CONSTRUCTION
INDUSTRY COUNCIL
建造業議會

CIC Beginner's Guide on Construction Digitalisation – **Adoption of open BIM**

2025

Construction Digitalisation – Adoption of open BIM

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Foreword

As we advance into a new era of construction digitalisation, the publication "CIC Beginner's Guide on Construction Digitalisation – Adoption of open BIM" marks a significant step forward in our industry's evolution. The journey towards effective Building Information Modelling (BIM) in Hong Kong has been transformative, and this document represents our commitment to embracing open BIM. Following the successful implementation of ISO 19650 and the release of the CIC BIM Standards, we recognise the growing need for guidelines that support the adoption of open BIM practices. This publication offers invaluable insights into the principles of digital construction, highlighting the importance of interoperability, collaboration, and information management across all project stages.

Informed by feedback from industry stakeholders, this document outlines good practices and methodologies that empower Appointing Parties, Employers, Clients to leverage BIM effectively. It provides a comprehensive framework for information management, ensuring that users can seamlessly integrate BIM into their project workflows. As you explore the "Construction Digitalisation – Adoption of open BIM," Together, let us embrace the future of construction with open BIM, fostering collaboration and excellence in every endeavor.

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Construction Industry Council

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Preface

The Construction Industry Council (CIC) is dedicated to driving continuous improvement across all facets of Hong Kong's construction industry. To support this mission, the CIC establishes Committees, Task Forces, and other collaborative platforms to examine specific areas of work. These groups aim to develop Alerts, Reference Materials, Guidelines, and Codes of Conduct that empower industry stakeholders to pursue excellence.

The CIC recognises that while some improvements and best practices can be implemented immediately, others may require more time and preparation. To reflect this, four distinct categories of publications have been established, each serving a specific purpose:

Alerts	**The Alerts are reminders in the form of brief leaflets produced quickly to draw the immediate attention of relevant stakeholders to the need to follow some good practices or to implement some preventive measures in relation to the construction industry.**
Reference Materials	The Reference Materials are standards or methodologies generally adopted and regarded by the industry as good practices. The CIC recommends the adoption of the Reference Materials by industry stakeholders where appropriate.
Guidelines	The Guidelines provide information and guidance on particular topics relevant to the construction industry. The CIC expects all industry stakeholders to adopt the recommendations set out in the Guidelines where applicable.
Codes of Conduct	The Codes of Conduct set out the principles that all relevant industry participants should follow. Under the Construction Industry Council (Cap 587), the CIC is tasked to formulate codes of conduct and enforce such codes. The CIC may take necessary actions to ensure compliance with the codes.

If you have read this publication, we encourage you to share your feedback with us. Please take a moment to fill out the Feedback Form attached to this publication so that we can further enhance it for the benefit of all concerned. With our joint efforts, we believe our construction industry will develop further and will continue to prosper for years to come.

1 Introduction

1.1 Overview of BIM and open BIM

Building Information Modelling (BIM) is a digital process that brings together geometric, spatial, and functional data to manage asset information throughout the entire project lifecycle—from planning and design to construction, operation, and eventual decommissioning.

In Hong Kong, BIM adoption is strongly supported by government policy. The Development Bureau (DEVB) has stated that **Capital works** projects with project estimates of more than **HKD 30 million** shall use BIM technology (Technical Circular (Works) No. 7/2017) and set out the Roadmap on Adoption of BIM for Building Plan Preparation and Submission (2023). This roadmap targets mandatory BIM submissions for private sector projects by 2029. In addition, the latest DEVB Technical Circular (Works) No. 1/2025 emphasises the need to bridge the seamless information flow and exchange across the full project lifecycle to enable effective asset management and facilitate Smart City Planning. This policy direction strengthens the case for adopting open BIM standards to ensure long-term data usability, interoperability, and integration with city-scale digital infrastructure.

The Construction Industry Council (CIC) has also published BIM Standards, such as the CIC BIM Standards General, to promote collaborative decision-making, reduce errors, and enhance efficiency in complex projects by supporting the use of open BIM.

The term open BIM refers to the universal concept of using open, neutral standards for collaborative BIM processes. In this publication, open BIM is defined as a broader concept that goes beyond file formats—it encompasses cross-software operations, platform-independent workflows, and collaborative practices that enable seamless data exchange across different tools and stakeholders.

Open BIM extends the benefits of BIM by enabling seamless data sharing and collaboration across different software platforms and project stakeholders. Open BIM relies on vendor-neutral standards, like Industry Foundation Classes (IFC) for exchanging model data and BIM Collaboration Format (BCF) for managing issues and coordination. This approach ensures compatibility across commonly used platforms (such as Revit, Tekla, and ArchiCAD), avoids vendor lock-in, and supports long-term data usability for asset management.

Open BIM directly supports Hong Kong's Smart City Blueprint, which emphasises digital transformation, integrated urban planning, and data-driven asset management for key initiatives like the Northern Metropolis.

1.2 Purpose of this publication

This publication is designed as a beginner's guide for Hong Kong's Architecture, Engineering, Construction, and Operation (AECO) industry professionals and government stakeholders who are new to BIM and open BIM. It aims to help readers adopt open BIM in line with international standards (such as ISO 19650 series and buildingSMART frameworks) and local requirements (including DEVB technical circulars, harmonisation guidelines, and CIC BIM Standards).

The main objectives are to:

1. Establish Foundational Understanding
   Equip stakeholders with a clear and practical understanding of open BIM principles and how they differ from proprietary BIM workflows. This includes explaining how open standards like IFC and BCF enhance data interoperability, prevent vendor lock-in, and ensure long-term data resilience for lifecycle management.

2. **Demystify Practical Implementation**
   In addition to offering recommendations for integrating open BIM into projects, this reference material also advocates for a more "open" exchange of information and data across various building information domains. We recommend this open exchange approach to better suit the practical adoption of BIM data across disciplines, including Quantity Take-Off (QTO), statutory code compliance checking, Facilities Management (FM), digital fabrication, site safety monitoring, and construction planning. This supports cross-domain collaboration and enhances the usability of BIM data throughout the project lifecycle.

