Building Information Management Toolkit for Housing

A Practical Guide for Housing Providers to Assess the Benefits and Costs of Using BIM in the Development of Efficient Multi-family Housing.

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buildingSMART™ Canada

NATIONAL HOUSING STRATEGY | STRATÉGIE NATIONALE SUR LE LOGEMENT

Canada

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Glossary of Key Terms

Term	Abbreviation	Description
Appointed Party		Delivery Team, provider of information concerning works, goods or services
Owner (Appointing Party)		Receiver of information concerning works, goods or services from a Delivery Lead (Lead Appointed Party)
Asset Information Model	AIM	Information model relating to the operational phase
Asset Information Requirements	AIR	Information requirements in relation to the operation of an asset
BIM Execution Plan	BEP	The methodology to meet the exchange information requirements
Building Information Management	BIM	Use of a shared digital representation of a built asset to facilitate design, construction and operation processes to form a reliable basis for decisions
BIM Collaboration Format	BCF	standard communication protocol for efficient issue management and coordination on BIM projects
BIM Requirements Specification		A common name for the document outinling the rules, requirements and collaborative processes for using BIM. It dictates the information, geometry and deliverables for each project phase. Also referred to as the EIR in ISO 19650.
Computerized Maintenance Management System	CMMS	a software platform used to centralize facility maintenance data, automate work orders, and schedule routine upkeep
Computer Aided Facility Management	CAFM	a software platform that digitizes and centralizes the management of physical buildings, assets, and workspaces
Common Data Environment	CDE	agreed source of information for any given project or asset for collecting, managing and disseminating each information container through a managed process
Delivery Lead (Lead Appointed Party)		organizes the information concerning works, goods or services from the appointed parties *BIM Consultant / Architect / Contractor*
Delivery Team		Delivery Lead (Lead Appointed Party) and their appointed parties
Exchange Information Requirements	EIR	information requirements in relation to an appointment
Facilities Maintenance Information	FMI	a software platform providing a centralized digital dashboard for proactive preventative maintenance
Facilities, Maintenance and Operations	FMO	the department or profesisonal role responsible for the day-to-day functionality, safety and operational efficiency of a building
Geographic Information System	GIS	a technology that captures, manages and maps spatial data to help facility managers track assets, optimize space and streamline maintenance
Industry Foundation Class	IFC	a neutral and open file format specification that ensures the longevity of data exchanges
information		reinterpretable representation of data in a formalized manner suitable for communication, interpretation or processing

Terminology/ Glossary

Term	Abbreviation	Description
information container		named persistent set of information retrievable from within a file, system or application storage hierarchy (files / model / documents)
Information Delivery Specification	IDS	a buildingSMART standard for defining information requirements in a computer interpretable form
information exchange (verb)		act of satisfying an information requirement or part thereof
information requirement		specification for what, when, how and for whom information is to be produced
Integrated Workplace Management System	IWMS	a comprehensive, centralized software platform that streamlines and optimizes corporate real estate, facilities, and workplace assets
Level Of Information Need	LOIN	framework which defines the extent and granularity of information
Master Information Delivery Plan	MIDP	plan incorporating all relevant task information delivery plans
open BIM		collaborative process that is vendor-neutral for sharable project information to benefit projects and assets throughout their lifecycle
Organizational Information Requirements	OIR	information requirements in relation to organizational objectives
Project Information Model	PIM	information model relating to the delivery phase
Project Information Requirements	PIR	information requirements in relation to the delivery of an asset
responsibility assignment matrix	RACI	a project management tool defining who is Responsible, Accountable, Consulted and Informed
Task Information Delivery Plan	TIDP	schedule of information containers and delivery dates, for a specific task team
trigger event		planned or unplanned event that changes an asset or its status during its lifecycle which results in information exchange
Work In Progress	WIP	

Part 1: Introduction

Background and Context

Canada's housing sector is under increasing pressure to deliver more housing, faster, while managing rising construction costs, operational complexity, and long term asset performance expectations. At the same time, housing providers are being asked to make better informed capital planning decisions, improve sustainability outcomes, and operate buildings more efficiently over their lifecycle.

Building Information Management (BIM) offers an opportunity to shift how information is managed throughout the design, construction, and operation of housing assets.

BIM should not be understood simply as 3D modeling or the digitization of drawings. At its core, BIM is a structured information management process that enables reliable, machine readable data to be created, coordinated, validated, and transferred throughout the lifecycle of a building. The value of BIM is not the model itself, but the quality, consistency, and usability of the information associated with it.

For housing providers, this represents a significant opportunity.

Traditionally, owners receive fragmented handover information at the end of construction, often in the form of disconnected PDFs, binders, spreadsheets, and consultant drawings that are difficult to validate, search, or integrate into operational systems. This creates inefficiencies during occupancy, maintenance, asset replacement planning, warranty management, and future capital projects.

A structured BIM process enables housing providers to define, from the outset of a project:

- what information is required,
- when it must be delivered,
- how it should be structured,
- and how it will support operational and asset management objectives.

When implemented correctly, BIM can support:

- improved coordination during design and construction,
- reduced rework and change orders,
- greater schedule certainty,
- improved support for prefabrication and modular delivery,
- more reliable handover information,
- and better operational readiness from day one of occupancy.

The principles outlined in this toolkit are based on the ISO 19650 framework for information management and promote the use of openBIM standards developed by buildingSMART International. These standards support interoperability, long term accessibility of information, and reduced dependence on proprietary software ecosystems.

This toolkit has been developed specifically for housing providers seeking practical guidance on how to implement BIM in a scalable and operationally focused manner. While the processes described can apply to projects of many types and scales, the guidance has been adapted to reflect the realities of affordable and multi family housing delivery in Canada.

The objective of this document is not to increase complexity or impose unnecessary technical requirements. Instead, it is intended to help housing providers make informed decisions about:

- which BIM processes provide value,
- what level of information is appropriate for their projects,
- how to define information requirements clearly,
- and how to structure deliverables that support long term operational outcomes.

How to Use This Guide

This toolkit contains five sections.

- Part 1: Introduction is the current section
- Part 2: Guidance outlines the uses of BIM and how to apply BIM on a given project.
- Part 3: Toolkit provides standard language and workflows to ensure the delivery team who bid on the projects clearly understand the owner's requirements.
- Part4: Case Studies provides examples of projects where BIM has been implemented in different manners.
- An Appendix containing a sample BIM Requirements Specification for reference.

Readers should familiarize themselves with the terminology and standards that have been adopted, and processes described in the Guidance section. Then, adopt and adjust the checklists and templates available in the Toolkit section to suit each project.

Current State of BIM Practice Among Canadian Housing Providers

Analysis of existing international and national standards confirms a strong foundation exists but requires targeted adaptation for the Canadian affordable housing context. ISO 19650 offers a scalable framework applicable regardless of project scale, and its core concepts (Asset Information Requirements, Project Information Requirements, Exchange Information Requirements, and Common Data Environments(CDE)) map well onto housing delivery, provided CDE requirements are kept scalable for organizations of varying size.

Internationally, several models were identified as directly relevant: Spain's tiered five-level maturity system supports the case for Basic/Standard/Advanced EIR templates; France's Plan BIM 2022 demonstrates BIM integration into public and social housing policy specifically; Singapore's CORENET X and Dubai's automated permit review illustrate how IFC-based data can integrate with regulatory approval processes, offering a possible model for future alignment with CMHC or provincial funding submissions. Across all these findings, global momentum toward openBIM (IFC-based, vendor-neutral) mandates supports long-term accessibility and software independence regardless of a housing provider's size or resources.

AEC Professionals Perspective

A survey of industry delivery teams was conducted to begin building a picture of how BIM is currently implemented on affordable housing projects across Canada; participation was limited, so findings should be read as directional rather than comprehensive. Even so, responses point to uneven sector-wide capacity to deliver digital workflows on affordable housing specifically, with capacity varying widely from small, specialized teams to larger dedicated groups.

Formal BIM practice remains inconsistent: BIM Execution Plans are used consistently by some firms and not at all by others, pointing to an opportunity for standardization and capacity-building around formal planning documentation.

Structured information-exchange practices are only partially adopted: Common Data Environments and federation strategies are used by some organizations, while more formalized elements like Exchange Information Requirements (EIR) and Project Information Requirements (PIR) are less common, and receiving formal information requirements from clients on affordable housing projects is rare. Notably, digital deliverables beyond traditional PDFs remain limited even where consultant collaboration is otherwise strong, but outputs remain largely traditional in format. Adoption of ISO 19650 and openBIM standards specifically remain nascent nationally: most firms report minimal or no use of ISO 19650 on affordable housing projects, training is inconsistent, and openBIM approaches have only been piloted selectively, indicating the sector is not yet positioned for widespread interoperable digital exchange.

The primary barriers cited are most notably a lack of client requirement for BIM use, resistance to change from traditional workflows, liability and legal concerns around BIM deliverables, and limited client willingness to compensate for BIM services. Despite these gaps, industry support for standardization is strong: most organizations strongly support standardized requirements and openBIM deliverables, expecting real efficiency and cost benefits. Training and upskilling are consistently identified as the most important resource for successful implementation, followed by standardized contracts and supporting guidance (best practices, guidelines, checklists). Organizations report moderate-to-strong readiness to deliver digital deliverables within two years, with client demand, government mandates, and demonstrated cost savings cited as the key motivators that would accelerate broader adoption.

Housing Provider (Asset Owner) Perspective

Housing authorities across Canada report a parallel set of structural challenges. Inconsistent design standards make it difficult to maintain downstream data consistency or verify compliance with owner requirements, and manual QA/QC checks introduce additional risk of undetected errors. Documentation schedules are frequently inaccurate, leaving information fragmented and unreliable, and providers are generally dissatisfied with their access to information, limiting their ability to oversee projects and influence design decisions. Consultation with Facilities Maintenance & Operations (FMO) teams is limited or absent, echoing the industry-side finding of weak digital deliverable practices, and existing FMO data requirements are minimal, leading to unreliable, duplicated, and hard-to-access information once projects reach operations.

Many contracts contain no BIM association at all, or include blank BIM addenda, making it difficult to achieve meaningful deliverables through legacy contract structures. Owner teams themselves are frequently not involved in the BIM process and lack clarity on what to review to ensure data quality, while change-management support needed to shift teams away from conventional workflows is largely absent. Providers conclude that where BIM has succeeded, it has depended on owner and team education and on a fully developed set of BIM Requirements being in place before the RFP is issued; otherwise, processes tend to revert to traditional methods.

Conclusion

Uneven adoption across all three sectors is creating challenges of inconsistent expectations, workflows, and deliverables. Training is needed across all sectors, but without a clear driver, adoption and implementation have remained piecemeal.

Part 2: Guidance

Benefits of using BIM for Housing

BIM as an Information Strategy

The construction industry has historically focused on delivering drawings and physical assets. However, buildings also generate large amounts of information that owners rely on throughout the lifecycle of the asset.

This information includes:

- equipment data,
- maintenance requirements,
- warranty documentation,
- room and space data,
- accessibility information,
- energy performance information,
- asset classifications,
- and operational records.

In traditional project delivery, this information is often fragmented across multiple systems and formats, making it difficult to validate, maintain, and use effectively after handover.

BIM introduces a different approach.

Rather than treating information as a byproduct of design and construction, BIM establishes a structured process for creating and managing information throughout the project lifecycle. This enables housing providers to define information requirements early and progressively verify that the required information is being developed alongside the building itself.

The result is not simply a better coordinated model, but a more reliable and usable information foundation for operations, maintenance, future renovations, and portfolio management.

Vienna House, Vancouver under construction. Vienna House used BIM during design and construction, and is providing asset data for FMO.
(photo: Bright Future Studios)

Why This Matters Specifically for Housing

Housing projects present several characteristics that make BIM particularly valuable:

- repetitive unit layouts,
- increasing use of prefabrication and modular construction,
- tight cost and schedule constraints,
- high operational and maintenance demands,
- and growing sustainability and reporting requirements.

Affordable and multi family housing projects also operate under significant financial pressure, where design inefficiencies, coordination issues, and construction delays can have substantial impacts on project viability.

Financial implications of BIM workflows

Upfront costs of implementing a BIM workflow should be considered an investment into more productive processes that can lead to significant savings during construction and operational phases.

- Software licence fees may be required
- Detailed design shifts costs earlier in the timeline
- Improved coordination processes add to design costs
- Training costs

However, these are offset by:

- Error reduction
- Reduced rework
- Better cost estimation
- Reduced waste of materials
- Asset management efficiency

While there is an initial financial outlay for BIM, the timing of costs is most noticeable. Early investment reduces time and money spent later in the project. The return on investment (ROI) is significant due to better collaboration, reduced rework, and enhanced operational efficiency over the project lifecycle.

BIM reduces cost overruns by 12-19%

BIM reduces field rework by 20-30%

BIM-based cost estimating improves accuracy by 15-20%

BIM reduces material costs by 7-10%

BIM reduces project duration by 10-15% on average

* Worldmetrics BIM Industry Statistics
https://worldmetrics.org/bim-industry-statistics/

Measuring ROI of your BIM Investment

Benefit	Characteristics	Measurement

Time Savings	• Labour savings from fewer changes and issues
	• Improved collaboration in BIM through a Common Data Environment allows for quicker information exchange.
		• Shorter schedules correspond to a reduction in
		  ◦ direct labour cost
		  ◦ time-dependent recurring costs (insurance, interest, permits)
		• If time savings result in accelerated project delivery, the net present value (NPV) of the project may also increase

Materials Savings	• Reduced waste • Reduction in order of extra material • Improved scheduling of maintenance materials	• Change in material quantities ordered • Reduction in embodied carbon of waste materials
Cost Savings	• Other costs saved from reduced changes and rework • Improvements to FMO	• Average cost of changes and rework on previous projects multiplied by an estimate of reduction in changes • Time and material savings of maintenance issues resolved by ease of access to asset data
Health & Safety Improvement	• Visualization for staff briefing and training • Simulation and optimization of sequencing	• Difference in average number of health and safety incidents multiplied by an estimate of cost per incident
Risk Reduction	• Increased visibility and certainty of costs, timeline and risks	• Potential reduction in required contingency funds
Improved Asset Utilization	• More productive use of assets during operation; faster maintenance or refurbishment	• Value of lost rent due to lost utilization
Improved Asset Quality	• Visualization benefits to design • Offsite fabrication enhancement	• Less turnover of tenants, improved satisfaction
Improved Reputation	• Improved experience of delivery team • Improved experience of tenants	• Surveys to evaluate experience • Repeat business • Demand for services

*Adapted from PricewaterhouseCoopers BIM Level 2 Benefits Measurement - Summary Guide

BIM Goals and Uses

When an owner specifies that they want to use BIM on a project, they should state their goals and intent for how the underlying inherent data generated will be used. This enables design and construction teams to gauge the level of effort needed to meet the requirements. This intent is often presented through a BIM Requirements Specification that identifies information requirements and the Level of Information Need.

