CONSTRUCTION
INDUSTRY COUNCIL
建造業議會

CIC Building Information Modelling Standards (Phase One)

September 2015

Disclaimer

Whilst reasonable efforts have been made to ensure the accuracy of the information contained in this publication, the CIC nevertheless would encourage readers to seek appropriate independent advice from their professional advisers where possible and readers should not treat or rely on this publication as a substitute for such professional advice for taking any relevant actions.

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Foreword

In 2014, the Construction Industry Council (CIC), in collaboration with around 20 stakeholder organisations of the construction industry, published a report named "Roadmap for the Strategic Implementation of Building Information Modelling (BIM) in Hong Kong's Construction Industry" (hereinafter referred to as the "BIM Roadmap") with an aim to establish a blueprint for the promotion and adoption of BIM in Hong Kong's Construction Industry.

The BIM Roadmap suggested seventeen initiatives in nine areas with three imminent actions. Establishment of a local BIM standards is one of the recommended imminent actions aiming to set out a common platform and language for Hong Kong's BIM practitioners.

The CIC's BIM Standards will be implemented in stages. The scope of this Phase One Standards is as follows:-

a. How to prepare an architectural model from concept, feasibility and planning stage to as-built stage;

b. How to prepare a structural model from concept, feasibility and planning stage to as-built stage;

c. How to prepare a mechanical, electrical and plumbing (MEP) model from concept, feasibility and planning stage to preliminary and scheme design stage.

The Phase One Standards is intended to be simple and straightforward such that it can be easily mastered by layman and new BIM practitioners. Upon receiving feedback from the practitioners subsequent to the issuance of this Phase One Standards, we will review the necessity for preparing further phase(s) of the standards.

This Standards was prepared with reference to current BIM standards of the Hong Kong Housing Authority (HKHA), MTR Corporation Limited (MTRC) and Hong Kong Institute of Building Information Modelling (HKIBIM). The Standards was also prepared with reference to the local practice whilst trying to bridge regional and international standards.

On behalf of the CIC, I would like to thank everyone who has contributed to the making of this Standards, in particular to the members of the Task Group on Establishment of Industry Standard.

Ada FUNG

Chairperson

Working Group on Roadmap for BIM Implementation

Construction Industry Council

Definition of Abbreviation

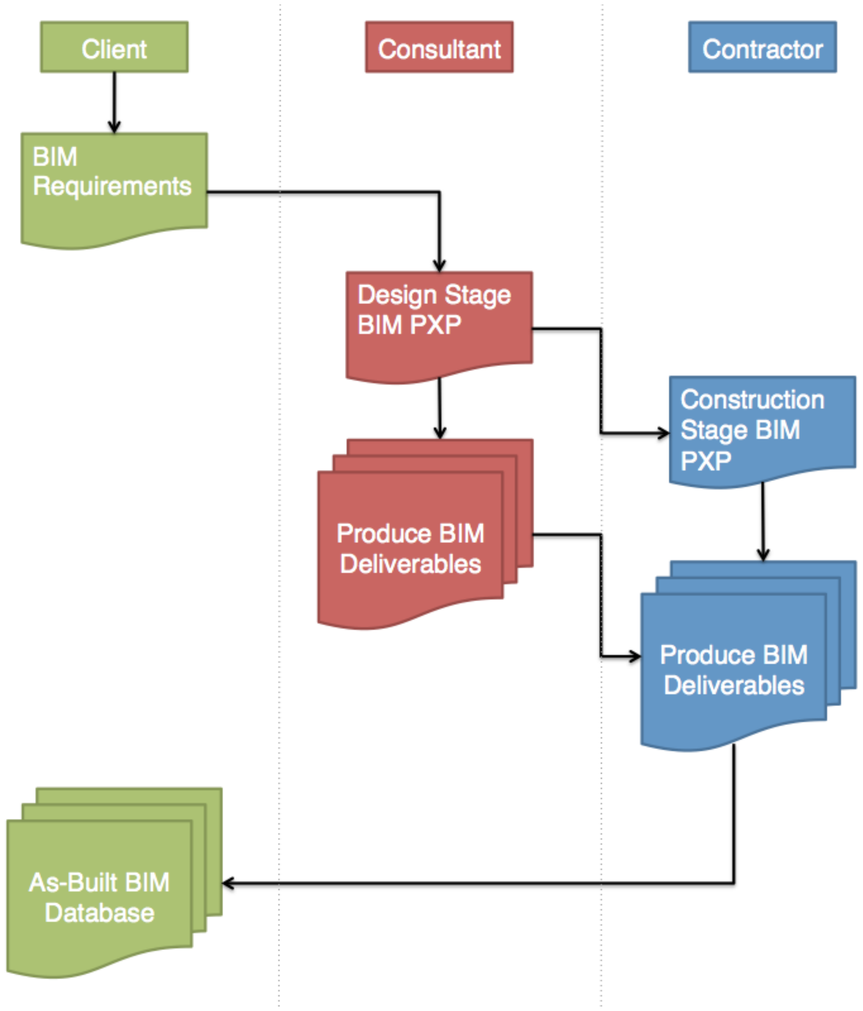
Abbreviations	Definition
BD	Buildings Department
BIM	Building Information Modelling
CAD	Computer Aided Drafting
CIC	Construction Industry Council, Hong Kong
CICBIMS	Construction Industry Council Building Information Model Standards
HA	Housing Authority
HKIBIM	Hong Kong Institute for Building Information Modelling
IFC	Industry Foundation Class
LOD	Level of Development
MEP	Mechanical Electrical Plumbing
MTR	MTR Corporation Limited
PXP	Project Execution Plan
RFP	Request for Proposal

The CIC BIMS requirements are expressed in sentences in which the principal auxiliary verb is "shall". Recommendations are expressed in sentences in which the principal auxiliary verb is "should". The use of the auxiliary verb "can" indicates that something is technically possible and the auxiliary verb "may" indicates permission.

Introduction

The **CIC BIM Standards** (CICBIMS) are designed to enable a client to specify, manage and assess BIM deliverables by architects, engineers, surveyors and contractors. The use of the CIC BIM Standards should ensure that project deliverables produced using the BIM processes achieve an agreed level of **quality**.

The principle for the development of the CIC BIM Standards is that the planning, implementation, management and checking of the use of BIM on a project requires client direction, involvement and leadership along with design consultant and contractor collaboration.



Building Information Modelling is the process of generating and managing building data during its design, construction and during the building or assets life cycle. Typically, the process uses three-dimensional building modelling software to increase productivity of consultants and contractors during design and construction.

The process produces the **Building Information Model** database, which encompasses building geometry, spatial relationships, geographic information, and quantities and properties of building elements.

The CIC BIM Standards establish a process for adopting BIM on building and infrastructure projects. Clients, project managers, architects, engineers, surveyors, contractors, manufacturers and facility managers can reference this standard to understand their role and responsibilities on a project.

Every project, which adopts BIM, shall have a clearly defined outcome from the BIM process. The purpose of the BIM process should be set out and agreed by the client with the design consultants and contractor at the beginning of a project.

The successful delivery of the BIM process to meet the established targets then requires careful planning, detailed BIM specifications and a defined set of procedures and methodologies for the implementation of the BIM process.

The production of the models shall be carried out by architects, engineers, surveyors and contractors with different software applications and at different times during the phases of the project. The client should appoint a professional BIM Manager to lead and support the BIM process. The BIM Manager could be an architect, engineer, surveyor or contractor or an independent BIM professional with relevant practical construction knowledge and design coordination experience.

The CIC BIM Standards are intended to be used to define the scope of work for a BIM process, the responsibilities of the project participants and the deliverables from the BIM Process for the overall benefit of the project and the owner. The CIC BIM Standards are sub-divided into four inter-related sections;

i. Project Execution Plan (BIM PXP)
ii. Modelling Methodology
iii. Level of Development
iv. Component Presentation Style and Data Organisation

The use of Building Information Modelling is a relatively new and innovative approach to building design and construction. The CIC BIM Standards may be used as a **handbook** by clients, architects, engineers, surveyors and contractors as it contains information and advice on how to implement BIM on a project. Additional supplementary advice, information and guidance notes are provided in the appendices to the CIC BIM Standards (CICBIMS) documents.

1.0 Project Execution Planning

The implementation of a Building Information Model process on each project should be planned by the client at the beginning of a project life cycle. The client may use the CICBIMS (cl 1.1 and cl 1.4.2) to specify the BIM deliverables during the project and at the final handover of the project.

The client may assign the role of **BIM Manager** to one or more individuals to develop these requirements. If the client does not have experience of specifying or managing the use of BIM, they may develop the **BIM Project Execution Plan** with the **lead consultant*** during the concept stage of a project.

The BIM Project Execution Plan should outline the overall vision for the project and provide implementation details for the consultants and contractors to follow throughout the project. The BIM PXP will be created at the start of the project and updated throughout the project when design team members, contractors and sub-contractors are appointed. The BIM PXP document includes the agreed BIM deliverables and processes for a project.

The CICBIMS specifies the minimum information to be delivered and the standards and processes to be adopted by the lead consultant and contractor as part of the project delivery process.

The **client BIM requirements** may be specified in the scope of services for the lead consultant. The client requirements shall specify the deliverables for each of the project stages of inception stage, feasibility & planning stage, conceptual design, preliminary design, detailed design, submission to approving authority, construction and as-built.

The client requirements may be incorporated into the lead consultancy and main contract tender documentation, to enable the lead consultant and contractor to produce a draft BIM PXP so that their proposed approach, capability and capacity can be evaluated.

Note: The client requirements shall be consistent with other contract documents in use on the project, which in turn should be aligned with the local industry standards.

** The term “lead consultant” refers to the design consultant which is responsible for leading the design process. On building projects, the architect may fulfil this role and on infrastructure projects, the engineer may fulfil this role.*

1.1 Client Requirement Specification

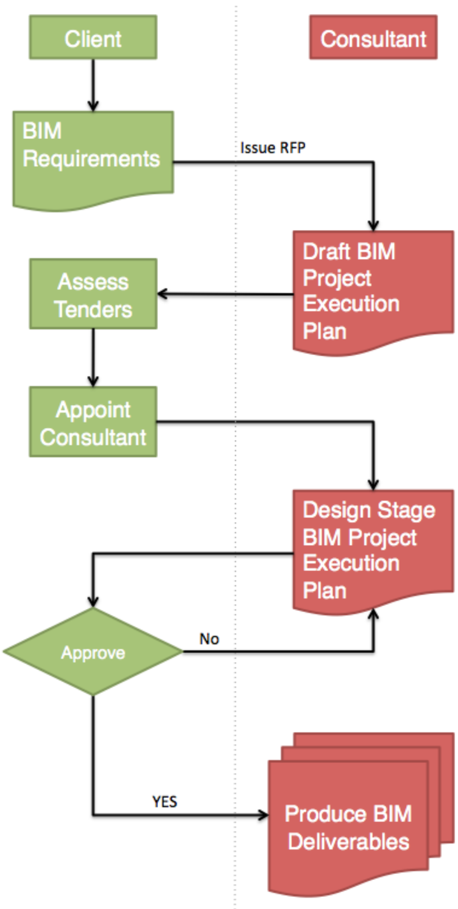
The client shall specify the project BIM requirements by providing or specifying the following minimum information to the lead consultant and main contractor:-

1. The clients strategic goals for implementing BIM;
2. The Level of development (LOD) and list of BIM deliverables expected for each defined project stage. Each deliverable shall consist of a set of Building Information Models. The models will be assembled from building or feature* elements which are a digital representation of the physical and functional characteristics of a building or feature component to be used in the project. Each element may consist of a set of geometric representations and non-geometric attributes or data, which can be increased in detail as the project progresses;
3. Responsibility matrix setting out each disciplines responsibilities for model creation, maintenance and collaboration in line with the defined project stages;
   The lead consultant and contractor shall provide details of their BIM Manager who will be responsible for the definition, implementation and management of the BIM Project Execution Plan. They may also provide details of their BIM Coordinators and Modellers.
4. Planning of work and data segregation (BIM uses and model breakdown)
   The lead consultant and contractor shall provide proposals for the management of the modelling process (e.g. model management, naming conventions, etc.) and an initial schedule for the deliverable dates;
5. Co-ordination and clash detection procedure
   The lead consultant and contractor shall provide proposals for the management of the co-ordination process and the resolution of clashes;
6. Collaboration and Model Exchange Process
   The lead consultant and contractor shall provide proposals for the management of the collaboration process, model exchanges and specify how they will share the models at each stage of the project;
7. Schedule of Information and data to be included in the BIM database;
8. Definition of the co-ordinates and origin system;
9. A schedule of any software formats, including version numbers, which shall be used to deliver the project.

** "feature" represents buildings, roads, infrastructure, terrain and other features.*

1.2 Design Stage BIM PXP

As part of the lead consultant selection process, the client shall request the tenderers for the design consultancy services to submit details of their approach to BIM Project Management with sufficient information to demonstrate the consultants proposed approach, capability, capacity and competence. The consultant may provide recommendations for additional resources and services which they consider may also be needed by the client.



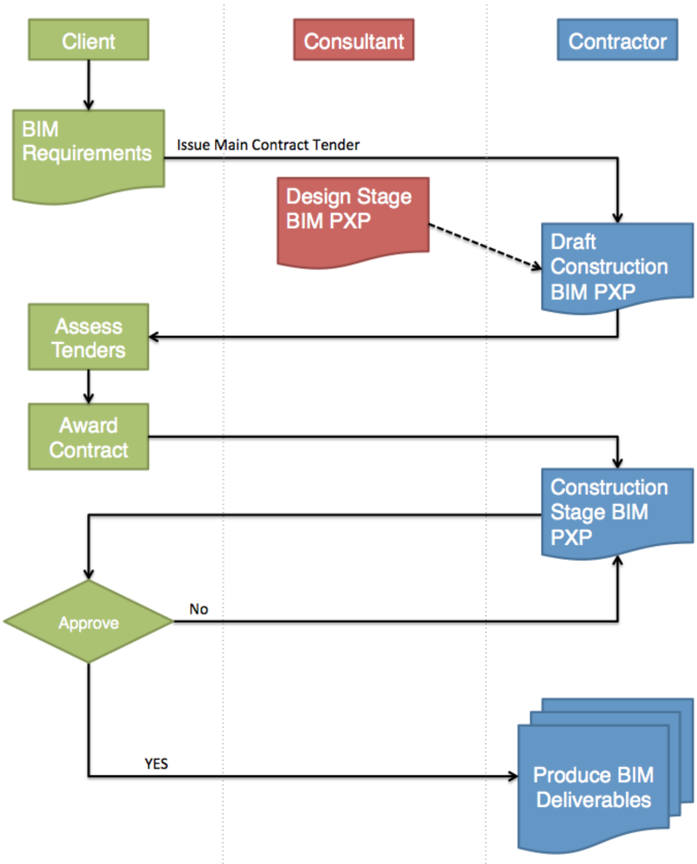
Upon appointment, the lead consultant **BIM Manager** shall prepare and submit a **Design Stage BIM Project Execution Plan** to the client for approval. This shall meet the client requirements for the conceptual design, preliminary design, detailed design and submission to approving authority stages of the project.

The lead consultant shall confirm that the architect, structural engineer and building services engineers have agreed and committed to the BIM PXP.

1.3 Tender Stage BIM PXP

As part of the contractor selection process, the client shall request the tenderers to submit details of their approach to BIM Project Management with sufficient information to demonstrate the contractors proposed approach, capability, capacity and competence. The contractor may provide recommendations for additional resources and services that may be needed by the client.

For the main contract tender, in addition to the clients BIM requirements, the lead consultant should provide the Design Stage BIM PXP to the tenderers for their review and consideration. The contractor shall update and amend the BIM PXP as needed for the purpose of producing the BIM deliverables for the project.



1.4 Construction Stage BIM PXP

Upon appointment, the contractors **BIM Manager** shall prepare and submit a **Construction Stage BIM Project Execution Plan** to the client for approval. This shall meet the client requirements for the construction and as-built stages. The contractor shall confirm that, when necessary, their selected and nominated sub-contractors have agreed and are committed to the BIM PXP.

The architects, engineers and surveyors will hand over their BIM databases, models and data to the Contractor upon approval of the Construction Stage BIM PXP.

The consultants and contractor shall agree a process for incorporating design changes and revisions in the models after the handover date. There are three methods which can be adopted:-

Option A

The BIM Databases are handed over to the contractor at an agreed date. Any design changes are documented on design drawings with changes highlighted by clouded areas. The contractor will update and revise the BIM database accordingly.

Option B

The BIM Databases are handed over in phases or areas to the contractor. Each phase or area shall be designed, coordinated and completed by the consultants before handover to the contractor.

Option C

The design consultants shall provide coordinators and modellers to work as part of the contractors BIM team. Under the supervision of the contractors BIM Manager, they will be entitled to make design changes and revisions to the BIM databases as needed.

1.5 BIM PXP Contents

The Building Information Model Project Execution Plan for the design stage (*cl 1.2*) and construction stage (*cl 1.3*) of a project shall contain the following details;

1.5.1 Project Information

The BIM PXP shall include the following details:-

- Project Name & Address;
- Project Number (Client Project Number or reference)
- Major Project Milestones (Design Start Date, Construction Start Date, Completion and Handover Date)
- Project Description

1.5.2 Client BIM Requirements

1.5.2.1 BIM Goals, Uses & Deliverables

The client shall specify which BIM uses and deliverables will be implemented on a project and the BIM PXP shall identify which consultant or contractor will be responsible for producing the required Building Information Models for each stage of the project.

The objectives and uses for BIM shall be defined at the start of the project as it will be difficult to implement additional functionality in the BIM models later.

The BIM Manager should consider the adoption of new BIM uses, processes and software tools that are developed from time to time which may not be listed below. The BIM Manager shall develop suitable implementation guidelines for new uses or alternative uses requested by a client.

Table of BIM Uses by Project Phases

	Concept Design, Inception Feasibility & Planning	Preliminary & Scheme Design	Detailed Design	Submission to Approving Authority	Tender Stage	Construction	As-built, Facilities Management, Operation
Design Authoring	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	
Design Reviews	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	
Existing Conditions Modelling	Y / N	Y / N	Y / N			Y / N	Y / N
Site Analysis	Y / N	Y / N	Y / N	Y / N			
3D Coordination			Y / N	Y / N	Y / N	Y / N	
Cost Estimation	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	
Engineering Analysis			Y / N	Y / N	Y / N	Y / N	
Facility Energy Analysis			Y / N		Y / N	Y / N	
Sustainability Evaluation	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	
Space Programming	Y / N	Y / N	Y / N	Y / N			
Phase Planning (4D Modelling)			Y / N	Y / N	Y / N	Y / N	
Digital Fabrication			Y / N		Y / N	Y / N	
Site Utilization Planning					Y / N	Y / N	
3D Control and Planning						Y / N	
As-Built Modelling						Y / N	Y / N
Project Systems Analysis						Y / N	Y / N
Maintenance Scheduling						Y / N	Y / N
Space Management and Tracking						Y / N	Y / N
Asset Management						Y / N	Y / N

Each of the BIM Uses in the table are defined below. The competencies and resources needed for each BIM Use are included in Appendix D.

Design Authoring

The process of using BIM software to create and develop a Building Information Model of a project which includes a database of properties, quantities, means and methods, costs and schedules. The architect, engineer, contractor and sub-contractor shall use the authoring tools to produce plan, elevation, section, detail, fabrication and shop drawings. The tools may also be used to produce schedules (room, door, window, finishes, etc). This applies to buildings, civil engineering and infrastructure projects and includes architecture, structure, building services and utilities.

Design Review

A process for stakeholders to view a model, images from the models or animated walk-throughs of a project, provide feedback and validate numerous design aspects such as meeting client requirements and previewing spaces and layouts in 3D. The reviewer can check layout, sightlines, lighting, security, disabled access and egress, way finding, ergonomics, acoustics, textures and colours, etc. The review can be done by using computer software only or with special virtual mock-up facilities, such as CAVE (Computer Assisted Virtual Environment) or immersive lab. Virtual mock-ups can be performed at various levels of detail depending on project needs.

Existing Conditions Modelling

The process of creating a 3D model of the existing site conditions. The model may be developed from laser scanning, photogrammetry, conventional survey methods and record drawings. For historic graded buildings, the author may include a heritage documentation and assessment.

Site Analysis

A process in which BIM and GIS tools are used to evaluate a site to determine the most optimal location, position and orientation for a future project. The analysis shall include master planning, sun and shadow studies, daylight analysis and solar envelope analysis.

3D Coordination

The process of using Clash Detection software tools to identify conflicts by analysing 3D models of the different building systems. The goal of the coordination process is to eliminate clashes before construction of the project. The 3D coordination process shall include checks for headroom requirements, working spaces for building operations and maintenance activities.

Cost Estimation

Accurate quantity take-offs may be extracted from models and used by quantity surveyors to develop cost estimates for a project. The quantity surveyor shall extract the data from the models provided by the architect and engineers.

Engineering Analysis

A process which uses the BIM model to analyse and assess different design options to determine the most effective engineering solution to meet design codes and client requirements.

For structural analysis, the analytical modelling software uses the model to determine the behaviour of a given structural system.

For lighting, energy, thermal, mechanical, acoustic, people movement analysis, the model can be used to predict the performance of a system which can then be compared to actual performance data such as commissioning results.

For civil engineering projects, the models could be analysed for hydraulic design of water supply, sewerage and storm water drainage systems.

Facility Energy Analysis

A process of using a building energy simulation programme with a model to conduct energy assessments of a project design to optimize the design to reduce life-cycle costs.

Sustainability Evaluation

A process in which a project model is evaluated based on HKBEAM, LEED or other sustainable criteria.

Space Programming

A process in which a spatial program is used to efficiently and accurately assess a design layout model in regard to client spatial requirements. The model may be analysed for compliance with building codes and regulations.

Phase Planning (4D Modelling)

A process of linking a programme to the model which is used to plan the phased occupancy in a renovation or to show the construction sequence and space requirements on a construction site.

Digital Fabrication

The use of models to facilitate the fabrication of construction materials or assemblies such as sheet metal fabrication, structural steel fabrication and pipe cutting. The models can also be used for prototyping with 3D printers as part of a design intent review process.

Site Utilization Planning

The model shall include permanent and temporary facilities on site for all of the phases of the construction process. The models shall be linked to the construction schedule (4D) to review space planning, site logistics, sequencing requirements, temporary works and safety.

