APPENDIX D
BIM USES DEFINITIONS

DIGITAL GUIDANCE SUITE: AOTEAROA | NEW ZEALAND 2023

CONSTRUCTION SECTOR ACCORD

BIM BETTER BUILDING PROCESS. BUILDING BETTER PERFORMANCE.

New Zealand Institute of Building

TABLE OF CONTENTS

Appendices are published separately and can be downloaded from **www.biminnz.co.nz/nz-bim-handbook**

Appendix A – Modeling and documentation best practice

Appendix B – Model coordination

Appendix C – Levels of development definitions

Appendix D – BIM uses definitions

Appendix E – Procurement Model Considerations

Appendix F – Exchange Information Requirements - template

Appendix G - Level of Development Specification

Appendix H - BIM evaluation and response - template

Appendix J – BIM execution plan – template

Appendix K - Model description document - template

BIM USE DEFINITIONS

Building Information Modelling (BIM) covers a number of processes and tasks, such as design authoring and coordination. To create a common language, this handbook lists these processes and tasks as BIM uses. Twenty-one uses have been identified. Some uses are common on projects; others are an indication of where BIM may be applied in the future.

REF.	BIM USE	PROJECT ESTABLISHMENT	DESIGN	CONSTRUCTION	OPERATION
1	Existing Condition Modelling				
2	Cost Estimation				
3	Phase Planning (4D Modelling)				
4	Spatial Programming				
5	Site Analysis				
6	Design Review				
7	Design Authoring				
8	Engineering Analysis: a) Energy b) Fire c) Lighting d) Mechanical e) Structural f) Other				
9	Sustainability (Green Star/NABERS) Evaluation				
10	Code Validation				
11	3D Coordination				
12	Site Utilisation Planning				
13	Construction System Design				
14	Digital Fabrication				
15	3D Control and Planning				
16	Record Modelling				
17	Asset Management				
18	Building (Preventative) Maintenance Scheduling				
19	Building System Analysis				
20	Space Management and Tracking				
21	Disaster Planning				

In the past five years the BIM Acceleration Committee, in conjunction with EBOSS, has collected data on the usage for each BIM use listed above. Data was drawn from an industry control group of small to large parties, covering all the cycle stages.

Find the report here: https://www.eboss.co.nz/bim-in-nz/bim-benchmark-survey-2021

EXISTING CONDITIONS MODELLING

Description

A process in which a project team develops a 3D model of the existing conditions for site, facilities on a site, or a specific area within a facility. This model can be developed in multiple ways, including laser scanning and conventional surveying techniques, depending on what is desired and what is most efficient. Once the model is constructed, it can be queried for information, whether it is for new construction, refurbishment, or a modernisation project.

Potential Value

- Used as an input to design and construction activities
- Provides documentation of environment for future uses
- Enhances the efficiency and accuracy of existing conditions' documentation
- Aids in future modelling and 3D design coordination
- Provides an accurate representation of work that has been put in place
- Real-time quantity verification for accounting purposes
- Used for visualisation purposes
- Provides detailed layout information
- Pre-disaster planning
- Post-disaster records
- Use as a verification process for completed works

Resource required

- Conventional surveying equipment
- 3D laser scanning hardware and software
- Design authoring software
- Laser scanning point cloud manipulation software

Team competencies required

- Ability to manipulate, navigate, and review a 3D model
- Knowledge of building information model authoring tools
- Knowledge of 3D laser scanning tools
- Knowledge of conventional surveying tools and equipment
- Ability to sift mass quantities of data generated by a 3D laser scan
- Ability to determine the level of detail required to add value to a project
- Ability to generate building information model from 3D laser scan and/or conventional survey data

Potential output information

- 3D point cloud of existing building
- Surface model of existing geometric elements
- Parametric model, including data regarding existing building components

Procurement considerations

- Define model tolerance requirements
- Define what will and will not be modelled
- Define survey requirements (laser scan vs measured vs photogrammetry etc)

COST ESTIMATE (5D COST ESTIMATION)

This BIM use should be read in conjunction with the ANZIQS BIM Best Practice Guidelines Nov 2018

Description

A process for which BIM can be used to assist in the generation of accurate quantity take-offs and cost estimates throughout the lifecycle of a project, typically undertaken by a quantity surveyor or pre-contract estimator. This process helps the project team to gauge the cost impacts of their changes during all phases of the project, and can help curb excessive budget overruns due to project modifications.