These goals may include:

Reduce rework during construction by enabling virtual coordination to reduce clashes, RFIs and change orders

Capture **reliable and structured data** for operations and future projects.

Support **prefabrication** and modular construction to:

- Reduce construction cost
- Improve schedule certainty
- Support sustainable and repeatable housing delivery

Establish a **repeatable information baseline** for similar housing developments.

Support **cost estimating** using quantity takeoffs exported from the BIM model.

Support **energy use analysis** (requires information such as material R values, U values, light transmittance, and solar heat gain to be specified in the BIM data).

Check **code compliance** for permitting in municipalities which have implemented automated checks for fire codes, accessibility, building heights and setbacks, etc.

Easing Into BIM

Implementing BIM does not require every project to adopt the highest level of digital maturity immediately.

Different housing providers will have different goals, capabilities, budgets, and operational requirements. The level of BIM implementation should align with the intended outcomes of the project.

For some organizations, the first step may simply involve:

- coordinated 3D models,
- structured digital deliverables,
- and improved handover documentation.

For others, BIM may support:

- prefabrication,
- automated quantity extraction,
- lifecycle asset tracking,
- CMMS integration,
- energy analysis,
- or future digital twin strategies.

The objective is not to request more information than necessary, but to define the minimum information required to support specific operational and project goals.

Within the ISO 19650 framework, this principle is formalized through the Level of Information Need (LOIN), which defines the minimum amount of geometric, alphanumeric, and documentation information required for a given purpose.

Anything beyond this minimum should be carefully evaluated against the value it provides to the project.

One of the most important shifts introduced by BIM is the recognition that owners must play an active role in defining information requirements.

Virtual Coordination and Clash Detection

Virtual coordination is a collaborative digital process used to support coordination of a proposed facility before it is built, ensuring that building systems, equipment, and spaces all fit together as intended.

Through regular reviews during design and construction, the team identifies conflicts (often referred to as clashes) and confirms that required access is maintained for code compliance, maintenance, and future replacement. The team assigns responsibility, criticality and the required timeline for resolving issues.

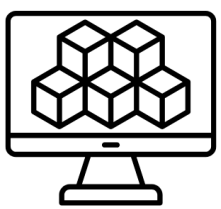
The process typically begins with large, costly, or difficult-to-move components and progresses to smaller or more flexible elements, helping reduce rework, construction waste, improve scheduling, constructability, and support better decision-making across the project team.

Level of Information Need (LOIN)

Level of Information Need (LOIN) defines the minimum necessary information, covering geometric, alphanumeric and documentation requirements (e.g. manufacturer name, performance specifications, fire rating). LOIN is a broader description than Level of Development (LOD), which focuses specifically on the detail of geometric data in the model. LOIN aligns with ISO 19650 information management framework, a more efficient and effective approach is to define information requirements based on the intended information purpose.

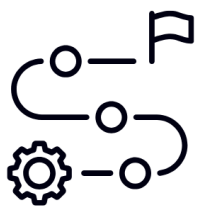
This Toolkit retains the industry recognized LOD convention exclusively to communicate the expected graphical resolution and reliability of model elements. This includes the presence and quantity of assets, their location, spatial relationships, orientation, size, geometric accuracy, and level of representation required at each project milestone. All non-graphical information requirements, including asset identification, classification, performance data, manufacturer information, and other alphanumeric attributes, are specified separately through the Asset Information Requirements (AIR), ensuring that graphical and alphanumeric requirements are independently defined, validated, and managed in accordance with ISO 19650.

Purpose of the Information (Why)

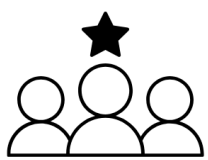


Accuracy Required for Geometric Information (How)

Information To Be Derived from Geometry (What)



Downstream Purposes Relying on Geometry (What)



Responsible Party (Who)

Project Milestone Needed By (When)

The Level of Information Need establishes:

- which aspects of the geometric information must be accurate (e.g. quantity, size, location, elevation, orientation, or appearance),
- what information is required to be derived from that geometry,
- which downstream information purposes rely on that information,
- and when, at which project milestone, the information is required.

In addition to geometric information, the Level of Information Need defines the alphanumeric (non-graphical) information required to be associated with the geometry. This may include system identifiers, asset identifiers, type identifiers, classification codes, classification names, performance properties, and other information attributes required to support downstream information uses.

Within the ISO 19650 framework, both graphical and alphanumeric information are treated as integral components of information delivery and shall be defined, delivered, and validated in accordance with the applicable BIM Information Requirements.

The Level of Information Need (LOIN) levels of information need can be used to communicate structured information requirements. It should be determined by the minimum amount of information needed to answer each relevant requirement, including information required by other appointed parties, and no more. Anything beyond this minimum is considered a waste. Refer to ISO 7817-1:2024 for additional explanation of LOIN.

Specifying BIM in procurement documents to align with needs

To begin, Owners must possess a clear understanding of their organizational goals in implementing BIM workflows on a given project. By developing their Organizational Information Requirements (OIR), they can clarify their current capabilities and resources and where they may need support. Since Owners will need to ensure that the deliverables they specify are being met, they must have a clear understanding of what they are asking for and how they will confirm that it has been delivered.

The information in the OIR can then be used to develop the PIR, AIR and EIR for the project, which should be included in procurement documents, identifying requirements for how BIM will be used, what the deliverables are, and the level of experience that is appropriate for the selected team. Including this information in procurement documents informs the delivery teams of the expectations so that they can budget appropriately. It also provides a means for the owner to hold the teams accountable during the design and construction phases.

This information is typically provided in the form of a BIM Requirements Specification that is included with procurement documents and contracts. A sample BIM Requirements Specification is provided in the Appendix, with instructions to guide Owners to provide the substantive details. Owners should only include requirements that add value to their project. Asking for too much may unneccesarily drive up costs.

Sample Menu of BIM Uses	Sample Priority
reduced rework and improved coordination	1-5
use a common data environment	1-5
cloud visulaization for digital review	1-5
create reliable and structured data	1-5
clash detection of structural and MEP systems	1-5
clash detection of prefabricated components and MEP	1-5
owner access to design data	1-5
provide facility data for FMO per set schedule	1-5
provide matching 2D and 3D model plans to prefab manufacturer	1-5
provide model data for cost estimating	1-5
conduct energy modeling using BIM data	1-5
create repeatable information baseline	1-5
provide 3D visualization for marketing	1-5
provide data for building code compliance checks	1-5

The BIM Requirements Specification is usually included in Requests for Proposals (RFPs) as an additional document, schedule or appendix to the RFP description. When the requirements are a separate document, language within the RFP should signal their importance by incorporating the BIM requirements by reference using language such as:

"*RFP Proponents are required to incorporate all of the requirements contained in the 'BIM Requirements for Housing' document in Appendix X, and include the obligations and costs to deliver them in the bid proposal.*"

Housing BIM Implementation Roadmap

	Foundation	Pilot	Scale	Optimize	Sustain

Owner (Appointing Party)	• Develop BIM Requirements Specifications:
	  ◦ Develop OIR and AIR
	  ◦ Develop EIR for pilot project
	  ◦ Engage BIM SME
	• Update procurement documents to include BIM Requirements Specifications
		• Issue BIM Requirements Specifications with RFP
		• Evaluate pre-BEP responses
		• Approve post-BEP
		• During Project Delivery: monitor Information deliverables via CDE
		• Monitor information deliverables via CDE using available issue-tracking methods
			• Standardize BIM Requirements Specifications across portfolio
			• Integrate BIM Requirements Specifications into standard contracts
			• Define AIM requirements for asset handover
			• Leverage BCF for issue management and collaboration
				• Receive and validate AIM at handover
				• Measure BIM ROI
				• Refine BIM Requirements Specifications based on lessons learned
					• Maintain and update AIM
					• Improve BIM Requirements Specifications templates
					• Archive project information per retention policy

Delivery Lead (Lead Appointed Party)	• Appoint Information Manager (internal or external) for the project • Assess BIM capability • Develop BEP template • Define information management workflows • Establish model element matrix • Identify Delivery Team Information Manager for the project	• Submit pre-BEP response • Finalize post-contract BEP based on BIM Requirements Specifications with Delivery Team • Mobilize CDE • Flow BIM requirements to appointed parties	• Standardize BEP across projects • Manage BIM process and BIM Requirements Specifications • Progress PIM toward AIM handover • Validate BIM Requirements using IDS	• Advanced analytics and reporting • Refine and update BEP templates from lessons learned • Support PIM-to-AIM transition • Cross-project knowledge sharing	• Final PIM delivery per handover requirements • Improve openBIM workflows • Update BIM processes from lessons learned
Delivery Team (Appointed Party)	• Assess BIM capabilities • Develop TIDP • Align with BIM Requirements Specifications	• Implement discipline workflows • Validate IFC exports against IDS • Use BCF for issue tracking • Deliver information containers per BIM protocols	• Optimize production workflows • Develop project-specific content libraries • Integrate analysis tools • Validate BIM Requirements using IDS	• Advanced analytics and reporting • Refine IFC mappings for data quality • Support PIM-to-AIM transition • Cross-project knowledge sharing	• Final model delivery and QA • Archive content libraries • Improve openBIM workflows • Contribute to lessons learned

	Foundation	Pilot	Scale	Optimize	Sustain
Technology & Infrastructure	• Select openBIM-compliant CDE platform • Obtain BIM-capable hardware and software • Establish naming conventions per standard • Configure IFC import/export	• Deploy CDE for pilot projects • Implement status and revision workflows • Configure IDS validation rules • Enable BCF integration • Establish data security protocols	• Scale CDE across organization • Configure IDS validation rules • Implement automated IDS validation • Develop dashboards and reporting	• AI/ML integration with openBIM data • Predictive analytics capabilities	• Archive and backup procedures • Long-term IFC model storage • Platform upgrade planning • Maintain ISO 19650 and IFC version currency
Upskilling	• Conduct skills gap assessment • ISO 19650 awareness training • openBIM fundamentals (IFC, BCF, IDS) (buildingSMART Foundations Certificate) • Develop role-based training paths • Identify BIM champions	• Project-based BIM training • CDE user onboarding • Mentorship network setup	• Advanced openBIM skills development • Additional buildingSMART certification pathways • Cross-functional training • IFC data management training • IDS and BCF workflow training	• Continuous learning culture • Emerging technology upskilling • Knowledge management systems	• Update training from project experience • Document competency development • Share best practices and lessons learned

Standards and Framework

ISO 19650

ISO 19650 is a series of standards which standardize on terminology and processes that are internationally recognized. While the standards can be adopted for any size project, the recommendations in this toolkit have been extracted to enable its use on affordable housing projects.

Due to the sheer complexity of this subject, the standard series is divided into the following individual standards:

- ISO 19650-1: Concepts and principles
- ISO 19650-2: Delivery phase of the assets
- ISO 19650-3: Operational phase of the assets
- ISO 19650-4: Information exchange
- ISO 19650-5: Security-minded approach to information management
- ISO 19650-6: Health and safety information

ISO 19650 is really a 'meta' standard, which can be implemented for projects by decisions on specific formats and processes that are 'compatible' with those in the standard. In this toolkit, many of the common terms are supplemented with ISO 19650 terms. For example, the Appointing Party in ISO refers to the role that establishes the project's BIM requirements, which would most commonly be the owner.

Classification Systems

A classification system is essential in BIM because it provides a consistent, structured way to organize information across all disciplines, phases, and platforms. It ensures that every element, whether a space, system, or asset, is named, categorized, and understood in the same way by everyone involved.

This consistency reduces ambiguity, supports automation, improves model coordination, and enables reliable data exchange into downstream systems such as estimating, scheduling, procurement, and asset management. Without a classification system, BIM data becomes fragmented, harder to trust, and significantly less useful for lifecycle decision-making.

There are four standard options that may be used for classification:

MasterFormat™ : standard jointly published by CSC/CSI is a copyrighted classification typically used for project specifications to define performance requirements.

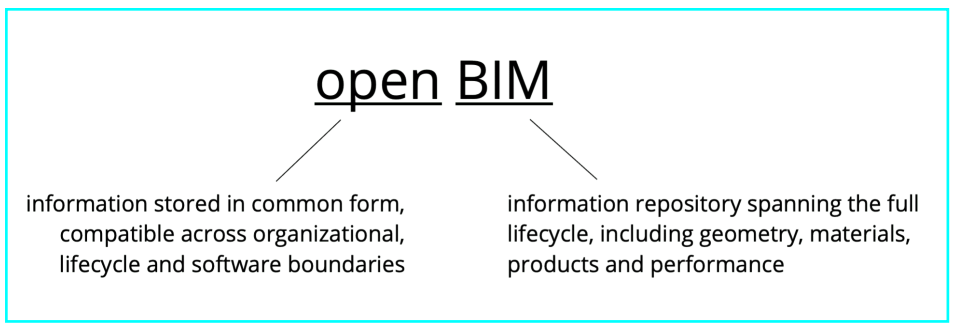
OmniClass® Table 23 – Products: classifies construction products, materials, equipment and manufactured items installed in buildings, organized by product type and function.

OmniClass® Table 13 – Spaces by Function: classifies spaces providing a more granular functional taxonomy defining spaced by purpose.