3. **Navigate Challenges & Risks**
   Identify and address Hong Kong-specific barriers to open BIM adoption, including:

   - Data loss during IFC conversion, especially at facility management handover. (Worldwide-issue)
   - Limited IFC support for 2D schedules and drawings generation.
   - Solutions and best practices, such as using validation tools (e.g., Solibri) and BCF for coordination.
   - Different IFC viewers can produce varying visualisations and data interpretations, which may lead to inconsistencies in model review and coordination.

- Open BIM is primarily used for view and coordination rather than direct editing. A native editable model may still be required for the project lifecycle.

4. **Support Smart City & Policy**

   Align BIM and open BIM adoption with DEVB and Hong Kong's Smart City Blueprint, including digital twin development and BIM-to-GIS integration.

2 Understanding open BIM

Open BIM is a collaborative approach built on transparent, vendor-neutral standards and workflows. It enables all project stakeholders to share and utilise BIM data, regardless of the software they use.

In Hong Kong, open BIM is particularly valuable for complex, high-density developments, where seamless data exchange and compliance with local regulatory requirements are critical.

2.1 Core Principles of open BIM

1. **Interoperability**:
   Open BIM also embraces inclusive workflows and file formats—such as text files, spreadsheets, vector files, GIS formats, and raster data—that enhance interoperability across disciplines and systems. Data can be exchanged through open standards like IFC, BCF, and COBie, supporting collaboration across different platforms. (See Section 4 for details.)

2. **Long-term Usability**:
   Asset data remains accessible even after proprietary software is no longer supported. It is important for infrastructure assets in Hong Kong with very long life cycles, such as the MTR and public housing.

3. **Process Transparency**:
   Workflows are based on open protocols (like Information Delivery Manual, IDM, and Model View Definition, MVD), making it easier to audit and track information.

4. **Vendor Neutrality**:
   Open BIM removes software lock-in, allowing teams to use their preferred tools (such as Revit, Tekla, or ArchiCAD) without compatibility issues. This supports both innovation and public-private partnerships in the AECO sector.

2.2 Differences Between Native BIM and open BIM

Native BIM uses software-specific (proprietary) file formats. Each BIM application (like Revit or ArchiCAD) stores data in its own format, which can only be opened, read and edited by a few specific software by the same developer.

Open BIM uses open, standardised file formats (such as Industry Foundation Classes, IFC) to manage and exchange BIM data. Data in these formats can be read by any compatible software (or even viewed as plain text) so information is not tied to one vendor or platform.

Open BIM does not replace the use of native BIM software. Instead, it acts as a bridge, allowing different BIM tools to share and use information through open file formats. This enables interoperability and preserves data for the long term.

Most BIM software can export data to open formats, allowing teams to share specific geometry, properties, or non-geometric data as needed. For example, only the information required for statutory submission can be exported. (See Section 4 for more on these standards.)

Aspect	**Native BIM**	**Open BIM**
Data Format	Proprietary (e.g.,. RVT for Revit,. PLN for ArchiCAD)	Open standard formats (e.g., IFC, BCF, COBie)
Interoperability	Limited to the same-platform users	Cross-platform (e.g., ArchiCAD ↔ Revit ↔ Tekla)
Data Longevity	Tied to software vendor updates	Sustainable beyond software/tool lifecycles
Customisation	High within native environment	Constrained by schema scope (e.g., IFC4)
Compliance Traceability	Follow proprietary algorithms	Can be validated via bSDD/IDS rules

Open BIM's use of open standards is essential for effective collaboration in multi-stakeholder projects. For instance, the IFC format enables seamless model exchange between architects using ArchiCAD and engineers using Tekla. In contrast, proprietary formats can lead to data silos.

2.3 Limitations

While open BIM offers significant advantages, several limitations should be considered in the context of Hong Kong's construction industry:

- **Geometric Simplification**:
  When converting a model from native BIM format to a software-neutral format (e.g., IFC) the geometry undergoes an "extract, transform, and load "(ETL)

process. This inevitably results in a loss of original parametric properties, representing the design primarily through its explicit geometry. Consequently, data loss or changes in file size may occur. Furthermore, information within BIM objects is automatically mapped to categories and descriptions based on the software converter's interpretation and pre-set data mapping rules, which can lead to information deviations.

- **Limited 2D Drawing Support:**
  Although IFC technically supports 2D drawings, the resulting files are often large and challenging to interpret. For effective design coordination and statutory submissions, using standard formats like PDF for 2D documentation remains the more practical approach.

- **Limited Editing Function:**
  IFC is primarily intended for visualisation and information exchange, allowing different users to review and share model data across platforms. However, it is not designed for detailed model editing, as the format simplifies complex geometries and properties. Therefore, to make precise updates or modifications to the BIM model, the use of native BIM software like Revit or ArchiCAD is necessary, since these programs support comprehensive editing capabilities that IFC cannot provide.

- **Domain Coverage Gaps:**
  Information requirements vary significantly across different domains. Construction models typically require object geometry, location, material descriptions, cost, and 5D information, whereas Facility Management (FM) models focus more on operational history and current status. Transferring information between these domains necessitates intelligent filtering and the careful selection of appropriate software-neutral formats. While IFC is widely adopted for buildings and infrastructure, it may not sufficiently capture specialised data for geotechnical or complex MEP systems. In such cases, alternative formats such as LandXML and AGS are more suitable. As Hong Kong advances its adoption of open BIM standards to support digital transformation in the construction and infrastructure sectors, it is important to acknowledge the role of these domain-specific open formats. Although not part of the core buildingSMART openBIM® suite (e.g., IFC, BCF, COBie), formats like LandXML and AGS are extensively used in civil, geotechnical, and infrastructure engineering. Their alignment with the principles of openness, interoperability, and long-term data usability reinforces their relevance in supporting cross-disciplinary collaboration and lifecycle data resilience.

- **Version Compatibility Issues**:

Developers of software-neutral formats periodically upgrade schemas or launch new versions to address specific industry needs. For example, the latest IFC includes support for infrastructure, a feature absent in previous versions. Converting files to an older schema (downgrading) may result in data loss.