> **BIM does not resolve quantity take-off-related issues exhaustively and not all quantities needed during a project can be taken off from a BIM. The professional skill of a Quantity Surveyor or pre-contract estimator is still needed for assessing the validity of the source data and source materials, ensuring the coverage of the take-off, proposing alternative solutions and analysing the results.**
>
> *- Finlands COBIM 2012, Series 7, page 5*

Potential Value

- Precisely quantifies modelled materials
- Quickly generates quantities to assist in the decision-making process
- Generates more cost estimates at a faster rate
- Better visual representation of project and construction elements that must be estimated
- Provides cost information to the owner during the early decision-making phase of design and throughout the project lifecycle, including changes during construction
- Allows estimators to focus on more value-adding activities, such as identifying construction assemblies, generating pricing, and factoring risks, which are essential for high-quality estimates
- Added to a construction schedule (such as a 4D model), a BIM-developed cost estimate can help track budgets throughout construction
- Enables easy exploration of different design options and concepts within owners' budgets

Resource required

- Model-based estimating software
- Design model built with quantity surveyor needs in mind
- Cost data

Team competencies required

- Ability to define specific design modelling procedures that yield accurate quantity take-off information
- Ability to identify quantities and their suitability for the appropriate design and estimate phases
- Ability to adjust a cost plan to suit data available in the model for the duration of the design phase

Potential output information

- Quantity take-off information in defined structure
- Cost estimate

Procurement considerations

- Define cost estimation requirements in the design EIR
- Clearly communicate that the quantity surveyor is responsible for the cost estimate and the model is to be used as a support tool. It does not replace the traditional responsibilities of the quantity surveyor

PHASE PLANNING (4D MODELLING)

Description

A process in which a 4D model (3D models with the added dimension of time) is used to effectively plan the phased occupancy in a renovation, retrofit or addition, or to show the construction sequence and space requirements on a building site. 4D modelling is a powerful visualisation and communication tool that can give a project team, including the owner, a better understanding of project milestones and construction plans.

Potential Value

- Provides a better understanding of the phasing sequence by the owner and project participants, showing the critical path of the project
- Monitors actual progress on site against programme and critical path activities
- Identifies programme, sequencing, and phasing issues
- Includes dynamic phasing plans of occupancy offering multiple options and solutions to space conflicts
- Integrates planning of human, equipment, and material resources with the BIM model to better programme and estimate the cost of the project
- Identifies opportunities for staged handover
- Identifies and resolves space and workspace conflicts ahead of the construction process
- Marketing purposes and publicity
- More readily constructible, operable, and maintainable project
- Monitors procurement status of project materials
- Increases productivity and decreases waste on job site
- Conveys the spatial complexities of a project, planning information, and supports conducting additional analysis

Resource required

- Design authoring software
- Scheduling software
- 4D modelling software

Team competencies required

- Knowledge of construction programming and general construction process (a 4D model is connected to a programme and is therefore only as good as the programme to which it is linked)
- Ability to manipulate, navigate, and review a 3D model
- Knowledge of 4D software: import geometry, manage links to programmes, produce and control animations, etc.

Procurement considerations

- If design models are expected to be used for 4D modelling, define them in the design EIR – elements may need to be broken down and more closely aligned with planned construction methodology to enable accurate visualisation

SPATIAL PROGRAMMING

Description

A process in which a spatial programme is used to assess design performance accurately in regard to the spatial requirements outlined by the client. The developed BIM allows the project team to analyse space and understand the complexity of space standards and regulations. Critical decisions are made in this phase of design and bring the most value to the project when needs and options are discussed with the client and the best approach is analysed.

