
CASE STUDY:

Christchurch Justice & Emergency Services Precinct





WHAT IS BIM:

Building Information Modelling (BIM) is a digital representation of physical and functional characteristics of a build asset – everything from bridges to buildings. A building information model is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle; defined as existing from earliest conception to demolition.

The key principle is that BIM is not any single act or process. It is not creating a 3D model in isolation from others or utilising computer-based fabrication. It is being aware of the information needs of others as you undertake your part of the process.

BIM facilitation of a major government project in the Canterbury rebuild.

This case study demonstrates how Building Information Modelling (BIM) is being used to co-ordinate the construction of the largest multi-agency, government co-location project in New Zealand's history – the Christchurch Justice and Emergency Services Precinct (CJESP), led by the Ministry of Justice.

The Precinct is one of the Government's anchor projects for the Christchurch rebuild. It will bring together all justice and emergency services agencies for Canterbury into one purpose-built, leading-edge facility featuring:

- A Justice Building that includes 19 courtrooms encompassing the Māori Land Court, Youth Court, Family Courts, District Courts, High Court, Environment Court and other specialist jurisdictions, and Probation Services. The judiciary will also be housed in a way that recognises and ensures its independence.
- An Emergency Services Building providing the base for South Island emergency services (New Zealand Police, Fire Service and St John), along with the civil defence and emergency management functions of the Ministry of Civil Defence & Emergency Management, the Christchurch City Council and Environment Canterbury.
- A parking building for operational vehicles.

An estimated 2,000 people will work in or use the 42,000 square metre Precinct daily when it opens in 2017. At the peak of construction around 500 people will work on the project. The Ministry of Justice made it a mandatory requirement that the lead contractor use BIM to assist the Precinct's construction to ensure effective cost and design management.

“This is not just about building a building, it's about how we deliver services in that building and connect with our community. The Precinct is going to be a wonderful facility that Canterbury can be proud of and BIM has been integral to making that happen.”

**NEVILLE HARRIS, CJESP PROJECT DIRECTOR,
MINISTRY OF JUSTICE**

PROJECT DETAIL:

DURATION

Earthworks began in February 2014. The Precinct is expected to be operational in 2017.

PROJECT PARTNERS

Lead agency:
Ministry of Justice

Main contractor:
The Fletcher Construction Company

BIM manager:
Warren and Mahoney

Architect:
A consortium led by Warren & Mahoney, with Cox and Opus Architecture

Project manager:
RCP

Quantity surveyor:
Rider Levett Bucknall

BIM USES

The New Zealand BIM Handbook Appendix D defines 21 distinct BIM Uses. To date, this project has used BIM for:

Design authoring

Design review

Site analysis

Engineering analysis (lighting and structural)

3D co-ordination

Site utilisation planning

Construction system design

Digital fabrication.



The Process

Fletcher Construction is managing the construction of the Precinct for the Ministry of Justice under a design and build contract. Fletcher appointed lead Precinct architect Warren and Mahoney (WAM) as BIM manager as there were multiple benefits in aligning goals and keeping the role within the extended project team.

Detailed 2D plans or 3D models were developed in Autodesk Revit by each of the 10 disciplines involved in the project including architecture, interiors, building services, civil and landscape.

From December 2014, the BIM manager worked with the design management team to pull the individual detailed design models together into a single 3D federated model using Autodesk Navisworks. The detailed design models and federated model were then shared with subcontractor teams as the basis for preparing their fabrication models or “shop drawings”.