- **Performance Constraints**:
  Large IFC files—typically those exceeding 1GB—can be slow to export, open, and share, particularly in complex projects. To maintain usability, strategies such as model segmentation, optimisation, or the use of lightweight viewers are recommended.

3 Why open BIM Matters in Hong Kong

Open BIM serves as a foundational driver of Hong Kong's digital transformation in the built environment, enabling seamless data interoperability, supporting long-term asset lifecycle management, and align with local regulatory and policy frameworks.

3.1 Smart City Blueprint and digital transformation

Open BIM plays a pivotal role in advancing Hong Kong's Smart City Blueprint through the following contributions:

- **Creating Unified Data Environments:**
  BIM data contain rich information of built assets which can facilitate the integration between BIM and GIS and the development of the Common Spatial Data Infrastructure (CSDI), as well as 3D city mapping managed by Lands Department. The Development Bureau's BIM Harmonization Guidelines for Works Department establish clear information requirements and standards, ensuring that BIM models and objects are prepared in a consistent and standardised way. This harmonisation enables efficient information exchange between Works Departments and the Lands Department, while also laying the groundwork for interoperability across the wider industry. The CIC's Reference Material of BIM Harmonisation for Digital Hong Kong complements this by identifying additional information requirements for both public and private sectors, supporting the Government's initiative to develop the Common Spatial Data Infrastructure (CSDI) and Smart City Blueprint.

  As-built BIM data from recently completed capital projects are collected in their native BIM formats for storage in the Government BIM Data Repository (GBDR). These data are then converted within the GBDR into open BIM format of IFC and open GIS format of CityGML, enabling wider use and application across disciplines to support AEC professionals and public usage. Of equal significance is the role of design data in supporting works design and city planning decisions. This combination of design and as-built BIM data enhances lay the foundation for digital twins. As the BIM data within the GBDR are converted into open formats, they can be more easily shared across departments, industries, and platforms, fostering interoperability and collaboration. This openness creates unified data environments, ensuring that spatial information can be leveraged for diverse applications to support city management.

- **Enabling Lifecycle Digitalisation:**
  Apart from the BIM Harmonisation Guidelines, ArchSD and EMSD issued BIM guide for facilities upkeep and BIM-AM Standards and Guidelines to

control As-built Information Models are compiled in specified data standard such that asset data in software neutral format is accessible and reliable in long run.

3.2 Government Policies and Industry Adoption

The Hong Kong Government has set clear policies to encourage BIM and open BIM adoption, supported by strong industry momentum. Open BIM helps ensure interoperability, efficiency, and regulatory compliance for both public and private projects.

3.2.1 Key Policy Drivers:

- **Development Bureau Technical Circular (Works) [Applicable only for public capital works projects with project estimates more than HKD 30 million] No. 1/2025:**
    - BIM CDCP should be adopted for delivering the BIM-adopted capital works projects and the use of open BIM approach in project collaboration should be considered, except under specific circumstances.
    - Tender specifications must be performance- and function-based to align with the software-neutral policy. Open BIM should be considered at different project stages.
    - For projects implementing Contractual BIM, both native and open file formats should be included in the tender.

- **DEVB's Roadmap on Adoption of BIM for Building Plan Preparation and Submission (2023)**
    - openBIM technology is an increasing trend in overseas jurisdictions. It emphasises interoperability and collaboration by promoting the use of open standards, facilitating seamless data exchange between different software applications and project stakeholders. It allows enhanced coordination and communication throughout the entire life cycle of a construction project.
    - The purpose-driven data extraction function of openBIM technology has the advantage of exporting native BIM model data into a standardised format (i.e. "industry foundation classes", or "ifc") of a much smaller file size containing only the necessary information for statutory submissions.

- **DEVB BIM Harmonisation Guidelines for Works Departments**
    - WDs should adhere to the Guidelines when preparing the BIM models (in native and open format) and object files for sharing with others.
    - To enable interoperability, open formats, such as IFC, shall be adopted to facilitate geometrical and non-geometrical information exchange. Geometrical information exchange aims to export BIM models to open BIM formats. Non-geometrical information exchange aims to export BIM attributes to tabular format such as COBie (Construction Operations Building Information Exchange). COBie is an international standard for data exchange, and it is the most commonly used standard for data handover from construction to operations. Through a conversion engine, the open format of IFC and CityGML will be made available and stored in the GBDR.
    - A geospatial-based federation strategy and open format should be adopted to ensure coherence amongst BIM models. These BIM models should conform to requirements outlined in previous sections to facilitate conversion into open formats within the GBDR, and to support BIM / GIS integration amongst WDs and LandsD.
    - To facilitate information exchange, the GBDR has been launched in May 2022. The GBDR serves to host native BIM models (developed in accordance with the Guidelines), shareable BIM models (IFC) and 3D GIS Open Format (CityGML).
    - A single, common or interoperable BIM modelling software that is able to generate open format files should be used for a project (composing of several contracts) as far as practicable.
    - When selecting software, project information requirements and support of open format such as IFC should be considered.

3.2.2 Other Key Guidelines and Standards

- CIC BIM Standards - General (2024)
- CIC Reference Material of BIM Harmonisation for Digital Hong Kong
- DEVB's Roadmap on Adoption of BIM for Building Plan Preparation and Submission (2023)
- DEVB's Technical Circular (Works)
- LandsD BIM and GIS Data Integration Guidelines (June 2023 Edition)

- LandsD Manual for Producing Harmonised IFC in Archicad (v.1.0)
- WDs' BIM development, standards, documents, practice notes, guidelines, regulations and legislations

4 Major resources of open BIM operation

Open BIM is built upon a suite of internationally recognised formats and protocols that ensure interoperability, transparency, and long-term data preservation. openBIM® is widely adopted in the project as part of the open BIM approach. Below is an overview of key terms and their local applications.

4.1 Industry Foundation Classes (IFC)

What is it?

IFC (Industry Foundation Classes) is an open BIM standard developed by buildingSMART to enable interoperability across software platforms. The most widely used versions include IFC2x3, IFC4, and IFC4.3. IFC2x3 is stable and commonly supported but lacks infrastructure capabilities. IFC4 improves geometry handling and data consistency, while IFC4.3 adds support for infrastructure domains like roads and bridges. IFC5 is under development, aiming to modernize the schema for better scalability.