Potential Value

- Efficient and accurate assessments of design performance with regard to spatial requirements by the owner

Resource required

- Design authoring software

Team competencies required

- Ability to manipulate, navigate, and review a 3D model

SITE ANALYSIS

Description

A process in which BIM/GIS tools are used to evaluate properties in a given area to determine the optimal site location for a future project. Collected site data is used to first select the site and then position the building, based on other criteria.

Potential Value

- Uses calculated decision-making to determine if potential sites meet criteria according to project requirements, and technical and financial factors
- Decreases costs of utility demand and demolition
- Increases energy efficiency
- Minimises risk of hazardous material
- Maximises return on investment

Resource required

- GIS software
- Design authoring software

Team competencies required

- Ability to manipulate, navigate, and review a 3D model
- Knowledge and understanding of local authority's system (GIS, database information)

DESIGN REVIEW

Description

A process in which stakeholders view a 3D model and provide their feedback to validate multiple design aspects. It includes evaluating the meeting programme, previewing space aesthetics and layout in a virtual environment, and setting criteria such as layout, sightlines, lighting, security, ergonomics, acoustics, textures, and colours.

This BIM use can be undertaken with computer software only, or with special virtual mock-up facilities. Virtual mock-ups can be performed at various levels of detail depending on project needs. One example is the creation of a highly detailed model of a small portion of a building, such as a façade, to analyse quickly design alternatives and solve design and constructability issues.

Potential Value

- Easily communicates design to the owner, construction team, and end users
- Delivers instant feedback on meeting programme requirements, owner needs, and building or space aesthetics
- Greatly increases coordination and communication between parties, which is more likely to generate better decisions for design
- Eliminates costly and time-consuming traditional construction mock-ups
- Different design options and alternatives may be easily modelled and changed in real time during design review, based on end user and/or owner feedback
- Creates shorter and more efficient design and design review processes
- Evaluates the effectiveness of design in meeting building programme criteria and owner needs
- Enhances the health, safety, and welfare performance of projects (for instance, BIM can be used to analyse and compare fire-rated egress enclosures, automatic sprinkler system designs, and alternative stair layouts. BIM can also be used to identify and capture safety issues (in design-related information)

Resource required

- Design review software
- Interactive review space
- Hardware that is capable of processing potential large model files

Team competencies required

- Ability to manipulate, navigate, and review a 3D model
- Ability to model photos realistically, including textures, colours, and finishes
- Strong sense of coordination, including understanding roles and responsibilities of team members
- Strong understanding of how building/facility systems integrate

Procurement considerations

- Define in the EIR the expected minimum number of design reviews required
- Define in the EIR whether design reviews will be with the 3D model or a more immersive technology, such as virtual reality

DESIGN AUTHORING

Description

A process in which design authoring and audit and analysis software is used to develop a building information model based on criteria important to a building's design or outlined in the MEA schedule.

Design authoring tools are a first step towards BIM and connect the 3D model to a powerful database of properties, quantities, methodologies, costs, and schedules.

Potential Value

- Transparent design for all stakeholders
- Better control of design, cost, and schedule
- Powerful design visualisation
- True collaboration between project stakeholders and BIM users
- Improved quality control and assurance

Resource required

- Design authoring software and/or design analysis software

Team competencies required

- Ability to create and develop a BIM model
- Knowledge of construction methodology
- Design and construction experience

Procurement considerations

- Define in the MEA the expected LOD required for project elements at each stage, and who will deliver them

ENGINEERING ANALYSIS (LIGHTING, ENERGY, MECHANICAL, OTHER)

Description

A process in which analysis software uses BIM to assess the performance of various system options to determine the most effective engineering solution based on owner performance requirements or design codes. Modelled performance data is first compared to physical commissioning results, providing the basis of material passed on to the owner and/or operator for building systems monitoring, or use in the building's operation (energy analysis, emergency evacuation planning, etc.). These analysis tools and performance simulations can significantly improve the design of the facility and its energy consumption during its lifecycle.

