



NEW ZEALAND
GOVERNMENT PROCUREMENT

Building Information Modelling (BIM)

Construction Procurement Guidelines

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**MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT**
HĪKINA WHAKATUTUKI

Construction Procurement Guidelines

The purpose of the Construction Procurement Guidelines is to provide government agencies with guidance on the government's standards of good practice for the development of their construction procurement strategy. The Guidelines are intended to support government agencies to improve the quality and consistency of their construction procurement practices.

The Guidelines consist of a suite of sections, each covering a subject matter area. They are considered to be live documents which may be updated and added to, from time to time, to ensure they remain current and relevant. You can download the latest version of each section, along with any accompanying tools and templates, from www.procurement.govt.nz.

To provide feedback on the Guidelines, email procurement@mbie.govt.nz.

Major infrastructure project guidance

Major infrastructure projects by their very nature are large scale and complex – they have bespoke issues, risks and challenges that may require more sophisticated project planning, management, procurement and governance approaches. The New Zealand Infrastructure Commission - Te Waihanga, publishes major infrastructure guidance for projects with a total cost of ownership of greater than \$50m.

For more information about major infrastructure project guidance and the support provided by the Infrastructure Commission, see www.infracom.govt.nz or contact the Infrastructure Commission at info@infracom.govt.nz.

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Building information modelling

Overview

Few things have as much potential to improve the performance of New Zealand's building, construction and asset operation sectors as building information modelling (BIM). An investigation conducted by the Ministry of Business, Innovation and Employment (MBIE) highlights BIM as the only improvement initiative likely to deliver a step-change, rather than an incremental gain in productivity.



Agencies must adopt Building Information Modelling (BIM) to aid the design, construction and maintenance of assets, in accordance with the New Zealand BIM Handbook.

Note: *As a minimum this should include the development of a project BIM brief that is aligned to the agency's goals. Section 1.4, Figure 3 of the NZ BIM Handbook provides an example of opportunities for different agency types and sectors.*

BIM has two primary value propositions:

1. The productivity gains and error reduction that BIM provides through the design, documentation, and delivery stages of a construction project.
2. The asset management efficiencies that BIM facilitates across the life cycle of the asset.

This wider lens allows agencies to move beyond evaluating construction projects solely as a year 0 capital expense, to one that leads to legitimate savings by utilising a BIM model.

Acknowledgement

MBIE acknowledges the contributions of the [New Zealand BIM Acceleration Committee](#) for its support and collaboration on the production of this focus area.

Primary source of content

This section of the guidelines has been adapted from version 3.1 of the [New Zealand BIM Handbook \(2019\)](#), which itself draws on documentation produced by a variety of international parties. Content from the handbook is third party copyright material and has been reproduced and adapted with the permission of the [New Zealand BIM Acceleration Committee](#). Refer to the licence for more information on its terms of reuse.

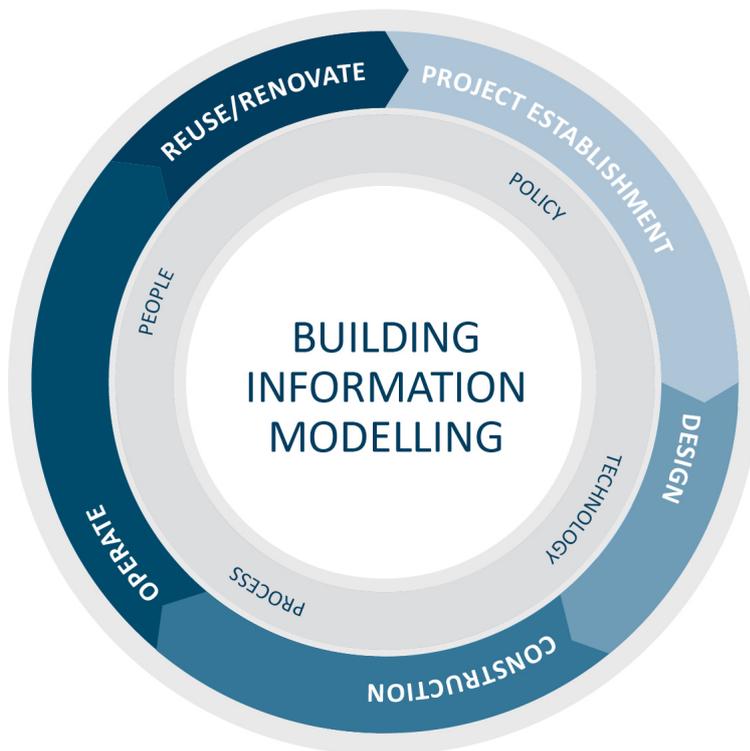
What is BIM?