To facilitate IFC data exchange, various converter plug-ins are available, such as Autodesk's Revit IFC Exporter, BIMvision, IfcOpenShell, and BIMDeX Manager. These tools help convert native BIM formats (e.g., RVT, DWG) into IFC while preserving metadata. Correct property mapping and using the latest BIM software version facilitate that BIM element attributes are properly translated into IFC property sets. Other best practices include using standardised naming conventions, defining property templates in CSV or JSON formats, and mapping Revit parameters to IFC classifications. Model View Definitions (MVDs) should be used to tailor IFC exports for specific use cases like coordination or quantity takeoff. Geo-referencing and validation tools further enhance data accuracy and compliance.

Why does it matter?

- Ensures data can be exchanged across platforms.
- Avoids vendor lock-in and enables long-term use of BIM data.

Hong Kong Application:

- Supports BIM-to-GIS integration and e-Submissions.
- Latest standard: IFC 4.3 (ISO 16739-1), with IFC 5 in development.

For more details, please refer to

https://www.buildingsmart.org/standards/bsi-standards/industry-foundation-classes/

4.2 BIM Collaboration Format (BCF)

What is it?

BCF is a standard format for tracking and sharing issues (like design clashes) in BIM projects. It uses simple files (XML/JSON) that allow any stakeholder to comment on, assign, and resolve issues — even if they use different BIM software.

Why does it matter?

- Makes project coordination and issue management clearer and more transparent.
- Allows for audit trails and easier follow-up.

Example (BCF file might include):

- Issue description ("Pipe runs through beam at Level 3")
- Location in the model
- Screenshot or viewpoint
- Person responsible
- Issue status (e.g., open, resolved, closed)

Best Practice:

Use BCF to coordinate issues in multi-disciplinary Hong Kong projects.

4.3 buildingSMART Data Dictionary (bSDD)

What is it?

bSDD is essential in daily BIM operations because it ensures consistent and accurate identification of objects and their properties across different software platforms and project stakeholders. By using standardized terminology and definitions, bSDD helps avoid confusion caused by varied naming conventions, enabling clear recognition of object nature and attributes. This semantic consistency supports reliable data exchange, automation of model checking, and compliance validation. It also enhances interoperability, allowing seamless integration between tools and systems, and supports multilingual collaboration in international projects.

Key Functions of bSDD in Daily Operations

- Correct Object Recognition During Conversion
    - When converting native BIM models (e.g., Revit, Archicad) to open formats like IFC, bSDD helps ensure that each object (e.g., wall, door, HVAC unit) is correctly identified and classified.
    - It provides a standardised vocabulary so that a "door" in one software is recognized as the same "door" in another, with consistent attributes like fire rating, width, and manufacturer.
- Property Mapping and Naming Consistency
    - bSDD defines property sets, allowed values, units, and translations, which are referenced during IFC export or validation.
    - This ensures that properties like "FireRating" or "MaterialType" are named consistently, avoiding confusion caused by custom or inconsistent naming conventions.
- Improved Data Quality and Compliance
    - By referencing bSDD definitions, BIM coordinators and BIM managers can validate models against required standards.
    - This supports automated compliance checking using tools like IDS (Information Delivery Specification), which can reference bSDD terms for rule-based validation.
- Cross-Platform and Multilingual Support
    - bSDD supports multilingual definitions and mapping to national standards, making it easier to collaborate across regions and software ecosystems.
    - It enables software-neutral workflows, aligning with open BIM principles.

Example:

During IFC export, a Revit model includes a "Wall" object with a custom parameter "FireRating." By referencing bSDD, the exporter maps this to the standardised IFC property Pset_WallCommon.FireRating, ensuring that downstream software (e.g., Solibri, BIMcollab) can interpret it correctly.

Hong Kong Application:
CIC are exploring local bSDD development to support standardisation.

4.4 Information Delivery Specification (IDS)

What is it?

IDS stands for Information Delivery Specification. It is a standard developed by buildingSMART International to define what information is required, when, and by whom in a structured and machine-readable way. IDS is particularly useful in the context of open BIM workflows, where different stakeholders need to exchange specific data at various stages of a project.

Why does it matter?

IDS acta as a data contract, specifying for both software and project participants exactly what data must be included in a model or file, such as:

- Which properties are required (e.g., fire rating, material, cost)
- Which objects they apply to (e.g., all doors, structural beams)
- What values or formats are expected (e.g., text, number, unit)
- At what stage or milestone the data is needed (e.g., design, construction)

It is written in XML and can be validated automatically, making it ideal for automated compliance checking.

Using IDS for Exporting Files Other Than IFC

While IDS was originally designed to validate IFC (Industry Foundation Classes) models, the concept of IDS can be extended to define data standards for exporting other file formats, such as:

- Excel (XLSX/CSV) for quantity take-offs or asset registers
- COBie for handover data
- GeoJSON or CityGML for GIS integration
- Revit schedules or Navisworks exports

How to apply IDS concepts to non-IFC exports:

- **Define the Purpose** (e.g., “Export all MEP equipment with maintenance data for FM handover.”)
- **Specify Object Types** (e.g., “All objects classified as MechanicalEquipment or ElectricalFixtures.”)
- **List Required Properties** (e.g., Manufacturer, ModelNumber, WarrantyPeriod, MaintenanceInterval.)

- **Set Value Constraints** (e.g., WarrantyPeriod must be in months, MaintenanceInterval must be numeric.)
- **Choose Export Format** (e.g., CSV with specific column headers, or COBie-compliant spreadsheet.)
- **Validate Before Export** - Use IDS-like rules to check if the model or database contains all required data before exporting.