Potential Value

- Saves time and cost by automating analysis
- Saves time and cost in developing separate analysis models
- Improves the quality and reduces the cycle time of the design analysis
- Improves the commissioning of systems
- Delivers optimum energy-efficient design solution by applying various rigorous analyses
- Improves specialised expertise and services offered by the design firm
- Enables more efficient building operations by applying post-occupancy audit and analysis tools to engineering systems' analysis

Resource required

- Design authoring tools
- Engineering analysis tools and software

Team competencies required

- Ability to manipulate, navigate, and review a 3D model
- Ability to assess a model through analysis tools
- Knowledge of construction means and methods
- Design and construction experience

STRUCTURAL ANALYSIS

Description

A process in which analytical modelling software uses the BIM design authoring model to determine the behaviour of a given structural system. Minimum required standards for structural design and analysis are used for optimisation. Based on this analysis, further development and refinement of the structural design takes place to create effective, efficient, and constructible structural systems. The development of this information is the basis for what will be passed on to the digital fabrication and construction system design phases.

This BIM use does not need to be implemented from the beginning of the design to be beneficial. Often, structural analysis is implemented at the connection design level to make fabrication more efficient and for better coordination during construction. This ties into construction system design. Examples include, but are not limited to, erection design, construction methodology, and staging. The application of this analysis tool allows for performance simulations that can significantly improve the design, performance, and safety of the facility in its lifecycle.

Potential Value

- Saves the time and costs of creating extra models
- Improves specialised expertise and services offered by design firms
- Delivers optimum efficient design solutions by applying various rigorous analyses
- Improves the quality and accuracy of the design analysis
- Reduces the iteration time of the design analysis

Resource required

- Design authoring tools
- Structural engineering analysis and design tools and software

Team competencies required

- Ability to create, manipulate, navigate, and review a 3D structural model
- Ability to assess a model through engineering analysis tools
- Knowledge of constructability methods
- Knowledge of analytical modelling techniques
- Knowledge of structural behaviour and design
- Design experience
- Integration expertise pertaining to building systems as a whole
- Experience in structural sequencing methods

FACILITY ENERGY ANALYSIS

Description

The BIM use of facility energy analysis is a process in the facility design phase, where one or more building energy simulation programmes use a properly adjusted BIM model to conduct energy assessments for the current building design. The core goal of this BIM use is to inspect building energy standards' compatibility and seek opportunities to optimise a proposed design to reduce a structure's lifecycle costs.

Potential Value

- Saves time and costs through obtaining building and system information automatically from BIM model instead of inputting data manually
- Improves building energy prediction accuracy by precisely determining building information, such as geometries and volumes
- Helps with Green Star assessments and building energy code verification
- Optimises building design for better building performance efficiency, and reduces building lifecycle costs

Resource required

- Building energy simulation and analysis software
- Detailed local weather data
- National/Local building energy standards

Team competencies required

- Knowledge of basic building energy systems
- Knowledge of compatible building energy standards
- Knowledge and experience of building system design
- Ability to manipulate, navigate, and review a 3D model
- Ability to assess a model through engineering analysis tools

SUSTAINABILITY

Description

A process in which a BIM project is evaluated based on NZGBC Green Star, NABERSNZ, or other sustainable criteria. BIM enables more sustainable practices to be adopted at all stages of a facility's life, including planning, design, construction, and operation.

The use of BIM technologies facilitates sustainable design techniques through the capture and incorporation of key data into the decision-making process, thereby enabling comparisons of the sustainability profiles of different building/system designs. It also enables complex energy and material usage analysis, facilitates efficient coordination of supply chains, and reduces the need for rework and subsequent wastage. Applying sustainable features to a project in the planning and early design phases is more effective (ability to impact design) and efficient (in the cost and scheduling of decisions).