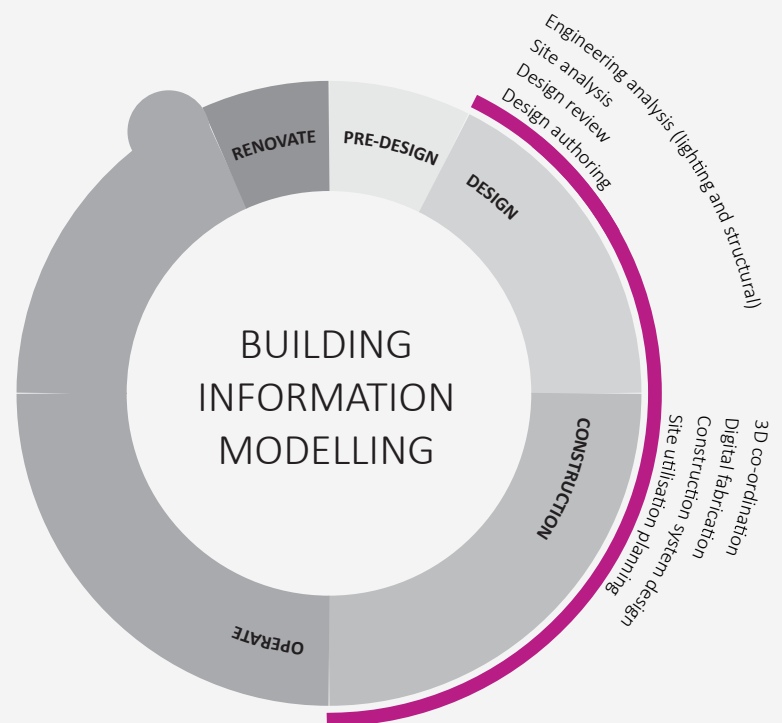
The entire design team worked together in this 3D environment before the build, co-ordinating their efforts – sharing and collaborating as a virtual project team. Weekly “town hall” meetings were held with all the sub-trades to identify and resolve pinch points. Issues and actions were captured in an online portal – the Fletcher BIM Tracker. The federated model enabled the team to peel away the façade and see different building elements layered on each other in order to detail, sequence and construct in the optimum way.

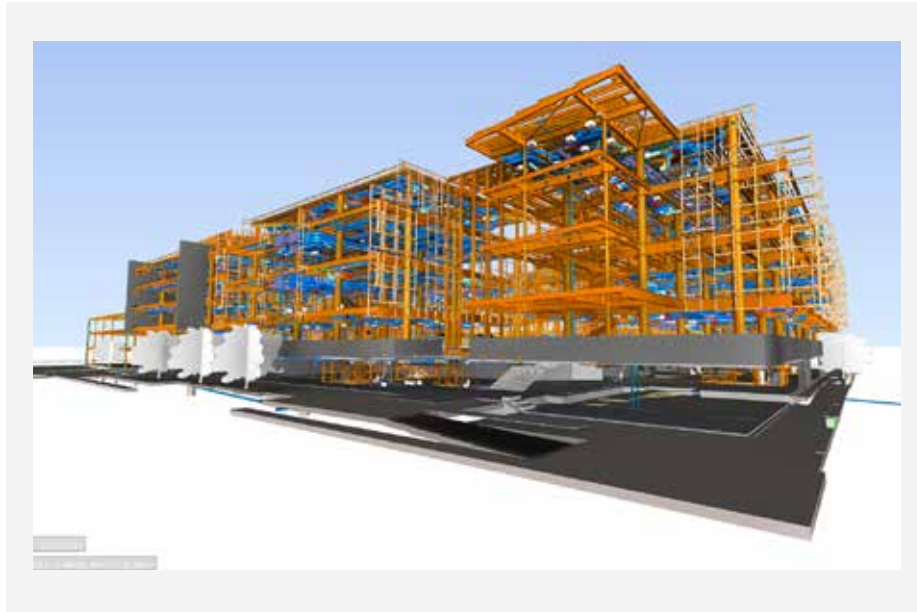
WHAT IS A BIM USE?

“BIM Use – a unique task or procedure on a project which can benefit from the application and integration of BIM into that process.”

THE NEW ZEALAND BIM HANDBOOK.

THIS CASE STUDY HIGHLIGHTS THE VALUE OF USING BIM IN THE DESIGN AND CONSTRUCTION STAGES OF THE PROJECT LIFE CYCLE.





Challenges and constraints

Post-earthquakes, Canterbury's pressing need for appropriate justice and emergency services premises presented a challenging timeframe. This meant some overlap between design and work on site which has made construction of the Precinct very complicated.

Meeting the requirements of multiple users and highly specialised agencies within one building was a significant challenge. The highly sensitive nature of many of the requirements demanded a higher than normal level of consultation with the building's users.

Given its role in post-disaster activities, the Emergency Services Building has been designed to an Importance Level 4 (IL4) standard* with extra-resilient building services. The Precinct has on-site water supply and power generation to operate for up to 72 hours after a natural disaster. The Precinct buildings are base-isolated at the first floor, accommodating movement of up to 600mm in any direction.