Example: IDS-like Rule for Excel Export

Object Type	Property Name	Data Type	Required	Notes
Door	FireRating	String	Yes	Must follow format "FRR" with specific values, e.g., "FRR30" for 30 minutes, "FRR60" for 60 minutes, etc.
MechanicalEquipment	MaintenanceInterval	Integer	Yes	In months
All	GUID	String	Yes	Unique identifier

Every “door” in a BIM model must include a “FireRating” property with values such as "FRR0", "FRR30", "FRR60", "FRR120", or "FRR240", corresponding to the minutes of fire resistance. Automated IDS tools can validate that these values are correctly formatted and within the accepted set, ensuring compliance and consistency.

Best Practice:

Practitioners are encouraged to adopt the IDS concept to ensure quality information exchange across disciplines. By defining object types, required properties, value constraints, and export formats, IDS helps teams produce consistent, validated data outputs—regardless of the file format. This awareness supports better collaboration, regulatory compliance, and long-term data usability in open BIM workflows.

4.5 COBie (Construction Operations Building Information Exchange)

What is it?

COBie is a format (often a spreadsheet) for delivering structured building asset data (like doors, equipment, spaces) to facility managers at handover.

Why does it matter?

Makes asset and maintenance data easy to find and manage after construction.

Supports digital lifecycle management in line with Hong Kong's Smart City goals.

Example (COBie table):

Door Number	Location	Width	Height	Fire Rating	Manufacturer	Maintenance Schedule
D001	Main Lobby	900mm	2100mm	60 minutes	Single Doors	Check annually
D002	Classroom 1	850mm	2000mm	None	Single Doors	Check annually

Note: COBie is for structured asset data, not 3D geometry or building visualisation.

4.6 IFC Viewer and BCF Viewer

What is it?

These are software tools that let users view and interact with IFC models and BCF issues without needing expensive or proprietary BIM software.

Why does it matter?

- Lowers the entry barrier for project teams and site staff to access and review BIM data.
- Supports both on-site and office-based workflows.

Example tools:

- Validation: Solibri, simplebim
- Lightweight viewers: BIMvision, usBIM.viewer, xBIM

Best Practice:

Train teams to use lightweight viewers (e.g., usBIM.viewer) for quick access on-site, especially in dense Hong Kong developments.

4.7 IDM (Information Delivery Manual) and MVD (Model View Definition)

What is it?

- IDM: Defines what information is needed, when, by whom, and how it should be exchanged during the lifecycle of a built asset. It provides a structured methodology to capture and specify processes and information flows across project stages. IDM is particularly valuable in multi-stakeholder environments like Hong Kong's AECO sector, where clarity in data exchange is essential for regulatory compliance and project efficiency.
- MVD: Specifies how this information appears in an IFC file for a specific use (e.g., for BD approval or MEP coordination).
- Think of an IDM as the 'shopping list' of all information required for a specific task (e.g., a submission). The MVD is the 'standard-sized box' (a defined subset of the IFC schema) that ensures the information is packaged in a format the recipient's software can open and understand.

Why does it matter?

- Ensures the right data is delivered at the right time in the right format.
- Supports regulatory compliance and efficient project delivery.
- These formats enable automated BIM audits, validation of IFC models, and integration with software tools for compliance checking. To make IDM operational, it must be supported by software capable of interpreting the defined exchange scenarios. Therefore, IDM development should be aligned with a clear strategy for implementation in digital platforms.

Example:

- IDM: All data needed for BD submission.
- MVD: Defines the technical rules for exporting just that data from the BIM model.

How to Apply IDM in BIM Workflows?

1. **Define Processes**:
    - Identify key project stages (e.g., design, construction, handover).
    - Map out who does what and when.
2. **Specify Exchange Requirements**:
    - Detail what information is needed at each stage.
    - Use **Model View Definitions (MVDs)** to define subsets of IFC data relevant to each exchange.
3. **Use Tools like Plannerly or BIMcollab**:
    - These platforms help create and manage IDM-based workflows.

- You can export **IDS XML** (Information Delivery Specification) files that are machine-readable and align with IDM principles.

4. **Integrate with BIM Software**:
    - Ensure your BIM tools support the required IFC schema and MVDs.
    - Validate models against IDM requirements using tools like **buildingSMART Validation Service**.

Details refer to [Information Delivery Manual (IDM) - buildingSMART Technical]

4.8 LandXML

LandXML is an open, XML-based format specifically developed to support civil engineering workflows. It enables structured data exchange for alignment geometry, terrain modelling, cross-sectional profiles, and drainage systems, and is widely supported by industry platforms such as Autodesk Civil 3D and Bentley OpenRoads. The format facilitates precise representation of both horizontal and vertical alignments and is compatible with the alignment schema introduced in IFC 4.3, thereby supporting integration with broader open BIM processes.

4.9 AGS (Association of Geotechnical and Geoenvironmental Specialists)

AGS is a structured, text-based format designed for the exchange of geotechnical and geo-environmental data. It supports the transfer of information such as borehole logs, soil profiles, laboratory test results, and groundwater records, and is widely adopted in geotechnical software platforms including HoleBASE SI and gINT. AGS complements BIM workflows by providing essential subsurface data that are not currently addressed within the IFC schema, thereby enhancing the completeness and reliability of digital project information.

5 Implementation Strategies

Implementing open BIM in Hong Kong's AECO industry requires structured workflows, robust data sharing, and practical strategies to address challenges. The following good practices and solutions are tailored to Hong Kong's environment and align with CIC recommendations.

5.1 Open BIM Workflows and Good Practices

- **Design Coordination Workflow:**
  - Reference Applicable BIM Standards
    Review and apply relevant BIM guidelines (e.g., DEVB and CIC standards) to configure project-specific information structures. Collaboratively agree on any customised data items with project stakeholders to ensure alignment.

  - Establish Information Exchange Protocols
    Define and agree on the standards for information exchange, including Model View Definitions (MVDs), Information Delivery Manuals (IDMs), Information Delivery Specifications (IDS), file formats, and versioning. Ensure all BIM collaboration parties are aligned on these protocols.

  - Select Collaboration Platforms and Coordination Tools
    Determine the Common Data Environment (CDE) and issue tracking tools to be used for model sharing, coordination, and communication. Ensure platform interoperability and accessibility for all stakeholders. Additionally, specify the IFC version(s)—such as IFC2x3, IFC4, or IFC4.3—for each coordination task, and confirm that all participating software and systems support these versions to ensure seamless data exchange.