Building information modelling is: “...the digital representation of the complete physical and functional characteristics of a built asset...It involves building better processes using a model with real life attributes within a computer and sharing that information to optimise the design, construction and operation of that asset...”

BIM equips everyone involved with an asset, at any stage in its lifecycle, with information they need to do their jobs efficiently. BIM processes are underpinned by digital technologies supporting collaboration and information sharing, creating efficiencies, saving money, reducing risk and, ultimately, maximising an asset’s potential.

BIM processes apply to all types of assets, including buildings, industrial facilities, and civil infrastructure. While it provides an efficient way to design and plan, it goes beyond initial conception and construction. BIM typically includes information on design, construction, logistics, operation, maintenance, budgets, schedules, and much more, providing a far richer analysis than traditional approaches. Information created in one phase can be passed to the next phase for further development and reuse.

The asset life cycle



BIM APPLIES DIGITAL TECHNOLOGIES TO DESIGN AND PROJECT MANAGEMENT PROCESSES SPANNING THE LIFE OF A BUILT ASSET – FROM PRE-DESIGN TO OPERATION.



Key messages

- › The client plays a critical role in driving the adoption of BIM processes. Client leadership and clear information requirements promote change that allows the construction supply chain to build its capacity to deliver.
- › BIM provides a consistent framework, a process that can be built upon to suit client requirements and project objectives
- › BIM can be used to improve communication, coordination, and collaboration on projects.
- › BIM is often seen as a cost rather than an investment (incorrectly), or as a design and construction aid rather than something that helps maximise whole-of-life value and supports asset/facilities management.
- › Project culture is critical as BIM is a collaborative process, and value can be constrained by adversarial project environments. Therefore, the overall approach to creating a collaborative environment and associated behaviours and BIM processes needs to be stated in the procurement process.
- › By investing in skills and technology and allowing more time for client reviews in between each of the design stages, the construction programme and post-construction benefits are more likely to be realised.
- › Comprehensive BIM brief and project brief documents (which are co-dependent) together set clear expectations of processes and deliverables.
- › BIM is an effective digital process for quantity surveyors and client advisers to assess and influence design and delivery processes to provide better commercial outcomes.
- › Health and safety outcomes can be improved, with better planning enabled by BIM.
- › BIM can improve sustainability outcomes through reduced on-site waste and rework due to improved coordination.
- › BIM can open up opportunities for off-site manufacture and prefabrication.
- › BIM can improve design quality through buildability and construction methodology reviews.
- › BIM can provide a platform for asset information to be delivered progressively throughout design and construction.
- › Having a skilled BIM resource client-side to help establish BIM brief requirements and review the BIM throughout delivery is vital, particularly for clients who have never used BIM before.
- › BIM processes are equally applicable to horizontal infrastructure as they are to vertical built assets.

Benefits of adopting the BIM process

BIM supports the feasibility, planning, design, construction, and operation stages of a project lifecycle.

Each phase is approached holistically, for better-coordinated information sharing, through a set of processes supported by BIM Uses. In the New Zealand construction industry, the following benefits are achieved through the implementation of BIM processes.



BIM Uses

BIM covers a number of processes or tasks, such as design authoring and coordination. To create a common language, The New Zealand BIM Handbook lists these tasks as BIM Uses.