Uniformat II: organizes information by functional elements, that supports cost estimates and other construction information into a structure, hierarchical format.

openBIM

openBIM enables universal data sharing for BIM information regardless of the proprietary platform or tool used to create it. It establishes a common language for a wide range of processes, providing a project dataset that can be continuously used throughout the entire asset lifecycle. This interoperability is fundamental to achieving the information management objectives set out in ISO 19650.



The importance of open standards lies in accessibility and longevity. An open definition of a data standard allows everyone to interpret the data consistently, and the guarantee of continued access makes it the only viable option for long-term archiving. Consider the value of knowing where building systems are located, or where hazardous materials were used, decades after construction. Open standards ensure this information remains accessible regardless of which software tools exist in the future.

OpenBIM is developed through collaboration and consensus rather than by any single vendor. This collaborative governance means organizations control their own digital destiny. An open standard is accessible and usable by anyone, allowing teams to select and change tools without being locked into a single vendor's ecosystem. Organizations maintain control of their workflows and data, both now and in the future.

The benefits of standardized, open BIM processes extend across the industry. Owners and public authorities gain better control of their data and can manage information consistently across asset portfolios, supporting ongoing operations and maintenance.

Design and construction teams enjoy flexibility in tool selection while collaborating efficiently with project partners. Operators make better decisions through reliable longterm access to asset information. Product and software vendors expand their market opportunities, while educators benefit from standards-based curricula. Ultimately, all stakeholders work together using common processes, workflows, and universally consistent data, resulting in an improved built environment for society.

RACI

RACI (**R**esponsible, **A**ccountable, **C**onsulted, **I**nformed) is a popular project management technique that describes the responsibilities of various stakeholders in completing tasks or deliverables. The matrix assigns one of four responsibilities to each stakeholder in executing a deliverable: Responsible, Accountable, Consulted, and Informed. The principle reduces confusion by mapping out who does the work, who holds final authority, who provides input, and who needs updates.

RACI documents typically take the form of a matrix which assigns project roles to tasks and deliverables, and specifies when and where the resulting data is required.

The BIM Requirements Specification

The BIM Requirements Specification is a project document defining the Owner's standards, goals, and technical expectations for using BIM throughout a project's lifecycle. In the ISO 19650 Standard it is also referred to as the Exchange Information Requirements(EIR). It ensures consistency in 3D models, data structures, and deliverables, enabling better collaboration, efficiency, and final asset management.

It should establish a clear, simple and consistent framework for:

- Coordinated design and construction
- Support for prefabrication strategies
- Lifecycle data and document handover
- Cost-effective and scalable BIM implementation

The BIM Requirements Specification states why BIM processes are important to the project and how the data gathered will be used. It includes technical requirements for things like software, file formats and naming conventions; Level of Information Need (LOIN) required for models; a timeline of deliverables; and roles and responsibilities.

The document serves as a basis for the BIM Execution Plan (BEP), which is prepared by the project team to identify how the requirements will be implemented.

A sample BIM Requirements Specification that is tailored to housing projects can be found in the Appendix.

The BIM Execution Plan

A BIM Execution Plan (BEP) is a comprehensive planning document that helps project participants move forward with clear roles and expectations, collaboratively. It is a framework for strategically implementing BIM using consensus-built best practices, standards and protocols. The BEP should be continuously used and updated throughout design and construction. The key components of a successful BEP include:

- **Clearly defined roles and responsibilities** of each team and organization
- **Strategic planning**, BIM scope definitions and defined key deliverables
- **Project milestones** and a realistic timeline
- **Project goals/BIM objectives**
- **Model quality control procedures**
- **Project reference information**, including key project contacts

A BEP is an essential element to create before beginning any construction project. A BEP keeps all collaborators in sync through clear roles, responsibilities and real-time communication while ensuring construction stays on track. A thorough BEP is a powerful project accountability tool that keeps work moving forward throughout the various planning and construction phases.

Templates are provided in the appendix for a BIM Execution Plan (BEP) Design phase (Appendix 3) and BIM Execution Plan (BEP) Construction phase (Appendix 4).

Why Structured Information Matters

Building Information Management (BIM) represents a shift from traditional document-based project delivery toward structured and connected information management.

Unlike conventional 2D CAD workflows, BIM combines geometry with associated information that can be searched, validated, coordinated, and reused throughout the lifecycle of a project. This allows information to become machine-readable and consistently structured across disciplines and project phases.

When information is developed in a structured manner, project teams can:

- improve coordination between disciplines,
- reduce duplication and inconsistencies,
- support more reliable decision-making,
- and deliver more usable information at handover.

For owners and operators, the value of BIM is not only the model itself, but the ability to access reliable and traceable information throughout design, construction, and operations.

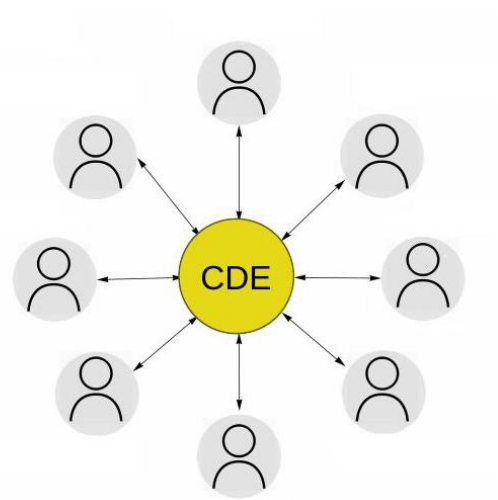
A **Common Data Environment (CDE)** is the agreed source of project information used by all participants throughout the project lifecycle. It provides a managed process for collecting, managing, reviewing, approving and distributing information.

Working within a shared environment, project teams can improve collaboration while maintaining version control, accountability, and traceability of project information.

A well-implemented CDE offers several advantages:

- A single source of truth across the project
- Improved coordination between disciplines
- Reduced duplication of information
- Clearer review and approval workflows
- A complete audit trail of information exchanges

Organizations may implement CDE workflows using different technologies and platforms. Regardless of the software used, the objective remains the same: ensuring that project information is consistent, accessible, and managed through defined governance processes.



Information States within the CDE

Within a CDE, information progresses through different states as it is developed, reviewed, and approved throughout the project lifecycle.

Typical information states include:

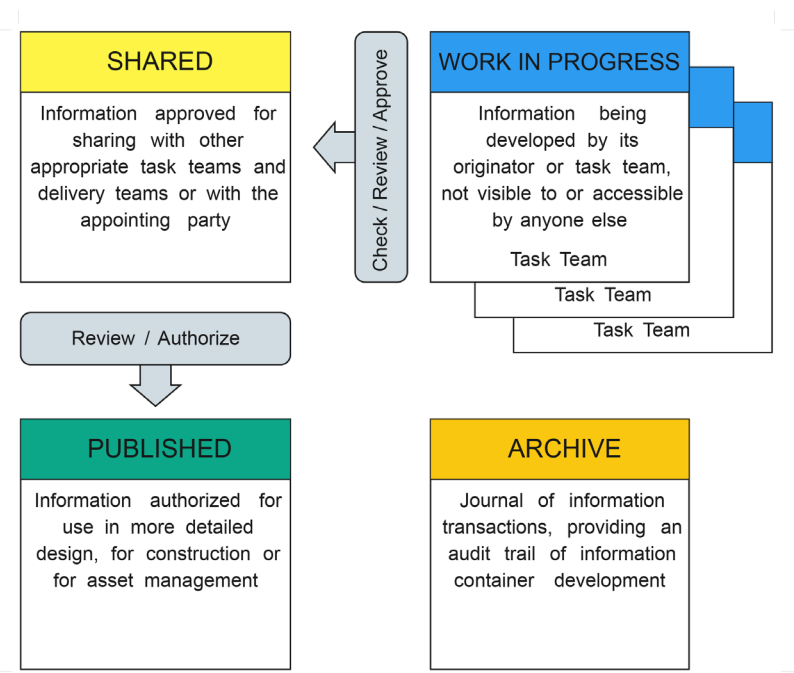
Work In Progress (WIP) Information actively being developed by the originating team and not yet shared for coordination or review.

Shared Information issued for interdisciplinary coordination, review, and collaboration.

Published Information approved for use in project delivery, construction, or operational activities.

Archive Historical records maintained to preserve traceability and document the evolution of project information.

These workflows support controlled information exchange and help ensure that project teams are working from the correct and most current information available.



Why This Matters for Housing Project Owners

For owners and operators, structured information management supports more reliable project delivery and improves long term operational readiness.

When information is properly governed and maintained throughout the project lifecycle, owners are better positioned to:

- receive more reliable handover information,
- support facility management and maintenance workflows,
- reduce information loss during project transitions,
- improve accountability across delivery teams,
- and maintain accessible project records over time.

A structured information environment also creates opportunities for future integration with asset management systems, capital planning processes, and broader digital operations initiatives.

Owner (Appointing Party)

This section defines the responsibilities, processes, and information management obligations of the Owner (Appointing Party) in accordance with ISO 19650.

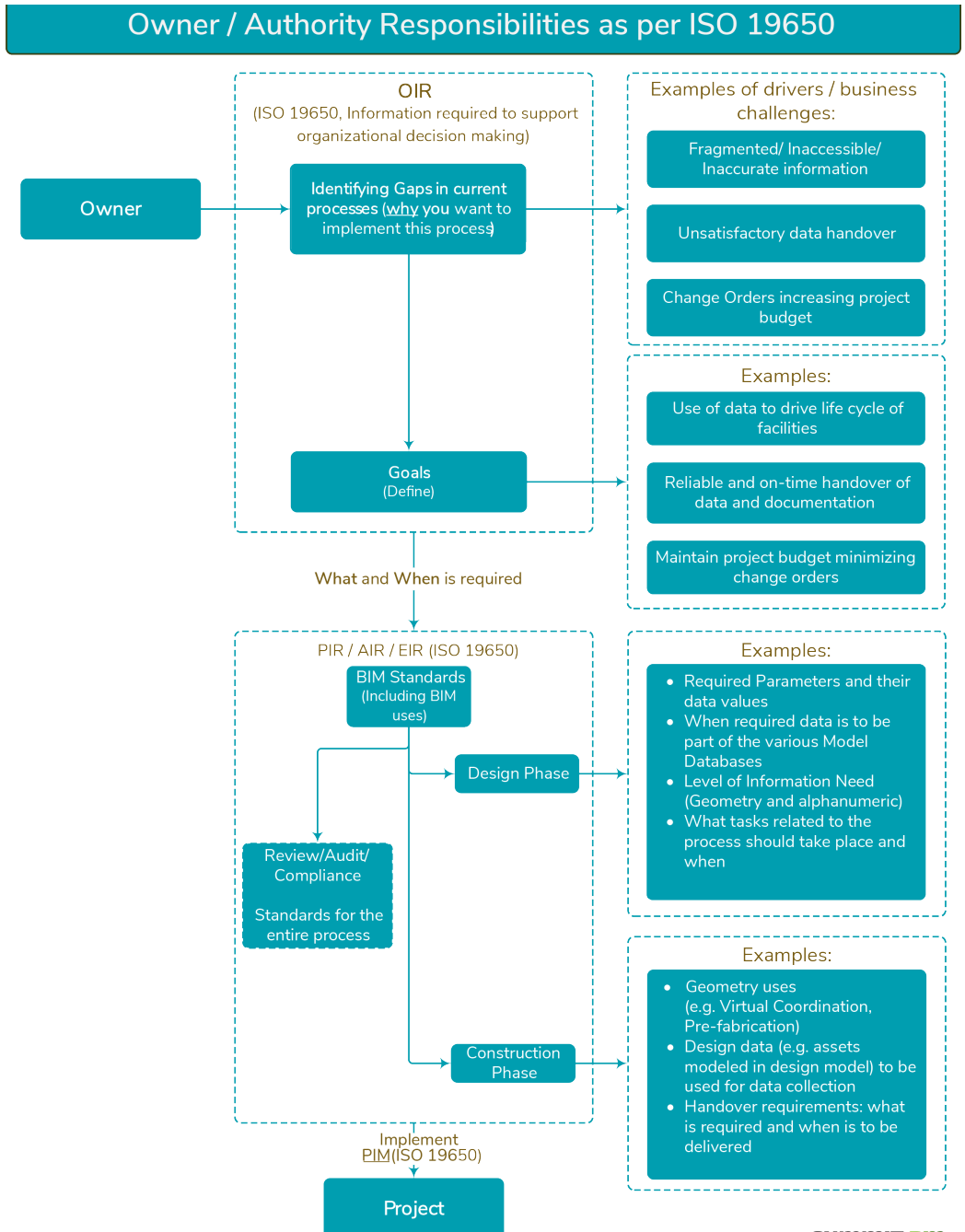
1. Role Explained

The Owner (Appointing Party) is responsible for defining, managing, and ensuring the delivery of information required to support both project delivery and long-term asset operation. In accordance with ISO 19650, the Owner (Appointing Party) acts as the ultimate information owner, accountable for establishing clear information requirements and governance structures.

The Owner's (Appointing Party's) role extends beyond project oversight and includes ensuring that information generated throughout the project lifecycle aligns with organizational objectives and operational needs. This requires early definition of information requirements, clear appointment of delivery teams, and ongoing verification that deliverables meet the intended use.

Key responsibilities include:

- Defining organizational and asset-level information requirements
- Establishing governance and information management protocols
- Appointing and managing the Delivery Team Lead (Lead Appointed Party) and delivery team
- Ensuring alignment between project outputs and operational use cases



2. Assessment & Needs

At the outset of the project, the Owner (Appointing Party) must clearly define the information required to support decision-making, asset management, and lifecycle performance. This is achieved through the development of structured information requirements in accordance with ISO 19650:

- Organizational Information Requirements (OIR):

  High-level information needs aligned with the organization's strategic objectives and portfolio management.

- Project Information Requirements (PIR):

  Information required to support the effective planning, design, construction, and delivery of the project. PIR defines the data needed for project decision-making, performance monitoring, and coordination throughout the delivery phase. See Project Information Requirements in Part 3.

- Asset Information Requirements (AIR):

  Detailed information requirements necessary for the operation, maintenance, and performance monitoring of the asset. See Asset Information Requirements in Part 3.

