

# BIM Outreach

04 *Contractors/Builders –  
Possible uses of BIM for  
Construction*

04

**BIM IN PRACTICE**



Australian  
Institute of  
Architects

# BIM Outreach

## 04 Contractors/Builders – Possible uses of BIM for Construction

### Contributors:

Toby Maple (Chair), HASSELL

Glenn Cunnington, Humphrey + Edwards

John Hainsworth, Arup

Belinda Hodgkinson, Sinclair Knight Merz

Daniel Jürgens, Cox Architecture

Peter Liebsch, Grimshaw

Darren Tims, Rice Daubney

Flavio Yamauti, Hansen Yuncken

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## INTRODUCTION

Contractors stand to gain a great deal from the use of BIM. Much of the development in the BIM authoring tools has been aimed at designers and the design stages of a project. As such, BIM's ground swell suffers from a lack of clarity or objective beyond the designers' intent. Whilst BIM is often referred to as 'the new CAD' it is actually much more – it is a virtual building, a collaborative process and database of computable information (or data) that can be interacted with by many.

In the most simple terms, where contractors will gain is through the process of virtual prototyping – focusing on the cost-saving potential and prevention of design and constructability issues – in three ways: quality, time and cost.

## QUALITY

A very important consideration is whether the design team is working in 3D or not. If it is, the design intent models can be used as background to planning work, or as background for fabrication models. Interoperability between software will only ever become more advanced, but both design intent models and trade models will continue to co-exist whilst contractual boundaries remain in place. See the document **L2 – Professional Indemnity Insurance** for greater detail. The designer uses their preferred software to develop their models, and the trades use theirs, resulting in many aggregate models. The way that these co-existing aggregate models are brought together, is through the use of a federated model environment, viewed in 3D interactive review software. The process can be aided using clash detection software, but is most effectively implemented at virtual construction workshops. By producing a virtual model it is possible to effectively visualise and manage design coordination, thereby improving confidence in the design and reducing the chance of late changes and clashes between building systems on site. Combining models over one another in the virtual environment promotes a right-first-time approach to the design, procurement and construction processes.

Interestingly, contractors need not wait for the designers to use BIM. Whether the design team is working in 3D or not, contractors can still rehearse their own upcoming activities by modelling their areas of risk or uncertainty. In doing so and interacting with the resulting models across a non-technical but experienced construction team, opportunities for planning repetitive work, prefabrication, sequencing and costing will be highlighted. BIM challenges the notion of getting some things wrong which may later tie people in litigation. It is a significant opportunity for builders to remove themselves from some risks of litigation through getting it right.

## TIME

### Communication

The capability of subcontractors will differ at times from the multi-hundreds of skilled tradespeople within a single national company, through to the SME working essentially out of the back of a ute. In order to communicate the construction requirements, free-to-view models are exceptionally easy to visualise and tailored to a specific trade if required, enabling interaction without specialist printing and issuing.

### Shop drawing

The speed of shop drawing development and the associated coordination between all trades can be developed simultaneously as the design unfolds, requests for information (RFIs) will be significantly reduced during construction due to the enhanced coordination and conflict reduction through the use of 3D.

Accurate as-built drawings can be made available at handover with the use of BIM and a 3D model. See Document **L3 – Stakeholders' Responsibilities**. The 3D model represents in electronic form the physical design and construction of the project throughout all trades. If this is a requirement of the project the BIM project plan should reflect this. See the document **P2 – What should be addressed within a BIM Management Plan?** for further information.

### Project planning – construction scheduling (4D)

Planning a construction site is notoriously difficult. BIM can provide the interactive ability to visualise, inform and rehearse construction sequences, driving more efficiency into the construction process.

In the early stages of a time-critical project it can be useful to witness simple visualisation/video presentations of the construction and site management sequencing. Sequential stills and movies of the scheme can be produced to help disseminate the information in a non-technical fashion.

The term '4D' is a term that has developed to represent the addition of the time dimension to a 3D model. In simple terms, the 3D model contains 'objects' which are controlled and driven by a Gantt chart timeline. The application of the fourth dimension allows us to manipulate the sequence of construction as time is attached to the objects with almost limitless permutations. If we wish to amend the staging process we amend the Gantt chart, not the 3D images which are simply a by-product of the process. Later in the project as more detailed programs are produced, the model can be used to describe the complex sequence of building without the need to read and understand pages of charts. The key aim is to highlight bottlenecks and site constraints within the staging of works in order to optimise the overall time of construction. Site management is assisted by illustrating the true scope of works and the staging necessary to solve key constructability issues. It is a highly effective planning communication tool for disseminating construction impacts to stakeholders, or overlapping and multiple subcontractors.