For more information, see [Appendix D: BIM Uses Definitions](#)

General benefits

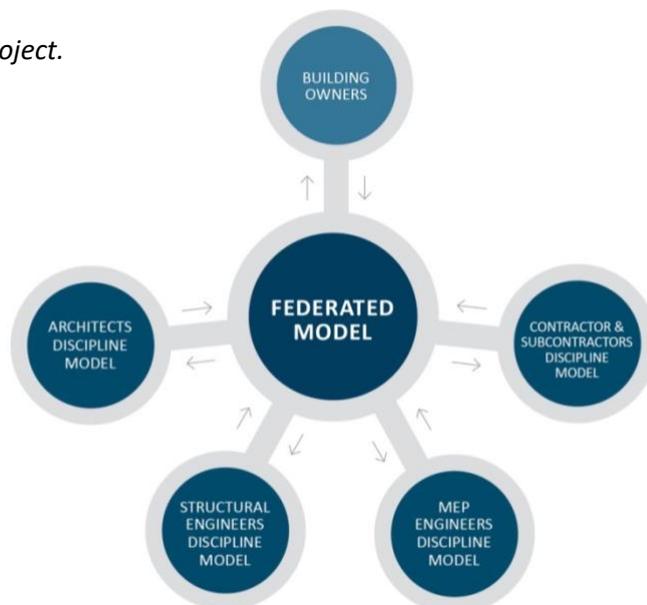
Design coordination

Independent 3D models can be combined into a single ‘federated’ model showing the ownership, spatial, and functional relationships between systems, components and elements. These relationships are updated automatically as the model evolves. The sharing and coordination of information, through the federation of separate models:

- improves workflows and transparency between design disciplines
- reduces coordination errors and unexpected changes
- facilitates standardisation in design
- improves design efficiency
- contributes to identifying risks and jointly developing effective design solutions to meet user needs.

Model federation diagram

This diagram is for a building project.



Communication

The collaborative planning approach that BIM promotes:

- provides for a high level of communication and information sharing between stakeholders
- enhances stakeholder engagement
- provides an opportunity to engage clients, contractors and other stakeholders much earlier in the design process when the greatest value can be derived from their input
- promotes engagement with non-technical stakeholders - the use of 3D models in the BIM process simplifies the interpretation of spatial relationships and final appearances, reducing the potential for misinterpretation.

Information management

BIM modelling software:

- manages graphical information associated with each element of the asset and updates the information automatically as changes are made to the model
- stores and generates non-graphical information such as schedules, dimensions, volume and attributes
- is digital, so BIM information can be easily stored and transmitted, searched, sorted and filtered
- the BIM process also eases the capture of as-built information during construction for use at handover.

Analysis and simulation

The relative ease of accurately re-calculating performance following changes to the BIM allows different design options to be explored and optimised:

- information associated with the model can be used for engineering, design and planning scenario analyses
- quantity take-off and costing capability within the BIM process allows for faster, more accurate and transparent costing and cost management
- leveraging BIM models for simulation, analysis and cost management can improve the design, construction process and operational safety of the asset.

Improved productivity during construction

The collaborative approach promoted by BIM in the design phase has a flow-on effect to the construction phase:

- more precise design
- fewer unexpected design changes during construction
- improved constructability
- improved construction quality
- improved on-site safety
- shorter construction programmes
- reduced costs
- better planning of site activities and construction sequencing
- quicker and more accurate set-out
- more off-site prefabrication
- productivity gains in terms of reduced waste and rework through better trade coordination, automated conflict avoidance, easier design interpretation and greater accuracy.

Better information for asset management

The BIM process promotes the involvement of asset managers/asset operators at the project establishment and briefing stage of the project, which can:

- improve the asset design
- capture information generated during design and construction in the as-built model/handover model to assist with asset and facility management.