- Exchange Information Requirements (EIR):

  Project-specific requirements defining what information must be delivered, at what stage, and in what format.

This phase also includes the assessment of existing systems (e.g., CMMS, CAFM, GIS) and the definition of data structures, classification systems, and naming conventions to ensure interoperability and long-term usability.

A clear definition of the Level of Information Need (LOIN) is required to distinguish between geometric, alphanumeric, and documentation requirements.

3. Procurement

During procurement, the Owner (Appointing Party) must ensure that all information requirements are clearly embedded within tender documentation, contracts, and appointment agreements. This ensures that expectations related to information delivery are contractual and enforceable. See Procurement in Part 3.

4. Project Delivery

Throughout project delivery, the Owner (Appointing Party) is responsible for ensuring that information is generated, managed, and validated in accordance with the defined requirements and ISO 19650 processes.

This includes oversight of the Common Data Environment (CDE), ensuring proper management of information states (Work in Progress, Shared, Published, and Archived), and maintaining clear approval workflows.

In accordance with ISO 19650, the Owner (Appointing Party) appoints an **Information Manager** to act on its behalf in managing and coordinating information processes. This role is responsible for implementing the information management framework, facilitating information exchanges, and ensuring compliance with established requirements. The Information Manager (on behalf of the Owner (Appointing Party)) governs and assures the process but does not own or author the information. To maintain objectivity and avoid conflicts of interest, this function should be independent from the delivery design and construction teams.

Under ISO 19650-2, the Owner/Client (Appointing Party) is accountable for defining, governing, and maintaining the project's information requirements. This responsibility includes:

- Appointing, or supporting the appointment of, Lead Appointed Parties and ensuring roles and responsibilities are clearly understood.

- Establishing the Exchange Information Requirements (EIR) and the associated information delivery plans that guide how, when, and in what format information must be produced.
- Providing or arranging a Common Data Environment (CDE) that supports controlled information management, collaboration, and traceability.
- Conducting audits and QA/QC reviews, verifying that submitted information models meet the specified requirements, conform to agreed formats, are delivered at the correct milestones, and formally accepting or rejecting submissions as appropriate.
- Ensuring accepted information is archived, maintained, and continuously improved through structured lessons-learned processes.

This role is central to maintaining data quality, consistency, and structure, enabling reliable project delivery, efficient asset operation, and long-term information use aligned with the BIM Requirements Specification and defined data uses. When executed effectively, it drives:

- Improved Efficiency
- Enhanced Collaboration
- Better Risk Management
- Cost Reduction

Regular information reviews should be conducted at defined project milestones to assess:

- Compliance with PIR and BEP
- Data completeness and consistency
- Alignment with Asset Information Requirements (AIR)

The Owner (Appointing Party) should implement structured quality assurance and quality control (QA/QC) processes to validate both model geometry and associated data, ensuring that information progressively develops in a coordinated and usable manner.

Ongoing activities during this phase include:

- Monitoring adherence to agreed information delivery milestones and exchange schedules
- Ensuring that information management processes defined in the BEP and PIR are consistently followed
- Verifying that information is being progressively developed in alignment with project stages, alongside geometric model development and alphanumeric information associated with the geometry
- Tracking and documenting information-related issues, gaps, or inconsistencies identified during reviews
- Flagging non-compliance and coordinating with the delivery team for resolution
- Ensuring that information remains aligned with its intended operational use

By maintaining active oversight throughout delivery, the Owner (Appointing Party) ensures that information is not only produced in accordance with contractual requirements but also developed in a manner that supports downstream asset management and operational performance.

5. Project Closeout

At project completion, the Owner (Appointing Party) must ensure the successful transition from the Project Information Model (PIM) to a validated and operational Asset Information Model (AIM).

The focus at this stage is on ensuring that all delivered information:

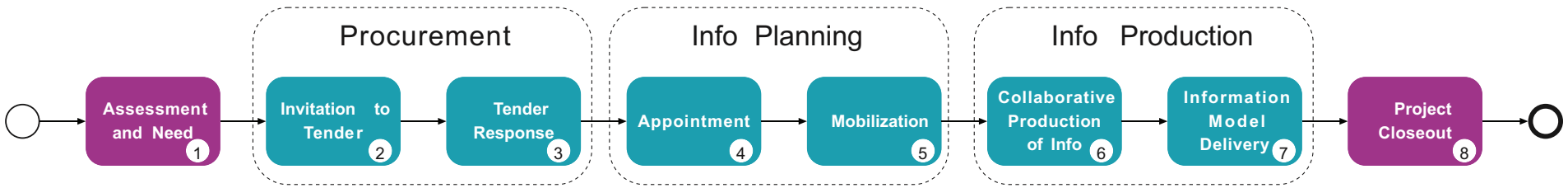
- Meets the defined AIR
- It is complete, accurate, and structured
- Is it interoperable with the owner's operational systems (e.g., CMMS/CAFM)

Validation processes should confirm that asset data is correctly classified, linked to relevant documentation, and organized according to the defined asset hierarchy.

At handover, compliance does not guarantee usability, information must be structured and aligned with operational workflows to deliver value.

Project Delivery Team (Appointed Party)

There are two primary roles defined in ISO 19650 for the Project Delivery Team to assign responsibilities for information management throughout a project. All parties are expected to participate in and follow the ISO 19650 framework and operate within the common data environment, following agreed workflows for information production, review, authorization, and acceptance.



Delivery Lead (Lead Appointed Party)

The Delivery Lead (Lead Appointed Party) coordinates information delivery across the project. This role coordinates information delivery across all appointed parties and validates compliance before delivery to the Owner (Appointing Party) via the established information exchange. Ensures consistent application of information management processes across the delivery team.

This role can be assigned to the prime consultant, the architect, or the contractor depending on the contract type and the project phase. The key responsibilities include:

- Coordinating information between the Owner (Appointing Party) and the Delivery Team
- Managing information flow across all appointed parties
- Ensuring consistent application of information management processes

Delivery Team (Appointed Party)

The Delivery Team (Appointed Party) provides information concerning works, goods, or services as part of the delivery team. This role produces and delivers information in accordance with project requirements. Prepares information management resources defining quality standards, processes, and protocols. Retains responsibility for the information within each container they produce, including ongoing maintenance of that information.

This role can be assigned to the architect, the contractor, the engineer, the trades, or the service operator. The key responsibilities include:

- Producing and delivering information in accordance with project requirements
- Preparing information management resources that define information quality standards
- Establishing processes and protocols governing information production and ownership

Assessment & Needs

The Assessment & Needs is conducted by the Owner (Appointing Party) prior to engaging the Project Delivery Team. There are no activities for the Project Delivery Team during this phase.

Procurement

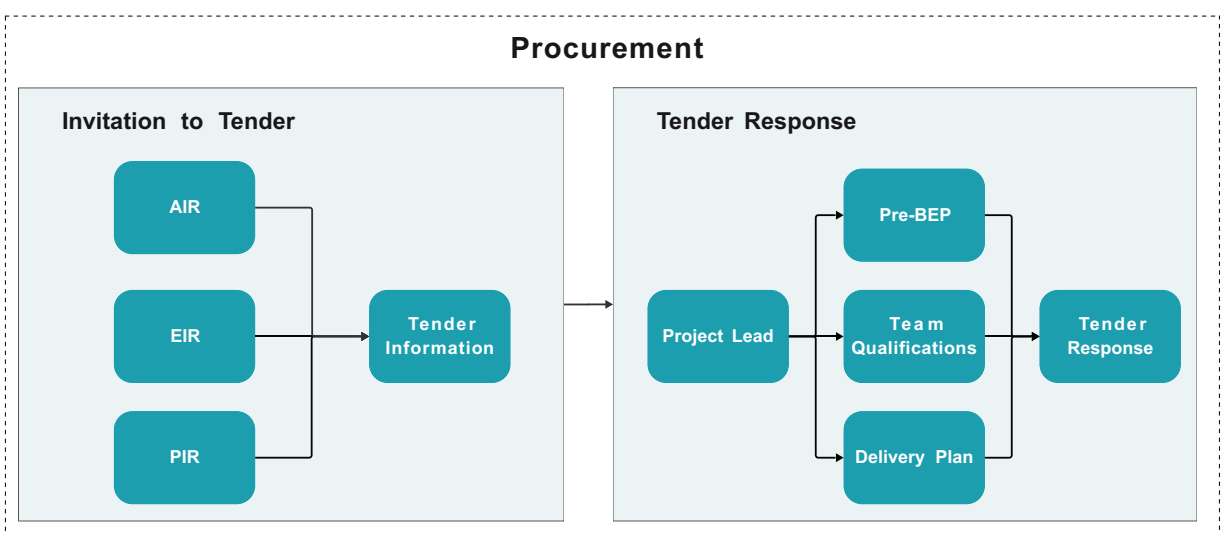
There are two main steps within the Procurement phase; the first is the Invitation to Tender conducted by the Owner (Appointing Party), the second is the Tender Response which is the responsibility of the Lead Owner (Lead Appointing Party).

Step 1: The Invitation to Tender will include all the Information Requirements and digital deliverables that have been validated and possibly edited from this Standard conducted during the Assessment & Needs phase.

Step 2: The Tender Response will require the Delivery Lead (Lead Appointed Party) to coordinate a response with all the Appointed Parties to explain how the digital deliverables and information requirements will be created, managed and delivered.

This response should include the following:

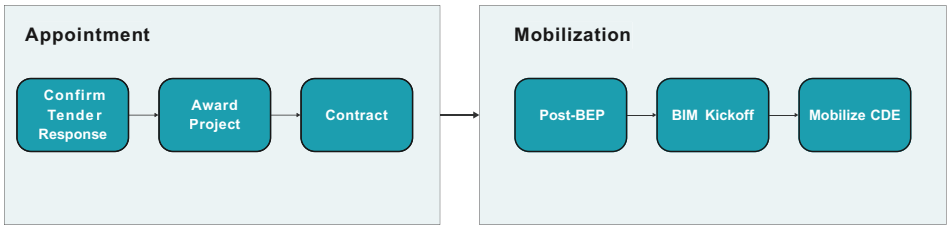
1. A Pre-BIM Execution Plan
   a. BIM goals and uses (coordination, 4D, 5D, asset data, etc.).
   b. Information management strategy: how the team will meet the EIR, develop and exchange the PIM, and align with standards
   c. Standards, methods and procedures: proposed information standards (naming, classification, data structures) and high-level CDE workflows, approvals, clash detection and issue management methods.
   d. Roles and responsibilities: high-level RACI
   e. Software stack and interoperability approach, main model/data deliverables and formats
   f. Quality Control checks and training plans
   g. High-level model element table



2. A compilation of the BIM qualifications (competencies and capabilities) of each potential Project Delivery Team (Appointed Party)
    a. Years of BIM experience and capabilities
    b. BIM Use project experience
    c. Certifications
    d. BIM Team size
3. An Information Delivery Plan or Master Information Delivery Plan (MIDP)
    a. how information will meet the requirements defined in the AIR or EIR;
    b. when information is going to be delivered, initially with respect to project stages or asset management milestones and later with respect to actual delivery dates;
    c. how information is going to be delivered;
    d. how information is going to be coordinated with information from other relevant appointed parties;
    e. what information is going to be delivered;
    f. who is going to be responsible for delivering the information; and
    g. who the intended recipient of the information will be.
4. A Risk Register (regarding information delivery)
    a. Established by Delivery Lead (Lead Appointed Party)
    b. Any risks that impact information delivery and information delivery milestones should be recorded in this risk register
    c. unrealistic deadlines
    d. resource issues
    e. concerns outside the Delivery Lead (Lead Appointed Party)'s control
    f. Gives all parties oversight of the risks and creates a mechanism to implement appropriate risk-mitigation measures

The Owner (Appointing Party) Lead will review the capability and capacity of the prospective delivery team to meet the information requirements.

Information Planning



After Tender Award or once the Project Delivery Team has been awarded the project. Information Planning is comprised of two main steps: Appointment and Mobilization, described in more detail below. Both steps are the responsibility of the Delivery Lead (Lead Appointed Party) with support from the Delivery Team (Appointed Parties) and approved by the Owner (Appointing Party) before moving forward.

Step 1: The Appointment includes confirming and expanding on the tender response. This includes:

1. The confirmation of the BIM Execution Plan often requires expansion and additional information or to incorporate any comments from the Owner (Appointing Party).
2. Confirmation of the RACI
    a. The Delivery Lead (Lead Appointed Party) responsible for establishing the detailed responsibility matrix, which identifies:
        - what information is to be produced
        - when the information is to be exchanged and with whom
        - which task team is responsible for its production
3. Confirmation of the Information Requirements with all the appointing parties
4. It is advisable to address the risk identified by trying to mitigate or address them

The Delivery Lead (Lead Appointed Party) will chair a BIM kickoff meeting and finalize all these documents for the Owner (Appointing Party) for review and approval.

Step 2: The second step after approval of the Information Plan is Mobilization, which includes setting up the means and methods. This primarily consists of setting up the Common Data Environment(s) and any other infrastructure needed to create and exchange information for the next phase, Information Production. The Delivery Lead (Lead Appointed Party) is responsible for mobilization and management of the common data environment(s).