Results and benefits

The Ministry of Justice has found BIM to be an excellent technology platform to assist with stakeholder engagement. The BIM process fast tracked stakeholder consultation and input to the design because the building's users could digitally sit inside a space and see how it was going to function.

If someone asked a question, on-screen interrogation of the federated model provided an instant answer. This included consultation with judges who could take a virtual tour of their courtrooms through the BIM model, for example, experiencing the line of sight from the judge's bench to the jury, counsel and witnesses. The federated model was hugely beneficial in providing assurance in a way that could not have been achieved with traditional 2D plans. This information-rich resource has resulted in very efficient use of consultants and their time.

**“BIM is a process,
not a product.”**

**JASON HOWDEN, ASSOCIATE
| TECHNICAL BIM MANAGER,
WARREN AND MAHONEY**

BIM is proving to be an invaluable co-ordination tool on this massive construction project.

BIM has enabled Fletcher Construction to detect clashes and plan in advance to maximise efficiencies and minimise waste. Fletcher Construction can interrogate the model and pick up required quantities quickly, and can isolate specific elements of the build to give an incisive view of what will and won't work "in situ".

BIM has created many unforeseen opportunities for the project. For example, through smart use of BIM the project team came up with an in-floor trunking solution to reticulate power and data throughout the building. This will give all of the resident agencies maximum flexibility to repurpose spaces within the Precinct over the life cycle of the building.

A lot of the building services infrastructure crosses the seismic isolation plane and it's critical to model their design and placement precisely.

BIM has made planning the location of building services easier, showing where they need to go under or through the structure. Having a digital representation of the entire Precinct and its components gives the construction team a heads-up so they can deal with issues before they happen on site. In addition, BIM has allowed Fletcher Construction to attribute metadata to plan and equipment to assist with future maintenance.

The federated model is a living virtual asset that is updated throughout each project phase reaching a Level of Development (LOD) 400 at the end of construction. Additional asset information is being added to the federated model that will assist the Precinct's future operation.

Impressed with BIM's many benefits, the Ministry is also using BIM for the Precinct's fit-out, zoning (tenancy and security), Facilities Management and BAU planning activities. A study is being done to identify the costs and benefits of maintaining an as-built model for the life of the building.

Based on its experience of BIM on the Precinct project, the Ministry insisted that its more recent Auckland High Court project follow the BIM process from the start so it had certainty of design before going to market for a main contractor. Used in this way, the Ministry believes BIM reduces risk for the main contractor which, ultimately, should lead to a reduction in the contractor's price.

It's estimated that BIM will cost between 0.5 and 2.5% of the project construction budget. Fletcher Construction says a lot of the cost is in the set-up and that you need to define what you want to do with BIM upfront in the pre-design stage to optimise its value.

"With one source of truth up on the screen in front of you, BIM can achieve in minutes what usually takes weeks."

JASON HOWDEN, ASSOCIATE | TECHNICAL BIM MANAGER, WARREN AND MAHONEY

"With BIM, we have been able to have a richer engagement process and one that has achieved significantly better outcomes."

NEVILLE HARRIS, CJESP PROJECT DIRECTOR, MINISTRY OF JUSTICE



“From contractors, consultants and client... there’s been an overwhelming endorsement of BIM. It has been well worth the investment that has been made in it. The whole construction sector owes it to itself to use BIM.”

NEVILLE HARRIS, CJESP PROJECT DIRECTOR,
MINISTRY OF JUSTICE

The benefits are hard to quantify as the ‘counter-factual’, i.e., what would have happened without using BIM, is difficult to evaluate. However, the critical occupiers of the building will have a better experience using it, owing to the myriad of design improvements they were involved in making prior to construction starting; an involvement only made possible through the use of BIM.

That the benefits significantly outweigh any costs is best illustrated by the Ministry’s insistence that its future projects be constructed using a similar BIM process.

For more information on the Christchurch Justice and Emergency Services Precinct go to: www.justice.govt.nz/justice-sector/christchurch-precinct

See construction in progress at: www.snowgrass.co.nz/cust/justiceprecinct/

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For all things BIM and other case studies in New Zealand go to www.BIMinNZ.co.nz



WITH THANKS TO