Value to the client

Productivity gain

Primarily, BIM realises this major benefit by:

- minimising duplication of effort and helping streamline the management of a project
- fostering communication and collaboration
- identifying errors early
- reducing rework
- reducing costs
- improving quality

Construction project management

Construction project managers using BIM processes report:

- fewer errors
- reduced rework
- shorter project durations
- greater confidence in the project programme
- lower overall construction costs when employing BIM in the early phases of a project.

BIM's ability to visualise design options make it:

- quick, easy and cheap to validate options against key performance criteria
- cost-effective and predictable in terms of project outcomes

BIM also has a strong influence on project duration. One overseas report¹, which documented construction practices over several years, found that the average duration of BIM projects was 37 per cent shorter than traditional projects. One survey¹ estimates that BIM's data sharing ability alone is enough to reduce the duration of a single project by up to seven per cent.

Asset operation

The information management process that underpins BIM also leads to high-quality post-construction outcomes. The greatest advantages for public sector asset managers are likely to arise from a new ability to create and manage building and infrastructure assets faster, more economically and with less environmental impact. Asset managers, owners and occupants can optimise the building's systems and performance for human comfort and safety, while minimising environmental impacts and running costs during operation.

At the end of the building's life, BIM documents all the materials, recyclables and any hazardous substances for the decommissioning team. In the United States¹, 62 per cent of organisations using BIM to procure and

¹ Productivity Benefits of BIM (www.biminnz.co.nz)

manage assets report a greater return on their investment, a figure that rises to almost three-quarters (74 per cent) of organisations in Europe. The economic return correlates strongly with the level of BIM engagement, rewarding asset managers with higher skill, greater experience and more extensive implementation of the technology.

A well-structured BIM process supports the asset owner with proactive maintenance scheduling and provides the following benefits:

- the ability to review BIM models throughout each design and construction stage to gain reassurance on the final usability and maintainability of an asset
- quicker population of asset data into existing asset information management systems (AIMS) and computer aided facilities management (CAFM) systems through progressively (throughout delivery of a project) exporting accurate data from an as-built BIM model and structured asset information
- the linking of operating and maintenance (O&M) manuals to specific components in the as-built BIM.
- more transparency in the commissioning process with the linking of final commissioning results to an as-built BIM for easy future retrieval
- smoother building completion when BIM is used in conjunction with contracted frameworks such as The Chartered Institution of Building Services Engineers (CIBSE) [Soft Landings](#) framework
- an as-built BIM can be used by FM to assess future building amendments
- using the capability of modelling rooms as spaces within the BIM model, the final BIM can be used for space management purposes
- BIM can be used for energy analysis and management, as well as other operational systems management to improve efficiencies and unlock cost savings in building operation
- improved end-user/occupier experience with fit-for-purpose design supported by a collaborative design process
- improved access to information afforded by the as-built BIM for asset management/facilities management resulting in time (and hence cost) savings for consultancy
- BIM helps to improve confidence in the ability of the project to be delivered on time and within budget.

Ultimately, BIM's ability to integrate processes and ensure accurate, timely and intelligent transfer of information between key project stakeholders lies at the heart of its productivity gains.

Communicating the value of BIM to stakeholders

BIM can offer the following key benefits across the asset lifecycle:

- Lower capital cost of the asset
 - Time and financial benefits in the design phase from greater understanding and transparency in the process, allowing value judgements to be made, as well as a more collaborative and efficient process, enabling the minimisation of errors and improving constructability.
 - Contractors passing on savings to the client through time and financial benefits afforded by BIM in the construction phase. Giving contractors extra detail through the BIM process can streamline their processes, improve the standard of construction, and reduce errors, risk, rework, and material and labour waste.
- Lower operating cost of the asset
 - Improved accuracy, completeness and accessibility of as-built/handover information, including meta-data, to facilitate and enhance asset and facilities management. BIM can inform the operation of a building throughout its lifecycle and help predict the whole-of-life costs of an asset. BIM can be used as a tool for operational systems management to unlock operational cost savings.