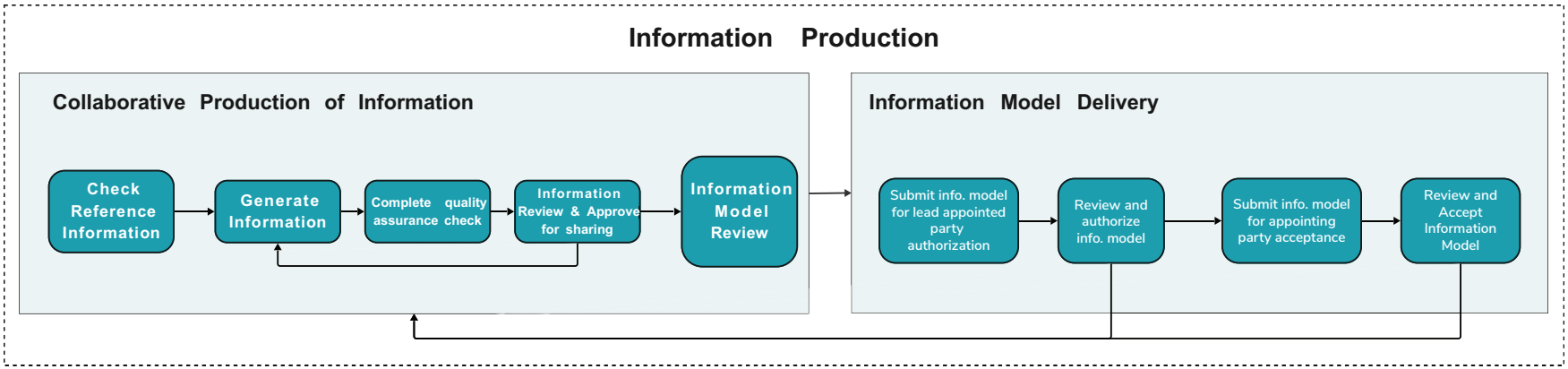
The Need for Centralized Communication

Traditionally, planning, design, construction, and operation of buildings has been fragmented, with decentralized communication and documentation. This fragmentation creates challenges: in addition to potential data loss during exchanges, teams face convoluted collaboration processes when many stakeholders participate in a project.

BIM addresses this by centralizing project information, communication, and documentation. All stakeholders both contribute to and draw from a shared information environment. BIM Collaboration Format (BCF) extends this principle by providing a standardized method for communicating about that shared information, ensuring that issues and feedback flow as efficiently as the data itself.

Information Production

At the start of the Information Production phase all Reference Information provided by the Owner (Appointing Party) should be reviewed and checked by the entire delivery team, this is especially important for projects with existing conditions. Each task team is to do their own review.



Collaborative Production of Information is when new information being generated in each Task Team's CDE space as a 'Work in Progress' state. Any information contained in this state should not be visible or accessible to any other task team. Cloud-based, managed with permissions with controlled access and exchanged via CDEs. Each task team is required to do their own quality checks, checks against the information delivery plan, and the agreed standards, methods and procedures for producing information before sharing the information.

Once information has shifted from 'WIP' to 'Shared' the information containers are visible and accessible but not editable. If editing is required, it must be done by the author in the WIP state for amendment and resubmission by its author.

This is cyclical until there is a required Information Deliverable. The shared information is reviewed against the relevant information requirements for coordination, completeness and accuracy by the Delivery Lead (Lead Appointed Party).

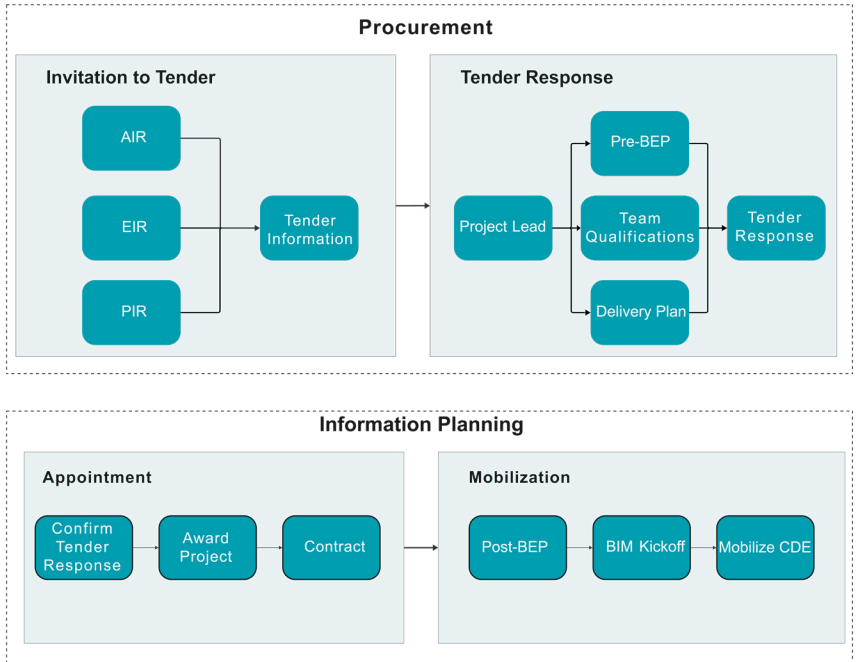
Information not meeting the information requirements will be returned to the work in progress state for amendment and resubmission by its author. If information meets the information requirements, its state is changed to published.

Validate & Confirm: Authorization separates information in the 'Shared' state to the 'Published' State, meaning the information may be used for its stated use, such as permits, costing, construction, asset management, etc. The published state is used for information that has been authorized for use.

Review and Accept: The Owner (Appointing Party) must review accept or reject the published information. If the review is unsuccessful, the Owner (Appointing Party) shall reject the information model and instruct the Delivery Lead (Lead Appointed Party) to amend the information and re-submit for Owner (Appointing Party)'s acceptance. Partial acceptance of the information to be exchanged can lead to coordination issues, therefore it is recommended that the Owner (Appointing Party) either accepts or rejects the entire information deliverable.

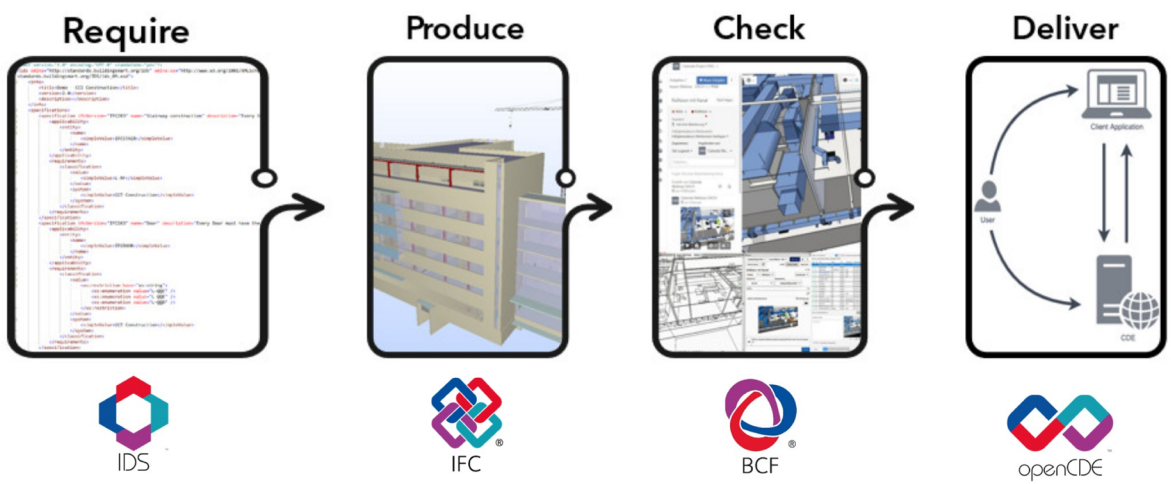
Information Checks

While the Canadian housing sector's adoption of BIM is still maturing, and few current projects are executing full information checks using openBIM standards, this section is included to establish a clear direction for where information management practices are headed. The Information Delivery Specification (IDS), together with open exchange formats such as Industry Foundation Class (IFC) and feedback protocols such as BIM Collaboration Format (BCF), represent the emerging international standard for verifying that model-based information meets defined requirements before delivery. Rather than prescribing these tools as an immediate requirement for all housing projects, this guidance is intended to help owners and delivery teams understand the direction the industry is moving in, so that current investments in digital processes are not made in isolation fromwhere the standards landscape is going. Organizations at earlier stages of BIM maturity may continue to rely on manual or platform-specific checking processes in the near term, while using this section as a reference point for longer-term planning.

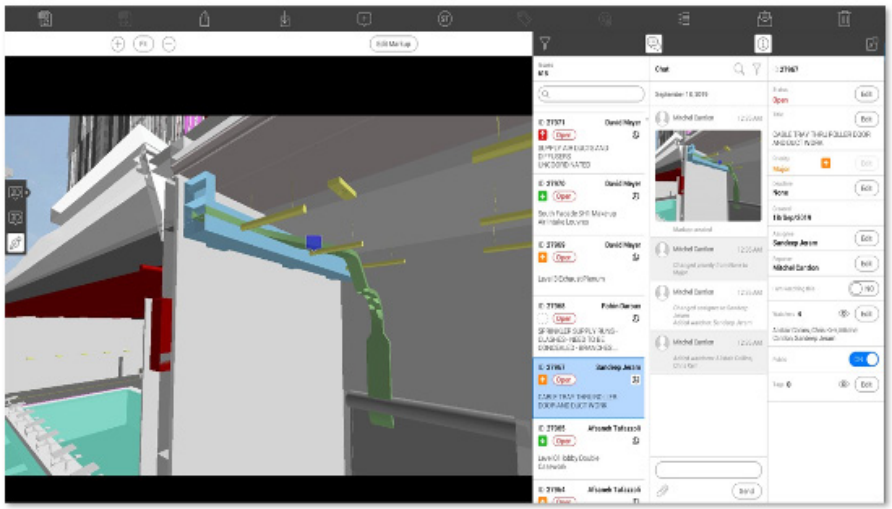


Information containers are checked against information requirements using the openBIM standard Information Delivery Specification. The **Information Delivery Specification (IDS)** is a buildingSMART standard that provides a computer-interpretable document for defining the exchange requirements of model-based information delivery. It offers a structured approach to specifying, validating, and verifying project information requirements throughout the BIM workflow.

IDS supports a clear process for information management. Project teams first define their information requirements, then create datasets, accordingly, check the data against those requirements, and finally share data or identify issues for resolution. This systematic approach ensures that information deliverables meet defined specifications before exchange.



BCF manages the feedback process by capturing and tracking comments, issues, responses, status updates, and visual snapshots. When an issue is identified, BCF records not just the comment but also the relevant context: the location within the model, the specific entities involved, and a viewpoint with an associated image showing exactly what the reviewer observed.



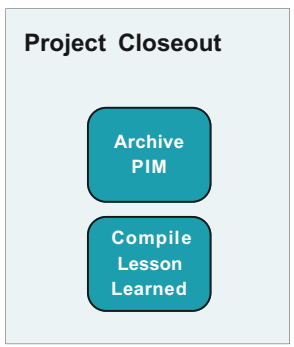
This structured approach ensures that feedback is clear, actionable, and tied directly to the model. Recipients can navigate to the precise location of an issue in their own BIM application, understand what was flagged, and respond accordingly. The result is more effective communication across disciplines and platforms, supporting the collaborative processes that are central to BIM.

It is important to note that these openBIM checking workflows, specifically IDS-based validation and BCF-based issue tracking, represent a maturity target rather than a starting point. Many housing sector projects today will continue to rely on native software checking tools, manual QA/QC processes, or platform-specific issue tracking, and this is an appropriate and reasonable stage in an organization's digital journey. As BIM adoption in housing progresses and teams build capacity and familiarity with openBIM workflows, adopting standards-based checking processes like IDS and BCF can offer greater interoperability, transparency, and longterm efficiency, particularly on projects involving multiple disciplines, software platforms, or external consultants.

Project Close Out

Project information containers, including any in the archive state, should be retained as read-only in case of dispute. The archive state is used to hold a journal of all information containers that have been shared and published during the information management process as well as an audit trail of their development. An information container referenced in the archive state that was previously in the published state represents information that potentially has been used for more detailed design work, for construction or for asset management. Most CDEs have built in versioning functions to maintain historic log, however it is still useful to create an official archive of published states.

Capture lessons learned for future projects. In collaboration with each Delivery Lead (Lead Appointed Party), the Owner (Appointing Party) shall capture lessons learned during the project and record them in a suitable knowledge store, to be called upon by future projects. It is recommended that lessons learned are captured throughout the entire project.



Part 3: Toolkit

Assessment & Needs

The ISO 19650 framework defines requirements as Strategic, Operational and Deliverable, culminating in Consolidated Requirements.

- Strategic Requirements: known as the **Organizational Information Requirements (OIR)**, setting out Why the organization is undertaking this process, explaining the high-level strategic objectives which typically address the following:
  - Provide an explanation for potential consultant and construction teams identifying what the organization hopes to achieve through the implementation of BIM Requirements, i.e. establishing the main goals and uses for the data.
  - Definition of specific data standards, i.e. classification, format and terminology as required to support data interoperability across the organization.
  - Expectations for the collection and collation of digital information related to installed assets to support the lifecycle, rooms, spaces, risk and assets.
  - Expectations for processes to be followed to reduce risk during design and construction to support on time and on budget construction, reduction in change orders, retention of space required for maintenance and replacement.
  - Data quality expectations to ensure trust, structured consistently so future-proofed, adhering to data governance.
  - Required accuracy of the record information.
- ISO 19650 introduces a new player, the '**Information Manager**'.
  - This a role that is either internal or external to the Owner Organization. The role supports the definition of requirements, and is responsible for checking that processes being proposed by the teams, in the BIM Execution Plan (BEP), will be able to support what has been asked for.
  - The role includes a QA/QC process to review and assess the design process to ensure that the data is robust and fit for purpose.
  - The frequency of the quality control checks is typically aligned with design reviews.
- Operational Requirements: known as the **Project Information Requirements (PIR)**
  - This section repeats to some extent the language contained in the OIR but establishes on the Project level the 'What' and 'When' processes must occur and data must be available within the model data sets to drive other established processes. It sets out the goals and uses to be achieved as defined in the OIR, i.e. provide:
    - Explanation of the information that is to be provided to support the OIR goals.
    - The PIR will vary dependent on project type, i.e. different projects, different assets, different locations, different circumstances.
    - Defines the Level of Information Need (LOIN) required to achieve the various goals and uses. The LOIN is comprised of geometrical information, alphanumerical information and documentation.