This comprehensive process creates an integrated building design philosophy that aims to include all team players from the very beginning of the project, to capture valuable insights. It may require contractual integration in the planning phase. In aiding the achievement of sustainability goals, seeking NZGBC certification requires the submission of certain calculations, documentation, and verification. Energy simulation, calculation, and documentation can be performed within an integrative environment when responsibilities are well defined and clearly shared.

Potential Value

- Facilitates the interaction, collaboration, and coordination of team members early in the project process
- Enables early and reliable evaluations of design alternatives
- Enables early availability of critical information, which helps with efficient problem resolution in terms of cost premiums and schedule conflicts
- Shortens the design process by facilitating early design decisions, resulting in cost and time savings
- Better project quality
- Reduces documentation loads after design and accelerates certification when concurrently prepared calculations are used for verification
- Reduces operational costs of a facility through improved energy management resulting from optimised building performance
- Increases the emphasis on environmentally friendly and sustainable design
- Assists project teams with potential future revisions throughout a facility's lifecycle

Resource required

- Design authoring software

Team competencies required

- Ability to create and review a 3D model
- Knowledge of up-to-date NZGBC Green Star/NABERSNZ credit information
- Ability to organise and manage the database

CODE VALIDATION

Description

A process in which code validation software is used to check model parameters against project-specific codes. Code validation is in its infancy, but should become more prevalent in the design industry in future.

Potential Value

- Ensures building design complies with specific codes
- Code validation in early stages of design reduces the chances of code design errors, omissions, or oversights that require time and money to correct later
- Code validation is done while design progresses, giving continuous feedback on code compliance
- Reduces turnaround times for 3D BIM reviews by local code officials, or reduces time that needs to be spent meeting council inspectors, visiting the site, etc., or fixing code violations during defect or closeout phases
- Saves time spent on multiple checking for code compliance and allows for a more efficient design process. Mistakes cost time and money

Resource required

- Local (or central) authority with resources (people and systems) to accept, review, and manage the approval of consent applications
- Local code knowledge
- Model checking software
- 3D model manipulation

Team competencies required

- Ability to use BIM authoring tool for design, and model checking tool for design review
- Ability to use code validation software and previous knowledge and experience with checking codes

3D COORDINATION

Description

A process used throughout the coordination process to determine conflicts of geometry within the BIM model that would result in problems on site. This process can be supported by using clash avoidance/ detection software, which will automate the process of checking for conflicts, or through manual visual reviews of federated models. The goal of 3D coordination is to eliminate any major system conflicts and improve buildability prior to installation.

Potential Value

- Coordinates building project through a model
- Reduces and eliminates on-site conflicts, which reduces RFIs significantly when compared to other methods
- Visualises construction
- Increases productivity
- Reduces construction costs through potentially fewer variations
- Reduces rework on site
- Decreases construction time
- Increases productivity on site
- More accurate As-Built drawings

Resource required

- Design authoring software
- Model review application
- Clash detection software

Team competencies required

- Ability to deal with people and project challenges
- Ability to manipulate, navigate, and review a 3D model
- Ability to run clash-detection software
- Knowledge of BIM model applications for facility updates
- Knowledge of building systems

Procurement considerations

- Define in the EIR the minimum number of formal 3D coordination reviews
- Define in the EIR the responsible party (i.e., the lead consultant, the architect, a third-party)
- Define in the EIR expected workflows or processes (if applicable)

SITE UTILISATION

Description

A process in which BIM is used to graphically represent both permanent and temporary facilities on site during multiple phases of the construction process. It may also be linked with construction programmes to convey space and sequencing requirements. Additional information incorporated in the model can include labour resources, materials with associated deliveries, and equipment locations. Because the 3D model components can be directly linked to the programmes, site-management functions, such as visualised planning, short-term re-planning, and resource analysis can be analysed over different spatial and temporal data.