3D Control and Planning (Digital Layout)

A process that utilizes a model to layout project elements such as the position of walls using a total station with survey points preassigned in the model. The process of automating the control of equipment's movement and location such as using GPS coordinates to determine if proper excavation depth is reached.

As-Built Modelling

The process of preparing an accurate record of the physical conditions and assets of a project. The As-Built model should contain information relating to the architectural, structural, civil and MEP elements with links to operation, maintenance, and asset data. Additional information and data for equipment and space planning may be included.

Project Systems Analysis

The process measures how a project performs compared to the design specifications. This may include assessing how a mechanical system operates, how much energy a project uses, conducting lighting analysis, solar gain analysis and airflow analysis using CFD.

Maintenance Scheduling

A process for planning and managing the maintenance of a project structure, building fabric and equipment during the operational life of a facility. The data required for facility management shall be collected during the construction stages and input into an As-Built Model.

Space Management and Tracking

The As-Built model can be used to assess, manage and track spaces and associated resources within a project. A BIM database may be integrated with spatial tracking software to analyse the existing use of space, apply transition planning for renovations and refurbishment projects.

Asset Management

The process of bi-directionally linking an As-Built Model database to an organised building management system which can be used to maintain and operate a facility and its assets. The assets may include buildings, infrastructure, systems and equipment which may be operated, maintained and upgraded. The process utilizes the data contained in an As-Built Model to populate an asset management system. The bi-directional link allows users to visualize an asset in the model before servicing it. The facility manager shall specify the data required for each element in the BIM PXP.

1.5.2.2 BIM Data

The data attributes required within each model should be specified as part of the Level of Development specification (*refer to section 3.2*). There are a number of international efforts which define and standardise the attributes for each BIM element. It is recommended that attributes of a BIM element be determined to meet their intended usage so as to avoid over specifying. References should be made to the BIM Forum "Level of Development (LOD) Specification" (BIMforum.org/lod/).

1.5.3 BIM Management

1.5.3.1 Roles, responsibilities and authority

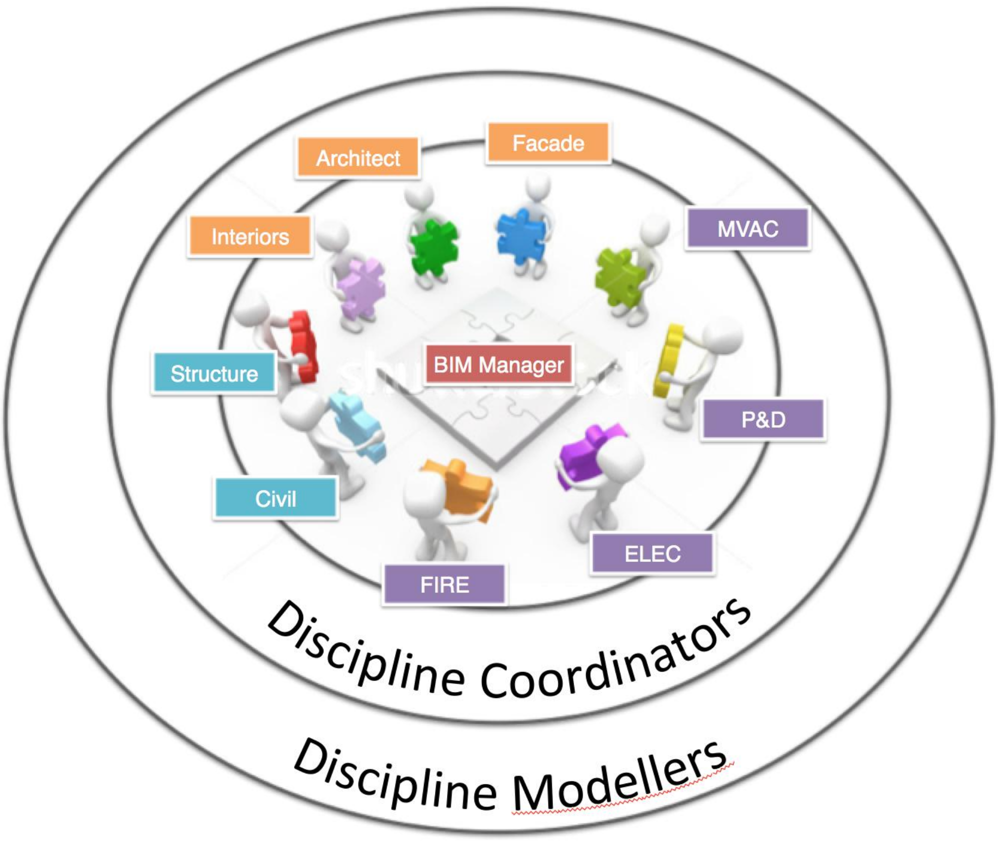
At the start of a project it is important to identify the roles and responsibilities of the consultant and contractor team members. A table shall be used to record the names and contact details of the individuals fulfilling the necessary project roles. The authorities for the different roles related to production and management of building information models shall be defined.

The following roles should be defined, agreed and maintained for each stage of a project. On smaller projects, one person may have multiple roles and responsibilities.

Role	Responsibility & Authority
Project Manager	Planning of overall project objectives, managing cost, time, scope and quality of all project deliverables.
Lead Consultant Design stage	Enforce spatial coordination between all design disciplines.
Contractor Construction stage	Manage spatial coordination between all sub-contractors.
BIM Manager	– Facilitate the development, implementation and management of the Project BIM PXP standards, processes, procedures; – Ensure delivery of the clients BIM requirements, goals and uses; – Be responsible for the BIM deliverables, delivery schedules, progress monitoring, quality control and BIM coordination; – Manage staffing resources and training; – Specify hardware, software and IT infrastructure.
Discipline Coordinator	– Manage a specific discipline model and ensure the discipline modellers produce compliant models, drawings, schedules and documents; – Define discipline-specific BIM uses including analysis; – Coordinate between designers, modellers and quantity surveyors; – Collaborate with consultants and contractors BIM Coordinators;

Role	Responsibility & Authority
	− Carry out quality control checks before sharing the models with other disciplines; − Track revisions, inclusions, changes or amendments; − Maintain a library of objects and elements for use on the project which are compatible with the selected software platforms; − Act as CAD Manager and enforce drawing standards.
Discipline Modeller	Create, maintain or amend models, drawings, schedules and documents to the LOD prescribed in the BIM PXP. List and track changes.
CAD Manager	Enforce drawing standards.

The BIM Manager and BIM Coordinator roles can be undertaken by existing members in the project team, such as project managers, architects, engineers, surveyors, contractors, etc.



Besides ensuring that the clients BIM objectives are achieved, the BIM Manager should also ensure that all parties work collaboratively to resolve conflicts in the most efficient way. The role of the BIM Manager does not include making decisions about design, engineering and construction solutions for the project, nor organisational processes for each discipline.

1.5.3.2 BIM Team Resources, Competency & Training

The staffing resources, skills, qualifications and training requirements should be planned and managed by the BIM Manager in collaboration with each of the discipline BIM coordinators, lead consultant and heads of department.

The requirements of the team members for carrying out their roles and responsibilities effectively should be recommended by the BIM Manager at the project commencement. This will depend on the size and complexity of each project.

1.5.3.3 BIM Deliverable Schedule (Programme)

For each project stage, the goals, objectives and deliverables for the BIM implementation shall be considered. The dates and durations for each stage should be defined. The deliverables shall be based on the BIM uses required by the client and meet the level of development needed for each stage.

Concept Design, Inception Feasibility & Planning	Preliminary & Scheme Design	Detailed Design	Submission to Approving Authority	Tender Stage	Construction	As-built, Facilities Managem ent

1.5.3.4 Approval of BIM Deliverables

To ensure that models, drawings and data schedules are adequately checked, some form of agreed approvals and quality control process should be in place to enable the design team, contractor and the client to approve and sign-off the development of the BIM for a project and to assign responsible team members.

The contractors construction stage BIM PXP, BIM deliverables and as-built BIM deliverable submission should be checked by the lead consultant before submission to the client.

1.5.4 BIM Process

1.5.4.1 Individual Discipline Modelling

For each project stage, a discipline modeller will create a model according to the agreed deliverables as stated in the BIM PXP. The model should be stored and worked on by the modelling team of each consultant or contractor. During the modelling process, the models may need to be checked and verified before they are issued to other consultants or contractors.

To ensure modelling quality, the modellers should follow a minimum standard of modelling requirements for each stage of the BIM project implementation. Each element should be modelled according to its size, shape, location, orientation and quantity. The modellers are expected to model all elements of the works in sufficient detail in order to illustrate that they have been properly sized, co-ordinated and documented to a degree where construction can proceed on site.

At the early stages of the project, element properties may be more generic and approximate. The properties and data should become more specific and increase in accuracy as the project progresses.

1.5.4.2 Revision Management

The model will evolve rapidly during the project stages. Changes should be tracked and documented, especially when the model creation task is divided into packages and handled by different consultants or contractors.

There are various software mechanisms to assist modellers to manage and monitor design changes. Discipline Modellers should work with their respective BIM software vendor to familiarise themselves with the use of these software mechanisms so that design changes can be managed more effectively. The BIM coordinator for each discipline should maintain a register to record the latest information incorporated in the model. They should work closely with the BIM Manager to coordinate the version of model shared or exchanged.

1.5.4.3 Collaboration and Model Sharing

The BIM PXP shall define how models will be exchanged and in what software formats. The BIM PXP should include procedures or methods for managing shared Models.

BIM Coordinators should share their models with the BIM team at regular intervals. The BIM Manager and BIM Coordinators should agree on a schedule for the sharing and exchange of models. A discipline model should be provided in native or neutral (such as IFC) format for other disciplines reference and use in relation to the project. It is recommended for the project team to map out a high level coordination flow, which shows the interactions between the client and project team members.

To ensure the life-cycle use of building information, information supporting common industry deliverables shall be provided in existing open standards, where available. For those contract deliverables whose open standard formats have not yet been finalised, the deliverable shall be provided in a mutually agreed format which allows the re-use of building information outside the context of the proprietary BIM software. The format could be any of the prevailing open standards, such as the Industry Foundation Class (IFC) standard. The formats used should be specified in the BIM Execution Plan.

Although a discipline BIM Coordinator should check the accuracy and quality of the model before sharing with other consultants or contractors, Coordinators and Modellers should use the model for reference only, and should also check, verify and otherwise confirm the accuracy of the model. Where inconsistency is found in the model, the recipient BIM Coordinator shall promptly notify the model issuer's BIM Coordinator for clarification.

BIM is a collaborative process. If one party has not named something correctly, not followed a modelling protocol or made other errors, there is an opportunity for members of other disciplines to highlight these and request they are corrected by the originator.

1.5.4.4 BIM Coordination and Clash Detection

At agreed milestones, models from different disciplines should be coordinated, allowing involved parties to resolve potential conflicts upfront and avoid costly abortive works and delays at the construction stage.

Prior to model coordination, the respective models should be checked, approved and validated as “fit for coordination”. The following steps shall be carried out to validate the BIM data to be used for coordination:-

- All drawing sheets and extraneous views should be removed from the model files;
- Each model file should be checked, purged and compressed;
- File format and naming conventions conform to project Data Exchange protocols;
- Data segregation conforms to the agreed methods in BIM Execution Plan;
- Model files are up-to-date, containing all users’ local modifications;
- Model is correctly assembled through visual inspection;
- Any changes since the last issue are communicated to the project team.

Successful BIM coordination requires careful planning and a clear understanding of different types of coordination process i.e. design coordination, clash detection or space validation. The “design coordination” processes resolves interferences between different disciplines. “Clash detection” is a BIM process where software tools are used to identify clashes between objects in the BIM files. “Space Validation” is a technique to check that headroom, operation clearances and delivery routes are reviewed in BIM.

In early coordination processes, entire models can be run against other models to determine the scope of interference, i.e. objects, elements and selection criteria, for future testing. However, it is important to recognise that not all conflicts detected are problems. Certain conflicts may have been intentional during the modelling process for the sake of simplifying the modelling process.

Proper element grouping and clash rules should be set up before running the respective coordination processes to :-

- reduce time and resources spent on detecting false positives;
- hide elements that are unnecessary in the coordination process, for example, known issues that are to be resolved in later project stages; elements that do not impact the cost when changed on site, etc;

- group particular elements for a specific type of coordination process, such as forming groups between the ceiling elements and a fire services model during a clash analysis.

The BIM PXP shall define which clash detection software will be used for the project. The clash analysis shall be performed on the federated model to check the coordination of the discipline models. The analysis should check for spatial allowances and detect interferences between different systems. The BIM Manager shall carry out the analysis.

Clash results need to be assessed in the context of the elements being analysed, and the type of clash detection software being used. For example, one issue that may occur are duplicate instances of the same co-ordination issue – for example, a pipe hitting steel could represent 20 clashes in a software analysis when in reality it is only a single coordination issue.

Responsibilities during the coordination process:-

- Each BIM Coordinator owns a discipline-specific model;
- During coordination, discipline models can be amended depending on the type of coordination needed;
- To resolve clash conflicts, each BIM Coordinator carries out agreed changes on their own discipline-specific model.

1.5.4.5 Drawing Production

The client shall specify when the consultants and contractors shall create and publish drawings such as plans, sections, elevations, details and schedules directly from the Building Information Models.

All of the drawing sheets produced by the Modellers shall comply with the current industry standards for 2D CAD drawings.

Drawings or documents which are not produced from the building information models should be clearly labelled as “2D CAD” or “NOT FROM BIM”

The BIM Manager, BIM Coordinators and CAD Managers should agree and document the common naming convention and drawing numbering systems for model views, legends, schedules and drawing sheets. The drawing naming and numbering system may vary for design drawings, authority submission drawings, tender drawings, working drawings and as-built drawings.

1.5.4.6 Model Archive

The BIM Manager shall maintain an archive of all of the Building Information Models, BIM output and deliverables including published, issued, superseded and as-built information.

For each project milestone, the BIM Manager shall create an archive record of the BIM database and deliverables and it should be stored for record. The archive may include all of the individual discipline BIM files, associated deliverables and a federated model in a format suitable for viewing. The archive shall not be editable or altered for any reason.

1.5.4.7 Quality Control

The BIM Manager should establish a quality assurance plan for the models, to ensure appropriate checks on information and data accuracy. The respective BIM coordinator of each discipline should also establish a quality control procedure to ensure that the discipline model is accurate and correct according to the modelling guidelines.

Each consultant and contractor shall be responsible for performing quality control checks of their design, dataset and model properties before submitting their deliverables.

The following should be considered when creating a quality assurance plan:-

- Modelling Guidelines - ensure that the model is created based on the modelling guidelines;
- Dataset Validation - ensure that the datasets are populated with correct data;
- Interference Check - detect clashes between building or feature components using clash detection software.

1.5.5 BIM Procedures

1.5.5.1 BIM Origin Point & Orientation

The origin or base point and orientation of the project shall be based on the project location and its reference to the Hong Kong 1980 Grid (HK1980 Grid) and Hong Kong Principal Datum (HKPD).

The HK1980 Grid is a local rectangular grid system based on the HK80 Datum and Transverse Mercator projection. It is used in cadastral, engineering surveying and large scale mapping in Hong Kong. In Hong Kong all heights and levels on land refer to the Principal Datum, which is formerly known as Ordnance Datum.

1.5.5.2 Model Division

The BIM Manager may consider dividing a project into separate parts, zones, volumes or levels. This may be necessary for large, complex or phased projects and will depend on the size of the project. The BIM Manager should agree and document the project zones as early as possible. The zones shall be defined by coordinates within an overall project model. Each zone should be modelled separately. This may enable multiple users to work on the project efficiently.

Zones should be allocated using cut lines to indicate their limits. For building projects, zone boundaries could be structural joints or grid lines. For road projects they could be sub-divided by chainage distances.

Each discipline coordinator shall ensure that the BIM elements are aligned and reviewed across the model division interfaces to ensure continuity of the systems between the model divisions.

1.5.5.3 Model Units

All of the BIM elements shall be modelled in consistent units, for example in millimetres (mm) for buildings or in metres (m) for infrastructure projects.

All projects in Hong Kong use metric units of measurement. Imperial units shall be shown in brackets where needed.

1.5.5.4 File Naming Convention

The models, component libraries, elements and drawing file names should follow a consistent file naming convention. The client may specify a file naming convention or the lead consultant shall recommend a suitable naming convention for the project.

A file naming convention similar to the existing Works Departments CAD standard convention may be adopted. The file names may be of the form “AGENT-PROJECT-ZONE-ID-STATUS”.

Definition	Code Format	Details
AGENT	3 alphanumeric	the list of agent responsible codes can be downloaded from the Development Bureau web site at www.devb-wb.gov.hk/cswp
PROJECT	1 to 8 alphanumeric	User definable project reference coding.
ZONE	3 alphanumeric	Required if project is subdivided by zones or levels
ID	2 alphabetic	Indicates the discipline. For list of ID’s refer to table below.
STATUS	1 alphabetic	A = as-built E = existing, to remain M = maintenance or record N = New work R = Remove T = Temporary Work W = All Work

Example = CIC-BIMS2014-POD-AR-W

As an alternative, the naming of model files may be based on BS1192:2007. The file names may be of the form and any of the fields may be omitted.

PROJECT-AUTHOR-ZONE-LEVEL-TYPE-ROLE-DESCRIPTION

Definition	Code Format	Details
PROJECT	1 to 8 alphanumeric	User definable project reference coding.
AUTHOR	3 alphanumeric	Can use the list of agent responsible codes which can be downloaded from the Development Bureau web site
ZONE	2 alphanumeric	Identifier of which building, area, phase or zone of the project the file relates to if the project is sub-divided by zones. For infrastructure (linear) the zone may be replaced by a location defined as a chainage and offset.
LEVEL	2 alphanumeric	Identifier of which level, or group of levels, the model file relates to if the project is sub-divided by levels.
TYPE	2 alphanumeric	Document type, which will be M3 for 3D model files or QT for quantity take off.
ROLE	2 alphabetic	Indicates the discipline. For list of ID's refer to table below.
DESCRIPTION	1 to 8 alphanumeric	Descriptive field to define the type of data portrayed in the file. Avoid repeating information codified in other fields. Can be used to describe any part of the previous fields, or to further clarify any other aspect of the contained data.

Example = BIMS2014-CIC-ZN-L3-M3-AR-FILENAME

The file naming shall not include a revision status. Revisions shall be tracked using data added to the models or by the BIM Coordinator in a change management register.

The ID or ROLE field in the above naming conventions shall be taken from the table below:-

ID	Discipline
AR	Architect
BS	Building Surveyor
CL	Client
CN	Contractor
CV	Civil Engineer
DR	Drainage Engineer
EE or EL	Electrical Engineer
FM	Facilities Manager
FS	Fire Services Engineer
GE	Geotechnical Engineer
GS	Geographical Information System Engineers or land surveyors
HY	Highways Engineer
IN	Interior Designer
LS	Land Surveyor
LA	Landscape Architect
ME	Building Services Engineer, MEP Engineer
MV or AC	Mechanical Ventilation & Air Conditioning Engineer
PL	Plumbing Engineer
PM	Project Manager
QS	Quantity Surveyor
SC	Sub-Contractor
ST	Structural Engineer
TP	Town Planner

1.5.5.5 Layer Naming Convention

Each discipline should provide the Lead consultants CAD manager with a full list of all layer names to be used on the project. This list should be published to all members of the project team for information.

1.5.5.6 Drawing Sheet Templates

All drawing templates shall be rendered and presented at one of a number of approved scales, which are typically defined by the “CAD Manager”. Scales other than those approved should not be used. The templates shall also be in the standard format for sharing and interoperability.

Drawing Sheet Scales	
Scale	Description of detail
1:1000	Overall shape and layout
1:500	
1:200	
1:100	Shape, layout and construction elements
1:50	How the construction elements meet at junctions
1:5	Shape, dimensions and assembly of the separate construction elements
1:1	All model files shall be modelled at 1:1 Scale

1.5.5.7 Annotations, dimensions, abbreviations and symbols

Each discipline should provide the Design Manager and the CAD manager with a full list to be used on the project. This list should be published to all members of the project team to ensure consistency of the document graphical presentation and shall be consistent throughout the project.

Dimensions should be derived automatically from the underlying coordinates by using the 'associative dimensioning' function of CAD systems. Dimensions should not be entered as 'text' as they are purely graphic characters having no relationship with the underlying coordinates and will cause the relative positions of elements in a drawing to be compromised.

The project team shall agree common units of measurement. These should include distance (e.g. metre and millimetre) and angles (e.g. degrees/radians measured clockwise or counter clockwise).

1.5.6 IT Hardware & Software Solutions

The requirements for the software, hardware and network bandwidth for modelling, coordination and visualization on desktop/notebook computers and mobile devices should be determined by the BIM Manager for each project. The minimum requirement varies for different applications, project sizes and operating systems. The actual needs of a project must be determined on a case by case basis.

1.5.6.1 Software Versions

The BIM and CAD software and versions that will be used by the design team and contractor shall be agreed before starting the project. The models should be created using suitable BIM authoring software applications that allow the assembly of data rich models and the production and checking of co-ordinated drawings and documentation. In order to allow for BIM interoperability, the BIM authoring tools should be IFC compliant.

1.5.6.2 Exchange Formats

The agreed formats for file exchange model, drawings, and schedules shall be DWG, DGN, DWF, PDF, IFC or other file formats.

1.5.6.3 Data Security & Back-up

A data security protocol should be established to prevent any possible data corruption, virus "infections," and data misuse or deliberate damage by project team members, other employees or outside sources. Adequate user access right should be established to prevent data loss or damage during file exchange, maintenance, and archiving. BIM project data residing on network servers should be subjected to regular back-ups.

1.5.6.4 Hardware Specifications

The BIM Manager should provide specifications for the consultants and contractors for the provision of BIM data servers, workstations and viewing platforms. The specifications should include recommendations for the operating system, CPU, memory, video cards, hard disk space and network speeds.

1.5.6.5 IT Upgrades

The BIM Manager should plan, manage and supervise the processes for upgrading of software and hardware changes throughout the project.

2.0 Modelling Methodology

The **CIC BIM Standards** (CICBIMS) are designed to enable a client to specify, manage and assess BIM deliverables by architects, engineers, surveyors and contractors. This section of the CIC BIM Standards provides information on how to enable model development and build-up which will facilitate the efficient use or re-use of BIM data and models with modelling data consistency within a single discipline or with other disciplines.