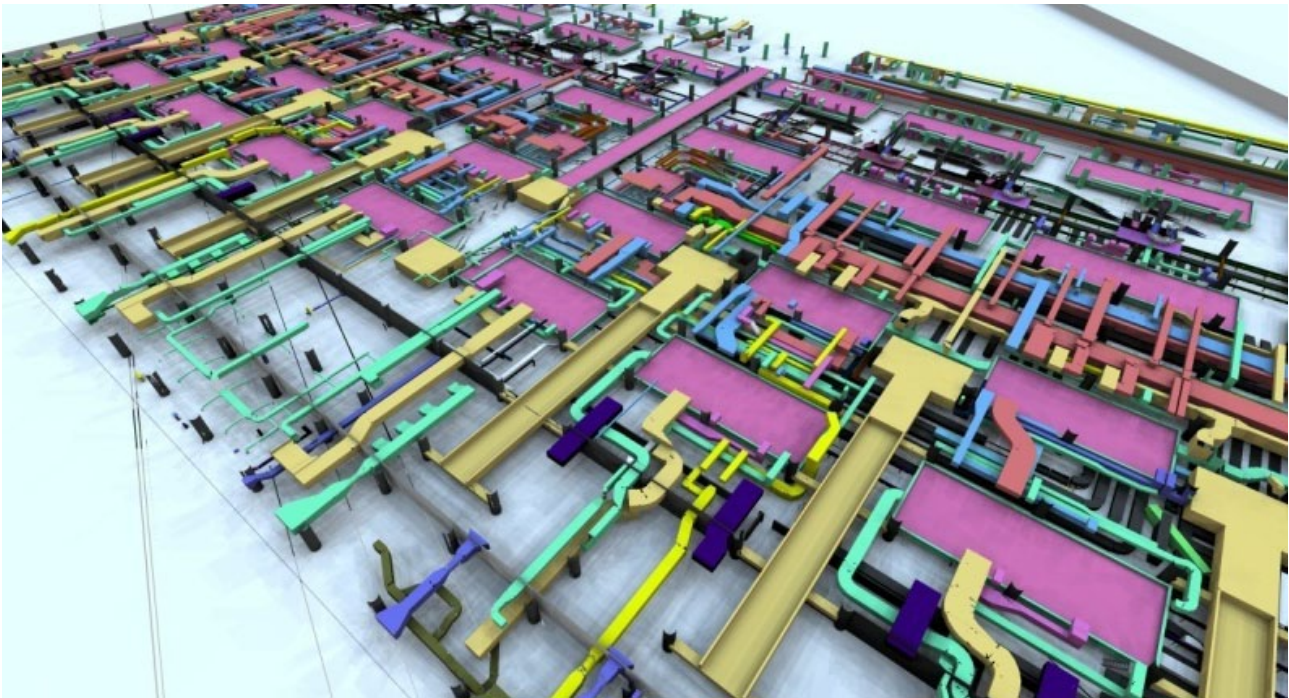


Image: Gain understanding of the project's challenges through interactive visualisation of overlain design and trade models (Source: Arup)

## COST

### Project planning – quantities

It is now becoming common practice to extract the precise measurement of materials or components from 3D models. Geometric information already has been used to create the model which can be extracted in summary form once complete. The benefit of this is that the manual take-off of quantities, which is often prone to human and scaling error can be verified and linked to instantaneous quantity reports. This is typically called '5D' (cost attributed to the model objects).

### Project planning – estimation 5D

One of the great benefits of a 5D process is that rapid assessment and reassessment of costs is now possible once the 3D model is set up. Any changes to the model and its impact on cost can be quickly assessed through the use of software that links the capability of the instantaneous quantity reports, to labour, machinery location and sequence of works to drive a true 5D project plan.

Clearly, human judgment process will never be replaced by software, however teams will be able to tweak designs of the future in real time to match project budgets, and thus eliminate the need for complex value engineering (and redesign) after a design develops to more complete stages.

## CONCLUSION

Whilst BIM encompasses many new processes for designers, at its core it features investigative ways of engaging across the whole project team and enables them to interacting with a virtual building of the project. For contractors, this better understanding results in a potential to reduce cost and time risks, and to enhance overall quality.

### Summary

- Interactive, visualisation of the project.
- Overlay design and trade models.
- Model areas of risk, sensitivity or alternative approaches.
- Create sequences for rehearsal of the construction activities.
- Extract quantities for budget estimates.