

# Wave to the future

## The wonderful world of 3D modelling

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Walt Disney Imagineering, the design side of the Disney corporate empire, is at the forefront of the world revolution in 3D modelling.

The 'wonderful word of Disney' is underpinned by the best in engineering and advanced technology and Australia is at the forefront in the use of that technology.

The Western Australian specialist steel detailing company Steelplan Australia, worked with the world renowned architect, Frank Gehry, on the amazing new Disney Concert Hall. This project was executed completely in steel (11,000 tons) from an Xsteel three dimensional model.

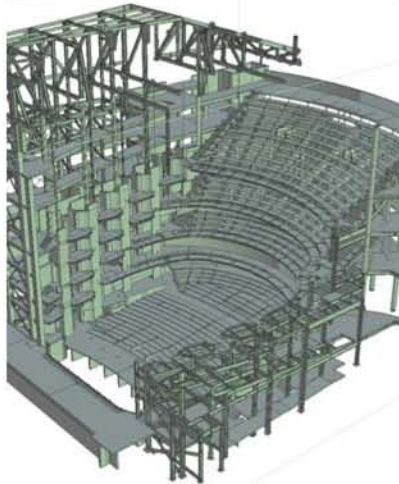
This exciting world of 3D computer modelling is becoming more familiar to a growing band of architects, engineers, steel detailers and fabricators. These professionals are working with the technology to model complex architectural and engineering concepts into virtual 3D structures.

Purpose developed structural modelling packages such as Xsteel, StruCad, Prosteel, BoCad and Catia, are enabling these professions to push the boundaries of what is possible and making the design, detailing, fabrication and erection of structural steel faster, cheaper and much less subject to expensive errors.

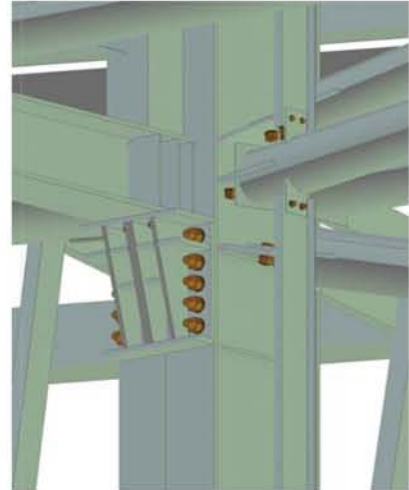
Conventional CAD systems simply automated the drawing board, using computers to generate lines and objects. True 3D modelling systems create an "intelligent" model, generating a database of component information. This enables such things as materials take-off lists, clash detection, automated generation of dimensions and connections, and automated updating of data arising from design changes.

Electronic data transfers can be made to automated fabrication, as well as structural and other design disciplines. This not only offers efficiencies, but improves accuracy and is leading to new ways of working on design documentation and construction.

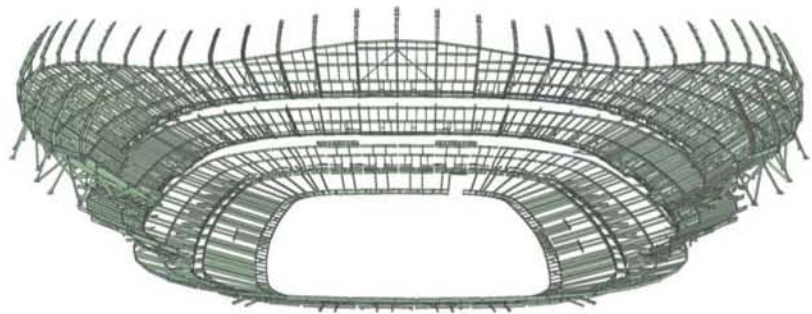
Central to the revolution is to have only one 3D model. "The idea of one model is the key to 3D" says Joe Burns, architect



Model of the Miami Performing Arts Center in Florida



Connection detail in the Gold Coast Convention Centre



Model of the Broncos Stadium in Denver detailed in Brisbane by BDS

and engineer from Chicago's Thornton-Tomasetti who was in Australia last year for industry briefings on the technology.

Joe's firm designed and stick modelled the recently reconstructed Soldiers Fields Stadium, home of the Chicago Bears football team. Around 10,000 tons of steel for this project was then detailed in Perth by Steelplan Australia for fabricators Hirschfeld Steel of Texas.

"The steel industry has been at the forefront in 3D modelling, not so much because of its use in architecturally complex building design and construction but led rather by its heavy industrial uses" says Joe Burns.

This has been the experience in Australia where the technology has delivered significant savings on large projects in the oil and gas and mining industries. In

Western Australia on the Woodside Phase IV LNG Expansion Project the 3D design of the plant layout and structural design was electronically linked. Steelplan Australia, joined the design team, detailing 8,500 tonnes of structural steelwork using the software package, Xsteel. The technology delivered reduced costs in project management, shop detailing, fabrication and site erection with improved quality from the electronic accuracy and transfer of data and a shorter fabrication schedule.

Steel detailers and fabricators have been using 3D modelling for over a decade for connection detailing, drawing production and generation of computer numerically controlled (CNC) information to drive automated steel processing machinery.

BDS, whose head office is in Brisbane, holds the largest number of Xsteel licences in the world and operates in six

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countries. Geoff Graham, a BDS Director and Manager Estimating, said recent work includes the Bronco's Football Stadium in Denver and the spectacular Miami Performing Arts Center in Florida and the Gold Coast Convention and Exhibition Centre to be opened in May 2004.

Geoff believes that 3D modelling will be the only way projects are detailed in the future. "This is leading edge technology delivering multiple benefits on a project" he said. "BDS has developed excellent management and tracking systems, in conjunction with the live 3D models, which assist in the control and management of projects." At any one time

deploy open standards, such as CIMsteel. With the International Alliance for Interoperability (IAI), they are driving development and delivering practical tools to enable designers to integrate their analysis and design systems with modelling systems, reducing re-work and improving responsiveness to changes and enabling sharing of electronic information within organisations."