This section includes:-

- Definition of "how" each BIM model is to be created, developed and shared with another discipline aiming to enable efficient use and re-use of BIM data with modelling data consistency.
- Model division and model structure (e.g. structure, zones, levels, systems, etc.).
- Drawing compilation and preparation for publication.

Modelling is the process of creating a digital building information model. Building Information Modelling replaces traditional 2D drafting and documentation. It is important to use the correct BIM software for the BIM purpose it has been created for. In practice, those who wish to model need to have modelling tools and those who have responsibility for co-ordination and construction processes need to have tools for these purposes.

The purpose of the model shall be clearly and unambiguously defined before construction of a model is commenced:-

- What is to be extracted from the model during the different phases?
- Who will use the model?
- How should the information in the model be communicated to others?

If the purpose is only to make a good visualisation or basic drawings, it would hardly be appropriate to model a BIM at a detailed level, with a substantial emphasis on correct technical construction and the level of information in the model. If the purpose of the BIM is however to make good working drawings, prepare a cost calculation or execute an energy simulation, then the need for a precise and "correctly" modelled BIM is crucial for a simple work process and a good result.

For feasibility and scheme design stages, a model for simple drawings and visualisations may be acceptable. For detailed design, construction and as-built models, an accurate

BIM is required. It is a prerequisite that all of the information shall be exchanged using the open file format IFC.

In order to develop a model that will, for example, be used for quantity take-off, it is a requirement that the model be modelled approximately as the building ”will actually be built”. Good modelling practices thus involves the technical solutions that will be used in the building also being used in the model.

This section sets out specific requirements that all of the discipline teams shall follow for the production of the Building Information models (BIM) for a project. The BIM Coordinators shall create and manage separate models for each design discipline. These system specific models will allow each team to model their systems separately and allow thorough coordination checks.

2.1 Discipline Modelling Guidelines

For each discipline, these guidelines provide recommendations on how BIM elements should be modelled at different project stages.

2.1.1 Site Modelling Guidelines

The architect, civil engineer or land surveyor shall carry out the modelling of the site which will include topography, land uses, site formation, massing models of surrounding buildings, roads, infrastructure and other features. The site model may include geological models of soil, fill and rock.

The level of development for each stage of the project shall be specified in the BIM PXP using the tables provided in section 3.2.1. The site elements shall be created using the correct software tools and components for surfaces such as slopes, roads, site areas, pavements, geological strata etc.

Whenever possible, the modeller should use the actual level, dimension or thickness to model an area of the site accurately. The model elements shall contain the information and data available at each stage.

The site model may use information available from the Lands Department and data from the BIM database could be shared with LandsD using the “Standard for exchange of 3D spatial data”.

The ground investigation data may be available in AGS format and could be added to the site model for reference.

2.1.2 Architectural Modelling Guidelines

The Architect shall carry out the modelling at each stage of the project and level of development of the elements produced at each stage will be specified in the BIM PXP using the tables provided in section 3.2.2.

The building or feature elements shall be created using the correct software tools and components for walls, slabs, doors, windows etc. If the features of the BIM authoring tool are not sufficient for modelling an element then it shall be created using other appropriate objects and defined with an appropriate “Type” name.

Building or feature elements shall be modelled separately for each floor level of a project.

2D lines and symbols may be used to complement the model when smaller elements are not modelled in 3D. For example, some elements smaller than 50mm may not need to be modelled. 2D standard details may be used on drawings produced using BIM authoring tools to complement overall drawing packages.

If an architect models structural elements, the size and location shall be as per the information from the structural engineers. It is recommended that the architect uses the structural model as a reference within the architectural model to avoid duplication of building elements.

The Level of Development for each architectural element is described in section 3 of the CICBIMS.

Whenever possible, the architect should use the actual dimension, thickness or detail to model an element accurately. The model elements shall contain the information and data available at each stage.

2.1.3 Structural Modelling Guidelines

The structural engineer shall carry out the modelling at each stage of the project and level of development of the elements produced at each stage will be specified in the BIM PXP.

The structural engineer may produce both an analysis model and a physical model with actual member sizes and position. The model shall be used for documentation.

The building or feature elements shall be created using the correct tools (Wall tool, Slab tool, etc.). If the features of BIM authoring tool are not sufficient for modelling the element, the required building elements shall be created using other appropriate objects. In that case, define the "Type" of the element correctly.

A Structural BIM may include all load-bearing concrete, wood and steel structures, as well as non-load- bearing concrete structures. Building Elements shall be modelled separately for each storey or floor level. If the structural design includes precast or prefabricated components, the element can be modelled and incorporated into the model.

Reinforcement and steel joint details may be done in the Detailed Design or Construction Stage based on the capability of the BIM authoring tool and the requirements will be stated in the BIM PXP.

2D drawings or standard details may be used to complement the BIM model when the elements are smaller than the agreed size, e.g. Elements Smaller than 50mm do not need to be modelled. 2D drawings with standard hatching and annotations may also be used for loading plans.

Structural models may not be required at the concept or feasibility stage of a project. For new building projects, the structural engineer may provide alternative framing options as sketches for the architect to assess alternative design layouts for different massing models.

For existing buildings, the structural engineer may develop an initial model from record drawings. The as-built model may be verified on site as part of a survey.

2.1.4 Building Services (MEP) Modelling Guidelines

The building services engineer shall carry out the modelling at each stage of the project and level of development of the elements produced at each stage will be specified in the BIM PXP. The model shall be used for documentation.

The building or feature elements shall be created using the correct tools (ductwork, pipe work etc.). If the features of BIM authoring tool are not sufficient for modelling the element, the required building elements shall be created using other appropriate objects. In that case, define the "Type" of the element correctly.

Building Elements shall be modelled separately for each storey or floor level.

2D drawings or standard details may be used to complement the BIM model when the elements are smaller than the agreed size, e.g. Elements Smaller than 50mm do not need to be modelled. 2D drawings with standard annotations may also be used for schematic diagrams.

Building Services models may not be required at the concept or feasibility stage of a project. For new building projects, the building services engineer may provide mechanical, electrical, plumbing & drainage and fire protection options as sketches for the architect to assess alternative design layouts for different massing models.

For existing buildings, the building services engineer may develop an initial model from record drawings. The as-built model may be verified on site as part of a survey.

2.1.5 Utilities Modelling Guidelines

The civil engineer or building services engineer shall carry out the modelling at each stage of the project and the level of development of the elements produced at each stage will be specified in the BIM PXP.

The utilities elements shall be created using the correct tools (cables, pipe work etc.). If the features of BIM authoring tool are not sufficient for modelling the element, the required utilities elements shall be created using other appropriate objects. In that case, define the "Type" of the element correctly.

For existing utilities, the engineer may develop an initial model from record drawings. The as-built model may be verified on site as part of a survey.

2.2 Model Set-up Requirements

2.2.1 BIM Model Zones

The use of separate discipline models can also be used to control the BIM file sizes. For larger projects, each discipline model may be divided into separate zones.

Due to the scale, complexity or anticipated construction phases, the BIM Manager may separate the project and discipline models by zone, by sub-dividing the project into separate areas or levels. These zones will aid each team to model their discipline more efficiently by reducing the individual BIM file sizes. The zones and the zone file name codes shall be determined by the BIM Manager during the scheme design stage when the overall scale and complexity of the project is understood.

2.2.2 BIM Project Co-ordinates

The models shall be set up to match true world coordinates in relation to the Hong Kong 1980 Grid and shall cross reference to the project gridlines. The project origin point will be set-up as the basis for all of the model sharing systems among the different disciplines.

The origin point or base point shall be defined as being located at 8YYYYY.YYY N 8XXXXX.XXX E.

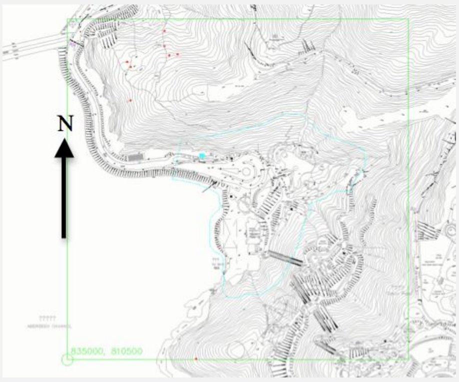
The rotation angle of the Project North to True North should be 0 degrees if possible, to avoid any need for rotation of models by surveyors. The z coordinates shall be in mm in relation to the Hong Kong Principal Datum.

If a model is produced in a local co-ordinate system due to software functionality or limitations, the BIM coordinator or modeller that produced the file shall be responsible for providing clear instruction and documentation as to the origin x, y, z and bearing translations accompanying their BIM submission.

Example ...

The Project Base Point is at 810500.000 N 835000.000 E on the Hong Kong 1980 grid.

The rotation angle of the Project North to True North is 0 degrees



2.3 Collaboration Procedures

The success of a BIM enabled project delivery process is highly dependent upon the level at which the entire design/construction team can collaboratively produce and manage information for the duration of the project. This section documents some of the management procedures that can be used for this purpose.

2.3.1 Collaboration Standards

In the absence of existing documented Information Management Standards mandated by the client, the BIM team shall develop a collaborative Information Management Standard to be used on the project.

As a minimum, the Collaborative Information Management Standard shall address the following:-

- lines of responsibility
- modes of communication
- reporting procedures
- approval and sign-off procedures
- information management and exchange protocols model sharing protocols
- model coordination procedures
- model and drawing versioning procedures.

2.3.2 Federated Model Creation

The BIM Manager shall manage the process of bringing all the various models together into a single “federated model”. This means a model consisting of linked but distinct component models and other data sources that do not lose their identity or integrity by being so linked. A change to one component model in a federated model does not create a change in another component model in that federated model.

If all designers are using the same modelling platform then this could be undertaken within the native file format, or through export into an open transfer format (e.g., IFC). If different platforms are used project review tools should be used to integrate and validate merged models. There may be benefits in using specific review software, even if all team members are using the same platform.

The method for creating and managing the federated model should be agreed and documented in the BIM PXP.

2.3.3 Facilitating BIM Coordination

Face-to-face meetings in which BIM models are used for design review and clash detection/coordination are the preferred means of facilitating technical discipline coordination. However, different project circumstances will determine the most appropriate approach. Remote means of conducting BIM coordination, such as web conferencing, should only be considered when no other practical alternatives exist.

Consideration should be given to establishing a BIM Coordination Room (typically a physical room set aside for this purpose) configured and equipped to allow multiple parties to view the federated model. Coordination sessions should include all designers. Where clashes are detected, resolution should be agreed and those impacted make the changes required in their respective models (not within the federated model).

The party responsible for providing the facilities shall be determined during the development of the BIM PXP. A current clash list shall be produced and circulated to all parties (key stakeholders) before each meeting, then be updated once the revised models have been released into the federated model and a new clash detection process undertaken.

3.0 Level of Development

Building Information Models will be developed from preliminary design to final as-built models with a number of distinct phases and stages throughout the process. This section contains tables which indicate the level of development required at each stage of the design, construction and as-built phases.

The Level of Development (LOD) tables enable clients, architects, engineers, contractors, quantity surveyors and facility managers to clearly specify the content of models at each stage of a project. The LOD tables follow the LOD definitions developed by the American Institute of Architects (AIA) and are grouped by the key disciplines used in Hong Kong construction projects.

The BIM Manager shall use the tables in section 3.2 to prepare the Design Stage and Construction Stage BIM PXP so as to define what Levels of Development are to be achieved at each stage of a project and what will be delivered by the project teams.

The specification of LOD allows BIM coordinators and modellers to define what their models can be relied on for and allows other stakeholders to understand the usability and the limitations of models they are receiving. LOD defines the extent to which a model element has been developed from design to construction to operation.

LOD should only be used to describe model elements and not models as a whole. An element has only progressed to a given LOD when all the stated requirements have been met. There is no direct link between LODs and design phases. Building systems are developed at different rates through the design process. For example, the design of the structural system proceeds ahead of the design of interior layouts. At the end of scheme design, the model may include many elements at LOD 200, but will also include many at LOD 100, as well as some at 300.

The client and/or BIM Manager shall specify in the design stage BIM PXP, what the LOD for each model element shall be when models will be handed over from the design team to the contractor.

3.1 LOD Definitions

LOD notations are comprised of numbers from LOD 100 to LOD 500 and are defined as follows:-

LOD 100	The Model Element may be graphically represented in the Model with a **symbol** or other generic representation. Information related to the Model Element (i.e. cost per square foot, tonnage of HVAC, etc.) can be derived from other Model Elements.
LOD 200	The Model Element is graphically represented within the Model as a **generic** system, object, or assembly with approximate quantities, size, shape, location, and orientation.
LOD 300	The Model Element is graphically represented within the Model as a **specific** system, object or assembly in terms of quantity, size, shape, location, and orientation.
LOD 350	The Model Element is graphically represented within the Model as a specific system, object, or assembly in terms of quantity, size, shape, orientation, and **interfaces with other** building systems.
LOD 400	The Model Element is graphically represented within the Model as a specific system, object or assembly in terms of size, shape, location, quantity, and orientation with detailing, **fabrication, assembly, and installation** information.
LOD 500	The Model Element is a **field verified representation** in terms of size, shape, location, quantity, and orientation.

For LOD 200 to 500, Non-graphic information and data may also be attached to the Model Elements.

3.1.1 LOD Explained by Example

In simpler terms, LOD 100, represents a conceptual level. For example, in a massing model the interior walls may not yet be modeled, but the architect can use the approximate floor area to generate an area-based interior construction cost. Thus the interior walls are at LOD 100 as they are not modeled, but information about them can be obtained from elements that are modeled (the floors) coupled with other information (area-based cost tables).

To continue with the wall example, a floor plan is often first laid out using generic walls. The walls can now be measured directly, but the specific wall assemblies aren't known and the quantity, thickness, and location measurements are approximate. The walls are now at LOD 200. To step back to the massing model, if generic exterior walls are modeled and can be measured directly, they are actually at LOD 200, even though there is little detail.

At LOD 300, the wall element is modeled as a specific composite assembly, with information about its framing, wallboard, insulation if any, etc. The element is modeled at the thickness of the specified assembly, and is located accurately within the model. Non-geometric information such as fire rating may be attached as well. This means that it's not necessary to model every component of the wall assembly—a solid model element with accurate thickness and location and with the information usually included in a wall type definition satisfies the requirements of LOD 300.

At LOD 350, enough detail for installation and cross-trade coordination is included. For the wall example, this would include such things as blocking, king studs, seismic bracing, etc.

LOD 400 can be thought of as similar to the kind of information usually found in shop drawings.

3.2 LOD Responsibility Matrix

The tables in section 3.2. indicate which LOD is typically expected for each model element at the completion of each project stage. The BIM Manager may choose to amend each of the cells and is allowed to add or remove elements required from the list to suit a project requirement.

Required	Y or N. This defines if a group of elements needs to be modelled for a project.
QTO	Typical data which can be extracted from BIM for quantity measurement. The quantity surveyor may request the BIM Manager to include other quantity take off requirements in the BIM PXP.
CAT Code	Category Code. 3 alphabetic code for each type of model element. This code can be used for clash analysis, QA and review of models. It is a quick and easy way to find a set of elements in a model. This code may be replaced by a Uniformat code.
AUT	Model Author. The actual firm's agent code shall be used to replace the discipline code in the template below.
LOD	Level of Development required.

3.2.1 Site Model (Topography, Slopes, Roadworks, Landscape, Street Furniture)

Model Element List	Required	QTO	CAT Code	Concept, Feasibility, Planning		Preliminary, Scheme		Detailed design		Submission to approval authority		Construction		As-Built	
				AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD
Topography (Existing Site and surrounding land use)	Y/N	m^2	TOP												
Topography (Site Formation)	Y/N	m^2	SIT												
Natural Slope	Y/N	m^2	NSL												
Artificial Slope	Y/N	m^2	ASL												
Flexible Barrier	Y/N	m^2	FBR												
Rigid Barrier	Y/N	m^2	RBR												
Massing model of adjacent areas or surrounding buildings	Y/N	-	SUR												
Geological model (soil, fill, rock)	Y/N	m^3	GEO												
Pavement (Carriageway, Footpath, Cycle Track)															
Profile Barrier, Parapet, Kerbs, Traffic island	Y/N	m^2	KRB												
Noise Barrier	Y/N	m^2	NSB												
Planter	Y/N	No.	PTR												
Bollard	Y/N	No.	BOL												
Phone Booth	Y/N	No.	PHB												
Signage	Y/N	No.	SGN												
Gully	Y/N	No.	GUL												

3.2.2 Architecture Model

Model Element List	Required	QTO	CAT Code	Concept, Feasibility, Planning		Preliminary, Scheme		Detailed design		Submission to approval authority		Construction		As-Built	
				AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD
Building Massing Model	Y/N	m^2	MAS												
Room space, corridor, plant & equipment room	Y/N	m^2	SPA												
Elevator shaft space	Y/N	-	LIF												
Floor, slab, ramp, roof	Y/N	m^2	FLR												
Basic structural columns and walls	Y/N	-	COL												
Basic structural beams and framing	Y/N	-	SBS												
Exterior wall	Y/N	m^2	EWL												
Interior wall / Partition / Non-structural wall	Y/N	m^2	IWL												
Curtain wall, including shading devices	Y/N	m^2	CTM												
Precast Facade	Y/N	m^2	CLD												
Door	Y/N	No.	DOR												
Window	Y/N	No.	WDW												
Louver	Y/N	No.	LOU												
Skylight	Y/N	No.	SKY												
Ceiling	Y/N	m^2	CLG												
Stairs, Steps	Y/N	m^2	STE												
Railing, balustrade, handrail	Y/N	No.	BAL												
Access ladder and catwalk	Y/N	No.	LAD												
Building Maintenance Unit	Y/N	No.	BMU												
Furniture, fixtures & fittings including desks, workstations, casework, cabinets, appliances, loose equipment	Y/N	No.	FUR												

3.2.3 Structure Model

Model Element List	Required	QTO	CAT Code	Concept, Feasibility, Planning		Preliminary, Scheme		Detailed design		Submission to approval authority		Construction		As-Built	
				AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD
Foundations (piles, pile caps, tie/ground beams & footings)	Y/N	m^3	SFO												
Diaphragm wall, retaining wall	Y/N	m^3	DWL												
Excavation & lateral stability system	Y/N	m^3	ELS												
Beam	Y/N	m^3	SBS												
Column, post, hangar	Y/N	m^3	COL												
Wall	Y/N	m^2	SWL												
Slab, floor, ramp, roof	Y/N	m^2	SLA												
Transfer Structure (transfer plate, truss)	Y/N	m^2	TRN												
Stairs (steps, risers, threads, landings)	Y/N	m^2	STE												
Bracing	Y/N	Ton	BRA												
Temporary works, temporary structures, platforms	Y/N	Ton	TMP												
Tunnel Structure (Tunnel Box, Subway, Utilities Tunnel)	Y/N	m^3	TUN												

3.2.4 Mechanical Ventilation & Air Conditioning Model

Model Element List	Required	QTO	CAT Code	Concept, Feasibility, Planning		Preliminary, Scheme		Detailed design		Submission to approval authority		Construction		As-Built	
				AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD
Ductwork	.		.												
Supply air duct	Y/N		SAD												
Fresh air duct	Y/N	m^2	FAD												
Exhaust (extract) air duct	Y/N	No.	EAD												
Return air duct	Y/N		RAD												
Transfer air duct	Y/N		TAD												
Fan	Y/N	No.	FAN												
Diffuser, air-boot, air grill, air filter, register	Y/N	No.	AIR												
Damper	Y/N	No.	DAM												
Fan Coil unit	Y/N	No.	FCU												
Air Handling unit	Y/N	No.	AHU												
Chiller Plant unit	Y/N	No.	CHL												
Variable refrigerant volume unit	Y/N	No.	VRV												
Cooling Tower	Y/N	No.	COT												
Split-type indoor & outdoor air conditioning unit	Y/N	No.	SAC												
Chilled water supply pipe	Y/N	m	CWS												
Chilled water return pipe	Y/N	m	CWR												
Condensate drain pipe	Y/N	m	CDP												
Ventilation/air conditioning control system for FSD	Y/N	No.	VCS												

3.2.5 Plumbing & Water Supply Model

Model Element List	Required	QTO	CAT Code	Concept, Feasibility, Planning		Preliminary, Scheme		Detailed design		Submission to approval authority		Construction		As-Built	
				AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD
Fresh water piping	Y/N	m	FRWP												
Valve	Y/N	No.	VLV												
Water storage tank	Y/N	No.	WAT												
Pressure vessel	Y/N	No.	PRV												
Sink, washbasin	Y/N	No.	SNK												
Tap, Faucet	Y/N	No.	TAP												
Water meter	Y/N	No.	WMT												
Pump	Y/N	No.	PMP												
Calorifer	Y/N	No.	CAL												
Boiler	Y/N	No.	BLR												
Water storage heater	Y/N	No.	WSH												

3.2.6 Drainage & Sewerage Model

Model Element List	Required	QTO	CAT Code	Concept, Feasibility, Planning		Preliminary, Scheme		Detailed design		Submission to approval authority		Construction		As-Built	
				AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD
Rainwater , storm water pipe, storm drain	Y/N	m	RWP												
Surface channel, slot channel, external drainage	Y/N	m	RWC												
Sewerage pipe, foul sewer drain	Y/N	m	SWP												
Toilet Fixture	Y/N	No.	WCS												
Sump or sewage pit	Y/N	No.	PIT												
Pump	Y/N	No.	PMP												
Grease Trap	Y/N	No.	TRP												
Sand Trap	Y/N	No.	TRP												
Kitchen waste pipe work including floor drain, open trapped gully, sealed trapped gully, clean outs and vent	Y/N	No.	KWP												
Manhole, Terminal manhole	Y/N	No.	SMH												
Box Culvert	Y/N	No.	CUL												
Nullah	Y/N	No.	NUL												

