Shrine arises again in style for the Ashes

Adelaide Oval Western Grandstand

It took a structural steel solution to redevelop the western grandstand at Adelaide Oval while retaining key heritage elements of the historic sports ground.

For many cricket fans and Adelaide residents alike, the stadium is sacred ground so any redevelopment had to be in balance with its heritage.

Established in 1871, the Oval is famous for being where **Sir Donald Bradman** scored the then highest score in Test Cricket and in 1932 for being centre stage in the Bodyline series.

According to Structural Engineer for the project, **Garth Rowland** of Aurecon Australia, a key design feature is the retention of the rear arched heritage wall and the central facade of the former Giffen Stand.

The redevelopment comprises the partial demolition and reconstruction of the existing western members' stand and the construction of a new 14,000-seat grandstand providing seats on two tiers a members' bar and 500-seat dining room above the retained Committee Room.

Vince Manuele the Director of the steel fabricator for that component of the project, said over 1600 tonnes of Australian steel was consumed just on the main grandstand.

"Steel components such as the raker beams approached 18 tonne in weight each," he said. "And apt cranage was required onsite to allow the erection of these major items from the western side of the heritage wall, over the wall and into place."

Demolition proceeded immediately following the Test Series v India in summer 2008-2009. The venue has remained operational and the construction has continued through the hosting of a full season of domestic and international cricket, League football and Rugby games as well as a *Pearl Jam* and an *AC/DC* concert. Prefabrication was essential to maximise the construction period off-site to make maximum gain for the 18 months onsite.

"Prefabrication meant that approximately 70 workers did not add to construction site congestion," Mr Manuele said.

"Fabrication off-site also allowed us to undertake trial assembly of complex weldments and other steel components in our factory to guarantee accurate fit onsite."

"And the use of steel as a prefabricated material allowed for the frame fabrication to be undertaken concurrently with demolition and temporary retention of the heritage elements essential to meet the project program," Mr Rowland said.

"The project timeframe is very tight with the November deadline looming. The plan is to put the new stand to the test during the November Tour match before its official launch just prior to the second Ashes Test match being held at the Oval."

He said a 'diagrid' roof forms the centrepiece of the new grandstand achieving a structural span up to 55 metes with arched 219CHS (circular hollow sections) leading to an elegant roof solution to provide the required cover to the grandstand patrons.

"Best stadium practice was essential to the new grandstand to provide unobstructed views from all seats to the playing surface," he said.

"This necessitated a long span column-free roof solution to ensure the upper tier seats are unobstructed while the mid tier seats serving the bars, operation areas and dining are maintained.

"And the use of a project 3D model clarified and facilitated clear sightlines for all seats in the grandstand and set out where supporting structure for the roof and frame could be positioned."

The roof is approximately 30 metres deep with six primary trusses cantilevering from the rear of the grandstand supported by roof columns cut into the rear of the upper bowl. These columns and associated struts were carefully set out to ensure sightlines were maintained for all patrons and match or exceed other stadia sightlines around Australia.

He said the 'diagrid' roof form allowed the creation of a 6000sqm roof that also maximises efficiency of materials.

"The 'diagrid' itself represents a steel quantity of approximately 25 kilogram per square metre to achieve spans up to 55 metres and so represents one of the lightest roof forms in Australia for such spans," he said.

The entire roof structure steel tonnage is approximately 432 tonnes.

"Design wind forces were calculated by a wind tunnel test in accordance with AS1170.2 for wind speeds up to 180kmph.

"The form also presented iconic architectural appeal with the resulting structure optimising grandstand volume while maintaining the desired drip-line, shade coverage."

He said that the impact of the steel fabrication, erection and site tolerances were identified early in the design as critical to the successful implementation of the 'diagrid' roof design.

"To accommodate this, the steel subcontractor for the roof, Samaras Structural Engineers was invited into the design team early at 50 percent completion and invited to workshop with the engineers, architects and client to provide the best project solution and ensure that the final design was constructible within the required design program and cost plan.

"This early involvement allowed the design team to consider these parameters early in the process and has resulted in a successful erection process to date."

Sales and Business Development Manger with Samaras, **Jeremy Owen** said the design workshops were conducted largely as a basis to finalise the Final Steel Roof Model and the 'For Construction' final design documentation.

"Prefabrication was implemented within the areas of the structural steelwork where assemblies and components required perfect alignment and matching in order to satisfy the engineering and architectural design intent," Mr Owen said.

"Extensive planning using large plant equipment was undertaken to accommodate the erection of the six main trusses and 'diagrid' steelwork from all separate areas within the construction site. Each fabricator directly reported to the builder, Built Environs."

"Rolled steel members and precision scalloped CHS steelwork was brought together to ensure accurate fitment between all steel members and was accomplished to fulfil the acquired architectural/engineering design with a two-coat acrylic protective coating applied to the structure to achieve a high gloss finish.

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The lifting and placement of the first of the roof trusses marked a major project milestone. The first of the 35 tonne trusses was craned into place during an eight hour operation in April.

The lift required a total of three cranes with a 350 tonne crawler crane performing the main lift with a 70 tonne crawler crane and a 50 tonne mobile crane assisting. Several weeks of planning was required to perfect the complicated lifting procedures.

The project team created a dedicated committee to review the process with particular regard for safety and weather conditions. While the craning procedure is often used at mining and other industrial sites, it is unusual for a lift of this size to be undertaken in the city at a building site.

Design meetings were also regularly held between Manuele Engineers, Built Environs, architects and the engineers to work through technical issues on the Grandstand superstructure as quickly as possible.

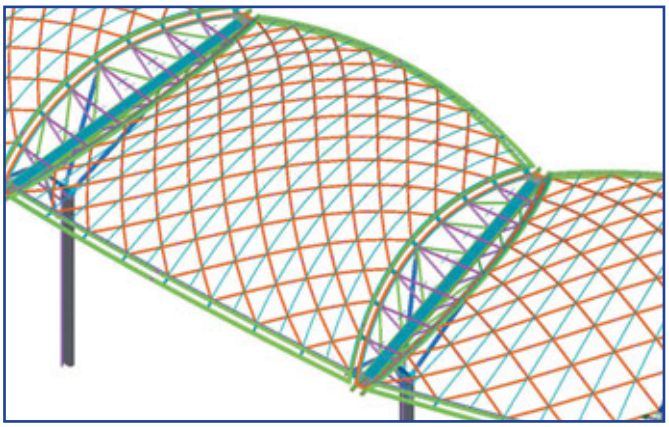
Mr Manuele said that issues worked through included the primary grandstand boxed raker beams that support the seating plats and the large loads created by the plats themselves and the dynamic loads applied by large groups of spectators.

Given the prominent profile expected of the grandstand, design aesthetics were uppermost.

"The fire escape stairs adjacent the lift shafts and also the wing stairs servicing the north and south stands are quite unique," he said.

"They span great lengths and are seemingly unsupported. Together with the plat support rakers, they give great visual impact from the western elevation."

The project is on track for completion by November 2010.



Courtesy of Samaras Structural Engineers 3D Modelling Services

PROJECT TEAM

Client: South Australian Cricket Association

Managing Construction Contractor: Built Environs

Architects: Cox Architects and HASSELL

Structural Engineering: Aurecon

Roof Steel Fabrication: Samaras Structural Engineers

Roof Steel Detailing: Samaras Structural Engineers

Main Grandstand Frame Fabrication: Manuele Engineers

Main Grandstand Frame Steel Detailing: Universal Steel Detailers South Australia