  - Conduct Trial Runs and Quality Assurance Checks
    Perform trial runs of the information exchange workflow to validate data flow and identify potential issues. Implement quality checks on delivered information to ensure compliance with agreed standards and project requirements.

  - Define Quantity Take-Off and Contractual BIM Scope
    Specify software-neutral quantity take-off requirements and clearly define the contractual BIM scope in tender documents and project agreements.

  - Develop Model Federation Workflows for Statutory Submissions

Establish workflows for federating models from different disciplines to generate the necessary information for open BIM-based statutory submissions, ensuring alignment with regulatory requirements.

- Implement Design Change Management Protocols
  Set up structured information flow mechanisms to manage and update design changes throughout the project lifecycle, ensuring traceability and version control.

- Align BIM Deliverables with Asset Management Objectives
  Collaborate with clients and stakeholders to define construction contract conditions that support contractors' BIM implementation and deliverables. Ensure these deliverables are compatible with open BIM-based asset management systems for post-completion operations.

- **Construction Workflow:**

  - Utilise Common Spatial Data for Site Validation
    Leverage available spatial datasets and BIM models to identify and assess site deviations. This supports accurate construction verification and alignment with as-built conditions.

  - Define Design Change and Update Protocols
    Collaboratively agree on workflows and information requirements for managing design changes, including the use of Model View Definitions (MVDs), Information Delivery Manuals (IDMs), and Information Delivery Specifications (IDS). Ensure all updates are traceable and compliant with project standards.

  - Establish Collaboration and Submission Frameworks
    Confirm the use of project collaboration platforms (e.g., Common Data Environment, CDE), issue tracking tools, submission and approval procedures, and data storage systems. Ensure accessibility and interoperability across all project participants.

  - Apply BIM Harmonisation Standards and Customisation Agreements
    Follow applicable BIM harmonisation standards and propose any project-specific customisations for approval. Engage with end users to agree on Asset Information Model (AIM) deliverables that support post-construction operations.

  - Adopt open BIM Tools for Site Management

Explore and implement open BIM-compatible project management tools to support construction progress tracking, quality assurance, and site safety monitoring. Ensure tools are interoperable and aligned with open BIM principles.

- **Asset Handover Workflow:**
  - Validate IFC Models Using IDS Rules
    Apply Information Delivery Specification (IDS) rules to validate the completeness and accuracy of IFC models prior to handover. This ensures that all required asset data is present, structured, and compliant with the Employer's Information Requirements (EIRs).

  - Extract COBie Data for Facility Management
    Generate COBie-compliant spreadsheets containing structured asset information—such as equipment specifications, locations, maintenance schedules, and manufacturer details—to support efficient facility management operations.

  - Integrate Asset Data with Maintenance Management Systems
    Link validated asset data to Computerised Maintenance Management Systems (CMMS), such as IBM Maximo or Archibus, to enable automated lifecycle tracking, preventive maintenance scheduling, and long-term asset performance monitoring.
    Reference: For details, see the EMSD BIM-AM Standards and Guidelines Version 3.0.

5.2 Interoperability

Smooth data exchange is essential in Hong Kong, especially for multi-team projects and statutory compliance. Interoperability challenges often arise when specific tasks require information exchange between different software platforms. To address this, several delivery methods can be adopted:

- **Exchange via Open Standard Formats**
  Use neutral file formats such as IFC, COBie, and CityGML to facilitate cross-platform data exchange. Ensure proper management of Model View Definitions (MVDs), Information Delivery Specifications (IDS), and buildingSMART Data Dictionary (bSDD) mappings to maintain semantic consistency and accurate geometry representation.

- **Use of Collaboration Files and Plug-ins**
  Implement BIM Collaboration Format (BCF) files and plug-in tools to support issue tracking, action assignment, and communication across disciplines. This method enables transparent coordination without requiring full model exchange.

- **Live-Linking BIM Tools**
  Employ connection plug-ins or cross-reference methods to establish real-time links between BIM tools. This approach supports dynamic updates and immediate feedback across different domains, enhancing responsiveness and reducing data silos.

- **Open BIM Collaboration Platforms**
  Adopt Common Data Environment (CDE) platforms that support model federation, viewing, issue tracking, and analytical functions. These platforms enable centralised access to validated models and streamline collaboration among stakeholders.

- **Open BIM Analytical Tools**
  Use analytical tools that support multi-format data input, allowing files from different sources to be appended, compared, and analysed. This enhances decision-making and supports advanced use cases such as clash detection, quantity take-off, and performance simulation.

Best Practice:

To ensure effective interoperability, all project participants should agree on the exchange protocols, supported formats, and validation workflows at the outset. This includes aligning on IFC versioning, property mapping strategies, and platform capabilities.

5.3 Problems and Challenges

Common challenges when implementing open BIM in Hong Kong include:

- **Data Loss Risks**:

  Challenges: Exporting to IFC may result in data loss (e.g., property sets, object links), particularly if the export settings are misconfigured. This can disrupt coordination and compliance, as testing the native BIM software and adjusting settings often entails a trial-and-error process.

- **Limited IFC support for 2D schedules and statutory drawings**

  Challenges: The current limitations of the IFC format in effectively supporting detailed 2D documentation required for legal and compliance purposes. This issue can impact the clarity, accuracy, and efficiency of statutory submissions and project coordination. For example, essential information like schedules of quantities, fire safety layouts, or access routes

are often represented as separate 2D drawings, which are challenging to embed or link directly within IFC models.

- **Modification Limitations**:

  Challenges: Most IFC viewers can't edit models, only view or comment. All major changes must be made in the original BIM software, then re-exported to IFC, which can cause delays if not managed well.

- **Software Dependency**:

  Challenges: Many facility management (FM) systems currently lack comprehensive support for the latest IFC standards, often requiring manual data entry, which increases workload and the risk of errors. Furthermore, different IFC viewers can produce inconsistent outputs or interpretations of the model data, potentially compromising data integrity. To mitigate these issues, it is recommended to utilize validation tools—such as buildingSMART's IFC Checker or other software such as Solibri—to verify the integrity and consistency of IFC models before submission. These tools help identify and address discrepancies early, ensuring reliable data exchange and reducing downstream errors.