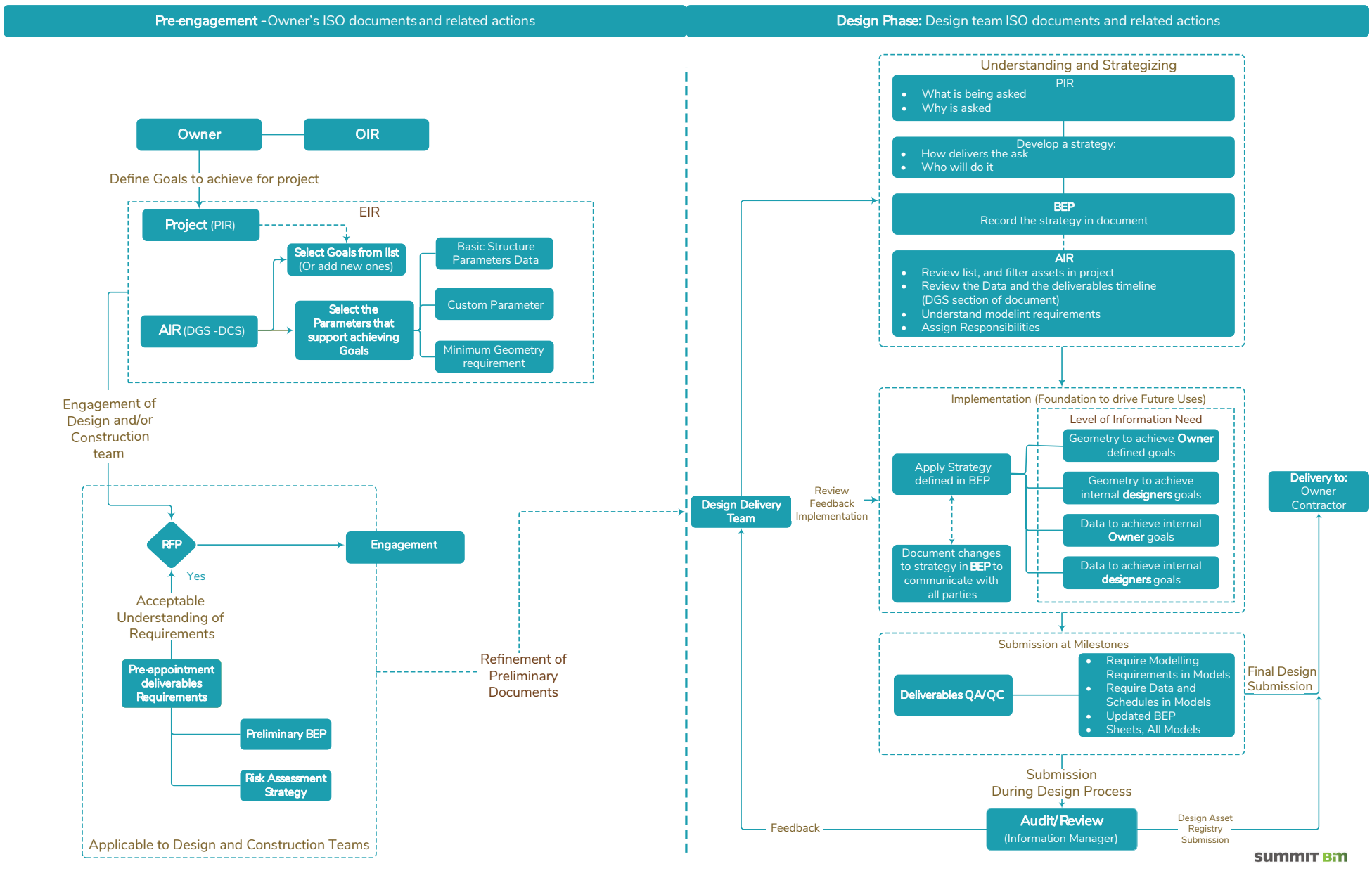
Within the Project Information Requirements (PIR) section are two sub-sections the **Asset Information Requirements (AIR)** and the **Exchange Information Requirements (EIR)**

- **Asset Information Requirements (AIR)**
  - Comprised of the Data Geometry Specification (DGS) and Data Collection Specification (DCS). The DGS is a master list of asset types of interest to the FMO team. The DCS identifies what information about those assets must be collected.
  - Defines the entire potential classification system, all possible assets, the level of geometry, the data fields required and the processes to be undertaken, all relative to the project timeline.
    - Project audits would use the AIR as the basis for the check.
  - Different projects have different assets and room requirements, and it is the responsibility of the design team to adjust the classification structure to show only assets and room categories that are contained within the facility they are responsible for designing.
  - The AIR defines information requirements for all phases of a project, i.e. design, construction and handover.

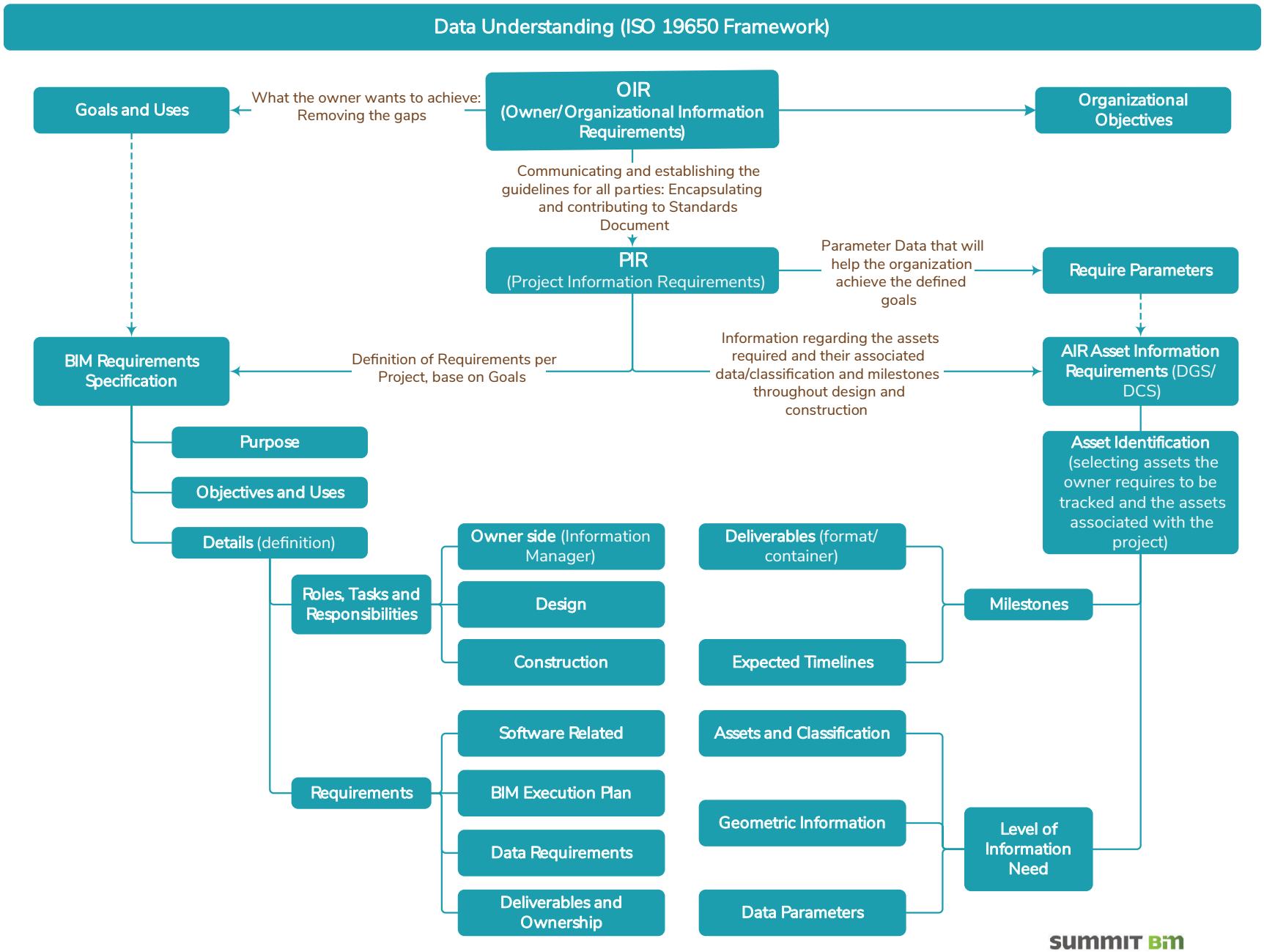
- **Exchange Information Requirements (EIR)**
  - Defines the exchange format and requirements, i.e. what is to be included in each deliverable throughout the project, including at handover, as it relates to BIM.
  - The template format required, for data transfer at handover.
  - Definition of installed asset information to be provided, identifying all required meta data and documents relative to asset type.
  - Timeline for information to be provided to support preventative maintenance plans.

The OIR and PIR, including the two sub-sections AIR and EIR form the BIM Requirements documentation distributed by the Owner (Appointing Party) during the RFP process.

Workflow of Information Requirements, Pre-engagement and Design Phases

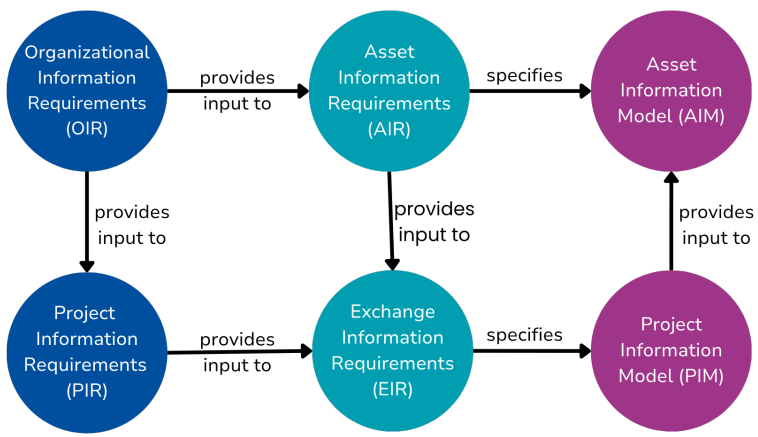


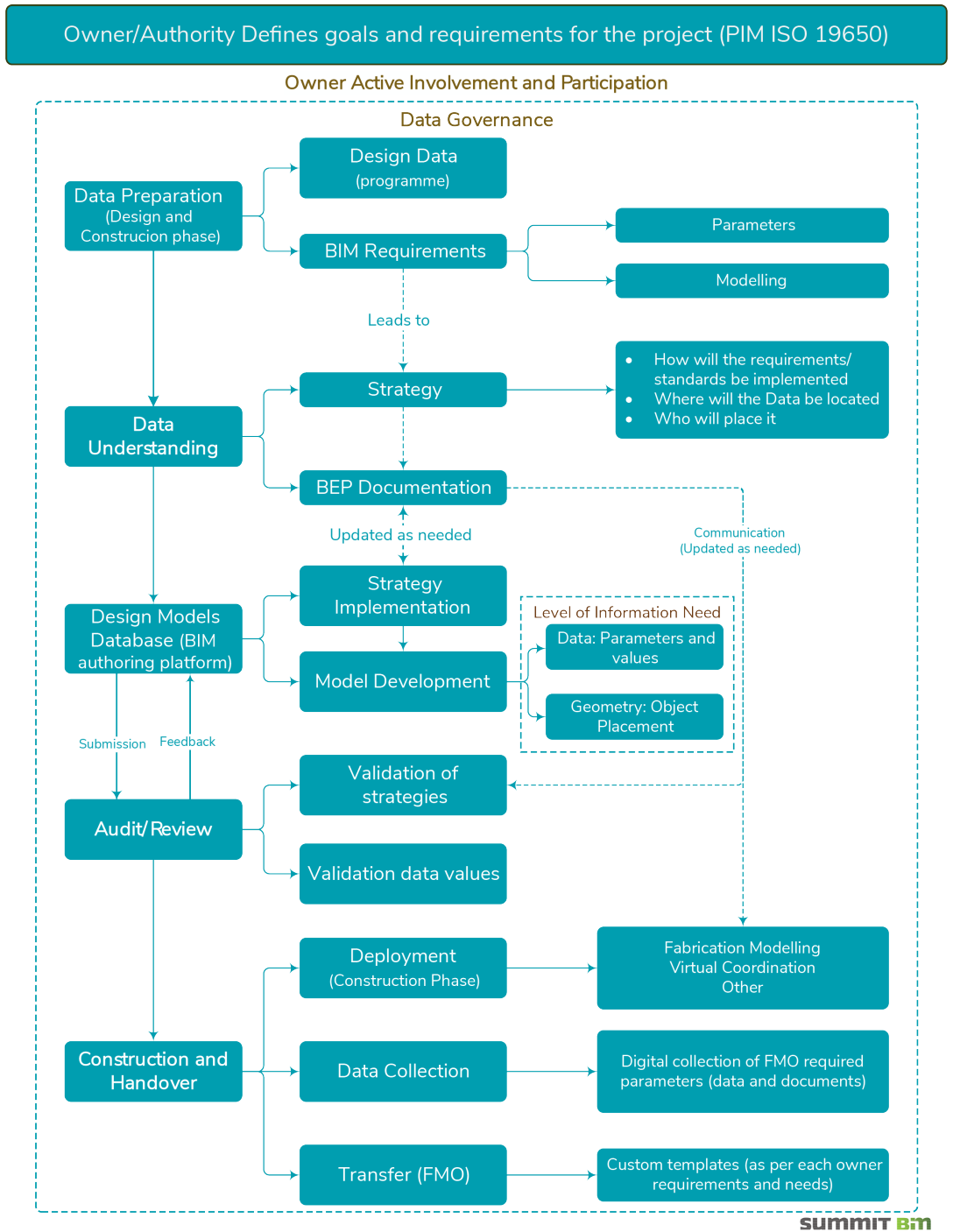
Data Requirements and Interaction with Project Processes



Project Information Model (PIM)

A Project Information Model (PIM) combines geometry in the form of 3D models, alphanumeric data (specifications, data sheets) and documentation within the Common Data Environment (CDE) to enable collaborative planning, coordination and simulation. It is developed during design and construction and provides data for the Asset Information Model (AIM) which is used for Facilities Maintenance and Operation.