Potential Value

- Efficiently generates site usage layouts for temporary facilities, assembly areas, and material deliveries for all phases of construction
- Quickly identifies potential and critical space and time conflicts
- Accurately evaluates site layouts for safety concerns
- Selects feasible construction schemes
- Effectively communicates construction sequences and layouts to all interested parties
- Easily updates site organisation and space usage as construction progresses
- Minimises the amount of time spent in site-utilisation planning

Resource required

- Design authoring software
- Scheduling software
- Model integration software
- Detailed existing conditions site plan

Team competencies required

- Ability to create, manipulate, navigate and review 3D models
- Ability to manipulate and assess construction programmes with 3D models
- Ability to understand typical construction methods
- Ability to translate site knowledge to technological processes

CONSTRUCTION SYSTEM DESIGN (VIRTUAL MOCKUP)

Description

A process in which 3D system design software is used to design and analyse the construction of a complex building system (e.g. form work, glazing, tie-backs) in order to improve planning and buildability. Note the use of the model can add construction system design opportunities during ECI, therefore this can occur during the design phase of the project.

Potential Value

- Increases constructability of complex building systems
- Increases construction productivity
- Communicates understanding of complex construction sequences
- Decreases language barriers
- Increases safety awareness of a complex building system

Resource required

- Design authoring software

Team competencies required

- Ability to manipulate, navigate, and review a 3D model
- Ability to make appropriate construction decisions using 3D system design software
- Knowledge of typical and appropriate construction practices for each component

DIGITAL FABRICATION

Description

A process using digitised information to facilitate the fabrication of construction materials or assemblies. Uses of digital fabrication can be seen in sheet metal fabrication, structural steel fabrication, pipe cutting, prototyping for design intent reviews, etc. The process helps ensure the downstream phase of manufacturing is clear and there is sufficient information to fabricate with minimal waste. An information model could also be used to assemble fabricated parts into the final assembly.

Potential Value

- Saves time and cost of creating extra models
- Ensures quality of information
- Minimises tolerances through machine fabrication
- Increases fabrication productivity and safety
- Reduces lead times
- Reduces dependency on 2D paper drawings

Resource required

- Design authoring software
- Machine readable data for fabrication
- Fabrication methods

Team competencies required

- Ability to understand and create fabrication models
- Ability to manipulate, navigate, and review a 3D model
- Ability to extract digital information for fabrication from 3D models
- Ability to manufacture building components using digital information
- Ability to understand typical fabrication methods

3D CONTROL AND PLANNING (DIGITAL LAYOUT)

Description

A process the uses an information model to lay out facility assemblies or automate control of equipment movement and location. The information model is used to create detailed control points to aid in assembly layout. One example is the layout of walls using a total station with points preloaded and/or using GPS coordinates to determine if proper excavation depth is reached.

Potential Value

- Decreases layout errors by linking model with real-world coordinates
- Increases efficiency and productivity by decreasing time spent surveying in the field
- Reduces rework because control points are received directly from the model
- Decreases/Eliminates language barriers

Resource required

- Machinery with GPS capabilities
- Digital layout equipment
- Model transition software (software that takes a model and converts it to usable information)

Team competencies required

- Ability to create, manipulate, navigate, and review a 3D model
- Ability to interpret if model data is appropriate for layout and equipment control

Procurement considerations

- If the contractor is required to use design models for digital layout, include requirements in the design BIM Execution Plan.

RECORD MODELLING

Description

Record modelling is the process used to depict an accurate digital representation of the physical conditions, environment, and assets of a facility.

The record model should, as a minimum, contain information relating to the main architectural, structural, and MEP elements. It has the potential to represent the culmination of all BIM throughout a project, including linking operation, maintenance, and asset data to the As-Built model (created from the design, construction, 3D coordination models, and subcontractor fabrication models) to deliver a record model to the owner or facility manager. Further, field verification of installed elements can add an extra layer of surety that the digital representation is a true reflection of what has been built. Additional information, including equipment and space planning systems, might be necessary if the owner intends to use the information in the future.