5.4 Overcoming common challenges

To address common challenges in open BIM implementation, Hong Kong project teams should adopt the following strategies:

- Mitigating Data Loss During Exchange
    - Define Task-Specific Information Scope: Clearly identify the essential scope of information exchange for each task. Ensure that only relevant data is exported with reasonable accuracy and routed to the correct recipients.
    - Reference open BIM Resources: Use standards such as IFC, BCF, IDS, bSDD, and MVD to guide data structuring and exchange.
    - Apply LOD-G Strategies: Start with basic geometry and incrementally add detail. Avoid overloading models with unnecessary data.
    - Use Validation Tools: Employ tools like buildingSMART's IFC Checker or Solibri to verify model integrity before submission.
- Managing Design Modifications
    - Maintain Native Authoring: Major design changes should be made in the original BIM authoring tools (e.g., Revit, Archicad). Open BIM formats should be used for specific tasks such as coordination or compliance checking.
    - Re-export After Updates: After modifications, re-export models for the same task to maintain consistency.
    - Automate Synchronisation: Use scripting tools (e.g., Dynamo) to automate updates between native and open formats.
- Ensuring Reliable Configuration for Export/Import
    - Set Up Consistent Project Parameters: Define common base points, survey points, naming conventions, and classification systems.
    - Standardise Property Formats: Ensure object properties follow agreed formats and mapping rules.
    - Use bSDD for Semantic Consistency: Reference the buildingSMART Data Dictionary to align terminology and property definitions across platforms.

- Exploring Multiple Exchange Methods
    - Depending on project needs and software capabilities, consider various approaches to information exchange:
    - Neutral File Formats: Use IFC, COBie, CityGML, CSV, or GeoJSON for structured data exchange.
    - Third-Party Translators and Viewers: Useful when native export functions are limited.
    - Open BIM Collaboration Platforms: Use CDEs for model federation, issue tracking, and analytics.
    - Analytical Software: Import and append files of different formats for simulation, validation, or reporting.
    - Plug-ins and Scripting: Enable live-linking between BIM tools for real-time updates and cross-platform coordination.

6 Open BIM for Smart Asset Management

Open BIM is transforming asset management in Hong Kong by providing a standard, interoperable framework for facility management (FM) and lifecycle integration. This approach enables seamless, data-driven operations and digital twin applications, supporting both compliance and smart city goals.

Note: The definition of asset management and facility management can refer to the latest CIC BIM Dictionary.

6.1 Facility management and lifecycle integration

Effective smart asset management begins with strategic planning during the early stages of project procurement. It is common for clients to recognise the value of smart asset management only after construction contracts have concluded, often prompted by emerging technologies or operational needs. However, retroactive implementation can be hindered by incomplete or incompatible data. To mitigate this, the Employer's Information Requirements (EIRs) must be clearly defined prior to tendering, with explicit Asset Information Model (AIM) deliverables embedded in contract documentation. These requirements should anticipate future facility management (FM) technologies and ensure that data captured during construction remains relevant and interoperable at handover. This includes specifying openBIM® standards such as IFC and COBie, semantic consistency through the bSDD, and validation protocols using IDS. Early alignment among clients, consultants, and contractors is essential to ensure smooth data transmission and long-term usability of asset information across evolving FM platforms.

- **Automated Handovers**:
    - **How it works**: IFC models enriched with COBie data (e.g., equipment specs, warranties, maintenance schedules) can automatically populate Computerised Maintenance Management Systems (CMMS) like IBM Maximo or Archibus. This reduces manual data entry and errors.
    - **Best Practice:** Use Model View Definitions (MVDs) for FM to extract just the needed COBie data, then validate against IDS rules for compliance with Asset Information Requirements (AIRs).IFC models enriched with COBie data (e.g., equipment specifications, warranties, maintenance schedules) automatically populate Computerised Maintenance Management Systems (CMMS) like IBM Maximo or Archibus, reducing manual data entry.

- **Lifecycle Compliance**:

- **How it works**: Use standardised properties from the buildingSMART Data Dictionary (bSDD) to ensure all O&M data is consistent and ready for handover.
- **Hong Kong Context**: This approach supports long-term management of assets that may last 50–100 years, such as MTR lines and public hospitals.

6.2 Hong Kong Implementation Framework

The successful implementation of open BIM in Hong Kong requires a comprehensive framework that supports not only smart asset management but also the full spectrum of design and construction processes. To achieve this, it is essential to embed structured data requirements and validation protocols into project workflows from the outset.

At the procurement stage, Employer's Information Requirements (EIRs) must be clearly defined to include both Asset Information Model (AIM) deliverables and task-specific data standards that support open BIM operations throughout the project lifecycle. These standards should anticipate future technological developments and ensure that data captured during design and construction remains interoperable and usable for statutory submissions, quantity take-off (QTO), construction project management, site safety monitoring, and other downstream applications.

To facilitate this, project teams should adopt openBIM® resources such as Industry Foundation Classes (IFC), Construction-Operations Building Information Exchange (COBie), and BIM Collaboration Format (BCF), alongside semantic consistency tools like the buildingSMART Data Dictionary (bSDD). Information Delivery Specification (IDS) templates should be used to define and validate required data attributes for each task, ensuring that models meet regulatory and operational requirements.

Furthermore, the use of Model View Definitions (MVDs) and Information Delivery Manuals (IDMs) enables targeted data exchange tailored to specific use cases, such as Building Department submissions or contractor coordination. These protocols should be embedded in contract documentation and supported by Common Data Environment (CDE) platforms that facilitate model federation, issue tracking, and compliance checking.

By establishing a robust implementation framework that integrates procurement planning, data standardisation, and validation mechanisms, Hong Kong's AECO industry can ensure that open BIM delivers long-term value across all phases of the built asset lifecycle.

