

Casino extension works beat odds on tight site

Multi Use Entertainment Facility at 'The Star', Sydney

A steel-intensive approach is allowing a Multi Use Entertainment Facility (MUEF) with capacity for thousands to be built atop of The Star casino near Sydney Harbour whilst patrons play on.

Once complete in early 2013, the MUEF will be able to accommodate 4000 patrons in concert mode, 1500 in ballroom mode and 1300 in conference/business mode with a turnaround time of just a few hours between each to allow 24 hour multi-mode capability.

The main MUEF structure encloses a 40 by 60 metre long 'gem-like' enclosure which is supported on eight existing structural columns and two new columns on the roof of the main casino building.

The façade of the building and the peripheral balconies are supported by faceted outrigger truss members, the large majority of these elements acting as hanging elements which support the façade and internal floors off the main ring truss.

Project architect, **Nicholas Bandounas** of fitzpatrick+partners said the MUEF is unique in design and its placement on top of a functioning building makes it even rarer as the pinnacle component of the \$860 million redevelopment of The Star.

"Being predominantly a concert venue means large clear internal spans are needed and its ability to convert into ballroom and conferencing means large portions of retractable and raked seating,

staging and movable ceiling grids require flexible supports for which steel is ideal," he said.

"We use 'box within a box' terminology to describe the black rectangular box which contains the showroom that is itself enclosed by a translucent multifaceted box both constructed with interconnecting steel.

"The structure's form used the geometry of the facade elements allowing deep trusses to be used to construct the building's walls. The separation of internal and external walls is optimised for acoustics using the cavity itself to reduce the overall quantity of acoustic material required."

He said that besides the complex geometry of structural steel frame the site location is extremely challenging as work is hemmed in by a working casino floor below and adjacent structures such as the hotel, hotel pool, fly tower/plant room, terrace void and glass cone.

Project Engineer from TaylorThomson Whitting (TTW), **Kevin Berry** said the tight worksite limited suitable laydown areas, materials handling and trades access to the site.

ATTW report on steel construction for the project identified the steelwork erection sequence as an important consideration in the design along with prefabricating elements such as trusses off-site.





“Due to constructing over the live main gaming floor as well as other functional operating areas, careful and extensive consideration was given to the materials handling strategy such as selecting and positioning tower cranes and the principle of ‘delivery as required’ for all materials,” he said.

“Existing structural capacities also influenced the erection methodology and resulted in extensive temporary works and propping to allow the structure to be erected in a time-efficient manner and the steel-intensive approach was absolutely the driver as there was no viable alternative.

“The combination of the structure’s weight and the primary load path through the eight existing columns/load points meant that steel was the only solution.”

Mr Hodgett said that standard paint systems/finishes are used for varying exposure classifications ranging from single coat primer through to hot-dipped galvanising and two and three coat epoxy systems all based on durability requirements but mindful of material handling during erection.

“When finished it will have about 800 tonnes of steel forming the base structure and main triangulated façade structure,” he said.

Project Team

Client: Echo Entertainment

Architect: fitzpatrick+partners architects

Structural Engineer: Taylor Thomson Whitting Consulting Engineers

Builder: Brookfield Multiplex

ASI Steel Fabricators: Cullen Steel Fabrications, Pacific Steel Constructions, S&L Steel Fabrications, Sebastian Engineering

Structural Steel Project Management: ICMP Steel Structures

Steel Detailing and Shop Drawings: Elmasry

ASI Steel Distributor: Southern Steel

ASI Steel Manufacturers: OneSteel, BlueScope Steel

The size of any prefabricated elements would need to be limited not only for transport but also to be manageable with crane operation onsite. The steel is split up into different phases to be erected sequentially working around the site constraints and maximising or retaining as much working area as possible.

Each stage is reviewed and analysed to ensure that it is laterally stable. A Robot Structural Analysis model is used to assess the relevant steelwork for each stage. Propping locations are then positioned in the model and analysed to ensure each is stable, adjusted in the model and reanalysed to avoid site constraints and suit the contractor’s requirements in erecting future steelwork.

A portion of time during the design phase was spent developing the erection of the building with Brookfield Multiplex and working with it to ensure the structure can be delivered to the tight construction program.

“A huge amount of detailing work has been undertaken with Brookfield Multiplex and ICMP to simplify the erection and installation of the steel frame,” Mr Berry said.

“Structural limitations of the existing building led logically to chose a steel-intensive approach in allowing for off-site fabrication, removing the need for any formwork and minimising propping requirements.

“The lightweight construction achievable with structural steel was the only logical way to make the project work on top of the existing building.

“The use of steel also facilitates the large geometric flexibility in building shape required.”

Design Manager Engineering with Brookfield Multiplex, **Richard Hodgett** concurred that respecting the operational requirements of the existing casino is key.



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