Asset Information Requirements (AIR)

The AIR is most likely an Excel file that has two parts:

- The Data Geometry Specification (DGS)
- The Data Collection Specification (DCS)

During the **Design Phase** of a project, the **DGS** is developed as a master list of asset types that the Facilities Maintenance and Operations (FMO) team is interested in. Assets of these types are then tracked if they are part of the design.

Each asset type has a classification, acronym, and a minimum geometric level of detail, along with a list of attributes or properties that **must be included in the design model** to facilitate the Owner (Appointing Party)'s compliance checks, design analysis and facilities management functions.

Note1 : All parameters relative to the design containers (models) of the project must be present in the models associated to their respective assets, even if those parameters are not specified in the AIR (DGS/DCS). The reason is to retain design data. Some examples may be manufacturer, model, capacity, size, mounting, etc.

During the **Construction Phase**, the **DCS** identifies what information must be collected against different asset types, 'tracked assets', during construction and later transferred to an FMO/CMMS/CAFM/IWMS solution. The AIR (DGS/DCS) should be **provided during the RFP process** to support definition of requirements for document upload.

Adding this information into a BIM dataset such as a Facilities Maintenance Information (BIMFMi©) database tool allows it to be easily exported into an Owners' Computerized Maintenance Management System (CMMS) software. There, components can be identified by the location and the manufacturer and manuals can be searched digitally and accessed with the click of a link. Digitization of this information has demonstrated significant improvement in efficiency for operations.

Note 2: Designers are not expected to update or override the design container's (model) data with the installed data during construction. The expectation is to retain the design information in the database. Example: if a designer assigned a manufacturer to a piece of mechanical equipment, that information must be present in the container (model) associated to the asset, this is the design data specified by the designer and is not related to the AIR (DCS) parameter 'manufacturer' that will be provided by the trades during construction. The actual installed manufacturer will not override the design data manufacturer.

Note 3: It is the responsibility of the Design Delivery Team to review the AIR (DGS) portion of the spreadsheet and identify assets that will be included in their design and assign a responsible party to the scope and indicate any variations they would like to submit for approval. All other assets can be marked as N/A and filtered out.

The Design Delivery Team must maintain the AIR (DGS/DCS) throughout the design phase of the project and include it with all required submissions.

The spreadsheets are combined into a single Excel file to facilitate management. The editable version of this file is shared with the Team after project award.

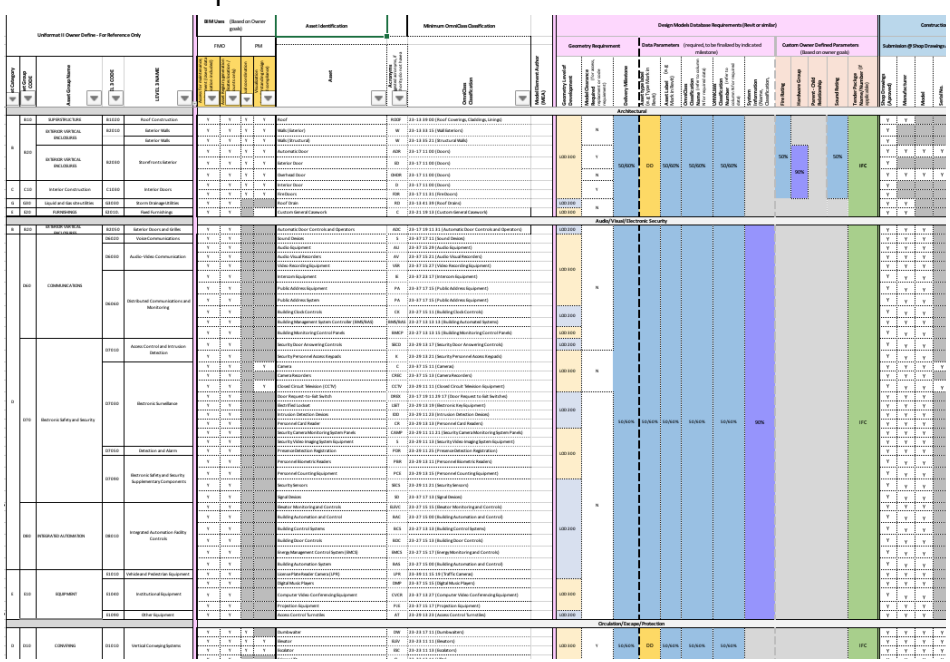
Creating the Documents

The **BIM Requirements Specification** establishes the Project Information Requirements (PIR) and defines the data, modeling, and process expectations for all project participants throughout the Design and Construction phases.

It is intended to be used as a reference and compliance framework by all members of the Design and Construction Delivery Teams to understand:

- What information is required (data, models, documents)
- When it is required (project milestones and phases)
- How it must be delivered (standards, formats, workflows)
- Who is responsible for its production and validation

The BIM Requirements Specification should be read in conjunction with the AIR (the **Data and Geometry and Data Collection Specification (DGS/DCS)**) spreadsheet, which describes information requirements for different assets.



These two documents define the project-specific goals, uses and asset-level requirements that are to be achieved. The **BIM Execution Plan (BEP)** must be developed addressing the strategies that are proposed to achieve the goals set out in these two documents.

Key principles for use:

- Compliance-driven: All deliverables will be reviewed against these requirements through BIM Compliance Reviews.
- BEP execution: The Design and Construction Delivery Teams must define how they will meet these requirements within the BEP.
- Lifecycle focus: Requirements are structured to ensure that information produced during Design and Construction supports downstream uses, including Facilities Maintenance and Operations (FMO).
- Data-first approach: Emphasis is placed on structured, consistent, and machine-readable data, not only geometric model development.

This document is not intended to prescribe exact workflows, but rather to define expected outcomes, allowing project teams flexibility in execution while ensuring alignment with the Owner's objectives.

Project teams are not restricted to a specific authoring platform and may use any software capable of meeting the defined information requirements and objectives, in alignment with openBIM principles.

DGS/DCS (Asset Information Requirements)

The Data and Geometry Specification (DGS) and Data Collection Specification (DCS) together define the asset-level information requirements for the project across both Design and Construction phases.

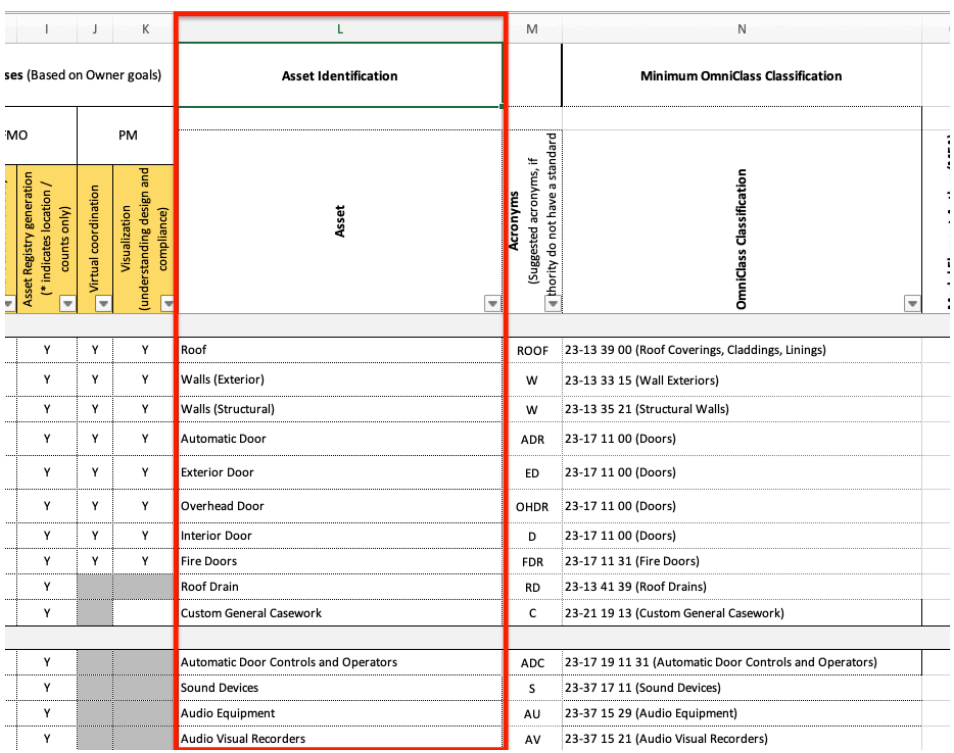
This document is intended to be used as a working tool by the Design and Construction Delivery Teams to identify, assign, track, and validate asset-related requirements throughout the project lifecycle.

1. During the Design Phase (DGS Use)

The Design Delivery Team shall use the DGS to:

- **Identify applicable assets**

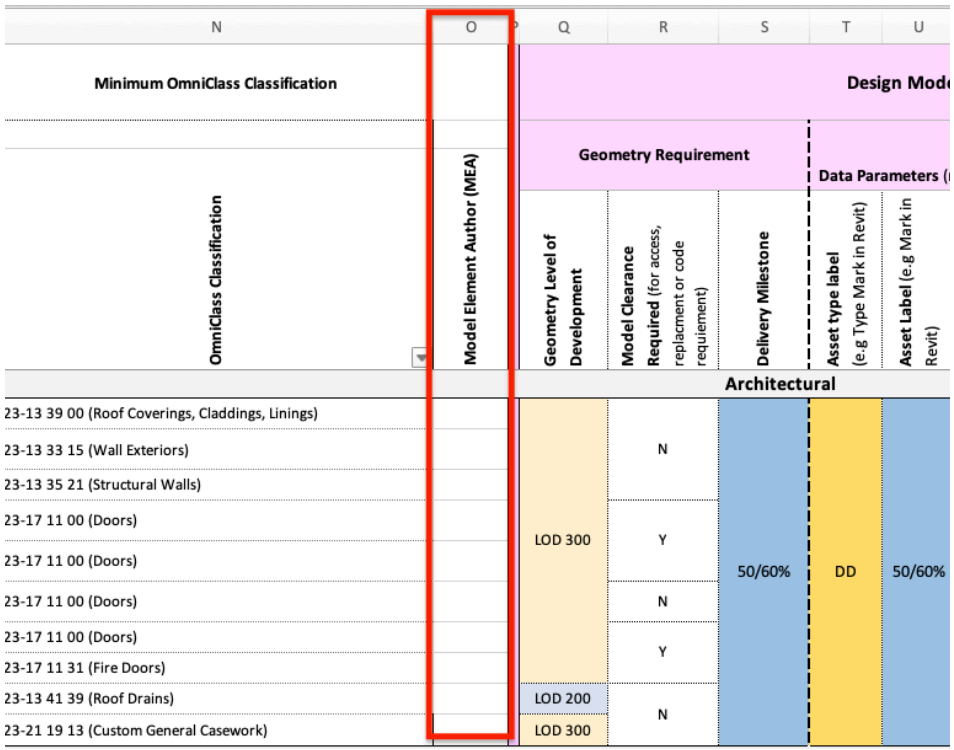
Review the full asset list and determine which asset types are included within the project scope (Column L).



I	J	K	L	M	N
ses (Based on Owner goals)			Asset Identification		Minimum OmniClass Classification
MO	PM				
Asset Registry generation (* indicates location / counts only)	Virtual coordination	Visualization (understanding design and compliance)	Asset	Acronyms (Suggested acronyms, if thority do not have a standard	OmniClass Classification
Y	Y	Y	Roof	ROOF	23-13 39 00 (Roof Coverings, Claddings, Linings)
Y	Y	Y	Walls (Exterior)	W	23-13 33 15 (Wall Exteriors)
Y	Y	Y	Walls (Structural)	W	23-13 35 21 (Structural Walls)
Y	Y	Y	Automatic Door	ADR	23-17 11 00 (Doors)
Y	Y	Y	Exterior Door	ED	23-17 11 00 (Doors)
Y	Y	Y	Overhead Door	OHDR	23-17 11 00 (Doors)
Y	Y	Y	Interior Door	D	23-17 11 00 (Doors)
Y	Y	Y	Fire Doors	FDR	23-17 11 31 (Fire Doors)
Y			Roof Drain	RD	23-13 41 39 (Roof Drains)
Y			Custom General Casework	C	23-21 19 13 (Custom General Casework)
Y			Automatic Door Controls and Operators	ADC	23-17 19 11 31 (Automatic Door Controls and Operators)
Y			Sound Devices	S	23-37 17 11 (Sound Devices)
Y			Audio Equipment	AU	23-37 15 29 (Audio Equipment)
Y			Audio Visual Recorders	AV	23-37 15 21 (Audio Visual Recorders)

- **Assign responsibility**

Define which discipline or party is responsible for each applicable asset within the DGC/DCS file (MEA Model Element Author, Column O).