7 Open BIM for Digital Twin and Smart City

Open BIM is a cornerstone of Hong Kong's smart city strategy, providing a standardised, interoperable data backbone for digital twin development and integrated infrastructure management. By leveraging open BIM, Hong Kong can facilitate city-wide data sharing, enhance urban planning efficiency, and establish resilient, future-ready urban operations aligned with the Smart City Blueprint. Ensuring data security and privacy is critical in this context; therefore, open BIM implementations incorporate robust security protocols—including secure data transmission, access controls, and encryption—to protect sensitive information from unauthorised access and cyber threats. This safeguards the integrity of digital twins and maintains stakeholder trust in data-driven urban management.

7.1 Core Integration Framework

The DEVB's Roadmap on Adoption of BIM for Building Plan Preparation and Submission (2023) positions open BIM at the core of smart city planning. By expanding the Government BIM Data Repository (GBDR) to include both public and private sector BIM models, Hong Kong enables seamless BIM-to-GIS integration through the Common Spatial Data Infrastructure (CSDI) Portal.

Data security measures, such as secure access authentication, data encryption, and adherence to cybersecurity standards, should be integrated into this framework to protect the shared data environment. Details refer to the latest CIC Beginner's Guide on Construction Digitalisation – Cybersecurity.

(See Section 3.2 for related policy details.)

7.2 Hong Kong Smart City Alignment

Open BIM directly supports the goals of Hong Kong's Smart City Blueprint by enabling:

- Data-driven decision-making
- Efficient and sustainable urban development
- Open, cross-sector collaboration

7.3 Critical Success Factors

To fully realise the benefits of open BIM for smart city and digital twin initiatives, stakeholders should focus on:

1. **The project implementation:**
    - The adoption of open BIM approach for all relevant projects.

2. **Interoperability Protocols**:
    - Develop and use the bSDD to map properties to Hong Kong-specific codes, ensuring consistent and accurate terminology for city-scale applications.

8 Getting Started with open BIM

Adopting open BIM in Hong Kong requires structured training, access to validated resources, and industry collaboration. This section outlines practical steps for stakeholders to build open BIM capacity and competency.

8.1 Training and Skill Development

Hong Kong's AECO industry should prioritise competency building to harness open BIM's potential:

- **CIC-Accredited BIM Manager Courses**:
  - **BIM Manager Course**: Provide the construction professionals with appropriate skill levels and competency in using BIM technology. To ensure the scope and quality of BIM courses provided in the market meet requirements, it was important to establish a certification body for BIM personnel and an accreditation body for BIM training courses in Hong Kong.
  - https://www.bim.cic.hk/en/certification_and_accreditation/accreditation_manager_introduction
- **Webinars**:
  - HKABAEMIA provide a series of webinars introducing openBIM®.
  - https://www.hkabaeima.org/
- **buildingSMART PCERT Foundation openBIM®**
  - This course benefits anyone connected with BIM-empowered projects — openBIM® extends the benefits of BIM (Building Information Modelling) by improving the accessibility, usability, management, and sustainability of digital data in the built asset industry, including horizontal infrastructure and vertical building types. At its core, openBIM® is a collaborative process that is vendor-neutral. openBIM® processes can be defined as sharable project information that supports seamless collaboration for all project participants. openBIM® facilitates interoperability to benefit projects and assets throughout their lifecycle.
  - https://www.hkabaeima.org/file/PCERT.pdf
- **Executive Training Programme on BIM x GIS Integration**
  - about the integration of the Building Information Modelling (BIM) and Geographical Information System (GIS). The contents will cover how the openBIM® and openGIS integration can support various data transformation, streamline the workflows and empower the AEC industry, ultimately to support the Smart City Development of Hong Kong.
  - https://www.hkabaeima.org/file/BIMGIS_executive2024_leaflet_v2.pdf

8.2 Resources

Hong Kong stakeholders should leverage these webpages and platforms to implement open BIM:

- **CIC BIM Portal**: Provides downloadable Hong Kong BIM Standards and BIM objects. Access at www.bim.cic.hk.
- **buildingSMART International Website**: Offers global openBIM® standards (e.g., IFC, BCF, IDS), video tutorials, Professional Certification details, and success stories, which use BIM models without drawings. Access at www.buildingsmart.org to explore standards, services, and community resources globally.
- **HKABAEMIA Website**: Alliance, which is a non-profit making body/organisation with the objectives including to enhance the collaboration among built asset and environment information management communities in Hong Kong. Access at https://www.hkabaeima.org/
- **openBIM® Quality Platform – Verification, Assessment & Tracking**: Developed under the CIC R&D funding scheme, this platform supports openBIM® model validation. Details at https://www.bim.cic.hk/en/industry_support/page/Research_on_openBIM®_Quality_Platform

9 Conclusion

9.1 Strategic approach

Open BIM is increasingly recognised as a strategic enabler for Hong Kong's digital transformation in the built environment. Rather than focusing solely on international frameworks, this publication emphasises the local relevance of open BIM operations—particularly in supporting statutory submissions, asset lifecycle management, quantity take-off (QTO), construction coordination, and smart city integration. The adoption of open BIM is not merely a technical preference but a necessary response to evolving government policies, industry needs, and long-term data usability requirements.

To ensure successful implementation, stakeholders must proactively address technical concerns such as data loss during IFC conversion, interoperability limitations, and software compatibility. These challenges can be mitigated through early definition of Employer's Information Requirements (EIRs), use of validation tools (e.g., IDS, Solibri), and alignment with open standards such as IFC, COBie, and bSDD. The Construction Industry Council (CIC) encourages the industry to adopt structured workflows, leverage available resources, and participate in ongoing capacity-building initiatives to strengthen open BIM competency across disciplines.

9.2 Call to Action

To realise the full potential of open BIM in Hong Kong:

- Government bodies could continue to encourage to support open BIM workflows across project stages.
- Industry practitioners are encouraged to build technical capacity, adopt interoperable tools, and contribute to the development of Hong Kong-specific data standards.
- Project teams should embed open BIM requirements into procurement and contract documentation to ensure long-term data usability and regulatory compliance.
- By focusing on practical implementation strategies and aligning with local policy frameworks, Hong Kong's AECO industry can unlock the full value of open BIM—not as a global ideal, but as a locally grounded solution for smarter, more resilient infrastructure.

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