Potential Value

- Aids in future modelling and 3D design coordination for renovation
- Improves documentation of environment for future uses, e.g. renovation or historical documentation
- Aids in the consenting process (e.g. continuous change vs. specified code)
- Minimises facility handover disputes (e.g. links to contracts with historical data highlights expectations and comparisons drawn to final product)
- Opportunities to embed future data based on renovation or equipment replacement
- Provides owner with accurate model of building, equipment, and spaces within a building to create possible synergies with other BIM uses
- Minimises building handover information and required storage space for this information
- Better accommodates the owner's needs to help foster a strong relationship and promote repeat business
- Easily assesses client requirement data, such as room areas and environmental performance, to as-designed, As-Built, or as-performing data

Resource required

- 3D model manipulation tools
- Compliant model authoring tools to accommodate required deliverables
- Access to essential information in electronic format
- Database of assets and equipment with metadata (based on owner capabilities)

Team competencies required

- Ability to manipulate, navigate, and review a 3D model
- Ability to use BIM application for building updates
- Ability to thoroughly understand facility operations processes to ensure correct input of information
- Ability to effectively communicate between the design, construction, and facilities' management teams

Procurement considerations

- Define in the EIR expected tolerances for As-Built model information (e.g. the tolerance for a light switch could differ from the tolerance of a chiller)
- Define the responsible party for the provision of As-Built information in the EIR
- Define in a MEA the expected level of development for As-Built information (e.g. an element could be developed to LOD 200 but modelled in its As-built location)

ASSET MANAGEMENT

Description

A process in which an organisation's asset management system is bi-directionally linked to a record model, or data within a record model is imported into the asset management system to aid in the maintenance and operation of a facility and its assets. These assets, consisting of the physical building, systems, surrounding environment, and equipment, must be maintained, upgraded, and operated at levels of efficiency and cost-effectiveness that satisfy both owners and users. Asset management assists financial decision-making, short-term and long-term planning, and generating scheduled work orders.

Asset management uses data contained in a record model to populate an asset management system, which is then used to determine the cost implications of changing or upgrading building assets. The bi-directional link also allows users to visualise the asset in the model before servicing it, potentially reducing service time.

Potential Value

- Stores operations, maintenance owner user manuals, and equipment specifications for fast access
- Performs and analyses facility and equipment condition assessments
- Increases the opportunity for measurement, tuning, and verification of systems during building occupation (optimises building efficiency)
- Maintains up-to-date facility and equipment data, including but not limited to maintenance schedules, warranties, data on costs, upgrades, replacements and damage/deterioration, maintenance records, manufacturers' data, and equipment functionality records
- Provides one comprehensive source for tracking the use, performance, and maintenance of a building's assets for the owner, maintenance team, and financial department
- Produces accurate quantity take-offs of current company assets to support financial reporting, bidding, and estimating the future cost implications of upgrades or replacements of particular assets
- Allows for future updates of record model to show current building asset information after upgrades, replacements, or maintenance by tracking changes and importing new information to model
- Aids financial department to analyse efficiently different types of assets through an increased level of visualisation
- Automatically generates scheduled work orders for maintenance staff

Resource required

- Asset management system
- Ability to bi-directionally link facilities record model and asset management system

Team competencies required

- Ability to manipulate, navigate, and review a 3D model (preferred but not required)
- Ability to manipulate an asset management system
- Knowledge of construction and the operation of a building (replacements, upgrades, etc.)
- Pre-design knowledge of which assets are worth tracking, whether a building is dynamic or static, and the end needs of the building to satisfy the owner
- Knowledge of related financial software

Procurement considerations

- Define the asset information requirements in the EIR
- Define in the EIR the party responsible for delivering asset information (e.g. certain information should come from the designer, while other information is best delivered by the contractor)
- Define in the EIR when the asset information is to be delivered (e.g. certain information may be available during design; other information may be delivered as construction progresses)

BUILDING (PREVENTATIVE) MAINTENANCE SCHEDULING

Description

A process in which the functionality of a building structure (walls, floors, roof, etc.) and equipment serving the building (mechanical, electrical, plumbing, etc.) are maintained over the operational life of a facility. A successful maintenance programme will improve building performance and reduce repairs and overall maintenance costs.

