for traditional (and very formal) connection design documentation. This collaboration on the connections saved the project huge amounts of time in achieving complex connections that worked the first time, avoided long-winded formal RFI processes, and removed the need to formalise the connection designs on drawings.

From the final connected steelwork model, BDS Vircon then exported 3D files to the cladding contractor as the basis for his cladding set-out and manufacture. And the same files were also provided to the fire sprinkler and decking supply contractors for their set-outs and manufacturing.

This ability to constantly import and export data from the 3D models saved the project a huge amount of time and effort in avoiding the need to provide formal documentation to all parties. The collaborative process to evolve the highly complex nature of the final steelwork's geometry would not have been possible without the use of the BIM models.

The collaboration required a willingness from all of the parties to work together to find the most cost-effective solutions. But that willingness to collaborate helped make the project a great success story for model collaboration. And shows just how much can be made possible through the use of these latest modelling technologies.

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