The benefits of BIM are hard to quantify, as the ‘counter-factual’, ie what would have happened without using BIM, is difficult to evaluate. Importantly, projects need to be considered on a whole-of-life basis, and as most of the cost of BIM is in the design phase of a contract, while the benefits mostly arise during the “build” and “operate” phases, the focus should be placed on overall investment and long term operational benefits rather than up front straight-line costs. This requires a deliberate shift in asset management approach from reactive maintenance to place greater emphasis on proactive and preventative maintenance.



BIM case studies

There is no better way to understand the benefits of BIM than to see how it has impacted real projects. See below for a series of case studies demonstrating the costs, benefits and risk management advantages of using BIM.

For more information, see [BIM case studies](#)

Getting started with BIM

Shared understanding of overarching objectives is key to project success. These key actions maximise BIM benefits:

- The client reviewing operational strategy, and clearly defining their asset information requirements, that will be provided by the as-built model.
- Recording and documenting stakeholder-approved objectives during the feasibility and planning stages of the project.
- Identifying the expected BIM Uses that will help meet project objectives. A clear scope of deliverables in the project BIM brief. BIM Uses that do not align with project objectives should be avoided. Refer to Appendix D of the New Zealand BIM Handbook for more information on BIM Uses.
- Identifying how BIM will be planned, executed and managed collectively by the project team in the BIM execution plan.
- Ensuring procurement methodologies and programmes are aligned with the BIM process.
- Procuring a suitable team, executing the design and construction BIM requirements, and producing project and asset information models that are relevant to the project needs.
- Identifying what models can and cannot be used for, aligned with the contracted requirements of the project BIM brief.
- Conducting regular information audits to confirm that BIM model includes what has been asked for.

For more information, see [The New Zealand BIM Handbook](#)

Identifying client operational strategy

BIM can be used as a tool to facilitate an asset owner's current operational needs or future operational strategy. Crucial to this is understanding the asset owner's BAU facilities management systems. Most asset owners have a variety of information on their current assets stored in a range of asset management systems (AMS).

Prior to embarking on a BIM process, the client should consider what information will be of value to them to support their long-term project and organisational requirements, along with how this information needs to interact with their current systems.

It is recommended that clients develop a holistic asset information strategy independent of currently-planned projects. In developing the strategy, consideration needs to be given to what information is currently required and what may be required in the future. Clients should work with all parts of their organisation (eg operations, FM/AM, finance, compliance) to develop their asset information requirements (AIR).

A client's understanding of their AIR is the first step in gaining a useful information model tailored to the planned operational stages of an asset. Successful delivery of requirements can be further enhanced with contractual frameworks that encourage active client involvement. Such frameworks have appeared internationally with the development of new procurement routes meant to reduce data duplication, through the centralised use of BIM to share project information.

For more information on AIR refer to Section 4 of [The New Zealand BIM Handbook](#)

Procurement and collaboration with BIM

Project procurement strategy impacts the way BIM is enabled and managed. However, regardless of the chosen delivery model and approach to market, the client must first define their objectives as they relate to digital information during the design, construction, and operation phases.



Potential project participants should be made explicitly aware of these objectives before they are contracted. This creates a transparent environment that builds trust between the project participants. BIM processes work properly when the project participants understand what information is required and why, by whom, when, how the information will be relied upon and in what format it will be delivered.

BIM's many benefits focus on improved collaboration between project participants. These benefits increase when the procurement strategy promotes collaborative approaches. This understanding needs to be embedded into the [procurement strategy](#).

Traditional

Contracts should promote designers who take a more collaborative approach. Everyone must agree who models what, and when. Contractors bidding for work must understand the nature and completeness of the models they will receive.

Design and build, or early contractor involvement

These stages present designers and constructors with the opportunity to work together to ensure things are modelled only once. Including specific elements in design stage models rather than generic ones will produce more efficient designs.

Collaborative contracting or integrated project delivery

Linking the client, designers, and constructors to common objectives will maximise the benefits of BIM processes. All parties must trust each other implicitly, and the incentives and risk profile of the project participants must be properly understood in order to align behaviours towards the project objectives.