3.2.7 Fire Services Model

Model Element List	Required	QTO	CAT Code	Concept, Feasibility, Planning		Preliminary, Scheme		Detailed design		Submission to approval authority		Construction		As-Built	
				AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD
Automatic actuating device	Y/N	No.	AAD												
Drencher system	Y/N	m	DRE												
Dust detection system	Y/N	No.	DDS												
Dynamic smoke extraction system	Y/N	No.	SES												
Fire alarm system, gongs & break glass unit	Y/N	No.	AFA												
Fire detection system, heat or smoke detectors	Y/N	No.	SHD												
Fire hydrant/hose reel system	Y/N	No.	FHR												
Fire shutter and hood/enclosure	Y/N	No.	SHT												
Fixed automatically operated approved appliance	Y/N	No.	FAA												
Gas detection system	Y/N	No.	GDS												
Gas extraction system	Y/N	No.	GES												
Portable hand-operated approved appliance, fire extinguisher	Y/N	No.	PAA												
Ring main system with fixed pump	Y/N	m	RMS												
Smoke curtain or barrier	Y/N	No.	FSB												
Sprinkler pipe work	Y/N	m	SPR												
Sprinkler head	Y/N	No.	SPH												
Sprinkler valve & flow switch	Y/N	No.	SPV												
Sprinkler supply tank	Y/N	No.	SPTK												
Sprinkler pump	Y/N	No.	SPP												
Static smoke extraction system	Y/N	No.	SES												
Street Fire Hydrant system	Y/N	No.	SFH												

3.2.8 Electrical Model

Model Element List	Required	QTO	CAT Code	Concept, Feasibility, Planning		Preliminary, Scheme		Detailed design		Submission to approval authority		Construction		As-Built	
				AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD
Cable tray, trunking, cable containment, conduit, busduct, busbar, busway, power feed	Y/N	m	CAB												
Generator or Emergency generator	Y/N	No.	GEN												
Generator exhaust flue incl. acoustic treatment	Y/N	No.	EXH												
Diesel tank & fuel pipes	Y/N	No.	FUL												
Electric Meter	Y/N	No.	MET												
Transformer	Y/N	No.	TRN												
Switch board, switchgear	Y/N	No.	BRD												
Panel board, motor control centre	Y/N	No.	PAN												
Concealed and cast-in place conduit	Y/N	m	CCC												
Outlet, panel, wall switch, circuiting to device, security device, card access and “Plug mould” (socket point)	Y/N	No.	SWT												
Light fitting	Y/N	No.	LGD												
Emergency lighting	Y/N	No.	ELG												
Emergency power point	Y/N	No.	EPP												
Exit sign	Y/N	No.	EXI												

3.2.9 Specialist Systems Model

Model Element List	Required	QTO	CAT Code	Concept, Feasibility, Planning		Preliminary, Scheme		Detailed design		Submission to approval authority		Construction		As-Built	
				AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD
Lifts & Escalators															
Elevator system (by lift supplier)	Y/N	No.	LIF												
Escalator	Y/N	No.	ESC												
Moving walkway	Y/N	No.	EMS												
Communications & Security															
Audio/visual advisory system	Y/N	No.	AVS												
Closed circuit television system	Y/N	No.	CCTV												
Fireman's communication system	Y/N	No.	FCS												
Conduit associated with access, data communication, security system	Y/N	No.	ELV												
Telecommunication equipment	Y/N	No.	TEL												
Computer Racking, Servers etc	Y/N	No.	ITE												
Security system including smart card access	Y/N	No.	SEC												
Car park control system, barrier gate	Y/N	No.	CAR												

3.2.10 Underground Utilities

Model Element List	Required	QTO	CAT Code	Concept, Feasibility, Planning		Preliminary, Scheme		Detailed design		Submission to approval authority		Construction		As-Built	
				AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD
Connection point, manhole, inspection pit	Y/N	No.	TMH												
Electrical supply cable, trench, power distribution system	Y/N	No.	ELU												
Gas supply main, piping, valve	Y/N	No.	GAS												
Water supply main & control valve	Y/N	No.	WSM												
Underground Telecommunication system	Y/N	No.	UTL												

3.2.11 Bridges

Model Element List	Required	QTO	CAT Code	Concept, Feasibility, Planning		Preliminary, Scheme		Detailed design		Submission to approval authority		Construction		As-Built	
				AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD
Bridge column/pier	Y/N	m^3	PIR												
Bridge abutment	Y/N	m^3	ABT												
Precast bridge segment	Y/N	m^3	PBS												
Steel bridge segment	Y/N	m^3	STB												
Bridge deck	Y/N	m^3	DCK												

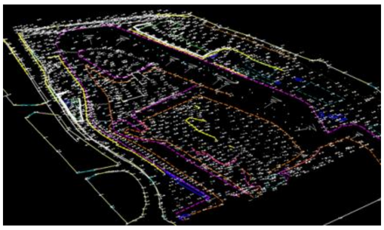
3.2.12 Marine Works

Model Element List	Required	QTO	CAT Code	Concept, Feasibility, Planning		Preliminary, Scheme		Detailed design		Submission to approval authority		Construction		As-Built	
				AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD	AUT	LOD
Seawall	Y/N	No.	SEA												
Breakwater	Y/N	No.	BRW												
Pier, Jetty	Y/N	No.	JTY												

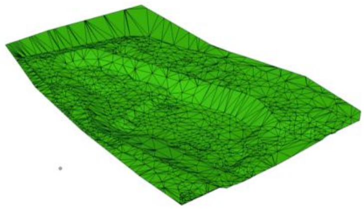
3.3 LOD Specification

3.3.1 Site Model

Site Topography (existing site and surrounding land use)

LOD	Description	Data	Example Image
100	The site contours and key features are represented in 3D space based on the surveyors' information (spot levels, northing and easting).	N/A	
200	The site is represented as a 3D surface generated from the surveyors' information. The model may include the approximate size, shape and location of: − Existing site surfaces; − Existing walls, stairs, surface drains etc. − Existing foundations; − Existing utilities; − Underground or buried structures.	N/A	
300	The existing site model may include improved definition from supplemental site surveys.		

Topography (Site Formation)

LOD	Description	Data	Example Image
100	Diagrammatic or schematic model		
200	The planned site formation shall be represented as a 3D surface to show the approximate levels for excavation, cut and fill, blinding layers, backfill and site grading. The model may include the approximate size, shape and location of new:- − Foundations and retaining walls; − Slope improvement works; − Access roads. The site boundary shall be marked based on the surveyors setting out information.	N/A	
300	The site formation shall be represented as complete and accurate 3D surfaces or objects to show the specific levels for excavation and site grading. The model shall include the site infrastructure for roads, curbs, pavements, car parking, access, hard landscaping and planter boxes. Models of trees may be included.		
350	For hard landscaped or paved areas, the model shall be modelled to falls and coordinated with the planned surface drainage model.		
400	N/A		
500	The model elements shall be verified and updated based on as-built site surveys.		

3.3 LOD Specification

Natural Slope

LOD	Description	Data	Example Image
100	Approximate location and boundary		
200	Element modelling to include: – Approximate 3D boundary – Approximate toe line of the slope – Approximate location of the exposed rock head – Approximate location of the soil nails	N/A	
300	Element modelling to include: – Accurate layout and boundary of the slope, including berm and toe lines – Accurate location and size of the exposed rock head – Accurate location and size of the existing retaining structure – Accurate location, size and orientation of the slope nails – Accurate location and size of existing trees Required non-graphic information associated with model elements includes: – Surface Material type – Unique Slope Identifier – Maintenance party – Unique Tree identifiers, species, crown and spread information		
350	N/A		
400	N/A		
500	N/A		

Artificial Slope

LOD	Description	Data	Example Image
100	Approximate location and boundary, cut/fill requirements		
200	Element modelling to include: – Approximate 3D slope extend – Approximate location of the exposed rock head – Approximate toe line of the slope – Approximate location of the soil nails – Approximate location of settlement markers		
300	Element modelling to include: – Accurate layout and boundary of the slope, including berm and toe lines, cut/fill slope and transition parameters – Accurate location and size of the exposed rock head – Accurate location and size of the u-channels/step-channels, catch pits, and maintenance access – Accurate location, size, orientation and extend of the slope nails – Accurate location and size of newly planted trees – Accurate location and size of surfacing materials Required non-graphic information associated with model elements includes: – Surface Material type – Unique Slope identifier – Unique settlement marker identifier – Unique soil nail identifier – Slope Maintenance party – Unique Tree identifiers and respective species information – Unique Catch pit identifier		
400	Element modelling to include: – Accurate size and shape of each layer of excavation and refill – Accurate location and shape of benching and waterproof layer – Accurate location of settlement markers – Extend of the temporary works and working space – Required non-graphic information associated with model elements includes: – Excavation and refill Material Information – Tree crown and spread information		
500	A field verified as-built model with complete non-graphic information		

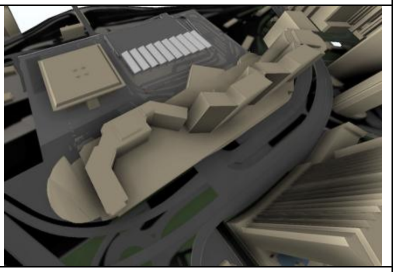
Flexible Barrier

LOD	Description	Data	Example Image
100	Approximate orientation, location and size of the elements using typical section or standard symbol		
200	Element modelling to include: – Approximate location and size of the pole and fencing systems		
300	Element modelling to include: – Accurate size and orientation of the standing post and the base plate and post – Accurate size and orientation of the foundation mass concrete and wedge foundation – Accurate location and size of the flexible rockfall barrier – Accurate location, size and shape of the adjoin cut/fill slope, stepped channel, u-channel, and soil nail (refer to LOD 300 of artificial slope) Required non-graphic information associated with model elements includes: – Unique identifier of the ground anchor and its design load – Material type		
400	Element modelling to include: – Accurate location of the base plate and post – Accurate location of the foundation mass concrete and wedge foundation – Accurate location and size of the wire and anchor system		
500	A field verified as-built model with complete non-graphic information		

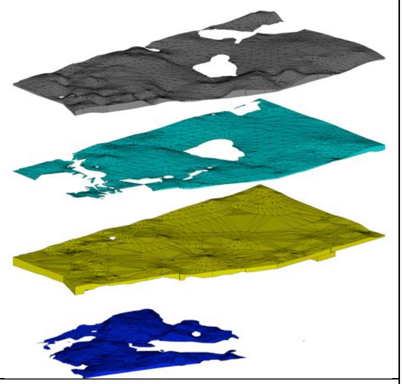
Rigid Barrier

LOD	Description	Data	Example Image
100	Approximate orientation, location and size of the elements using typical section or standard symbol		
200	Element modelling to include approximate location and size barrier structure		
300	Element modelling to include: − Accurate location and orientation barrier structure − Accurate location, size and shape of the cantilever slab, vertical slit, openings, concrete chamfer, concrete baffle − Accurate size location and shape of the maintenance stairways, hand railing, trash grating − Accurate location, size and shape of the adjoining cut/fill slope, stepped channel, u-channel, and soil nail (refer to LOD 300 of artificial slope) Required non-graphic information associated with model elements includes: − Unique identifier of the barrier − Concrete grade		
400	Element modelling to include: − Accurate location of the barrier structure − Location and size of reinforcements − Extend of the temporary works and working space − Locations of Construction Joints − Locations of Movement Joints − Locations of Box-out Openings		
500	A field verified as-built model with complete non-graphic information		

Massing models of adjacent or surrounding buildings

LOD	Description	Data	Example Image
100	If existing buildings are not in BIM, 2D record drawings can be used to complement the project BIM model.		
200	Surrounding buildings, bridges or other structures shall be modelled as mass elements to locate the project in relation to the local area.		
300	N/A		
400	N/A		
500	N/A		

Geological model (soil, fill, rock)

LOD	Description	Data	Example Image
100	N/A		
200	3D model showing approximate layers of soil, fill, decomposed rock and hard rock.	m^3	
300	3D model of layers of soil, fill, rock etc. based on bore hole logs from site investigations.	m^3	
400	N/A		
500	N/A		

Pavement (Carriageway, Footpath, Cycle Track)

LOD	Description	Data	Example Image
100	Approximate alignment, width and spot levels of the paving surfaces		
200	Element modelling to include approximate 3D alignment, shape and width of pavement		
300	Element modelling to include: – Accurate size and geometry of every layer of paving components (frication course, wearing course, base-course, road-base, sub-base, etc.) that varies continuously along the road alignment – Accurate super-elevation and longitudinal fall of the pavement components Required non-graphic information associated with model elements includes: – Polygon Feature Type * – Surface Material Type * – Paver Type * – Headroom requirement (* to match HyD GIS requirement)		
400	Element modelling to include: – Locations of Construction Joints – Locations of Movement Joints – Locations of Box-out Openings – Lane and Road markings Required non-graphic information associated with model elements includes: – Unique Identifier of construction bay		
500	A field verified as-built model with complete non-graphic information		

Profile Barrier, Parapet, Kerbs, Traffic island

LOD	Description	Data	Example Image
100	Approximate orientation, location and size of the elements using typical section or standard symbol		
200	Element modelling to include approximate 3D orientation, shape and width		
300	Element modelling to include: – Accurate size and geometry of every construction layer that varies continuously along the 3D road alignment – Accurate cross-fall and longitudinal fall of the elements components – Accurate location and size of the foundation concrete Required non-graphic information associated with model elements includes: – Material type – Concrete Grade		
400	Element modelling to include: – Location and size of the Parapet rail and post – Location and size of reinforcements – Locations of Construction Joints – Locations of Movement Joints – Locations of Box-out Openings Required non-graphic information associated with model elements includes: – Unique Identifier of construction bay		
500	A field verified as-built model with complete non-graphic information		

Noise Barrier

LOD	Description	Data	Example Image
100	Approximate orientation, location and size of the elements using typical section or standard symbol		
200	Element modelling to include: – Approximate location, size and shape of the poles and/or steel structure – Approximate location, size and shape of the noise barrier panels		
300	Element modelling to include: – Accurate location, size, orientation and shape of the poles and/or steel structure – Accurate size and shape of the noise barrier panels Required non-graphic information associated with model elements includes: – Material type – Concrete Grade – Panel materials		
400	Element modelling to include: – Size and shape of each noise barrier panels – Locations of Construction Joints /Welding – Locations of Movement Joints – Location and size of the holding down bolt – Location and size of the anchor system		
500	A field verified as-built model with complete non-graphic information		

Planter

LOD	Description	Data	Example Image
100	Approximate location and shape of the elements using typical section or standard symbol		
200	Element modelling to include approximate location, shape and width		
300	Element modelling to include: – Accurate location, overall size and geometry of planter wall and footing – Accurate cross-fall and longitudinal fall of the elements Required non-graphic information associated with model elements includes: – Material type – Sub soil material – Top soil material		
400	Element modelling to include: – Locations of Construction Joints – Locations of Movement Joints		
500	A field verified as-built model with complete non-graphic information		

Bollard

LOD	Description
100	Approximate location, size and shape of the element using standard symbol
200	Element modelling to include approximate location, size, shape and height. Required non-graphic information associated with model elements includes: – Bollard Type – Material Type – Spacing and clearance requirements

Phone Booth

LOD	Description
100	Approximate location, size and shape of the element using standard symbol
200	Element modelling to include approximate location, size, shape and height. Required non-graphic information associated with model elements includes: – Phone Booth Type – Material Type – Spacing and clearance requirements – Unique identifier of Phone Booth

Signage

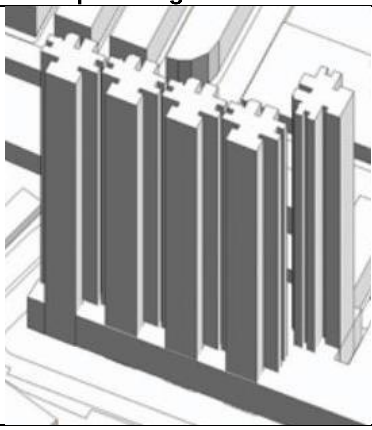
LOD	Description
100	Approximate location, size and shape of the element using standard symbol
200	Element modelling to include approximate location, size, shape and height. Required non-graphic information associated with model elements includes: – Signage Type – Unique identifier of Sign Plate – Material Type – Spacing and clearance requirements – Unique identifier of Signage

Gully

LOD	Description	Data	Example Image
100	Approximate location and shape of the elements using typical section or standard symbol		
200	Element modelling to include approximate location, shape and width		
300	Element modelling to include: – Accurate internal height of gully/gully former – Accurate location and orientation of outlet pipe to main drain Required non-graphic information associated with model elements includes: – Gully Type – Material Type – Spacing and clearance requirements – Unique identifier of Gully		
400	Element modelling to include: – Location and size of gully grating – Concrete surround – Supplementary components required for fabrication and field installation Required non-graphic information associated with model elements includes: – Direction of Gully Grating – Concrete Grade		
500	A field verified as-built model with complete non-graphic information		

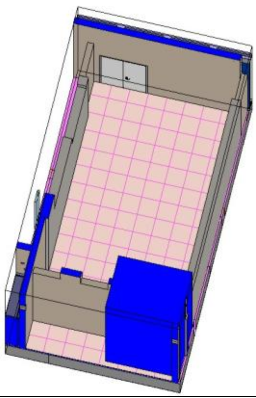
3.3.2 Architecture Model

Building Massing Model

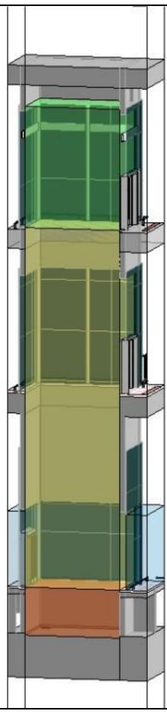
LOD	Description	Data	Example Image
100	Massing model representing the overall building volume, shape, location and orientation. The model may include schematic wall elements.	Floor areas	
200	N/A		

Note: the conceptual massing model shall be converted into normal building elements of floors, walls, doors, window etc. at the scheme design stage.

Rooms, spaces, corridors, plant & equipment rooms

LOD	Description	Data	Example Image
100	Room or space functions or purposes may be indicated by symbol or text.		
200	Spaces shall be modelled approximately to show size, function, location and orientation. Each space shall have a unique ID and name based on the room function which can be used to locate the space.	Room Data	
300	Space height shall be modelled from FFL to soffit of exposed slab or suspended ceiling above.		
400	N/A		
500	The as-built room ID, name and associated Room Data shall be verified on site and updated.		

Elevator shaft spaces

LOD	Description	Data	Example Image
100	Lift shaft location may be indicated by symbol or text.		
200	Lift shafts shall be modelled approximately to show size, location and orientation. Each shaft shall have a unique ID and name based on the lift allocation which can be used to locate the space.	m^2	
300	Lift motor room space requirements may be modelled to allow building services engineers coordinate with the electrical model.		
400	N/A		
500	N/A Refer to Lifts & Escalator table 3.3.8		

Floor slabs, ramps, roofs

LOD	Description	Data	Example Image
100	N/A		
200	Floor element with approximate dimensions and overall thickness including structural depth and finishes. The model may include approximate supporting framing members. The primary grids shall be defined.		
300	Floor slabs shall be modelled as per the structural engineers' information. Finishes materials shall be accurately modelled based on specific types (tiles, wood etc.)	Fire Rate	
350	All structural floor elements shall be replaced by using a reference model from the structural engineer. The model shall contain accurate floor finishes details including tiling, carpet, raised floor, computer flooring or screed only. The finishes shall be modelled to falls.		
400	The floor finishes details may be updated with manufacturers information such as pattern layouts, expansion/control joints, dividing strips, edge details etc.		
500	As-built floor finishes model.		

Basic structural columns, walls& beams

LOD	Description	Data	Example Image
100	N/A		
200	Include basic structural element with approximate dimensions. The primary grids shall be defined.		
300	Structural elements shall be modelled as per the structural engineers' information. Any finishes materials shall be accurately modelled based on specific types (tiles, wood etc.)		
350	All structural elements shall be replaced by using a reference model from the structural engineer. The model shall contain accurate finishes details.		
400	The column and wall finishes details may be updated with manufacturers' information such as pattern layouts, expansion/control joints, dividing strips, edge details etc.		
500	As-built column and wall finishes model.		

Exterior walls

LOD	Description	Data	Example Image
100	N/A		
200	Wall element with approximate dimensions and overall thickness including structural width and finishes. The model may include approximate supporting framing members. The primary grids shall be defined.		
300	Structural walls shall be modelled as per the structural engineers' information. Finishes materials shall be accurately modelled based on specific types (tiles, stone, plastered, painted etc.). Stone/GRC cladding may be modelled as mass elements of overall thickness	Fire Rtng	
350	The model shall contain accurate wall finishes details including tiling, stone, cladding or screed only. Openings for mechanical vents, louvers or other builders' works requirements shall be included. All structural wall elements shall be replaced by using a reference model from the structural engineer.		
400	The wall finishes details may be updated with manufacturers' information such as pattern layouts, expansion/control joints, dividing strips, edge details etc. For cladding systems, the fixing details, secondary structures may be modelled.		
500	As-built wall finishes model.		

Interior walls / Partitions / Non-structural walls

LOD	Description	Data	Example Image
100	N/A		
200	Wall element with approximate dimensions and overall thickness including finishes.		
300	Internal walls shall be modelled from floor slab to soffit of beam or slab above. Finishes materials shall be accurately modelled based on specific types (tiles, stone, plastered, painted etc.).	Fire Rate	
350	The model shall contain accurate wall finishes details including tiling, stone, cladding or screed only. Openings for building services builders' works requirements shall be included.		
400	The wall finishes details may be updated with manufacturers' information such as pattern layouts, expansion/control joints, dividing strips, edge details etc. If required by the BIM PXP, studs and layers may be modelled for dry wall construction.		
500	As-built model.		