3D modelling, coupled with electronic data interchange (EDI) allows a complete project model file to be exchanged between all the parties working on the project. This model file can be held on a central "project web" and accessed by all.

## Australia is playing a key role in the adoption of design and construction technology bringing real benefits to the industry.

more than 50% of BDS's work could be for far flung overseas projects delivering real benefits back to the Australian economy.

This technology enables many players to work on major projects from distant locations and exchange information electronically. John Lyons, General Manager and a Director of PDC Consultants (formally Perth Drafting Company) said his company works in StruCad and interfaces with a variety of engineering software packages. The company has concurrent projects with Canada's Waiward Steel Fabricators in Edmonton, Alberta, and Shell's HDS2 Project in Geelong, Victoria.

At Connell Mott MacDonald's Sydney office engineers are working in Prosteel to model the partly retractable 300 metre Wembley Stadium roof and its main span sarch. They are working as part of the Mott Stadium Consortium, the joint venture redeveloping the four hectare London site.

Ricky Hains, Director of the PlanIt Design Group also used Prosteel for the steelwork in the recently occupied BHP Billiton Centre in Melbourne.

One of the early stumbling blocks with this technology was the interface between the detailing, architectural and engineering design softwares. Joe Burns says that: "The steel detailing packages need to interface with the rest of the team. Architects and engineers are figuring out ways to import the models from Xsteel and StruCad."

"The Centre for Integrated Facilities is leading global initiatives to develop and

This method of file interchange was adopted during the design and construction of the international award winning Australian Museum in Canberra, completed in March 2001, where all documentation was transferred via EDI using a project web as a communications hub.

With the technology interface barriers down, the industry is seeing wider and faster adoption of 3D modelling, requiring a fundamental shift in thinking by both individuals and the industry.

Peter Cocciardi, the immediate past President of the Victorian Institute of Steel Detailers and Chief Executive Officer and co-founder of Precision Design Australia has a passion for 3D modelling, fed by both knowledge and experience. He says that: "It would be more efficient if the drafting company developing the 3D fabrication model were part of the design team. In most cases they are more proficient in producing the 3D model which could then be relied on to be dimensionally accurate. "We have to start thinking outside the box and find a new way, contractually, for this to happen. I think the construction industry has to start to look at how it can obtain the expertise and form alliances with companies who can provide it."

Peter Cocciardi's firm is responsible for the modelling and detailing of the majority of the steelwork on the new Perth Convention Centre. Peter believes that: The early use of the 3D model provides that extra design tool to analyse any design change. So if a concert hall changes shape or a ballroom isn't big enough there is accurate data for structural

## Need for skilled people

The demand for people skilled in this technology is outstripping their supply but Australia is at the forefront of the take-up and application of the technology. Rupert Grayston, Director WA Division, Engineers Australia and former Australian Steel Institute State Manager said that: "There is a lack of expertise world wide. To start you have to work with people who can do it and start to learn and lift your base."

Rupert Grayston observed that: "Companies entering the field have to invest a lot of time in training and face downtime while their staff skill up. This often exceeds the cost of a software licence but the benefits are there."

In Australia the skill shortage is gradually being addressed by the introduction of the more sophisticated 3D packages into tertiary institutions. Rupert Grayston says that there are compelling reasons why the design and construction industries should embrace this technology. "For example the design of low and high rise multi-storey buildings can be greatly streamlined by 3D modelling as the connections are readily standardised, and can be generated automatically by the 3D software. Such buildings are also suited to beam-line steel fabrication. The 3D software systems readily generate electronic files to drive fabrication machinery, resulting in fast and accurate construction. The 3D systems can also assist construction, producing such information as bolt lists, 3D assembly drawings and assembly simulations."

analysis, and you can more easily investigate a number of different design options with vastly reduced documentation costs."

"Flexibility has to be built into the model at every stage so you have something accurate and defined to work with. We ensure that we keep our model absolutely accurate. Unless we do that we can't be sure any of the elements in the model will fit. It allows us to assess the cost implications and the impact of any changes on any number of elements provided that they have been included in the model. The whole point of doing the 3D model is to enable the whole process to happen more accurately."

Peter Cocciardi says that: "In the future we'll see better interfaces between the various software packages and improved automated detailing packages." He says: "The next generation will be incredible".

"We are beginning to incorporate 3D scanning software with an ability to scan within a 40 degree cone so that you can actually set up a series of scans in the model. You can then import that scanned image straight in as solid elements. We couldn't even think about this type of scanning ten years, five, or even two years ago."

"We are now being commissioned to provide 3D dimensional coordination as a separate role within the design team. The scope will be to coordinate all main trades and professions and then manage access to the 3D model. We are seeing less 'Request for Information' (RFI), site instructions and architects' instructions. They'll be a thing of the past. It is proving to be a far more streamlined and cost effective solution."

"The other impact in the future will be the fourth dimension - time. These fabrication models will be used well beyond construction and become an invaluable tool for maintenance and refurbishment."

Joe Burns says that: "Although some organizations may feel that other issues are more significant, such as protecting margins or reducing risk on projects, technology undoubtedly changes the way we do business. As with the emergence of 2D CAD, it seems inevitable that companies unresponsive to change may not be able to compete in the business environment of the near future."

This technology is capable of reducing project costs and delivers greater accuracy and time savings, creating a competitive advantage for firms using the technology, and greatly enhancing the appeal of the

Modelled in 3D the multi million dollar Perth Convention and Exhibition Centre is taking shape on the banks of the Swan River

