

# Aussie detailer tops casino-land mega build

## Crystals Mall at City Center, Las Vegas



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Australian company, BDS VirCon recently undertook the modeling and detailing of the massive and complex roof structure within arguably the most expensive, privately-funded development in the history of the Western Hemisphere – where else but in Las Vegas.

A joint venture between MGM Mirage and Dubai World, the City Center development cost in excess of A\$12 billion and incorporates an array of complex designed structures.

BDS VirCon Manager-Business Development, **Kerry Lindemann** said that Building Information Modeling (BIM) was essential on the highly complex roof structure of Crystals Mall, a massive retail and

entertainment district situated in the heart of City Center with the roof featuring no less than 16 interlocking roofs (nine flat and seven curved).

BIM is an object-oriented style of 3D project design that streamlines workflow on complex construction projects.

"The construction required extensive collaboration between architect, engineer and our experienced team of modelers as the geometry of the roofs could not be readily defined by traditional 2D documentation," he said.



"We used Tekla Structures software here in Australia to import the data for the various building components directly from the project's design files from the US, presenting 3D models of those components in-situ within the design."

The BIM approach also allowed detailed imagery and information to be attached to designs which became 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," he said.

The Tekla software was then used for advanced material quantities, sequence break-ups, fabrication scheduling, placing locations for truss splices and erection planning (including temporary prop-ups).

"All of that allowed the project plans to be 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," Mr Lindemann said.

"The architects provided 3D reference files for the roof skin and these were used to ensure that neither the connection plates and bolts nor the primary steelwork would penetrate the roof skin and thus prevented any onsite clashes or the need for costly rectification.

"The files were also used to setout the necessary curved bent-plate roof edge plates on the perimeter steelwork of the roof. Three engineers from the design team were located in the Brisbane office for four weeks to work more closely with the BDS VirCon modelers in solving design and connection issues directly in the model.

"Some of the curved roof trusses also required temporary propping so we modeled this steelwork and produced shop drawings for that as well. The propping steelwork was able to be positioned as it was to be built, ensuring it could not only be erected into position, but also removed readily once deemed redundant to the final structure.

"This meant the structure could be visualised by all parties prior to signing the design off for the temporary propping."

He said that the BDS VirCon Tekla BIM software model became the 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 structure's 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 their setout and manufacture. And the same files were also provided to the fire sprinkler and decking supply contractors for their setouts and manufacturing.

This ability to constantly import and export data from the live 3D models saved the project a huge amount of time and effort by avoiding the need to provide formal documentation to all parties.

Mr Lindemann said that BDS was chosen because of its outstanding track record on large complex projects with the fabricator, Schuff Steel Company.

The construction of Crystals Mall consumed approximately 11,000 tonnes of steelwork and was completed onsite by late 2009 as planned.

The entire City Center development covers about 73 acres of the Las Vegas Strip, complete with a 61-storey, 4000-room gaming resort; three luxury non-gaming hotels; two large multi-residential towers; approximately 2400 condominiums, and Crystals.

#### Project Team

**Project Cost:** A\$12,500,000,000

**Owner:** MGM Mirage Inc

**Architect:** Studio Daniel Libeskind

**Structural Engineer:** Halcrow Ylles

**Steel Detailer:** BDS VirCon

**Steel Contractor:** Schuff Steel Company

**General Contractor:** Perini Building Co.