
CASE STUDY:

University of Auckland Undergraduate Laboratories

 **Beca**



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 assisting detailed building services co-ordination.

An upgrade of the University of Auckland's School of Sciences required a suite of new and modern chemistry laboratories to replace the original laboratories dating from the 1960s, which didn't meet current requirements. Beca provided building services and structural engineering design for the new laboratories using BIM to precisely plan the location and integration of services, with a view to optimising future comfort, safety, performance and ongoing energy management.

The laboratories comprise two large teaching spaces for undergraduate chemistry students and a number of supporting spaces including a preparation lab, an instrumentation lab, an analytical lab, a change room and a separate write-up space. This highly interactive environment needed to allow for a cross flow of staff and students through pressure controlled spaces, and for safe handling of flammable gases, solvents, oxidants, liquid nitrogen and corrosive materials.

“The complicated nature of this project plus the tight timeframe required intensive collaboration between the project partners and client. BIM was hugely beneficial in this regard.”

JON WILLIAMS, BECA

PROJECT DETAIL:

DURATION

Mid 2011 to January 2013. Design of the laboratories took approximately nine months and construction approximately a further nine months.

PROJECT PARTNERS

- Client: University of Auckland
- Services, structure: Beca
- Architect: Architectus
- Specialist lab design: Labworks
- Main contractor: Fletcher Construction
- Mechanical subcontractor: Hasties
- Project manager: RCP

BIM USES

The New Zealand BIM Handbook Appendix D defines 21 distinct BIM Uses. On this project BIM was used for:

- Design authoring
- Design review
- Engineering analysis
- Sustainability
- 3D co-ordination



The Process

As this was a services intensive project, services engineer Beca took the lead role. Beca modeled all ceiling void and plantroom services in 3D Revit format. Details fed into the services model included fume cupboards, ductwork, piped gases and drainage pipework, cable trays for power and data, and sprinklers.

As well as developing the services model, Beca used BIM to build a new structural model of the existing building, and integrated both of these models with the architectural model, produced by Architectus, of the reconfigured spaces. This integrated model enabled Beca to look at how to best service the functions required by the client and modify the design accordingly. For Beca, working collaboratively with the client and architect on the virtual model of the laboratories was a vital part of this process.

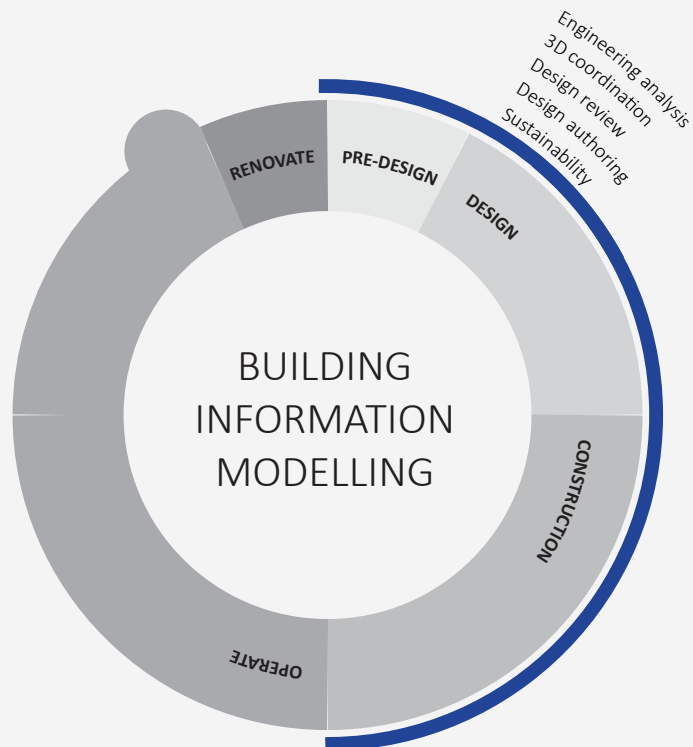
The integrated Revit model was supplied to the contractor to help them build the new laboratories and they were provided in the construction phase, design inputs and updated 3D Revit models throughout. On completion of the upgrade, the Revit model was passed to the University of Auckland’s Facilities Management department to assist with ongoing operation and maintenance of the new laboratories.

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 PRE-DESIGN, DESIGN AND CONSTRUCTION STAGES OF THE PROJECT LIFE CYCLE.





Challenges and constraints

The project had to be completed within a tight timeframe to fit in with the University's teaching programme.

Beca needed to co-ordinate heating, ventilation and air conditioning (HVAC), electrical, specialist laboratory services and plumbing services within the existing laboratory shell and also ensure they interfaced seamlessly with existing operational systems.

Containing more than 60 fume exhausts in a confined space was a major challenge. BECA's neat solution – enabled by BIM – was to design innovative manifolded fume cupboards which reduced the number of exhaust pipes penetrating the roof to 25.

Results and benefits

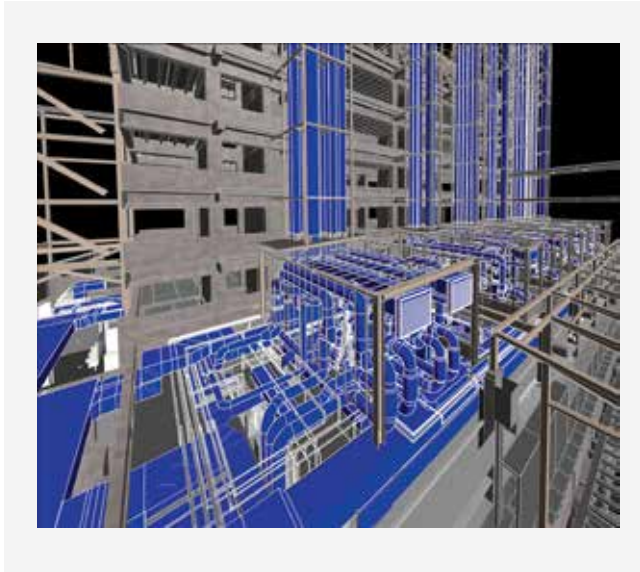
Detailed co-ordination of services in a tight space using BIM enabled construction to proceed smoothly.

BIM allowed the estimators, contractors and subcontractors to visualise and co-ordinate a fully integrated system before and during installation, resulting in reduced material and labour waste, and a shorter construction time, saving almost two weeks in a very tight programme.

“The integrated Beca Revit model was invaluable in showing the contractors where to install the services to co-ordinate with the other trades and structure and resulted in very few co-ordination issues on site. Without BIM we would not have achieved our programme timeframe without significant additional resource and associated cost.”

COLLEEN SETH,
UNIVERSITY OF AUCKLAND PROPERTY SERVICES

Beca's non-standard manifolded engineering solution for the laboratories' ventilation system, designed with the assistance of BIM, saved on installation and ongoing running costs, compared with single-ducted systems.



The new laboratories are a far cry from the energy inefficient old laboratories with their timber benches and tap water condensing.

Features include:

- fume cupboards with air flow tracking controls
- bench and fume cupboard process cooling water system for condensing
- pod fan plantrooms and risers to enable natural light to reach upper floors
- variable volume supply and extract systems optimised for containment and energy efficiency
- multi-gas detection and alarms
- password-controlled touch screen for user interface and fault diagnosis.

Attention to detail and proven control methodologies ensured that state-of-the-art, safe, new undergraduate laboratories were ready for the start of the academic year and assisted in the timely completion of the wider upgrade of the School of Sciences building.

CONTACT: Beca: Jon Williams, Business Director – Practice Development, email: jon.williams@beca.com

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WITH THANKS TO