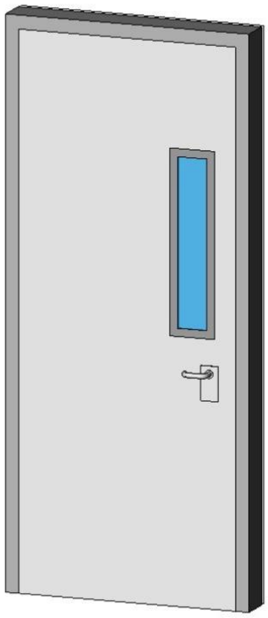
Curtain walls, including shading devices

LOD	Description	Data	Example Image
100	N/A		
200	Modelled as generic wall objects with approximate overall curtain wall thickness represented as a single assembly.		
300	Modelled accurately as an assembly with a specific thickness that accounts for structure, spacing and location of mullions and transoms, insulation, air space and any interior or exterior skins and shading devices. Operable components defined (windows, louvers and doors) and included in the model. Penetrations are modelled to nominal dimensions for major openings such as doors, mechanical elements or structures. Ironmongery (handles, locks, hinges etc.) may be included as data for schedule output.	Materials	
350	Mullion and transom shapes and geometry defined. Façade brackets, embeds, fixings, cast-ins, secondary sub-frames shall be modelled in actual locations for coordination with structure.		
400	All curtain wall elements are modelled to support fabrication and installation. Update the models with specific manufacturers' information including section or extrusion profiles, glazing sub-components, etc.		
500	As-built model		

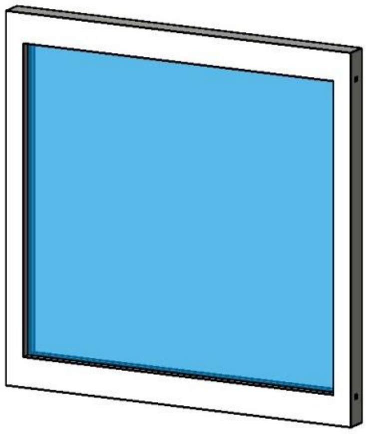
Precast Facades

LOD	Description	Data	Example Image
100	N/A		
200	Model facades with approximate dimensions.		
300	Model facades accurately based on specific types. Material of concrete, grc, fibreglass, aluminium or other should be specified. Penetrations are modelled to nominal dimensions for major openings such as doors, windows, mechanical elements or structures. Ironmongery (handles, locks, hinges etc.) may be included as data for schedule output. Identify exterior and interior by type.		
350	Façade brackets, embeds, fixings, cast-ins, secondary sub-frames shall be modelled for coordination with structure.		
400	Update with specific manufacturers information.		
500	As-built window model.		

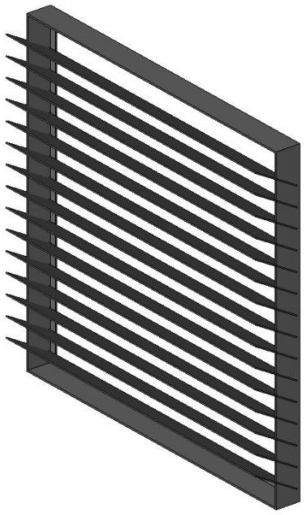
Doors

LOD	Description	Data	Example Image
100	N/A		
200	Model doors with approximate dimensions in terms of location, size, count and type.		
300	Model doors accurately based on specific types. Ironmongery (handles, locks, hinges etc.) may be included as data for schedule output. Identify exterior and interior by type and by function. Each door shall have a unique ID based on the room or space which it is used to access.	Fire rating	
400	Update with specific manufacturers information.		
500	As-built door model.		

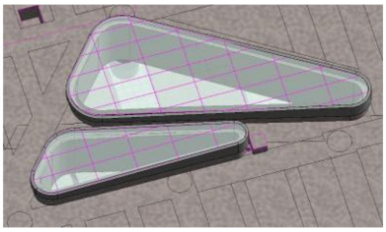
Windows

LOD	Description	Data	Example Image
100	N/A		
200	Model windows with approximate dimensions in terms of location, size, count and type.		
300	Model windows accurately based on specific types, specified location and nominal size. The outer geometry of the window frame elements and glazing modelled to within 3mm precision. Ironmongery (handles, locks, hinges etc.) may be included as data for schedule output. Identify exterior and interior by type and by function. Each window shall have a unique ID based on the room or space which it is used to enclose. Required non-graphic information associated with model elements includes: Aesthetic characteristics (finishes, glass types) Performance characteristics (i.e. U-value, wind loading, structural, air, thermal, water, sound) Functionality of the window (fixed, double/single hung, pivot, sliding) etc.		
350	Brackets, embeds, fixings, cast-ins, secondary sub-frames shall be modelled for coordination with structure.		
400	Update with specific manufacturers information including frame profiles, glazing sub-components.		
500	As-built window model.		

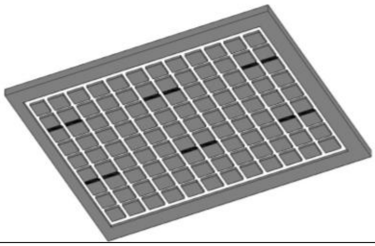
Louvers

LOD	Description	Data	Example Image
100	N/A		
200	Generic model element that is indicative of approximate area and location of intended louver or vent.		
300	Louver assembly modelled by type, indicative of area and location of intended louver/vent and includes accurate frame (boundary dimensions) and blades. Opening for louver is cut from host wall. Performance level defined in non-graphic information associated with model elements (e.g. storm proof or not, free air).		
350	Brackets, embeds, fixings, cast-ins, secondary sub-frames shall be modelled for coordination with structure.		
400	Update with specific manufacturers information including frame profiles, blade profiles and sub-components.		
500	As-built louver model.		

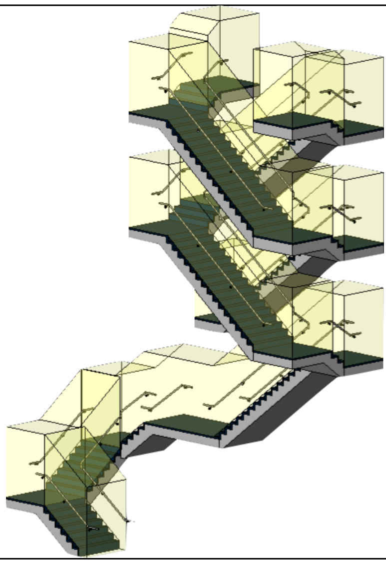
Skylights

LOD	Description	Data	Example Image
100	N/A		
200	Model skylights with approximate dimensions in terms of location, size, count and type.		
300	Model skylights accurately based on specific types, specified location and nominal size. The outer geometry of the frame elements and glazing modelled to within 3mm precision. Ironmongery (handles, locks, hinges etc.) may be included as data for schedule output. Identify exterior and interior by type and by function. Each skylight shall have a unique ID based on the room or space which it is used to enclose. Required non-graphic information associated with model elements includes: – Aesthetic characteristics (finishes, glass types) – Performance characteristics (i.e. U-value, wind loading, structural, air, thermal, water, sound) – Functionality of the window (fixed, double/single hung, pivot, sliding) etc.		
350	Brackets, embeds, fixings, cast-ins, secondary sub-frames shall be modelled for coordination with structure.		
400	Update with specific manufacturers information including frame profiles, glazing sub-components.		
500	As-built model.		

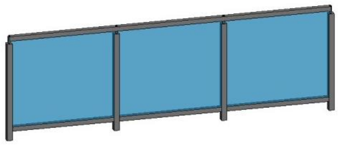
Ceilings

LOD	Description	Data	Example Image
100	N/A		
200	Model ceiling approximately to show overall scope and thickness or system depth of suspended ceiling.		
300	Overall assembly modelled to specific system thickness including framing. Major penetrations are modelled. Location of expansion or control joints may be indicated, but not modelled.		
350	Ceiling suspension grid is modelled. Fixtures & housings for light fixtures shall be included for coordination with electrical system. Structural backing members including bracing/lateral framing/kickers are modelled. Expansion or control joints are modelled to indicate specific width.		
400	All assembly components are modelled including tees, hangers, support structure and ceiling tiles.		
500	As-installed model		

Stairs, Steps

LOD	Description	Data	Example Image
100	N/A		
200	Generic model element with simple threads and risers with approximate plan (length & width) and vertical (levels, landings) dimensions.		
300	Threads, risers, goings are modelled accurately to indicate stringers and nosing. Create specific objects or components for staircases or steps with special shapes or geometry when the standard default stairs in the BIM authoring tool are not sufficient.		
350	Stairs shall include headroom clearance requirements for coordination with structure and building services. Secondary support elements shall be modelled (hangars, brackets etc.).		
400	All stair elements are modelled to support fabrication and installation.		
500	As-built model		

Railings and balustrades

LOD	Description	Data	Example Image
100	Approximate alignment and location of the element using standard symbol		
200	Generic model elements without articulation of materials of structures		
300	Model assemblies by type to include railings, posts and supports. Element modelling to include: – Accurate horizontal alignment – Accurate length and height of railings Required non-graphic information associated with model elements includes: – Railing Type – Material Type – Spacing and clearance requirements	Material	
350	Secondary railing support elements are modelled including bracing or supports.		
400	All elements are modelled to support fabrication and installation.		
500	As-built model.		

Access ladders and catwalks

LOD	Description	Data	Example Image
100	N/A		
200	Generic model elements without articulation of materials of structures		
300	Model assemblies by type to include, steps railings, posts and supports.	Material	
350	Secondary railing support elements are modelled including bracing or supports.		
400	All elements are modelled to support fabrication and installation.		
500	As-built model.		

Building Maintenance Unit

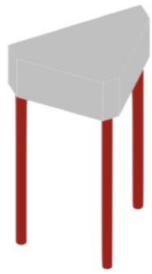
LOD	Description	Data	Example Image
100	N/A		
200	Generic representation of the BMU envelope, including critical path of travel zones.		
300	Specific system elements modelled by type, including all path of travel/boom swing zones. Lay-down/pick-up zones are modelled. Major structural support elements modelled. Connections to mechanical or electrical services.		
400	Sizing adjusted to the actual manufacturer specifications. Model shall include guiding tracks/rails and service/access zones All connections, supports, framing, and other supplementary components shall be modelled.		
500	As-built model		

Furniture, fixtures & fittings, desks, workstations, casework, cabinets, appliances

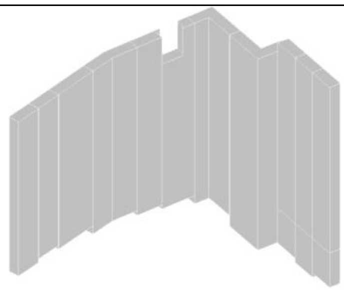
LOD	Description	Data	Example Image
100	A schematic model element or symbol that is not distinguishable by type or material.		
200	Generic model elements with approximate nominal size.		
300	Modelled types with specific dimensions, locations, and quantities.		
350	Include any applicable service or installation clearances. Include any applicable support or connection points.		
400	Supplementary components added to the model required for fabrication and field installation.		
500	As-fitted model		

3.3.3 Structure Model

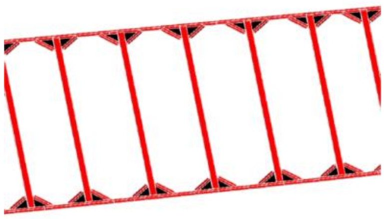
Foundations (piles, pile caps, tie/ground beams & footings)

LOD	Description	Data	Example Image
100	Approximate location, size and shape of the element using typical section or standard symbol		
200	Model the elements using approximate sizes and shapes of foundation components. The primary structural grids shall be defined.		
300	Elements shall be modelled to the design-specified size and shape of the foundation with accurate size, geometry and location of the foundation element. Assumed bearing depth, foundation depth, pile cut-off depths shall be modelled. Required non-graphic information associated with model elements includes: – Concrete Grade Unique identifier of individual Pile and Pile Cap	Concrete strength Reinforcing strength	
350	Assumed bearing depth, foundation depth, pile cut-off depths shall be modelled. Elements modelling shall include: – Location of sleeve penetrations – Pour joints & Expansion joints – All elements needed for cross-trade collaboration – Exposed embeds or reinforcement – Penetrations detailed and modelled		
400	The model will be updated with as-constructed levels by the foundations contractor: – Rebar detailing – Chamfer – Finish – Waterproofing		
500	A field verified as-built model with complete non-graphic information`		

Diaphragm walls & retaining walls

LOD	Description	Data	Example Image
100	Approximate orientation, location and size of the elements using typical section or standard symbol.		
200	Model the elements using approximate sizes and shapes of foundation components including retaining walls and footings.		
300	Elements shall be modelled to the design-specified size and shape of the foundation with accurate size, geometry and location of the retaining wall elements. Assumed bearing depth, foundation depth, pile cut-off depths shall be modelled. Element modelling to include: − Accurate location, size, shape and orientation of the retaining wall and footing Required non-graphic information associated with model elements includes: − Concrete grade − Depth of the cover soil − Unique identifier of each wall panel	Concrete strength Reinforcing strength	
350	Actual bearing depth, foundation depth, wall cut-off depths shall be modelled. Elements modelling shall include: − Location of sleeve penetrations − Pour joints & Expansion joints − All elements needed for cross-trade collaboration − Exposed embeds or reinforcement − Penetrations detailed and modelled		
400	The model will be updated with as-constructed levels by the foundations contractor. Elements modelling shall include: − Rebar detailing − Chamfer − Finish − Waterproofing		
500			

Excavation & lateral stability systems

LOD	Description	Data	Example Image
100	N/A		
200	Model the elements using approximate sizes and shapes of foundation components.		
300	Elements shall be modelled to the design-specified size and shape of the supports with accurate size, geometry and location of the elements	Concrete strength Reinforcing strength	
400	The model will be updated with as-constructed levels by the foundations contractor.		
500			

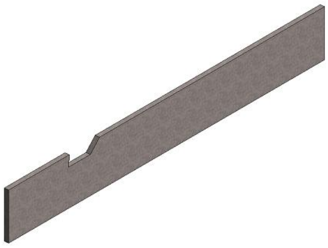
Beams

LOD	Description	Data	Example Image
100	N/A		
200	Element modelling to include the type of structural concrete system and approximate geometry (e.g. depth) of structural elements		
300	Element modelling to include: – Specific sizes and locations of main structural members modelled per defined structural grid with correct orientation, slope and elevation – Concrete or steel grade defined as per spec (strength, aggregate size, etc.) – All sloping surfaces included in model element Required non-graphic information associated with model elements includes: – Finishes, camber, chamfers, etc. – Typical connection details – Embeds and cast-ins – Cover requirements – Reinforcing spacing – Reinforcing – Design loads – Shear reinforcing		
350	Element modelling to include: – Penetrations for MEP – Concrete reinforcement called out, modelled if required by the BIM PXP, typically only in congested areas – Shear reinforcement – Embeds and cast-ins – Reinforcing post-tension profiles and strand locations. Post-tension profile and strands modelled if required by the BIM PXP Large elements of all connections applied to structural steel connections such as base plates, gusset plates, stiffeners, sleeve penetrations etc. Any permanent forming or shoring components		
400	Element modelling to include: – All reinforcement including post tension elements detailed and modelled – Finishes, camber, chamfer, etc. For structural steel models, welds, coping, all plates, bolts, washers, nuts and assembly elements shall be modelled.		
500	As-built structural model		

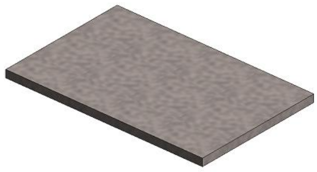
Columns, posts, hangars

LOD	Description	Data	Example Image
100	N/A		
200	Element modelling to include the type of structural concrete system and approximate geometry (e.g. size) of structural elements		
300	Element modelling to include: – Specific sizes and locations of main structural members modelled per defined structural grid with correct orientation; – Concrete grade defined as per spec (strength, aggregate size, etc.) Required non-graphic information associated with model elements includes: – Finishes, camber, chamfers, etc. – Typical details – Embeds and cast-ins – Cover requirements – Reinforcing spacing – Reinforcing – Design loads		
350	Element modelling to include: – Reinforcement called out, modelled if required by the BIM PXP, typically only in congested areas. – Embeds and cast-ins – Reinforcing – Any permanent forming or shoring components		
400	Element modelling to include: – All reinforcement including post tension elements detailed and modelled – Finishes, camber, chamfer, etc.		
500	As-built structural model		

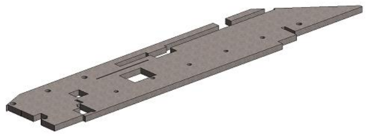
Walls

LOD	Description	Data	Example Image
100	N/A		
200	Element modelling to include the type of structural concrete system and approximate geometry (e.g. size) of structural elements	m^2	
300	Model the walls from structural floor level to soffit of structural slab or beams above. Element modelling to include: – Specific sizes and locations of structural walls modelled per defined structural grid with correct orientation; – Concrete grade defined as per spec (strength, aggregate size, etc.) Required non-graphic information associated with model elements includes: – Finishes, camber, chamfers, etc. – Typical details – Embeds and cast-ins – Cover requirements – Reinforcing spacing – Reinforcing – Design loads		
350	Element modelling to include: – Reinforcement called out, modelled if required by the BIM PXP, typically only in congested areas. – Embeds and cast-ins – Reinforcing – Any permanent forming or shoring components		
400	Element modelling to include: – All reinforcement including post tension elements detailed and modelled – Finishes, camber, chamfer, etc.		
500	As-built structural model		

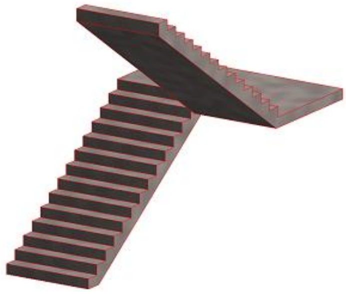
Slabs, floors, ramps, roofs

LOD	Description	Data	Example Image
100	N/A		
200	Element modelling to include the type of structural concrete system and approximate geometry (e.g. depth) of structural elements	m^2	
300	Element modelling to include: – Specific sizes and locations of main concrete structural members modelled per defined structural grid with correct orientation – Concrete grade defined as per spec (strength, aggregate size, etc.) – All sloping surfaces included in model element Required non-graphic information associated with model elements includes: – Finishes, camber, chamfers, etc. – Typical details – Embeds and cast-ins – Cover requirements – Reinforcing spacing – Reinforcing – Design loads – Shear reinforcing		
350	Element modelling to include: – Penetrations for MEP – Reinforcement called out, modelled if required by the BIM PXP, typically only in congested areas – Shear reinforcement – Pour joints and sequences to help identify reinforcing lap splice locations, scheduling, etc. – Expansion Joints – Embeds and cast-ins – Reinforcing Post-tension profiles and strand locations. Post-tension profile and strands modelled if required by the BIM PXP – Any permanent forming or shoring components		
400	Element modelling to include: – All reinforcement including post tension elements detailed and modelled – Finishes, camber, chamfer, etc.		
500	As-built structural model		

Transfer Structure (transfer plate, truss)

LOD	Description	Data	Example Image
100	N/A		
200	Element modelling to include the type of structural concrete system and approximate geometry (e.g. depth) of structural elements		
300	Element modelling to include: – Specific sizes and locations of main structural members modelled per defined structural grid with correct orientation – Concrete or steel grade defined as per spec (strength, aggregate size, etc.) – All sloping surfaces included in model element Required non-graphic information associated with model elements includes: – Finishes, camber, chamfers, etc. – Typical details – Embeds and cast-ins – Cover requirements – Reinforcing spacing – Reinforcing – Design loads – Shear reinforcing		
350	Element modelling to include: – Penetrations for MEP – Reinforcement called out, modelled if required by the BIM PXP, typically only in congested areas – Shear reinforcement – Embeds and cast-ins – Reinforcing post-tension profiles and strand locations. Post-tension profile and strands modelled if required by the BIM PXP – Any permanent forming or shoring components		
400	Element modelling to include: – All reinforcement including post tension elements detailed and modelled – Finishes, camber, chamfer, etc		
500	As-built structural model		

Stairs (steps, risers, threads, landings)

LOD	Description	Data	Example Image
100	N/A		
200	Element modelling to include the type of structural concrete or steel system and approximate geometry (e.g. depth) of structural elements		
300	Element modelling to include: – Specific sizes and locations of main structural members modelled per defined structural grid with correct orientation – Concrete or steel grade defined as per spec (strength, aggregate size, etc.) Required non-graphic information associated with model elements includes: – Pressurization of staircase for FSD – Finishes, camber, chamfers, etc. – Typical details – Embeds and cast-ins – Cover requirements – Reinforcing spacing – Reinforcing – Design loads		
350	Element modelling to include: – Penetrations for MEP – Reinforcement called out, modelled if required by the BIM PXP, typically only in congested areas – Pour joints and sequences to help identify reinforcing lap splice locations, scheduling, etc. – Expansion Joints – Embeds and cast-ins – Reinforcing Post-tension profiles and strand locations. Post-tension profile and strands modelled if required by the BIM PXP – Any permanent forming or shoring components		
400	Element modelling to include: – All reinforcement including post tension elements detailed and modelled – Finishes, camber, chamfer, etc.		
500	As-built structural model		

Bracing

LOD	Description	Data	Example Image
100	N/A		
200	Element modelling to include the type of structural bracing system and approximate geometry (e.g. size) of structural elements		
300	Element modelling to include: – Specific sizes of main structural braces modelled per defined structural grid Required non-graphic information associated with model elements includes: – Structural steel materials		
350	Element modelling to include: – Connection details – Actual elevations and location of member connections – Large elements of typical connections applied to all structural steel connections such as base plates, gusset plates, anchor rods, etc. – Any miscellaneous steel members with correct orientation		
400	Element modelling to include: – Welds – Bolts, washers, nuts, etc. – All assembly elements		
500	As-built structural model		

Temporary works, temporary structures, platforms

LOD	Description	Data	Example Image
100	N/A		
200	Element modelling to include the type of temporary works system and approximate geometry (e.g. size) of structural elements		
300	Element modelling to include: – Specific sizes of main structural elements modelled per defined structural grid Required non-graphic information associated with model elements includes: – Structural steel materials or concrete grades		
350	Element modelling to include: Connection details – Actual elevations and location of member connections – Large elements of typical connections applied to all structural steel connections such as base plates, gusset plates, anchor rods, etc. – Any miscellaneous steel members with correct orientation		
400	Element modelling to include: – Welds – Bolts, washers, nuts, etc. – All assembly elements		
500	As-built structural model		

Tunnel Structure (Tunnel Box, Subway, Utilities Tunnel)

LOD	Description	Data	Example Image
100	Approximate alignment, location, size and assumed elevation of the element using typical section or standard symbol		
200	Element modelling to include approximate 3D alignment, location, size and shape		
300	Element modelling to include: − Accurate location, overall size and geometry of element (roof and base slab, lining, ventilation duct, etc.) that varies continuously along the alignment − Accurate cross-fall and longitudinal fall of the element component Required non-graphic information associated with model elements includes: − Concrete Grade		
400	Element modelling to include: − Location and size of the panel walls − Location and size of the waterproof membrane − Locations of Construction Joints − Locations of Box-out Openings − Location and size of reinforcements − Supplementary components required for fabrication and field installation Required non-graphic information associated with model elements includes: − Unique Identifier of construction bay		
500	A field verified as-built model with complete non-graphic information		

3.3.4 Mechanical Ventilation & Air Conditioning Model

LOD	Description	Data	Example Image
100	Diagrammatic or system schematic to show conceptual layout or flow diagrams.		
200	Schematic layout with approximate size, shape and location of elements including mains, risers and equipment. Shafts and riser requirements modelled. Approximate access requirements modelled. Design performance parameters as defined in the BIM PXP to be associated with model elements as data.		
300			
400			
500			

Note: The LOD 300 models should indicate the different mechanical air systems by type such as exhaust air ducts, fresh air ducts, supply air ducts, return air ducts and transfer air ducts. The LOD 350 models should include hangars for ductwork support for coordination with other disciplines. For fans, the different types shall be identified such as exhaust or extract fans, fresh air fans or jet fans.