Potential Value

- Tracks maintenance history
- Reduces corrective maintenance and emergency maintenance
- Increases the productivity of maintenance staff because the physical location of equipment/the system is clearly understood
- Evaluates different maintenance approaches based on cost
- Allows facility managers to justify the need and costs of establishing a reliability centred maintenance programme

Resource required

- Design review software to view record model and components
- Building management system (BMS) linked to record model
- Computerised maintenance management system (CMMS) linked to record model

Team competencies required

- Ability to understand and manipulate CMMS and building control systems with record model
- Ability to understand typical equipment operation and maintenance practices
- Ability to manipulate, navigate, and review a 3D model

BUILDING SYSTEM ANALYSIS

Description

A process that measures how a building's performance compares to the specified design. It includes how the mechanical system operates and how much energy a building uses. Other aspects of this analysis include, but are not limited to, ventilated facade studies, lighting analysis, internal and external CFD airflow, and solar analysis.

Potential Value

- Ensures buildings are operating to specified design and sustainable standards
- Identifies opportunities to modify system operations to improve performance
- Creates what-if scenarios and changes materials throughout the building to show better or worse performance conditions

Resource required

- Building systems analysis software (energy, lighting, mechanical, other)

Team competencies required

- Ability to understand and manipulate CMMS and building control systems with record models
- Ability to understand typical equipment operation and maintenance practices
- Ability to manipulate, navigate, and review a 3D model

SPACE MANAGEMENT AND TRACKING

Description

A process in which BIM is used to effectively distribute, manage, and track appropriate spaces and related resources within a facility. A facility building information model allows the facilities management team to analyse the existing use of the space and effectively apply transition planning management to any applicable changes. Such applications are particularly useful during a project's renovation when building areas are to remain occupied. Space management and tracking ensure the appropriate allocation of spatial resources throughout the life of the facility. This BIM use benefits from the utilisation of the record model. This application often requires integration with spatial tracking software.

Potential Value

- More easily identifies and allocates space for appropriate building use
- Increases the efficiency of transition planning and management
- Tracks the use of current spaces and resources
- Assists in planning future space needs for a facility

Resource required

- Bi-directional 3D model manipulation; software and record model integration
- Space mapping and management input application (Mapguide, Maximo, etc.)

Team competencies required

- Ability to manipulate, navigate, and review record model
- Ability to assess current space and assets, and manage future needs
- Knowledge of facilities management applications
- Ability to integrate the record model effectively with facilities management applications and appropriate software associated with the client's needs

DISASTER PLANNING

Description

A process in which emergency responders access critical building information in the form of a model and information system. The BIM model provides critical building information to the responders that improves response and minimises safety risks. The dynamic building information is provided by a Building Management System (BMS), while the static building information, such as floor plans and equipment schematics, resides in the BIM model. These two systems are integrated via a wireless connection; emergency responders are linked to an overall system. The BIM model coupled with the BMS can clearly display where an emergency is located within a building, possible routes to the area, and other harmful locations within the building.

Potential Value

- Provides police, fire, public safety officials, and other emergency services with real-time access to critical building information
- Improves the effectiveness of emergency responses
- Minimises risks to responders

Resource required

- Design review software to view record model and components
- Building Automation System (BAS) linked to record model
- Computerised Maintenance Management System (CMMS) linked to record model

Team competencies required

- Ability to manipulate, navigate, and review a BIM model for facility updates
- Ability to understand dynamic building information through BMS
- Ability to make appropriate decisions during an emergency

NOVEMBER 2023

The New Zealand BIM handbook.

This document is one of a suite of documents forming the New Zealand BIM Handbook. You can download or view the remaining documents here: http://www.biminnz.co.nz/nz-bim-handbook