The information delivery cycle

A typical BIM workflow follows the information delivery cycle. Figure 8 in the third version of the [New Zealand BIM Handbook](#) shows the information management for the capital/delivery phase of construction projects using BIM. The figure shows the generic process for identifying a project need, defining a project's BIM requirements, procuring a suitable team, executing the design and construction BIM requirements, and producing project and asset information models that are relevant to the project needs.

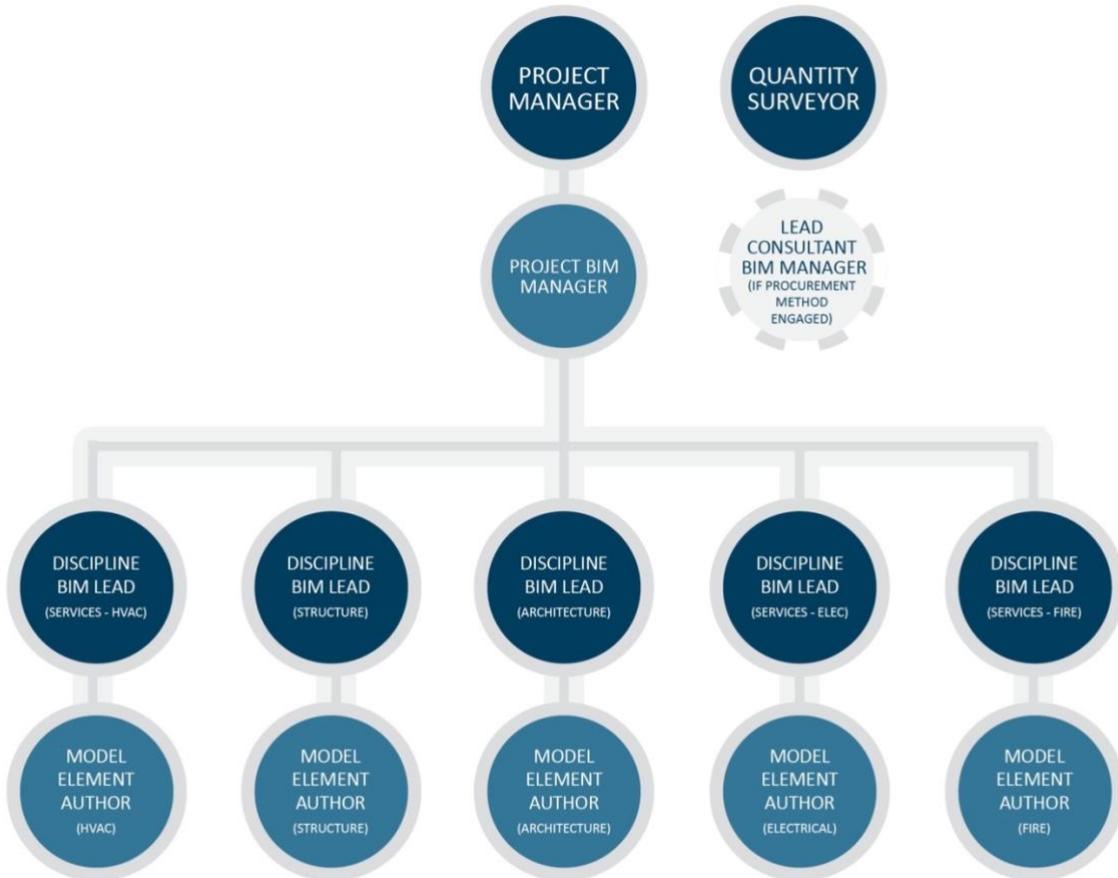
For more information refer to Section 4 of the [New Zealand BIM Handbook](#).

The information delivery cycle has two distinct start points:

1. **The CAPEX start**
For stand-alone new-build projects, where the focus is on capital delivery efficiencies rather than ongoing operational requirements. This starts with the development of the project BIM brief.
2. **The OPEX start**
For projects that are part of a larger asset portfolio, or for projects that involve existing assets. This starts with the FM/AM plan and draws on information from the existing asset information model.

