4.5.10 WHAT DOES THE FUTURE HOLD

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For The Warren Centre

Introduction

The key facts emerging from the Technology Issues Group the views expressed on 'what the future holds' were:

- The take-up of digital information documentation and transfer of technology by the Australian steel construction sector is low compared with other industries undertaking similar process operations and is waiting to be utilised.
- There is an abundance of automated fabrication technology, some already in use, which can transform the industry.
- Once introduced, the progressive improvement of existing technologies and introduction of new techniques will establish and maintain the competitiveness of structural steel.

Project resources did not permit an exhaustive analysis of all technologies, the priorities addressed being:

- design, detailing and information flow
- fabrication and erection.

Design detailing and information flow

Increased take-up of 3D technology

The Technology Group concluded that, given the practice of fabrication of steel off site under factory conditions and the increase in dimensional accuracy now governing the construction industry, the benefits to be gained in the foreseeable future from 3D documentation and electronic information flow, in combination with progressive automation of fabrication, will be more beneficial to steel construction than concrete. This applies particularly to the greater accuracy and quality control of the steel product and the lesser site construction activities. While this is a given, 3D technology and information flow is equally applicable to the concrete sector, particularly with respect to automated scheduling and bending of reinforcement. There will also be a greater prefabricated component finding favour with concrete construction with the adoption of pre-cast elements such as columns and formwork profiles for hybrid composite construction. The aspect of 'design freeze' will therefore tend to apply equally to both the steel and concrete sectors.

Progressive development and uptake of BIM for larger projects

Software for Building Information Modelling (BIM) has developed rapidly over recent years, and is being energetically promoted by its vendors. While BIM definitions vary, the concept of data flow, data manipulation and what-if scenarios is becoming more commonplace in construction globally. Climate change will influence the market place and concepts such as carbon footprint data will become a more dominant driver of change. Increasing pressure is now being placed on UK steelwork contractors to furnish planning authorities with this carbon footprint data. Through BIM practices, the future planning of buildings will progressively translate the data held by the model's objects in all permutations of analysis, leading to comparable results of design options. These will be scrutinised as more emphasis is placed on sustainable design and construction. The steelwork industry will focus on sustainability and the product will become more cost effective over the lifecycle of the building, addressing, ease and safety of erection, adaptability, recyclability, serviceability and asset value. The larger clients will become increasingly focused not just on today's cost, but also life-cycle costs and quite possibly how an impact on their branding/image might be affected if they choose inappropriate materials and services.

Continuing pressure on interoperability of software with cost reductions throughout the value chain

Uniform standards for interoperability are being promoted by the Australian Co-operative Research Centre for Construction Innovation, The International Alliance for Interoperability and others, and various government and industry reports (EngAust, NIST, CSIRO) have highlighted the potential cost savings to building owners and other participants in the construction supply chain. From a 'steelwork' perspective, interoperability of software through SDNF (steel detailing neutral format) and CIS/2 (CIMsteel Integration Standards) especially, as well as VRML (Virtual Reality Model Language,) X3D (Extensible 3D Graphics) are already well established and serve the industry well. With the next generation of BIM applications aimed upstream of the supply chain, what seems most encouraging is that these protocols are already taking hold in the vast range of software, and so the future passing and translation of data that the supply chain needs will only get better over the next five years.

Engineer, detailer and fabricator linkages

It is not foreseen that great changes will occur in this link of the steel value chain. The project has shown that detailers have been more pro-active in taking up technology and establishing overseas markets. While closer relationships and mergers between engineers and detailers would seem likely, engineers' perception of risk exposure and management of the detailing discipline would tend to work against possible marriages. Furthermore, detailing business drivers are very much production focused compared with engineering, which is project and concept focused.

The detailer's scope of services will become progressively larger with the increase in fabrication automation and associated CNC input. Detailers will become more familiar with the fabricator's technology. There will also be a trend back to some in-house detailing capability based on workshop equipment exposure for the reasons mentioned later under the fabrication and erection section of this report.

Fabricators' input to design team

The project has confirmed that in general fabricators' expertise is not being sought at project inception. It is projected that, with those fabricators taking up the Design and Construct (D&C) route as well as new entrants, the fabricators' status will be redeemed. Sales and business promotion will be essential for the D&C contractor requiring experienced representation, thus enabling fabricators to recover their seat at project inception. UK experience has shown that the D&C procurement route has aided the advancement of the fabricator's role from that of a mere supplier role, to an innovative, solution-based steelwork contractor. In order for Australian fabricators to advance in this way, it seems logical to have them court the larger contractors, engineers and architects, by offering advice and up-to-date experience as well as costing and rationalisation knowledge. From this, trusting relationships will be nurtured with repeat business coming, with a will to deliver a steel-framed solution time and time again. Equally, this will bring fabricators into contact with people they may need to employ to develop their business.

Progressive integration of digital flow of information from engineer to workshop floor

With current practice and the existing value chain, the likelihood of rapid take-up of 3D software and associated digital information data transfer with other than selected organisations is not thought to be likely. There will be document exchange and transfer of material data for tendering and pre-ordering but it is difficult to see a versatile system developing rapidly that can envelop all of the roles traditionally undertaken by each party. On the other hand, with the D&C steelwork contractor, the change will be rapid, with take-up depending on the degree of investment in technology already readily available for a 'one–stop shop solution'.

Adaptability of systems to handle change

The advent of D&C provided by steelwork contractors will bring with it more programmed discipline in the phasing of the project. Change will be possible, at little or no extra cost within the phasing windows. This will be a direct benefit of the enhanced information flow system. This will be little different to a concrete project, except that changes in formwork profile and reinforcement can be accommodated more rapidly, provided the concrete has not been poured. With the advent of pre-cast components and more hybrid type concrete, composite deck buildings, change irrespective of the building system, will pose equal challenges.

Pricing benchmarks, material lists and budget pricing

It is likely in the next five years with the progressive use of the Building Information Model, to envisage pricing benchmarks and budget pricing being linked to price indices. In the meantime, material lists will continue to be routinely issued with tender documentation to assist the pricing process. Where there could be change to assist in project estimating may be with the introduction, on a regular quarterly basis, of the reporting of the finished erected cost of steelwork on a unit area basis for various types of building. The reporting entity could also maintain a database of steel statistics for recently completed buildings of given types. These statistics would be available in weights per unit area for given elements, in addition to a general description of the structure but without name disclosure.

Fabrication and erection

It is foreseeable that in three years, world's best practice will produce painted fabrications for multi-storey buildings with less than three hours per tonne labour content. That is about four to seven times faster than the current Australian average. The introduction of technology throughout the steel value chain will be the best insurance available to counter imported fabricated product in the large project end of the market.

The key to this revolution will be more streamlined digital information flow from engineer, through

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