3.3.5 Plumbing & Water Supply Model

LOD	Description	Data	Example Image
100	Diagrammatic or system schematic to show conceptual layout or flow diagrams.		
200	Schematic layout with approximate size, shape and location of elements including mains, risers and equipment. Shafts and riser requirements modelled. Approximate access requirements modelled. Design performance parameters as defined in the BIM PXP to be associated with model elements as data.		
300			
400			
500			

Note: The LOD 350 models should include pipe supports and brackets for coordination with other disciplines.

3.3.6 Drainage & Sewerage Model

LOD	Description	Data	Example Image
100	Diagrammatic or system schematic to show conceptual layout or flow diagrams.		
200	Schematic layout with approximate size, shape and location of elements including mains, risers and equipment. Shafts and riser requirements modelled. Approximate access requirements modelled. Design performance parameters as defined in the BIM PXP to be associated with model elements as data.		
300			
400			
500			

Note: LOD 350 models should include pipe supports and brackets for coordination with other disciplines.

Rainwater, storm water pipe, storm drain

LOD	Description
100	Approximate horizontal pipe alignment and location; assumed elevation and size
200	Element modelling to include approximate alignment and size of pipe
300	Element modelling to include: − Accurate horizontal alignment and invert level of pipe − Accurate size and thickness of pipe − Accurate location and size of risers and equipment Required non-graphic information associated with model elements includes: − Type of the Pipe − Material Type − Unique identifier of Pipe, risers and equipment − Spacing and clearance requirements
400	Element modelling to include: − Accurate horizontal alignments, invert levels, size and thickness of pipes (including Cut pipe, Short pipe and Full length pipe) in every section of pipe system − Locations of Box-out Openings − Size and shape of Bedding − Extend of the temporary works and working space Required non-graphic information associated with model elements includes: − Bedding Type − Bedding Concrete Grade
500	A field verified as-built model with complete non-graphic information

3.3 LOD Specification

Sewerage pipe, foul sewer drain

LOD	Description
100	Approximate horizontal pipe alignment and location; assumed elevation and size
200	Element modelling to include approximate alignment and size of pipe
300	Element modelling to include: – Accurate horizontal alignment and invert level of pipe – Accurate size and thickness of pipe – Accurate location and size of risers and equipment Required non-graphic information associated with model elements includes: – Type of the Pipe – Material Type – Unique identifier of Pipe, risers and equipment – Spacing and clearance requirements
400	Element modelling to include: – Accurate horizontal alignments, invert levels, size and thickness of pipes (including Cut pipe, Short pipe and Full length pipe) in every section of pipe system – Locations of Box-out Openings – Size and shape of Bedding – Extend of the temporary works and working space Required non-graphic information associated with model elements includes: – Bedding Type – Bedding Concrete Grade
500	A field verified as-built model with complete non-graphic information

Manhole

100	Approximate location and size of the element using typical section or standard symbol
200	Element modelling to include approximate location, size, shape and height, standard type
300	Element modelling to include: – Accurate location, size, shape, internal headroom and shaft of manhole cover – Accurate wall thickness – Accurate benching size, height and invert level of inlet and outlet pipes Required non-graphic information associated with model elements includes: – Type of Manhole – Concrete Grade – Unique identifier of Manhole
400	Element modelling to include: – Locations of Box-out Openings – Supplementary components required for fabrication and field installation
500	A field verified as-built model with complete non-graphic information

Box Culvert

100	Approximate alignment, location, size and assumed elevation of the element using typical section or standard symbol
200	Element modelling to include approximate 3D alignment, location, size and shape
300	Element modelling to include: – Accurate size and geometry of element that varies continuously along the 3D alignment – Accurate cross-fall and longitudinal fall of the element components Required non-graphic information associated with model elements includes: – Concrete Grade
400	Element modelling to include: – Extend of the temporary works and working space – Location and size of reinforcements – Locations of Construction Joints – Locations of Box-out Openings
500	A field verified as-built model with complete non-graphic information

Nullah

100	Approximate alignment, location, size and assumed elevation of the element using typical section or standard symbol
200	Element modelling to include approximate 3D alignment, location, size and shape
300	Element modelling to include: – Accurate size and geometry of element that varies continuously along the 3D alignment – Accurate cross-fall and longitudinal fall of the element components – Accurate location, size and shape of the adjoin cut/fill slope, stepped channel, u-channel, and soil nail (refer to LOD 300 of artificial slope) Required non-graphic information associated with model elements includes: – Concrete Grade
400	Element modelling to include: – Location and size of reinforcements – Locations of Construction Joints – Locations of Box-out Openings Required non-graphic information associated with model elements includes: – Unique Identifier of construction bay
500	A field verified as-built model with complete non-graphic information

3.3.7 Fire Services Model

LOD	Description	Data	Example Image
100	Diagrammatic or system schematic to show conceptual layout or flow diagrams.		
200	Schematic layout with approximate size, shape and location of elements including mains, risers and equipment. Shafts and riser requirements modelled. Approximate access requirements modelled. Design performance parameters as defined in the BIM PXP to be associated with model elements as data.		
300			
400			
500			

3.3.8 Electrical Model

LOD	**Description**	**Data**	**Example Image**
100	Diagrammatic or system schematic to show conceptual layout or wiring diagrams.		
200	Schematic layout with approximate size, shape and location of elements including mains, risers and equipment. Shafts and riser requirements modelled. Approximate access requirements modelled. Design performance parameters as defined in the BIM PXP to be associated with model elements as data.		
300			
400			
500			

3.3.9 Specialist Systems Models

LOD	**Description**	**Data**	**Example Image**
100	Schematic model elements.		
200	Schematic layout with approximate size, shape and location of elements including system envelope, clearance or headroom requirements and travel zones.		
300			
400			
500			

3.3.10 Underground Utilities

Connection point, manhole, inspection pit

100	Approximate location and size of the element using typical section or standard symbol
200	Element modelling to include approximate location, size, shape and height
300	Element modelling to include: – Accurate location, size, shape, internal headroom and shaft of manhole cover – Accurate wall thickness – Accurate benching size, height and invert level of inlet and outlet pipes Required non-graphic information associated with model elements includes: – Type of Manhole / inspection pit – Concrete Grade – Unique identifier of Manhole / inspection pit
400	Element modelling to include: – Locations of Box-out Openings – Supplementary components required for fabrication and field installation
500	A field verified as-built model with complete non-graphic information

Electrical supply cable, trench, power distribution system and underground telecommunication system

100	Approximate horizontal routing and location; assumed elevation and size
200	Element modelling to include: – Approximate routing and size of cable trunking – Approximate location of the containments, risers, switch boards
300	Element modelling to include: – Accurate 3D routing and size of cable trucking – Accurate size and thickness of pipe – Accurate location of equipment, containments, risers, switch board Required non-graphic information associated with model elements includes: – Unique identifier of cables – Unique identifier of equipment – Spacing and clearance requirements
400	Element modelling to include: – Extend of the temporary works and working space
500	A field verified as-built model with complete non-graphic information

Gas supply main, piping, valve, water supply main, control valve

100	Approximate horizontal pipe alignment and location; assumed elevation and size
200	Element modelling to include: – Approximate 3D alignment and size of pipes – Approximate location of the valves and equipment – Project coordinate system are defined in model and coordinated with global civil coordinate system (HK1980 Grid System)
300	Elements are modelled to the design-specified geometry and size Element modelling to include: – Accurate horizontal alignment and invert level of pipe – Accurate size and thickness of pipe – Accurate location and size of valves and equipment Required non-graphic information associated with model elements includes: – Type of the Pipe – Material Type – Unique identifier of Pipe – Unique identifier of valves and equipment – Spacing and clearance requirements
400	Element modelling to include: – Accurate horizontal alignments, invert levels, size and thickness of pipes (including Cut pipe, Short pipe and Full length pipe) in every section of pipe system – Joints and fittings for mains and branches – Locations of Box-out Openings – Size and shape of Bedding – Extend of the temporary works and working space Required non-graphic information associated with model elements includes: – Bedding Type – Bedding Concrete Grade
500	A field verified as-built model with complete non-graphic information

3.3.11 Bridges

Bridge Column/Pier

LOD	Description
100	Approximate location, size and shape of the element using typical section or standard symbol
200	Element modelling to include approximate 3D location, size and shape
300	Element modelling to include: – Specific sizes and locations of piers modelled per defined grid with correct orientation; – Concrete grade defined as per spec (strength, aggregate size, etc.) – Accurate size and location of soffit Required non-graphic information associated with model elements includes: – Finishes, camber, chamfers, etc. – Typical details – Embeds and cast-ins Cover requirements Reinforcing spacing Reinforcing – Design loads – Concrete Grade – Unique identifier of Column/Pier
400	Element modelling to include: – All reinforcement including post tension elements detailed and modelled – Finishes, camber, chamfer, etc. – Location and size of Bearings component – Location and size of reinforcements – Locations of Construction Joints Required non-graphic information associated with model elements includes: – Unique Identifier of construction bay
500	A field verified as-built model with complete non-graphic information

Bridge Abutment

100	Approximate location and size of the element using typical section or standard symbol
200	Element modelling to include approximate location, size and shape of the abutment
300	Element modelling to include: – Accurate location, size and shape of the abutment, wing-walls, and back-wall – Accurate location and shape of the compacted and granular filled Required non-graphic information associated with model elements includes: – Concrete Grade – Compacted filled and granular fill material – Unique identifier of the abutment
400	Element modelling to include: – Locations of Construction Joints – Locations of Movement Joints – Location and size of reinforcements – Location and size of bearings components – Supplementary components required for fabrication and field installation
500	A field verified as-built model with complete non-graphic information

Precast Bridge Segment

100	Approximate alignment, location and size of the element using typical section or standard symbol
200	Element modelling to include approximate alignment, location, size and shape
300	Element modelling to include: – Accurate location, overall size and geometry (top slab, bottom slab, parapet, profile barrier, etc.) of element that varies continuously along the 3D setting out alignment – Accurate size and location of the surfacing materials – Accurate cross-fall and longitudinal fall of the element components Required non-graphic information associated with model elements includes: – Concrete Grade – Unique identifier of the bridge segment – Unique identifier of the Segment Type
400	Element modelling to include: – Locations of Construction Joints – Locations of Expansion Joints – Locations of Box-out Openings, Gully, catch pits and downpipes, Recess and drainage pipes – Location and size of reinforcements – Control points for the segment launching – Size and location of the openings, blister for pre-stress tendon – Supplementary components required for fabrication and field installation
500	A field verified as-built model with complete non-graphic information

Steel bridge segment

100	Approximate alignment, location and size of the structural element or using standard symbol
200	Element modelling to include approximate alignment, location and geometry of structural elements
300	Element modelling to include: – Accurate overall size and geometry of structural elements along the 3D alignment – Accurate cross-fall and longitudinal fall of the element components Required non-graphic information associated with model elements includes: – Material Type – Unique identifier of Bridge System
400	Element modelling to include: – Locations of Construction Joints – Locations of Expansion Joints – Locations of Box-out Openings, Gully, catch pits and downpipes, recess and drainage pipes – Location and size of stiffeners – Control points for the segment erection – Supplementary components required for fabrication and field installation
500	A field verified as-built model with complete non-graphic information

Bridge Deck

100	Approximate alignment, location and size of the element using typical section or standard symbol
	Refer to pavement tables in Site Model

3.3.12 Marine Works

Seawall

100	Approximate alignment, location, size and shape of the elements using typical section or standard symbol
200	Element modelling to include approximate 3D alignment, size and shape
300	Element modelling to include: – Accurate overall size and geometry of every layer of elements that varies continuously along the 3D alignment – Accurate location, size and shape of individual seawall block – Accurate gradient of filled sloping surface – Accurate gradient of seawall block placement Required non-graphic information associated with model elements includes: – Material type – Concrete Grade
400	Element modelling to include: – Locations of Construction Joints – Locations of Movement Joints – Location and size of reinforcements Required non-graphic information associated with model elements includes: – Unique Identifier of construction bay
500	A field verified as-built model with complete non-graphic information

Breakwater

100	Approximate alignment, location and shape of the elements using typical section or standard symbol
200	Element modelling to include approximate 3D alignment, shape and width
300	Element modelling to include: – Accurate overall size and geometry of every layer of elements that varies continuously along the 3D alignment – Accurate gradient of filled sloping surface and berm Required non-graphic information associated with model elements includes: – Material type – Concrete Grade
400	Element modelling to include: – Locations of Construction Joints – Locations of Movement Joints – Location and size of reinforcements – Required non-graphic information associated with model elements includes: – Unique Identifier of construction bay
500	A field verified as-built model with complete non-graphic information

Pier/Jetty

100	Approximate alignment, location and shape of the elements using typical section or standard symbol
200	Element modelling to include approximate alignment, shape and width
300	Element modelling to include: – Accurate overall size and geometry of every layer of elements that varies continuously along the 3D alignment – Accurate cross-fall and longitudinal fall of the elements components Required non-graphic information associated with model elements includes: – Material type – Concrete Grade
400	Element modelling to include: – Locations of Construction Joints – Locations of Movement Joints – Location and size of reinforcements Required non-graphic information associated with model elements includes: – Unique Identifier of construction bay
500	A field verified as-built model with complete non-graphic information

4.0 Component Presentation Style & Data Organisation

The **CIC BIM Standards** (CICBIMS) are designed to enable a client to specify, manage and assess BIM deliverables by architects, engineers and contractors. This section of the CIC BIM Standards provides information on how to enable model development and build-up which will facilitate the efficient use or re-use of BIM data and models with modelling data consistency within a single discipline or with other disciplines.

This section also includes information on how to set-up folder structures, model hierarchy and data structures and includes details on drawing production guidelines from BIM databases.

4.1 Folder Structures

This section defines how BIM data shall be stored within the project filing system. All project model files, drawings, references and data, regardless of project size or type, shall be organised and filed into a standard folder structure on a central server. During daily working of a model, a copy of the model could be placed on a local workstation.

All models should be stored on a central server to ensure that backup and disaster recovery facilities are provided to safeguard the models and databases. Subfolders structure under the central server should be standardized and setup by the System Administrator. In general, other users are restricted from modifying the folder structures. If there are any special needs, project team members can discuss with the administrator to setup optional subfolders.

4.1.1 Resource Folder Structure

Standard templates, drawing borders, object definitions and other non-project- specific data shall be held within the server based Central Resource Library, with restricted write access.

The Central Resource Library shall be organised by software and version. Resources for each product and version, the Central BIM Resource Library, shall be maintained within each folder.

4.1.2 Project Folder Structure

All project data shall be held within the standard project folder structure located on central network servers or an appropriate Document Management platform. This includes all work in progress files, components or assemblies.

The defined structure may follow the principles of BS1192:2007's 'Work In Progress (WIP)', 'Shared', 'Published' and 'Archived' segregation of data within a designated set of folders.

Where a project comprises of a number of separate elements such as multiple buildings, zones or areas, the BIM structure shall be maintained within a set of designated sub-folders representing the various project elements.

4.1.3 Local File Folder Structure

Where it is a requirement of a BIM authoring software to store files on each local workstation, a strict folder convention shall be defined and employed throughout.

4.1.4 Example Folder Structure

The following folder structure is provided as an example arrangement, designed to encourage compliancy with the strategies contained within this standard.

Folder	Description
- ***[Project Folder]***	
- BIM	[BIM data repository]
- **01-WIP**	**[WIP data repository]**
- CAD	[CAD files (incl. 'Modified')]
- BIM	[Design models (incl. 'Modified')]
- SheetFiles	[Sheet/dwg files]
- Export	[Export data e.g. gbXML or images]
- Families	[Components created during this project]
- WIP_TSA	[WIP Temporary Shared Area (TSA)]
- **02-Shared**	**[Verified Shared data]**
- CAD	[CAD data/output files]
- BIM	[Design models]
- CoordModels	[Compilation models]
- **03-Published**	***[Published Data]***
+ YYYYMMDD-Description	[Sample submission folder]
+ YYYYMMDD-Description	[Sample submission folder]
- **04-Archived**	**[Archived Data repository]**
+ YYMMDD-Description	[Archive folder]
+ YYMMDD-Description	[Archive folder]
- **05-Incoming**	**[Incoming Data repository]**
- Source	[Data originator]
+ YYYYMMDD-Description	[Incoming folder]
+ Source	[Data originator]
- **06-Resource**	**[Project BIM Resources Library]**
+ Titleblocks	[Drawing borders/titleblocks]
+ Logos	[Project logos]
+ Standards	[Project standards]

This is provided as an example only and should not be used in preference to or replace any internal company standard folder structures. Always consider your company processes and procedures.

No spaces are to be used in the folder naming as this can potentially interfere with certain file management tools and collaboration across the internet.

Well-organised project data both within project folders and internally within your BIM authoring software will help to identify, locate and efficiently use the information you need. Maintaining separate folders for WIP, Shared and Published data is part of a best approach even if they are not named exactly in this manner. Structure and label your files, models and data according to requirements outlined in the software- specific supplements

4.2 Model Hierarchy & Data Structures

For a BIM project, it is NOT recommended to create a single large model and embed all the details in a single file. The project should be divided into logical groups (e.g. by discipline, by trade) and link the models in logical hierarchy for easy handling.

This section deals with the principles of subdividing a model for the purposes of:-

- multi-user access;
- operational efficiency on large projects;
- inter-disciplinary collaboration.

4.2.1 Good Practice

The following practices shall be followed:-

- The methods adopted for data segregation shall take into account, and be agreed by, all internal and external disciplines to be involved in the modelling.
- No more than one building shall be modelled in a single file.
- A model file shall contain data from one discipline only (although exceptions may apply for Building Services where multiple disciplines converge).
- Further segregation of the geometry may be required to ensure that model files remain workable on available hardware.
- In order to avoid duplication or co-ordination errors, clear definition of the data ownership throughout the life of the project shall be defined and documented.
- Element ownership may transfer during the project time-line – this shall be explicitly identified in the Project BIM Execution Plan Document.
- Where multiple models make up a single project, a container model should be considered, whose function is to link the various assemblies together for coordination/clash detection purposes.

4.2.2 Model Division

Division of a model allows multiple users to simultaneously work on a model. Properly utilised, division of a model can significantly improve efficiency and effectiveness on projects of any size, but in particular multi-user projects.

Appropriate model divisions shall be established and elements assigned, either individually or by category, location, task allocation, etc.

Division shall be determined by the lead designer in conjunction with the person responsible for co-ordination. How and when the model is split shall be defined in the Project BIM Execution Plan document.

Model division shall be carried out in a logical manner that allows for other members of the design team to collaborate and/or assist with the model development without recourse to complicated introductions to the project methodology.

Where required, access permissions and model ownership shall be managed to avoid accidental or intentional misuse of the data.

4.2.3 Referencing

Referencing enables additional geometry and data to be used within a project. This may be either other parts of a project which are too big to manage in a single file, or data from another discipline or external company.

Some projects require that models of single buildings are split into multiple files and linked back together in order to maintain manageable model file size.

Various container files may exist to bring model files together for different purposes.

Task allocation shall be considered when dividing the model so as to minimise the need for users to switch between models.

When referencing, the models shall be positioned relative to the agreed project origin. The real-world co-ordinates of an origin point on the project shall be defined and coordinated in all models.

4.2.4 Inter Disciplinary References

Each separate discipline involved in a project, whether internal or external, shall have its own model and is responsible for the contents of that model. A discipline can reference another discipline's shared model for coordination.

Details of any discipline-specific requirements, such as the difference between Finished Floor Level (FFL) and Structural Slab Level (SSL), shall be fully documented in the Project BIM Execution Plan.

Ownership of elements shall be properly communicated and tracked through the project time-line (e.g. floors may be created by the Architectural team, but are then adopted by the Structural team to form part of the load-bearing structure).

Each discipline shall be conscious that referenced data has been produced from the perspective of the author and may not be modelled to the required specification for other purposes. In this case, all relevant parties shall convene to discuss the potential re-allocation of ownership.

Should a team develop a 'starter model' for a partner discipline, such as defining the structural model in conjunction with the architecture, this shall be done in a separate model which can then be referenced as required to allow development of the continued design.

With models produced for Building Services, several disciplines may be collated in a single model, as a single piece of equipment may require connection to various services. In this scenario, the model may be split in various ways. This project- specific strategy shall be defined in the Project BIM Execution Plan.

4.3 Drawing Production

A key principle of the CIC BIM Standards is that the architect, engineers and other involved in a project can produce good quality and consistent drawings from the model databases.

Where drawings are a product of the BIM process, traditional drawing conventions still apply.

Each drawing shall contain design information solely for the purpose of the intended use of the drawing. To maximise efficiency, a policy of minimum detailing without compromising quality and integrity shall be adopted and repetition of details should be eliminated.

The numbers of drawings should be kept to a minimum and organised in a logical manner.

4.3.1 Preparation for Publication

Prior to the transmittal of the model, the file contents and structure need to be agreed. Drawing sheets from the BIM shall be published to PDF (preferred), DWF or other non-editable format, where they can be checked, approved, issued and archived as traditional documents.

Key Points to consider:

- Does the drawing border and title block need amending for work-in-progress?
- Is there a need for a model matrix to explain the file structure?
- If Phasing and Design Options are utilised these will require an explanation.

The current sheets when viewed in the BIM are classed as “work-in-progress” and so when a model file is published for sharing, it may be preferable to remove them from the model to stop any confusion over what is validated information.

2D output from the BIM shall be constructed in a manner that is usable to the team, reasonably complies with project CAD Standards, and allows easy manipulation of the data held within the file, e.g. layering.

The appropriate export layer tables shall be used during export to CAD.

4.3.2 Model and Drawing Detail

At the outset of the project, consideration shall be given to the maximum level of detail to be included in the BIM. Too little and the information will not be suitable for its intended use; too much and the model may become unmanageable and inefficient.

It shall be dictated in the Project BIM Execution Plan the point at which 3D geometry ceases and 2D detailing is utilised to prepare the published output.