BIM roles

The key BIM roles in a project include the project BIM manager, discipline BIM leads and model element authors. These roles fit into the following BIM organisational structure:



Project BIM manager

Clients typically appoint an information/BIM manager before the design team is engaged. In some cases the lead consultant can assume all or part of the responsibilities of a BIM manager.

BIM managers are responsible for satisfying project objectives as they relate to BIM uses, information, and BIM. Broad responsibilities include:

- Facilitate the development of a project BIM brief
- Brief project stakeholders
- Develop the project BIM execution plan
- Maintain and revise the BIM execution plan during the project
- Communicate progress to project stakeholders
- Tackle BIM issues in a timely and efficient manner
- Audit models received from project stakeholders to ensure geometry and information develops according to the BIM execution plan and project requirements
- Coordinate federated models
- Detect, report and allocate responsibility for resolution of clashes
- Facilitate coordination meetings
- Communicate coordination issues to project stakeholders
- Support the client and the project to ensure BIM requirements are followed and BIM-related project goals are achieved

Projects with a lead consultant could split BIM responsibilities which must be clearly delineated. A client-side BIM manager will focus on briefing, defining, and information, while the lead consultant BIM manager will focus on execution, coordination, and federation.

Discipline BIM lead

Each discipline (architect / structural engineer / services engineer/ quantity surveyor, etc.) should appoint a BIM lead to manage BIM-related activity. Broad responsibilities include, but are not limited to:

- Participate in BIM execution planning
- Participate in design review and model coordination meetings
- Facilitate the use of the BIM execution plan within their organisation and teams
- Ensure model files develop according to the project BIM execution plan
- Validate levels of model development at each project stage
- Perform detailed model audits before they're shared with the wider team
- Communicate issues to model element authors
- Implement internal coordination and clash detection procedures
- Manage model transfer and version control
- Maintain knowledge of BIM for relevant disciplines

Model element author (MEA)

A model element author is the project participant responsible for delivering the building information model during the project delivery process. Model element authors are tasked with facilitating BIM uses and BIM goals.

Broad responsibilities include:

- Determine model elements in the MEA and BIM execution plan
- Develop model elements to appropriate levels at each project stage
- Communicate issues to project participants

Key BIM documents

New Zealand BIM Handbook

The aim of the New Zealand BIM Handbook is to promote the use of BIM to create, maintain and operate quality built assets in New Zealand. The Handbook follows the typical progression of a project, from establishment through to operation, and documents a consistent approach, using a common language, to BIM in New Zealand.

[The New Zealand BIM Handbook](#)



Client asset information requirements template

In conjunction with NZ metadata standards

Prior to embarking on the BIM process, the client needs to be able to clarify and communicate their asset information requirements (AIRs) for the creation or maintenance of their assets (refer to NZ BIM Handbook, Section 4.4). This determines the information and level of detail to be captured during the BIM process.

As well as specifying information required relating to objects within an asset, the client team needs to confirm the format in which this information is to be provided.

The [New Zealand Metadata Standards](#) have been developed to provide a standard format and structure for asset information. This standard can be used as a 'shopping list' for asset information, keeping in mind that the requirements specified should be relevant to your specific needs.

The client's AIRs will form the basis of the project BIM brief.

Project BIM brief

The project BIM brief is developed by the client prior to engaging the project team and forms part of a wider set of procurement documentation. It is a subset of the project requirements or equivalent contract documentation and introduces the client's objectives, information requirements, reasons and purpose to the project team, along with any technical and commercial details that need to be addressed through the implementation of BIM.

Refer to Section 5.2 and Appendix E of the New Zealand BIM Handbook for a template and example of a project BIM brief.



BIM evaluation and response template

The BIM evaluation and response document is a supplemental template to the project BIM brief in the request for proposal (RFP) or contractor procurement stage, used to provide a consistent framework for the BIM component in the response to an RFP.

