

# Streamlining the supply chain

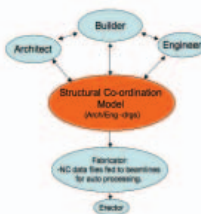
## Industry Best Practice for steel structure coordination

This article is based on a presentation delivered in April to senior management of Brookfield Multiplex by ASI National Manager – Manufacturing & Distribution, **Ian Cairns**, Managing Director of Cocciardi, **Peter Cocciardi** and Business Development Manager – South West OneSteel Manufacturing, **Spiros Dallas**.

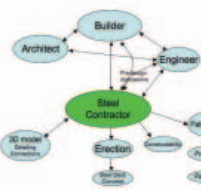
Standard Model – Current Approach



Structural Coordination Model



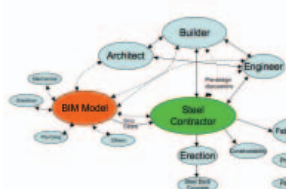
Steel Contractor Model



BIM – Building Information Model



BIM/Steel Contractor Model



Experts from the Australian steel industry have been busy formulating and assessing strategies aimed at freeing up the steel supply chain on major development projects in the wake of The Warren Centre report, *Steel: Framing the Future*.

Released during 2007, the Report found the local steel industry to be fragmented and identified key improvement opportunities for the industry as requiring closer collaboration and achieving better technological parity.

How steel contractors share information and to what extent IT systems are compatible are seen as major contemporary issues not dealt with sufficiently by traditional project management approaches. The standard approach involves three separate supply and information streams between the builder to the architect and structural engineer and finally to the steel fabricator.

This builder-hinged way has several flaws such as limiting steel fabricators and detailers from suggesting more economic designs and creating cumbersome lines of referral that make requests for information (RFI's) more expensive and time consuming.

Another mainstream approach gaining acceptance, which the presenters call the Structural Coordination Model (SCoM), hinges on the project management team of the builder, engineer and architect feeding drawings and related data directly to the modeler/detailer.

This way has the advantage of all parties working from the one 3D model allowing all architectural and engineering drawings to be updated quicker with more integrity and accuracy. It also allows all structural connections to be reviewed and detailed in the model whilst still maintaining one point of responsibility for the total steel package. This approach is responsive enough to facilitate 'just in time delivery' for improved erection sequencing.

It has also been reported that RFI's turnaround times have been reduced by up to 90 percent under this digital project management regime.

Then there's the Steel Contractor Model that basically involves a lead steel contractor acting as intermediary between the engineer, architect and builder team and downstream

with steel contractors like detailers and fabricators.

Apart from the obvious advantage of having one point of responsibility for the total steel package, it allows for earlier engagement of steel contractors and other trades, saving time and money on excessive RFIs and allowing for design solutions purely tailored for the chosen building materials.

### Building Information Model

The emerging Building Information Model (BIM) is a holistic approach to design, fabrication and construction incorporating all trades into the process. This is not necessarily a role for existing consultant teams but one for a new, separate and independent team of 3D modelers with detailing experience in all main fields. This specialist BIM modeling team incorporates and coordinates all trade data and manages the dissemination and incorporation of this data to design, fabrication and construction as required.

This totally integrated digital approach to project management covers the entire spectrum of existing site infrastructure (excavations, roads, pavements, car parks, site sheds, lay down areas, drainage overlays, waterways, drains, public space), utilities (electrical, gas, drainage and water mains), hard and soft external landscaped areas, all new structural elements (concrete and steel elements, columns, walls, beams, slabs, service penetrations), vertical circulation systems (stairs, escalators and lifts), HVAC ducting, all piping mains (fire protection services, piping and waste water), curtain wall and stone clad facades and glazing systems, and architectural finishes (ceilings, internal partitions, doors).

Modern software interfaces now enable BIM-generated data to be immediately available and fully utilised by an appropriate Facility Management System (FMS). It also allows architects and engineers to lock in design earlier with full client review.

Other benefits of this process are virtually eliminating RFIs, variation claims and delays through real-time coordination and vastly improved document management and approval processes. This translates to 10 to 15 percent in cost savings through improved design processes, reduced reviews and rework changes and almost no overruns for any trade.



Clash detection and rendering software reduces unforeseen delays to projects and provides excellent 4D review through direct data links. The ability to link the various elements to a timeline and review of a 3D staged build of the project provides enormous benefits over traditional program reviews.

BIM is also a boon for materials supply by providing material take-offs and nesting data and tightening stock control throughout the project. This helps increase procurement options for improved pricing.

The BIM team assumes full dimensional responsibility for the accuracy and completeness of the Model throughout the process ensuring all main building elements meet the design criteria provided and are accurately positioned and modeled to enable significantly enhanced automation in fabrication.

### Synergies between strategies

There has been much discussion recently about applying the early engagement imperative of the Steel Contractor Model with the thorough integration of the BIM model. This integrated approach retains all of the benefits of BIM but with added input in the steel design chain by early incorporation of steel fabricators.

This provides tangible benefits in terms of streamlined fabrication, transportation and erection methodologies, earlier procurement of steelwork and improved connection design to allow for significantly more pre-fabrication and hence less construction site disturbance.

A variation of the Steel Contractor/BIM strategy was recently deployed in the development of the Melbourne Rectangular Stadium.

The new 31,500-seat soccer and rugby stadium being built at the Melbourne and Olympic Parks precinct hinges on a lightweight steel tubular frame with 'bioframe skin covered' design based on the inherent structural efficiencies of the dome structure that uses 50 percent less steel than a typical cantilever roof.

The approach adopted by the builder, Grocon was to secure the services of a specialist drafting team to model and detail all steelwork for the structure prior to the fabricator being appointed. Design issues in cladding, temporary propping, transport and erection could be reviewed and addressed far earlier and more accurately than under the conventional approach (where the shop details are annexed to the fabricator) by having a dimensionally accurate structural

model available. This approach has also allowed many of the secondary services to be investigated and incorporated as appropriate.

It will also enable complete and accurate development and pre-fabrication of all cladding elements into the structural model to ensure accurate alignment during installation and maximum pre-fabrication and nesting of glazing and cladding elements to reduce waste and improve efficiencies onsite. Surface area and shape rationalisation for glazing and cladding surfaces were able to be checked for best fit and look.

By starting the structural model early, Grocon has enabled the fabricators to explore various roof modules to smooth out transport issues and explore incorporating fabrication/transfer/erection jigs to ensure shape integrity throughout the entire delivery process.

While securing a specialist drafting team of 3D modelers is still a somewhat new approach, its acceptance within the Australian construction industry is growing as the benefits are being demonstrated and realised by those at the forefront of the industry.