Intelligent 2D line work shall be developed to accompany the geometry and enhance the required views without undue strain on the computer hardware. The use of 2D line work is not exclusive to detailed/fabrication information.

Detailing and enhancement techniques shall be used whenever possible to reduce model complexity, but without compromising the integrity of the model.

4.3.3 Drawing Compilation

Drawing compilation and preparation for publication can be carried out in two ways:-

i. Fully assembled compilation of views and sheets within the BIM environment (preferred).

ii. Export views in the form of output files for assembly and graphical enhancement using 2D detailing tools within a CAD environment. Exporting data in order to 'finish off' in CAD negates the advantages of the BIM data for coordination purposes and should be avoided where possible.

Whichever methodology is chosen, the 3D model shall be developed to the same maximum extent before 2D techniques are applied.

When CAD or BIM data is referenced into a project, the design teams shall ensure that the latest validated and checked design information is accessed directly from the project Shared folder structures when composing drawing sheets.

4.3.3.1 Sheet composition direct from within the BIM

Drawing sheet composition from within a BIM environment shall be established through the linking of views, callouts, elevations and drawing sheets fully within the BIM authoring software.

Care shall be taken to ensure that any referenced data is available and visible prior to the publication of documentation from the BIM.

4.3.3.2 Sheet composition from Views/Output files

Views exported from the BIM for sheet compilation in CAD, or for use as a background to other drawings in CAD, shall be placed on a plain border which clearly indicates the following:-

- The status and intended use of the data;
- Details of the origin of the data;
- The date of production or issue.

Where output files are exported from the BIM for further 2D detailing in CAD, originators shall ensure that changes occurring within the BIM are correctly reflected and updated within the CAD files used to produce the final drawing.

If it is a requirement to export data from the BIM authoring software in 'Real-World' co-ordinates, then the export operation shall be performed from a model view (such as a floor-plan) and not from a compiled sheet view which will be scaled and/or rotated.

4.3.4 View Naming

Conventions in the naming and use of views are necessary to coordinate team activity and prevent inadvertent changes in the output documents. View naming shall be consistent across all references to that view. Renaming of views shall be carried out with care as any changes will be automatically reflected across all documentation.

4.3.5 Sheet Naming

Sheet naming shall be based on the document and drawing numbering protocols established for the project. These names automatically match the text as it appears in the title block and any schedules.

4.3.6 Presentation Styles

This section defines the criteria which ensure the plotted appearance of drawing output from the BIM is consistent and of the highest quality. It is not the remit of this standard to dictate aspects covered by existing CAD standards. Most of the aspects covered in this section are software-specific and further information should be obtained from the relevant software providers.

Where client requirements deviate from those expressed in this standard, project-specific template files shall be created. These shall be stored within the Project BIM Resources Library

4.3.6.1 Annotation

Where no pre-defined text standards exist, the Text Style shall be ARIAL NARROW. The appearance of text shall be consistent across a set of drawings.

Annotation shall be legible, clear and concise.

An opaque background should be considered as an aid to clarity.

Text shall remain legible when drawings are plotted at reduced size.

Wherever practical lettering shall not be placed directly on top of lines or symbols.

Dot style arrowheads shall be used instead of closed filled arrowheads when calling up hatched/shaded areas.

4.3.6.2 Text Assignment

All text shall be restricted to the following sizes:

Text height (mm) Plotted full size	Usage
1.8	General text, dimensions, notes used on A3 & A4 size drawings
2.5	General text, Dimensions notes
3.5	Sub-headings General text, dimensions, notes – A0 drawings
5.0	Normal titles, drawing numbers
7.0	Major titles

Alternative text sizes shall not be used without clarification in the Project BIM Execution Plan.

4.3.6.3 Line Weights

The line weights control the graphical display of on-screen data as well as all published output. The plotted appearance of modelled components shall be consistent across the project.

The plotted appearance of modelled components shall be represented in a manner that provides ‘depth’ to the drawing and allows for adequate differentiation of elements cut in section, profile view and priority elements. For Line Patterns, Line Styles, Hatching and Filled Regions and View Templates, the modellers will need to refer to software-specific supplements

4.3.6.4 Dimensioning

Default dimension styles should be provided for the consistent appearance of dimensions across all project documentation. New styles shall be added only if authorised.

Where practical, all dimensioning shall be created using relevant software dimensioning tools. The dimension text shall not be exploded or overridden.

Where practical avoid duplicate dimensioning either within a drawing or within a set of drawings.

Where practical, dimension lines shall not be broken and shall not cross other dimension lines.

Dimensions shall be placed on a drawing so they may be read from the bottom or right-hand side of the drawing.

Dimension text shall be placed above the dimension line and shall be clear of other lines so that they are legible. The default dimension styles shall not be overridden.

4.3.6.5 Drawing borders and Title blocks

Project-specific title blocks shall be created and stored in the Project BIM Resources folder

4.3.6.6 Symbols

Standard symbols such as North point, section marks and call-ups shall be made available from within the project or central Resource folder.

4.3.6.7 Section and Detail Marks

All Sections shall be numerically labelled.

All Details shall be alphabetically labelled.

Where practical, sections shall be listed consecutively, from left to right and from top to bottom on the drawing on which they are drawn. All sections and details shall be correctly cross-referenced in both directions i.e. cross reference to where the section/detail is actually drawn.

Drawing cross referencing shall not include the revision code.

5.0 Reference

1. The Hong Kong Institute of Building Information Modelling
   BIM Project Specification version 3.0 (http://www.hkibim.org)
2. MTR Drawing & CADD Manual, version A4, Supplement B, BIM
3. Hong Kong Housing Authority and Housing Department,
   BIM Standards Manual, version 1.0
4. PAS 1192-2:2013 Specification for information management for the capital/delivery phase of construction projects using building information modelling.
5. CPIx Post Contract-Award Building Information Modelling (BIM) Execution Plan (BEP)
6. BCA Singapore BIM Guide Version 2
7. Explanatory Notes on Geodetic Datum in Hong Kong
   http://www.geodetic.gov.hk/smo/gsi/programs/en/GSS/grid/refdoc.htm
8. CAD Standard for Works Projects (CSWP), Development Bureau
9. Standard for Exchange of 3D Spatial Data, Land & Engineering Survey Board, Development Bureau, Hong Kong
10. AEC (UK) BIM Protocol (Model File Naming)
11. BIM Forum LOD Specification 2013.
12. New Zealand BIM Handbook (Final Draft, 2014).

Appendix A CIC BIM Standards Categories & Objectives

The BIM Standards are currently classified into four categories and the corresponding objectives are as follows:-

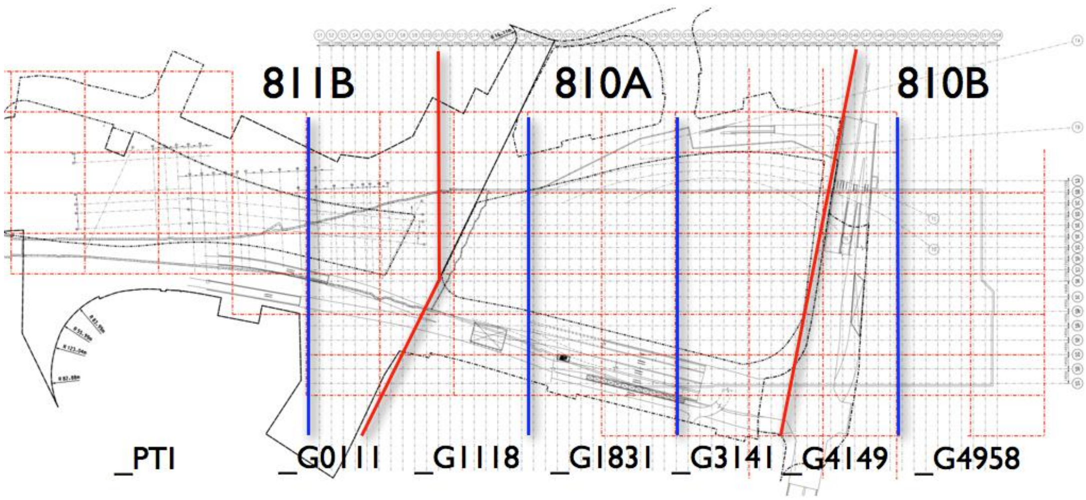
No	Category	
i.	Project Execution Plan BIM	Objective - To define overall project management and execution on strategy, collaboration process, production and data segregation. The Project Execution Plan should comprise, including but not limited to, the following elements:- – Project goals, BIM uses, analysis plan – Definition and abbreviation – Project template (e.g. folder and file structure, colour scheme and style, project parameters, etc.) – Organisational roles and responsibilities/staffing/team – BIM process design – Documentation – BIM modelling plan and model structure (e.g. model manager, planned model, model component, etc.) – BIM information exchanges – BIM and facility data requirements – Collaboration procedures and cross-disciplinary model coordination – Quality control – Technological infrastructure needs – Project deliverables – Publishing formats
ii.	Modelling Methodology This is a project specific document and applies to all the organisations involved in the delivery of a project.	Objective - To enable model development and build-up which will facilitate the efficient use or re-use of BIM data and models with modelling data consistency within in a single discipline or with other disciplines. The BIM Methodology should comprise, including but not limited to, the following elements:- – Define “how” each BIM model is to be created, developed and shared with another discipline aiming to enable efficient use and re-use of BIM data with modelling data consistency – Model division and model structure (e.g. structure, zones, levels, systems, etc.) – Properties of BIM elements – Drawing compilation and preparation for publication – Application of components
iii.	Level of Development	Objective - To specify the intended graphical scale and how much details are needed for architectural model and structural model for stages of conceptual, preliminary design, detailed design, submission to approving authority, construction and as-built. Objective - To specify the intended graphical scale and how much details are needed for mechanical, electrical and plumbing (MEP) models for stages of conceptual and preliminary design. The following elements are required (including but not limited to) in the Level of Development standard:- – Definition of elements in architectural building information model in stages of conceptual, preliminary design, detailed design, construction and as-built

No	Category	
		– Definition of elements in structural building information model in stages of conceptual, preliminary design, detailed design, submission to approving authority, construction and as-built – Definition of elements in MEP building information model during the conceptual and preliminary design stages.
iv.	Component Presentation Style and Data Organisation	Objective - To facilitate standard appearance, style, size, properties, categories, units and measurement, data structure and naming conversion, etc. The standards should comprise, including but not limited to, the following elements:- – Filename convention for project (presenting: project, project phase, building type, structure type, discipline, file type, revision, modification, etc.) – Filename convention for components (presenting: component name, type name, revision, systems, etc.) – Folder structure and folder content requirement – Model hierarchy and model links – Materials, colour, line style – Spatial location and co-ordination – Units and Measurement – Categories and systems

Appendix B Examples of Model Zones & Levels Definitions

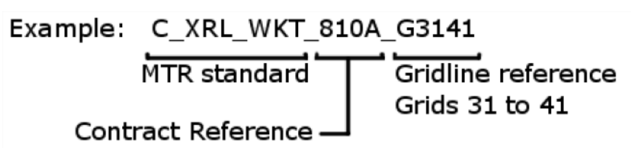
MTR West Kowloon Terminus – Large plan project with multiple contracts

The models for the project shall be created by sub-dividing the project on plan into three zones representing the 811B, 810A and 810B contracts. These zones will be further sub-divided to control the Revit file sizes. The files are identified by the project gridlines.



The file naming for the model files will be as follows:-

Contract	*Architecture*	*Structure*
811B	C_XRL_WKT_ARC_811B_G0111	C_XRL_WKT_STR_811B_G0111
810A	C_XRL_WKT_ARC_810A_G1118	C_XRL_WKT_STR_810A_G1118
	C_XRL_WKT_ARC_810A_G1831	C_XRL_WKT_STR_810A_G1831
	C_XRL_WKT_ARC_810A_G3141	C_XRL_WKT_STR_810A_G3141
810B	C_XRL_WKT_ARC_810B_G4149	C_XRL_WKT_STR_810B_G4149
	C_XRL_WKT_ARC_810B_G4958	C_XRL_WKT_STR_810B_G4958
811B	C_XRL_WKT_ARC_811B_PTI	C_XRL_WKT_STR_811B_PTI



Hong Kong International Airport – Large plan project with different phases of construction

Due to the scale, complexity and planned construction phasing, the BIM Manager will separate the models by zone and by discipline, by sub-dividing the Midfield Concourse on plan into 11 separate zones.

The zones and the zone file name codes are defined as:-

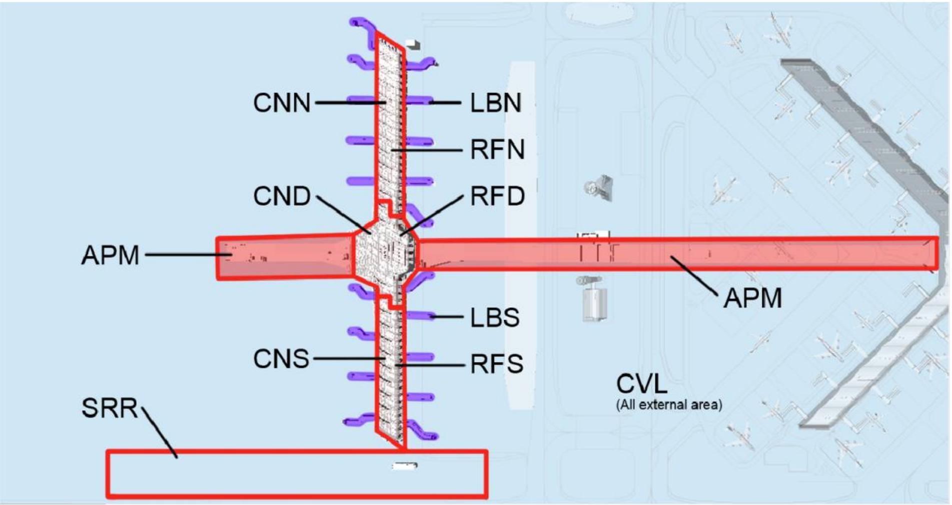


Figure 1 – BIM Model Zones	Levels
CNN - Concourse North	Foundation Level to L7 Mezzanine (see section below)
CND - Concourse Central Node	L0 APM track to L7 Mezzanine (see section below)
CNS - Concourse South	Foundation Level to L7 Mezzanine (see section below)
LBN – Fixed Link Bridge North	Foundation Level to L7 Mezzanine
LBS – Fixed Link Bridge South	Foundation Level to L7 Mezzanine
RFN - Roof Framing North	L6 Departure to L8 Roof (see section below)
RFD - Roof Framing Central Node	L0 APM track to L7 Mezzanine (see section below)
RFS - Roof Framing South	L6 Departure to L8 Roof (see section below)
APM - APM Tunnel	L0 APM track to Foundation Level
SRR - South Runway Road	Foundation Level to L5 Arrival
CVL - Civil Airfield Services	L4 Apron & below (Levels vary see fig. 9)

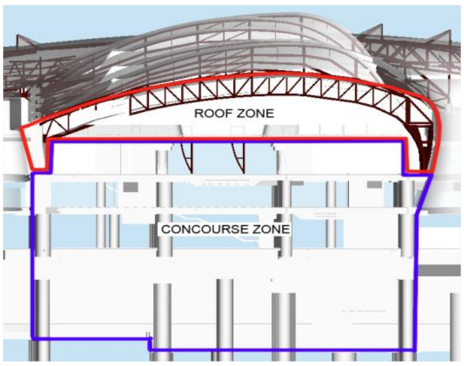


Figure 2 – BIM Model Zone Cross Section

The match lines between the Concourse Node and the North/South Concourse are shown along the structural movement joints as below:-

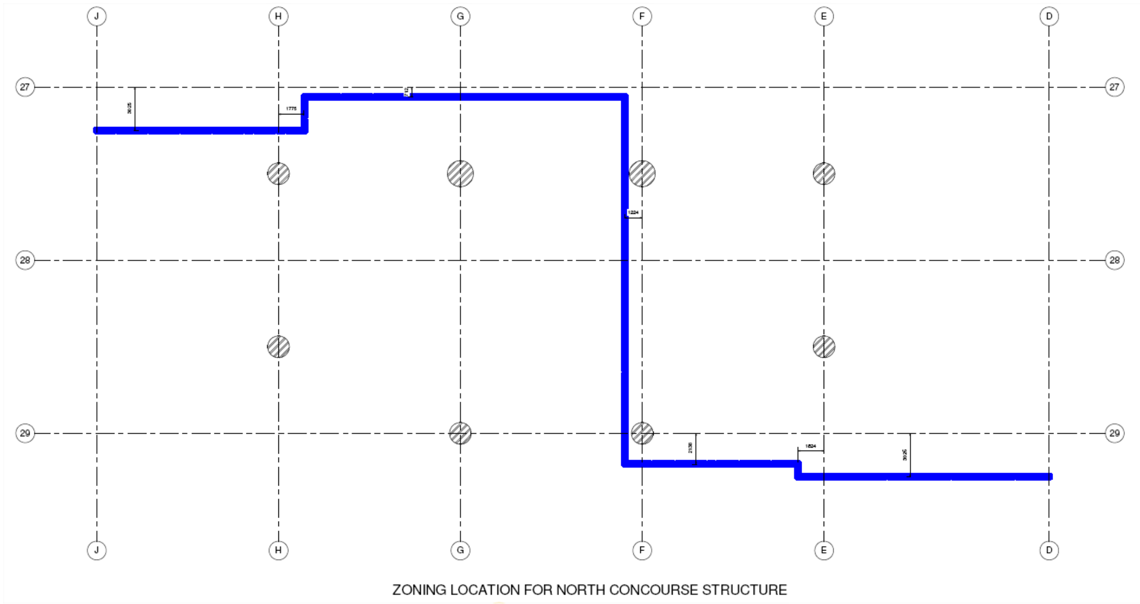


Figure 3 BIM Model Zone Break Line at North - Concourse

The match lines between the Roof Node and the North/South Roof follow the structural steel roof framing, as shown below, and match with the concourse movement joints.

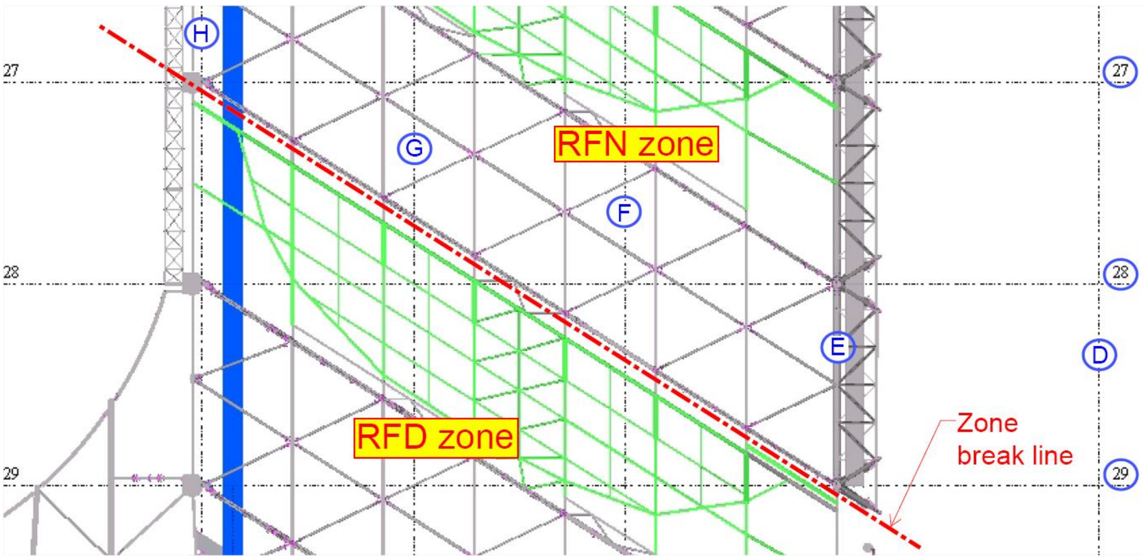
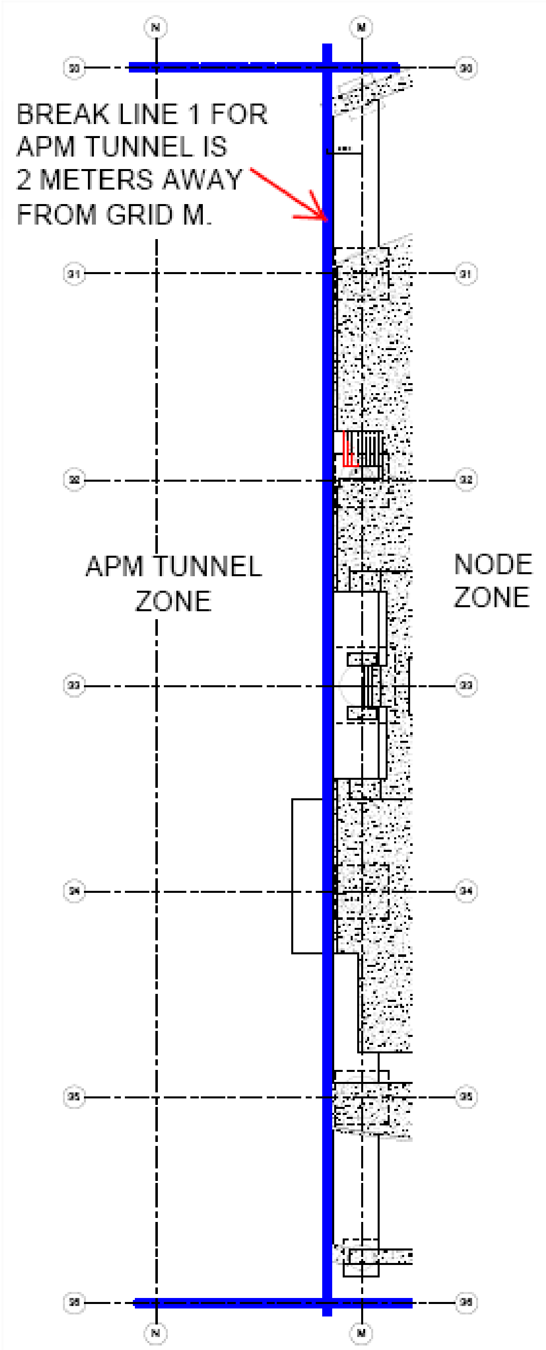


