

Shop detailing in consultancy using BIM

Senior Architect and BIM Manager at Oldfield Knott Architects, RICHARD CURRIE talks about how his practice designed, documented and administered a steel-framed quick service restaurant using elements of Building Information Modelling (BIM).

The project was a compact design with a tight budget, tight timeframe on a tight site. With these design inputs, the need for a more accurately coordinated design was apparent.

As architects, we are always looking for better ways to create well-designed, efficient buildings for our clients. Expectations of accuracy are on the rise while fees and budgets are becoming more challenging to work within. However, the smart use of BIM can benefit everyone in the procurement chain including the client. The benefits are:

- Improved accuracy and better coordinated documentation
- Efficient contract documentation
- Less waste and re-work onsite
- Speed of construction
- Budget containment
- A smooth construction process
- A profitable enterprise for all

The NATSPEC National BIM Guide (<https://bim.natspec.org/documents/natspec-national-bim-guide>), lists seven main uses of BIM:

- 7.1 Project definition, planning and pre-design
- 7.2 Architectural modelling
- 7.3 Structural modelling and analysis
- 7.4 MEP modelling and analysis
- 7.5 Quantity take-off and cost planning
- 7.6 Construction models
- 7.7 Facilities management/as-built models

A pre-fabricated, lightweight steel-framed and trussed building was identified as one possible cost-effective, accurate and durable way for the client's needs. Our main challenges with this in a traditional DBB procurement, were:

- How will we have certainty of budget for the steel framing (a significant part of the building cost) without a quantity surveyor being engaged?
- Will our mechanical services fit within the pre-fabricated trusses in the limited space available?
- How can we avoid delays relating to steel detail drawing preparation and approvals in the tight construction stage timeframe?
- Our consulting engineers generally use a combination of hot-rolled and cold-formed framing methodology and don't have access to self-certifying 'residential-type' framing software.
- We don't want to accept liability for the accuracy of steel detail drawings.

The answer was to engage the steel fabrication company as a consultant during the design and documentation stages of the project. By doing so, we could work with them in a less-pressured, studio environment, not subject to the normal commercial pressures during construction (time and sub-contractor cost-squeezing).



This effectively brings steel detailing up the procurement chain into the mix with other consultants who work in a fluid design environment, collaborating and coordinating to document a buildable design within the limitations of their normal scope. For the steel detailer to be involved in this process, a change of thinking and expectations is required for them and the entire consultant team. Steel detailing occurs when a design is complete, but in this case the framing software is also a self-certifying structural design tool, built to send instructions to the CNC machine (forward).

We needed the steel fabricator to give us their model (backward) for review, collaboration and revision to avoid re-work onsite and have more certainty that contract variations would not occur.

The steel fabricator said at the outset: "The smoothest process here for fast and efficient manufacturing design and fabrication (for cost and time saving) is accuracy from the start."

To which we answered: "But how can we have accuracy from the start when we still don't know if the air con will fit? We need to work together to make it fit and there needs to be some give and take; that's what your consultancy fees are for."

Challenging as this was, what became quickly apparent was the shared understanding between the steel fabricator, mechanical services consultant and us that we were doing the hard work to make everyone's lives easier later.

In this case, the mechanical services consultant was also a tendering sub-contractor, bringing the same desire for a coordinated, buildable design; one that would not create a headache of waste and re-work onsite.

So what about the liability associated with engaging a steel fabricator?

What was made clear was that our client was not engaging the steel fabricator as a manufacturer or supplier, but as a design consultant with the appropriate professional indemnity insurance for an agreed fee to produce a series of engineered and certified drawings (albeit more accurate than normal) to be included in the tender documents.

In the building contract, the steel fabricator was named as a Nominated Sub-Contractor with a clear scope and a provisional sum allowance.

Disclaimers were added to the specifications to ensure that the tendering builders allowed for any additional secondary framing not necessarily included in the shop drawings to complete the works. This would include items such as back-blocking for site-fixed equipment and fixtures or trimming out penetrations.

In the end, this project was well under budget and completed within four months with very few contract variations and design-related re-work. The contractor and his sub-contractors are happy to do another project with us and no one went belly-up. That's got to be good for industry.