Each tenderer should include a completed BIM evaluation and response template with their RFP response to demonstrate their proposed approach, capability, capacity and competence to meet the project BIM brief requirements in relation to their



specific discipline and/or role on the project. It will form part of the tender scoring and selection of the project team.

Refer to Section 5.4 and Appendix G of the New Zealand BIM Handbook for a template and example of a BIM evaluation and response document.

BIM execution plan

This is the key document for successfully executing BIM on a project.

An expansion of the project BIM brief, it is developed collaboratively by the project team after they have been engaged, before commencing the design. It is a live document and can be updated throughout the design and construction phases. The BIM execution plan expands on each of the client's objectives and details how BIM will be planned, executed and managed collectively by the team to achieve the objective. It allocates key responsibilities and defines the processes, procedures and tools to be used.

Refer to Section 5.5, 5.7 and Appendix H of the New Zealand BIM Handbook for a template and example of a BIM execution plan.



Model element authoring schedule

A model element authoring (MEA) schedule is developed as part of the BIM briefing and execution planning process. This schedule assigns responsibilities to model elements via an author and defines the level of development of model elements aligned to project phases. The purpose of an MEA schedule is to define who is responsible for modelling (including “what and when?”) in the project process.

Refer to Section 5.3 and Appendix F of the New Zealand BIM Handbook for a template and example of an MEA.



Model description document

A model description document (MDD) is a document issued with a model, by the discipline BIM lead, to describe what the model contains, explain its purpose, and identify any limitations of use.

Refer to Appendix J of the New Zealand BIM Handbook for a template and example of an MDD.



Legal implications of BIM

Consultant selection

The project BIM brief should be provided to any project consultant, along with other project information as a part of the request for proposal (RFP) process. The RFP must clearly outline what the client's BIM expectations are of the consultant, focusing on the specific BIM goals and benefits that the client has identified. It must be clearly detailed in the RFP how the BIM process will be managed and what each individual will be responsible for. In particular, it is important to define the BIM manager and lead consultant roles individually.

Reviewing the BIM evaluation and response document will allow the client to select a team with skills matched to the complexity of the specific project, who have aligned BIM methodologies.

The project BIM brief and the BIM evaluation and response template may form a part of the consultant engagement contract when it is executed.

The consultant's responsibilities with respect to timeliness, completeness and quality of deliverables are no different under BIM. The contract (including the project BIM brief and/or BIM evaluation and response documents) must clearly state what is to be produced, and when. However, with a BIM process there may be far more interdependencies that need to be included. These must be considered when developing the delivery programme.

Contractor engagement

The request for tender (RFT) process must clearly outline the client's BIM expectations of the contractor. The expectations should focus on specific BIM goals and benefits that the client has identified.

The project BIM brief and design BIM execution plan should be provided as part of the RFT process. The RFT needs to provide key BIM information including:

- what models, format and level of development and information will be provided to the contractor from the design team and how the information can be relied upon
- the handover process from design to construction BIM manager
- what format and level of development is required for handover models to the client/operator, and what format and asset information is required for handover to the client/operator.

Refer to the New Zealand BIM Handbook for further details on contractor engagement.

Intellectual property and model liability considerations

Most standard forms of contract adequately cover the ownership of intellectual property with regards to BIM models. The New Zealand BIM Handbook contains an example of how the Conditions of Contract for Consultancy Services 2017 can be applied to the copyright of BIM documents.

Regarding model liability, as the exchange of models is the very basis of the BIM process, all users need to understand the level of reliance that they can place on the models they are receiving. The issuer of a model must clearly define, ideally in the model description document, what it can (and cannot) be used for, eg:

- work in progress – issued for ongoing coordination
- developed design issue
- detailed design issue for consent and contractor pricing
- issued for construction – for production of shop drawings, not for fabrication
- issued for construction – suitable for fabrication.

Models should also be read in conjunction with the BIM execution plan, which defines the BIM Uses that can be applied to the model at a given project stage, and other project documentation including specifications and schedules.