Figure 4 BIM Model Zone Break Line at North - Roof

The match lines between the Concourse Node and APM Tunnel is as shown below:-



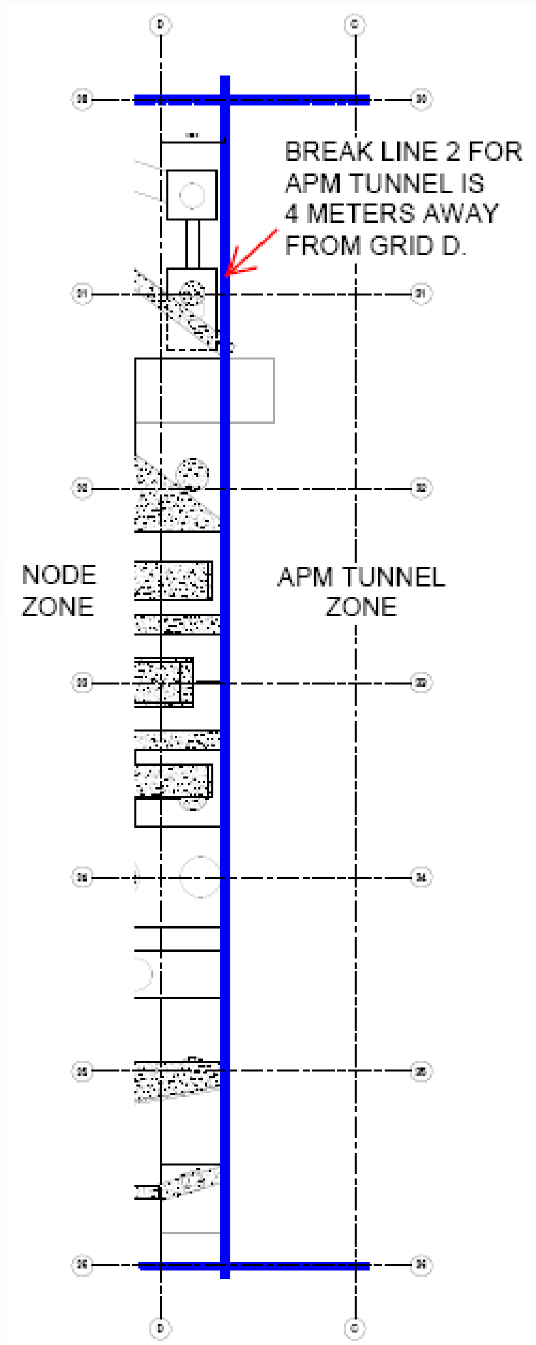
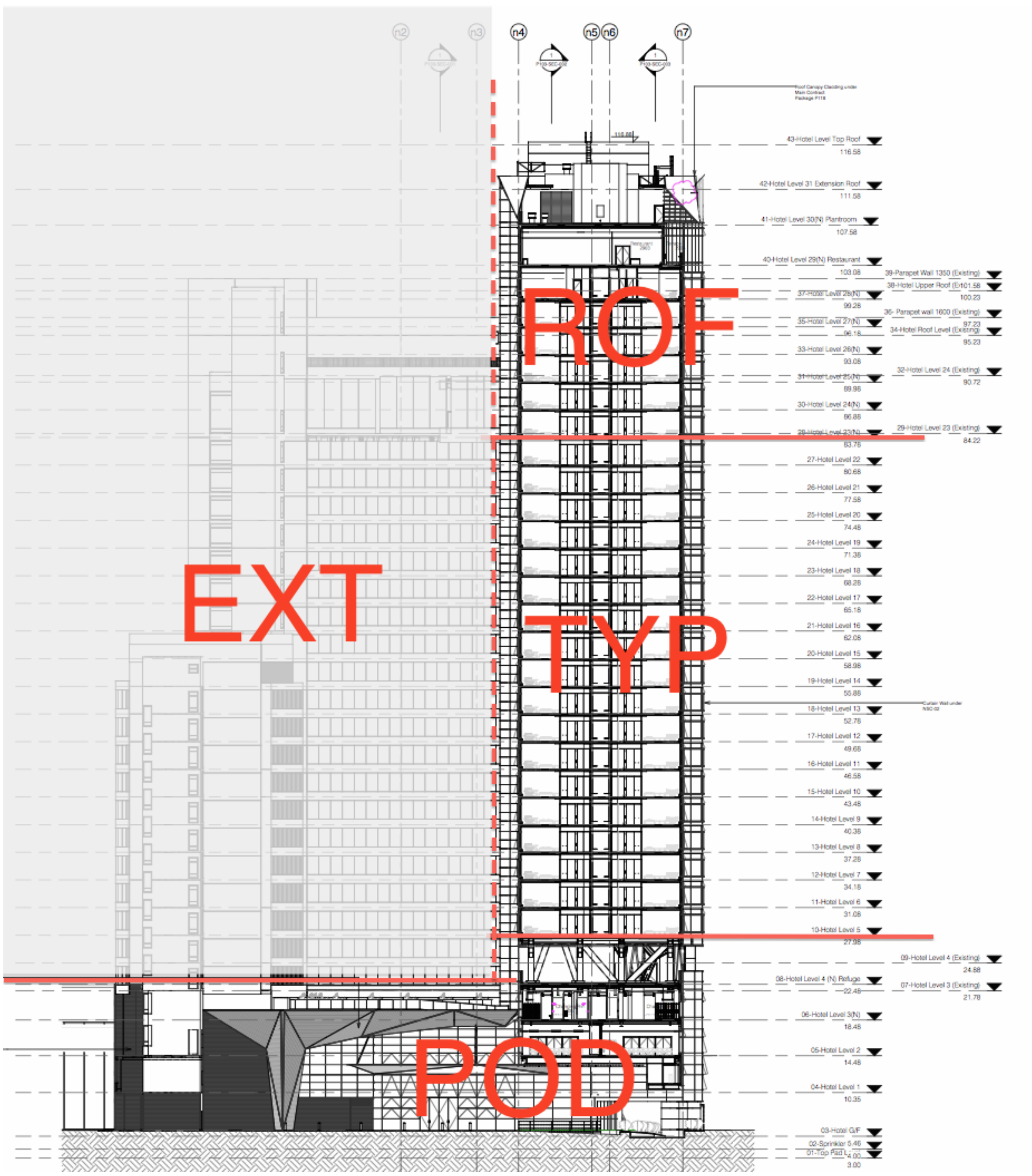


Figure 5 BIM Model Zone Break Line at Node / APM

Tall Building Example

For tall buildings, the project may be divided into basement, podium and tower models. In this example, a new residential tower will be constructed adjacent to an existing development. The models will be divided into the following zones;

POD	=	Podium	GF to Level 4
TYP	=	Typical Levels	Level 5 to Level 27
ROF	=	Roof Level	Level 28 to Top Roof Level
EXT	=	Existing Building	All levels (for reference)



Appendix C BIM Acronyms & Abbreviations

Acronyms / Abbreviations	Definitions
3D	Three dimensional
4D	Time
5D	Cost
6D	Lifecycle and Facilities Management
AAD	Automatic actuating device
AAV	Automatic air vent
ABT	Bridge Abutment
ACB	Air circuit breaker
ACC	Air cooled chiller
ACF	Air curtain fan
ACU	Air cooled condensing unit
ADB	Automatic drop barrier
ADP	Advertising panels
AEC	Architectural, Engineering and Construction
AFA	Automatic fire detection and alarm system
AFC	Automatic fare collection gates
AFR	Auto-roll filter
AGS	Association of Geotechnical and Geoenvironmental Specialists
AHU	Air handling unit, air-conditioning equipment for cooled incoming normal air from environment or returned air from room
AI	Architects Instruction
AIA	American Institute of Architects (US)
AIM	Asset Information Model / Modelling
AIR	Air Receiver or terminals
AIRC	Air compressor
AM	Asset Management
APG	Automatic platform gate
API	Application Programming Interface
APM	Association for Project Management
ARC	Architectural discipline, elements or components
ASL	Artificial Slope
ASP	Application Service Provider
AUT	Model Author used to define who produces a model file
AVS	Audio/visual advisory system
BAS	Building Automation System
BCF	BIM collaboration format
BDMS	Data Base Management System
BEP	BIM Execution Plan
BES	Building Energy Simulation
BIM	Building Information Model / Modelling / Management
BLR	Boiler
BM	Beam

Acronyms / Abbreviations	**Definitions**
BMS	Building Management System
BOL	Bollard
BQ	Bill of quantities
BRD	Switch boards
BS	Building Services
bSa	BuildingSMART alliance
bSI	BuildingSMART International
BSI	British Standards Institute
BWT	Bleeding water retention tank
CAB	Cable trays, trunking, containment
CAD	Computer Aided Design
CADD	Computer-Aided Design & Drafting
CAFM	Computer Aided Facility Management
CAL	Calorifier
CAPEX	Capital Expenditure
CAR	Car park control system, barrier gate
CAT	Category Code for LOD Responsibility Matrix
CATIA	Computer Aided Three-dimensional Interactive Application
CCC	Concealed, Cast-in-place cable containment or cable conduit
CCTV	Closed Circuit TV
CDE	Common Data Environment
CDF	Common Data Format
CDM	Construction (Design and Management) Regulations
CDP	Condensation drain pipe
CDU	Chemical dosing unit
CE	Ceiling
CEN	European Committee for Standardisation
CERL	Construction Engineering Research Laboratory (USACE)
CFA	Cold formed angle
CFD	Computational Fluid Dynamics
CHL	Chiller unit
CHP	Chilled water pump
CHS	Circular hollow section
CHWPR	Chilled water pipe return
CHWPS	Chilled water pipe supply
CIAT	Chartered Institute of Architectural Technologists
CIBSE	Chartered Institution of Building Services Engineers
CIC	Construction Industry Council
CIV	Civil
CL	Cladding
CLBP	Cleansing water booster pump
CLD	Cladding
CLG	Ceiling
CLP	China Light & Power

Acronyms / Abbreviations	Definitions
CLR	Clearance or headroom
CLWP	Cleansing water pipe
CMMS	Computerised Maintenance and Management System
CNC	Computer Numerical Control
COBie	Construction Operations Building Information Exchange
COL	Column
COM	Communication system
CON	Contractors or sub-contractors engaged in the BIM process during pre-construction and construction stages.
CoP	Code of Practice
COS	Control System
COT	Cooling tower
CPIC	Construction Project Information Committee
CPIx	Construction Project Information Xchange
CSI	Construction Specifications Institute
CT	Cable tray
CTM	Curtain Wall
CUC	Customer Service centre
CUL	Box culvert
CWP	Potable water pipe
CWR	Chilled water return
CWS	Chilled water supply
CWTK	Cleansing water tank
D&B	Design and Build
DAM	Dampers (fire, smoke, motorized, volume control)
DAms	Drawing Amendments
DBMS	Database Management System
DCK	Bridge Deck
DDC	Direct digital control panel
DDS	Dust detection system
DMS	Document Management System
DOR	Door
DP	Drainage pump
DR	Door
DRE	Drencher pipe
DRJP	Drencher jockey pump
DRN	Drainage discipline
DRP	Drencher pump
DSD	Drainage Services Department
DSM	Design Standard Manual
E&M	Electrical & Mechanical building services
EAD	Exhausted air duct, bare ducting, for transport of used air to outside area for ventilation
EAF	Exhaust air fan, which is air-conditioning equipment for pulling away the exhaust air to outside
EAP	Emergency Access Point

Acronyms / Abbreviations	Definitions
EAR	Earthing & lightning protection
ECI	European Construction Institute
ECS	Environmental control system
EDI	Electronic Data Interchange
EDM	Electronic Distance Measurement
EDMS	Electronic Data Management System
EEP	Emergency Evacuation Point
EI	Engineers Instruction
ELE	Electrical Discipline
ELG	Emergency lighting
ELS	Excavation and Lateral Stability
ELU	Electrical supply cable, trench for utilities company
ELV	Electrical Low Voltage discipline
EMS	Escalators and moving walkways
EN	Euro norm
EPP	Emergency power point
ESC	Escalators
EVA	Emergency Vehicle Access
EWL	External Wall
EXH	Generator exhaust flue incl. acoustic treatment
EXI	Exit Sign
EXT	Extinguisher
FAA	Fixed automatically operated approved appliance
FAD	Fresh air duct
FAF	Fresh air fan, which is air-conditioning equipment for pushing the fresh air to room
FAN	Fans in general
FBR	Flexible barrier
FCS	Fireman's communication system
FCU	Fan coil unit
FD	Floor drain
FDN	Foundations
FEE	Fabric Energy Efficiency
FFE	Furniture, Fitting and Equipment
FFJP	Fixed fire service jockey pump
FFL	Finished Floor Level
FFP	Fixed fire service pump
FH	Fire hydrant
FHP	Fire hydrant pipe
FHR	Fire hydrant and hose reel
FIM	Facilities Information Model
FL	Architectural floor (finish level)
FLR	Floor
FM	Facility Manager or Facility Management
FMA	Facilities Management Association

Acronyms / Abbreviations	Definitions
FP	Fire service pump
FPS	Fire protection system
FRWP	Fresh water pipe
FSB	Fixed smoke barrier
FSTK	FS water tank
FT	Footing
FTP	File Transfer Protocol
FUL	Diesel tank & fuel pipes
FUR	Furniture
FWBP	Flushing water booster pump
FWP	Flushing water pipe
FWTK	Flushing water tank
GAS	Gas piping
gbXML	Green Building Extensible Modelling Language
GDL	Geometric Description Language
GDS	Gas detection system
GEN	Generator or Emergency generator
GEO	Geotechnical
GES	Gas extraction system
GFA	Gross floor area
GHG	Green House Gases
GIS	Geographical Information System
GL	Grid line
GML	Geography Markup Language
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GRC	Glass reinforced cement
GRG	Glass reinforced gypsum
GSA	Government Services Administration (US)
GUID	Globally Unique Identifier
GUL	Gully
GWP	Global Warming Potential
H&S	Health and Safety
HR	Hose reel
HYD	Hydrants
IAI	International Alliance for Interoperability (now known as BuildingSMART)
IAM	The Institute of Asset Management
IBC	Institute for BIM in Canada
IBD	Intelligent Building Data
iBIM	Integrated Building Information Modelling
ICE	Institution of Civil Engineers
ICIS	International Construction Information Society
ICT	Information and Communications Technology
IDM	Information Delivery Manual

Acronyms / Abbreviations	Definitions
IFC	Industry Foundation Classes
IFMA	International Facility Management Association
IGES	International Graphics Exchange Standard
IP	Intellectual Property
IPD	Integrated Project Delivery
IPR	Intellectual Property Rights
IRBP	Irrigation water booster pipe
IRWP	Irrigation water pipe
IRWTK	Irrigation water tank
IS	International Standard
ISG	Implementation Support Group (BuildingSMART)
ISO	International Organisation for Standardization
IT	Information Technology
ITE	Computer Racking, Servers etc
IWL	Interior Wall
JTY	Jetty
KPI	Key Performance Indicator
KRB	Kerbs
KWP	Kitchen waste pipe work including floor drain, open trapped Y/N gully, sealed trapped gully, clean outs and vent
LAD	Ladders
LADAR	Laser detection and ranging
LAN	Local Area Network
LCie	Life Cycle information exchange
LDS	Hard landscape
LEED	Leadership in Energy & Environmental Design
LGD	Lighting device or fitting
LIDAR	Light detection and ranging
LIF	Lifts (elevators)
LIS	Lifts System
LMCP	Local motor control panel
LOD	Level of Development
LOU	Louvre
LRM	Linear Referencing Method
LVSB	Low voltage switchboard
M&E	Mechanical and electrical
MCC	Motor Control Centre
MEP	Mechanical, electrical and plumbing
MET	Meter
MIDP	Master Information Delivery Plan
MSG	Model Support Group (BuildingSMART)
MTR	MTR Corporation Limited
MVD	Model View Definition
NBIMS	National Building Information Modeling Standard (US)
NBS	National Building Specification

Acronyms / Abbreviations	Definitions
NC	Numerical Control
NIBS	National Institute of Building Sciences (US)
NIST	National Institute of Standards and Technology (US)
NRM	New Rules of Measurement
NSB	Noise Barrier
NSL	Natural Slope
NUL	Nullah
NURBS	Non Uniform Rational B-Spline Surface
O&M	Operations and maintenance
OLS	Overhead line system
OPEX	Operational Expenditure
OTE	over track exhaust duct
OTG	Open trap gully
PAA	Portable hand-operated approved appliance, fire extinguisher
PAD	Pre-treated air duct, insulated ducting, to transport the cooled air for air conditioning
PAN	Panels
PAS	Publicly Available Specification
PAU	Primary air unit, air-conditioning equipment
PAV	Pavement
PBS	Precast bridge segment
PC	Pre-cast
PCI	Pre-Construction Information
PCU	Packaged Condenser Unit
PDM	Project Delivery Manager
PEP	Project Execution Plan
PEU	Packaged Evaporator Unit
PFI	Private Finance Initiative
PHB	Phone booth
PII	Professional Indemnity Insurance
PIM	Project Information Model
PIR	Bridge Pier
PIT	Sump or sewerage pit
PIX	Project Information Exchange
PLM	Plumbing discipline
PMP	Pumps
PND	Plumbing & Drainage discipline
POT	Post-tensioned
PP	Plumbing pump
PQQ	Pre-Qualification Questionnaire
PRT	Pre-tensioned
PRV	Pressure vessel
PS	Pre-stressed
PSB	Platform supervisor box
PSD	Platform Screen Door

Acronyms / Abbreviations	Definitions
PSS	Power Supply System
PST	Precast concrete
PTR	Planter
PV	Solar Photovoltaic
PWP	Potable water pump
PWTK	Potable water tank MWTK Make-up water tank
PWY	Permanent Way
PXP	Project Execution Plan
QA	Quality Assurance
QS	Quantity Surveyor
QTO	Quantity Take Off
R&D	Research and Development
RA	Ramp
RACI	Responsible, Accountable, Consulted and Informed
RAD	Return air duct, a bare ducting, to transport the used air and return back to AHU
RBR	Rigid barrier
RC	Reinforced concrete
RCP	Reflected ceiling plans
RDS	Room Data Sheet (or Room Data Schedule)
RDS	MTR Radio system
RF	Roof
RFI	Request for Information
RFP	Request for Proposal
RHS	Rectangular hollow section
RIBA	Royal Institute of British Architects
RICS	Royal Institute of Chartered Surveyors
RMP	Ramp or sloped slab
RMS	Ring main system with fixed pump
ROF	Roof
ROI	Return on Investment
RSA	Rolled steel angle
RSC	Rolled steel channel
RSJ	Rolled steel joist
RWC	Surface channel, slot channel, external drainage
RWP	Rain water pipe
SaaS	‘Software as a Service’
SAC	Split-type indoor & outdoor air conditioning unit
SAD	Supply air duct, a bare ducting, to transport the outside air to room area
SAP	Standard Assessment Procedure
SBCS	Station based control system
SBEM	Simplified Building Energy Method
SBS	Structural beams
SDNF	Steel Detailing Neutral Format
SDO	Standards Developing Organisation

Acronyms / Abbreviations	Definitions
SDS	Space Data Sheet (or Space Data Schedule)
SEC	Security system or equipment
SED	Smoke extraction duct, a fire rated enclosed ducting, to transport the hot smoke air to outside
SEF	Smoke extraction fan, which is smoke control fan, to transport the hot smoke air to outside
SEJP	Sewage ejector pump
SEM	Structural electrical mechanical - builders work requirements
SES	Static smoke extraction system
SETK	Sewage ejector tank
SFH	Street Fire Hydrant system
SFO	Foundations
SHD	Fire detection system, heat or smoke detectors
SHJP	Street hydrant jockey pump
SHP	Street hydrant pump
SHS	Square hollow section
SHT	Fire shutter
SHTK	Street hydrant water tank
SIG	Signage
SIS	Signalling system
SIT	Site
SLA	Structural slab
SMH	Manhole, Terminal manhole
SMM	Standard Method of Measurement
SNK	Sink, washbasin
SP	Soil pipe
SPA	Room spaces
SPH	Sprinkler Head
SPJP	Sprinkler jockey pump
SPP	Sprinkler pump
SPR	Sprinkler pipe
SPTK	Sprinkler water tank
SPV	Sprinkler valve
SSL	Structural Slab Level
SSUP	Storm water sump pump
STB	Steel Bridge Segment
STE	Steps & stairs
STEP	Standard for Exchange of Product data
STG	Sealed trapped gully
STL	Standard Tessellation Language
STR	Structural discipline, elements or components
STS	Structural steel
SUR	Surrounding buildings
SWL	Structural wall
SWP	Soil & waste pipe, sewerage pipe

Acronyms / Abbreviations	Definitions
SWT	Outlet, panel, wall switch, circuiting to device, security device, card access, socket point
TAD	Transfer air duct
TAG	Tactile Path
TAP	Tap, Faucet
TAS	Trackside Auxiliaries System
TBA	To be agreed
TBC	To be confirmed
TBM	Tunnel boring machine
TEL	Telecommunication equipment
TIDP	Task Information Delivery Plan
TLS	Terrestrial Laser Scanner
TMH	Connection point/manholes for telecom utilities
TNK	Tank
TPI	Tender price index (or indices)
TQ	Technical Query
TR	Cable trunking
TRN	Transformer
TRP	Traps
TUN	Tunnel
TVS	Tunnel Ventilation System
TX	Transformer
UB	Universal beam
UC	Universal column
UGR	Underground drainage
UML	Unified Modelling Language
Uniclass	Unified Classification System
UPS	Uninterruptible power supply
USACE	United States Army Corps of Engineers
UTL	Underground Telecommunication system
UTS	Under platform supply duct
VC	Virtual Construction
VCS	Ventilation control system
VDC	Virtual Design and Construction
VLV	Valve
VP	Vent pipe
VPN	Virtual Private Network
VRML	Virtual Reality Modelling Language
VRV	Variable Refrigerant Volume
WA	Architectural wall (non-structural)
WAN	Wide Area Network
WAT	Water tanks (concrete)
WBDG	Whole Building Design Guide
WBS	Work Breakdown Structures
WCC	Water cooled chiller

Acronyms / Abbreviations	Definitions
WCS	Water Closets, Toilets
WDW	Window
WIP	Work In Progress
WL	Structural wall
WLC	Whole Life Costing
WLL	Wall
WMT	Water meter
WP	Waste pipe
WSD	Water Supplies Department
WSH	Water storage heater
WSM	Water supply main & control valve
WSUP	Waste water sump pump VP Vent pipe
X-REF	Cross reference
XML	eXtensible Markup Language

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