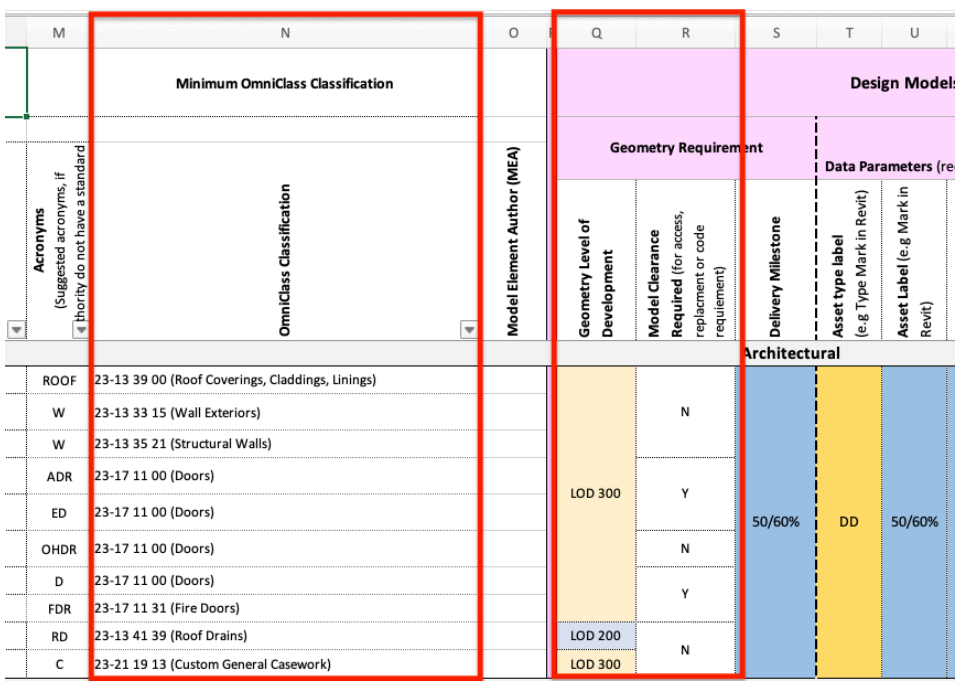


N	O	Q	R	S	T	U
Minimum OmniClass Classification		Design Mod				
		Geometry Requirement			Data Parameters (	
OmniClass Classification	Model Element Author (MEA)	Geometry Level of Development	Model Clearance Required (for access, replacement or code requirement)	Delivery Milestone	Asset type label (e.g Type Mark in Revit)	Asset Label (e.g Mark in Revit)
		Architectural				
23-13 39 00 (Roof Coverings, Claddings, Linings)		LOD 300	N	50/60%	DD	50/60%
23-13 33 15 (Wall Exteriors)						
23-13 35 21 (Structural Walls)						
23-17 11 00 (Doors)			Y			
23-17 11 00 (Doors)						
23-17 11 00 (Doors)			N			
23-17 11 00 (Doors)			Y			
23-17 11 31 (Fire Doors)						
23-13 41 39 (Roof Drains)		LOD 200	N			
23-21 19 13 (Custom General Casework)		LOD 300				

- **Model required assets**

Ensure all applicable Tracked Assets are:

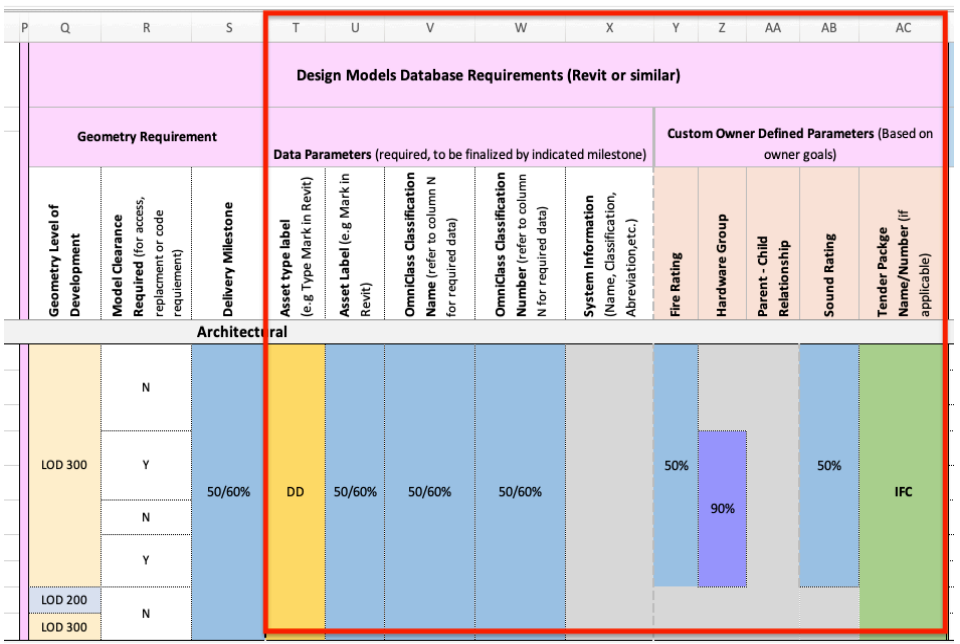
  - Modeled as object-based elements using the appropriate object definitions provided by the BIM authoring application.
  - Assigned to the appropriate object type to support consistent classification, coordination, and interoperable information exchange.
  - Modeled to the required LOIN (Column Q)
  - Clearances are modeled for the required tracked assets (Column R)
  - Classified using OmniClass (as specified in Column N)



	M	N	O	Q	R	S	T	U
		Minimum OmniClass Classification					Design Model	
	Acronyms (Suggested acronyms, if thority do not have a standard	OmniClass Classification	Model Element Author (MEA)	Geometry Level of Development	Model Clearance Required (for access, replacment or code requlement)	Delivery Milestone	Asset type label (e.g Type Mark in Revit)	Asset Label (e.g Mark in Revit)
				Geometry Requirement			Data Parameters (re	
						Architectural		
	ROOF	23-13 39 00 (Roof Coverings, Claddings, Linings)		LOD 300	N	50/60%	DD	50/60%
	W	23-13 33 15 (Wall Exteriors)						
	W	23-13 35 21 (Structural Walls)						
	ADR	23-17 11 00 (Doors)			Y			
	ED	23-17 11 00 (Doors)						
	OHDR	23-17 11 00 (Doors)			N			
	D	23-17 11 00 (Doors)			Y			
	FDR	23-17 11 31 (Fire Doors)						
	RD	23-13 41 39 (Roof Drains)		LOD 200	N			
	C	23-21 19 13 (Custom General Casework)		LOD 300				

- **Populate required parameters**

Input all required and applicable alphanumerical data fields as defined in the DGS for each asset (Columns T to AC). These parameters are specific for lifecycle needs; other parameters may be required for other purposes.



	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
					Design Models Database Requirements (Revit or similar)									
					Data Parameters (required, to be finalized by indicated milestone)					Custom Owner Defined Parameters (Based on owner goals)				
		Geometry Level of Development	Model Clearance Required (for access, replacment or code requlement)	Delivery Milestone	Asset type label (e.g Type Mark in Revit)	Asset Label (e.g Mark in Revit)	OmniClass Classification Name (refer to column N for required data)	OmniClass Classification Number (refer to column N for required data)	System Information (Name, Classification, Abreviation,etc.)	Fire Rating	Hardware Group	Parent - Child Relationship	Sound Rating	Tender Packge Name/Number (if applicable)
					Architectural									
		LOD 300	N	50/60%	DD	50/60%	50/60%	50/60%		50%			50%	IFC
			Y								90%			
			N											
			Y											
		LOD 200	N											
		LOD 300												

- **Maintain and update the DGS**

The DGS must be kept current throughout the Design Phase and submitted as part of each BIM Compliance Review.

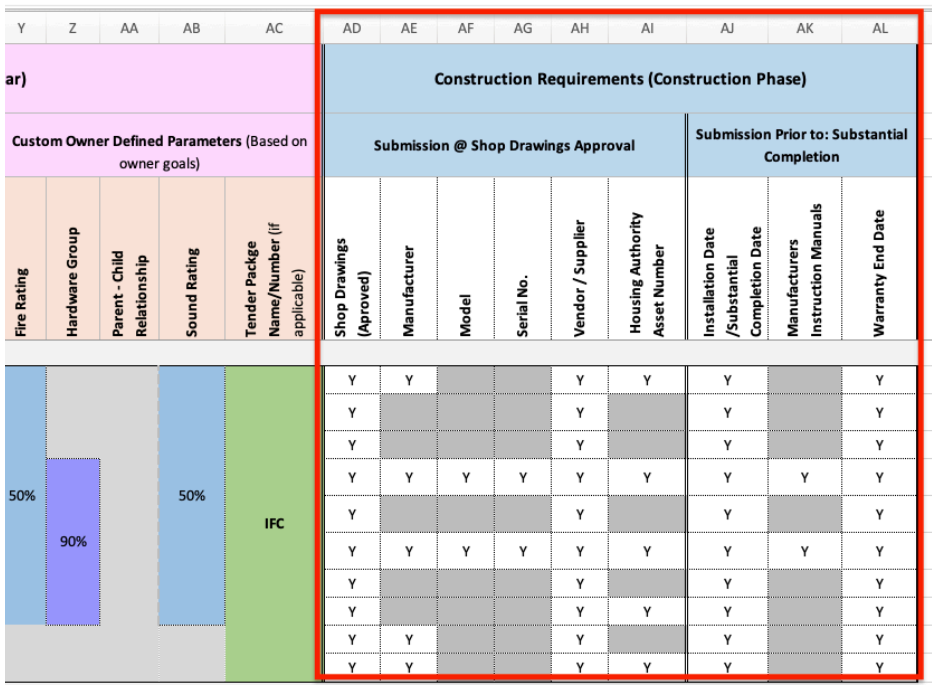
The DGS serves as the foundation for QA/QC, enabling validation of model completeness, data consistency, and alignment with project requirements.

2. During the Construction Phase (DCS Use)

The Construction Phase Delivery Team shall use the DCS to:

- **Understand data and document requirements**

Identify what information must be collected for each asset type (e.g., shop drawings, manufacturer data, O&M manuals). Columns AD to AL.



Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
ar)					Construction Requirements (Construction Phase)								
Custom Owner Defined Parameters (Based on owner goals)					Submission @ Shop Drawings Approval						Submission Prior to: Substantial Completion		
Fire Rating	Hardware Group	Parent - Child Relationship	Sound Rating	Tender Packge Name/Number (if applicable)	Shop Drawings (Aproved)	Manufacturer	Model	Serial No.	Vendor / Supplier	Housing Authority Asset Number	Installation Date /Substantial Completion Date	Manufacturers Instruction Manuals	Warranty End Date
50%	90%		50%	IFC	Y	Y			Y	Y	Y		Y
					Y				Y		Y		Y
					Y				Y		Y		Y
					Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y				Y		Y		Y
					Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y				Y		Y		Y
					Y				Y	Y	Y		Y
					Y	Y			Y		Y		Y
					Y	Y			Y	Y	Y		Y

- **Assign trade responsibility**

Coordinate and communicate to the Owner's Information Manager the scope of work and responsibilities of each trade, relative to the Data Collection Specification (DCS), to ensure assignment of responsibility for upload to the appropriate party.

- **Support data collection workflows**

Ensure that required data and documents are:

  - Uploaded to the Data Collection Environment
  - Submitted according to defined triggers (e.g., shop drawing approval)
  - Complete, accurate, and associated with the correct asset

3. Relationship to Asset Registry and Handover

The DGS/DCS document directly supports:

- Asset Registry generation (based initially on Design models)
- Data and document collection (during Construction)
- Final handover to CMMS
- Final Asset Registry generation (from the design Record model)

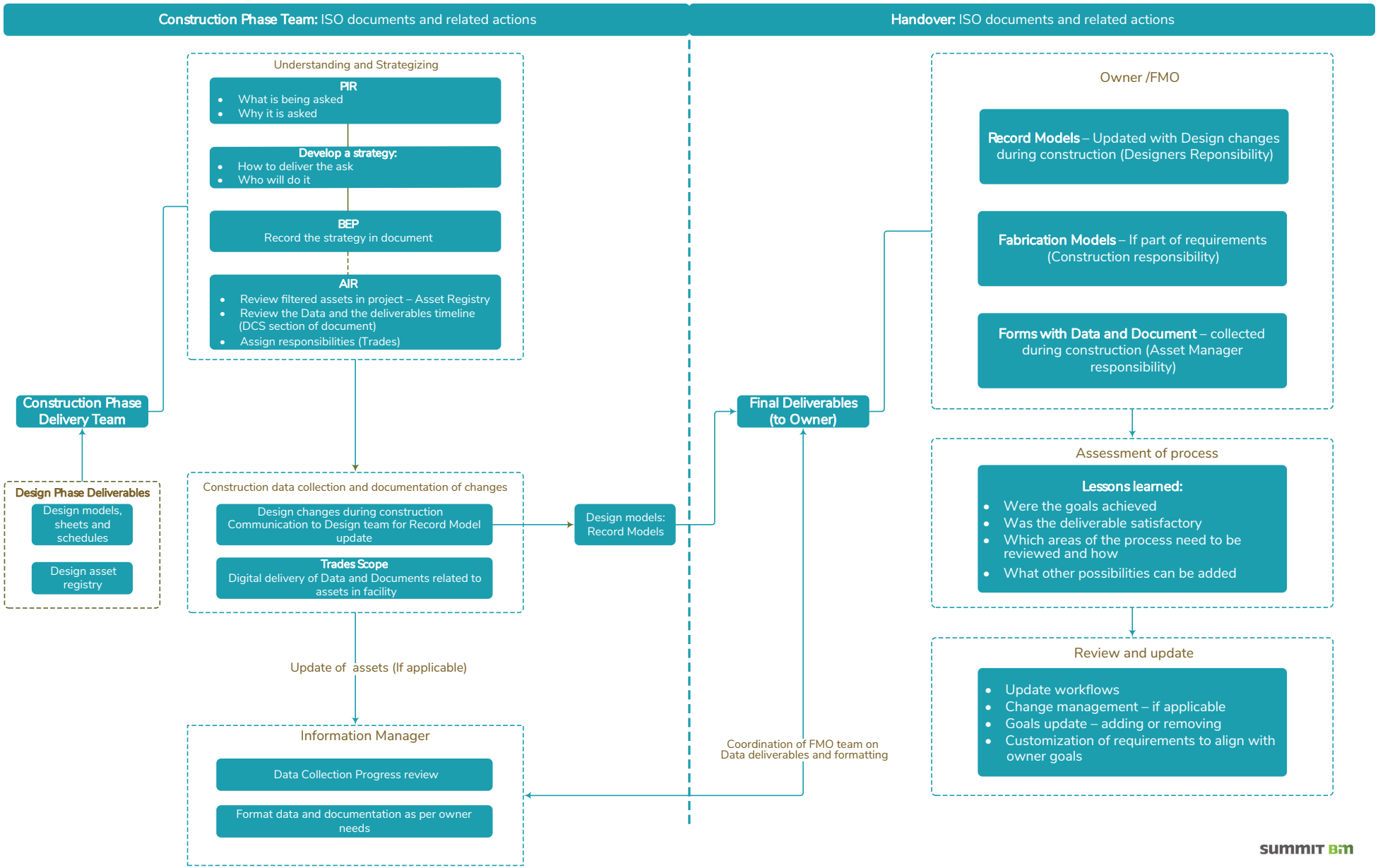
Accurate use of this document ensures that each asset is:

- Properly modeled
- Correctly classified
- Fully populated with required lifecycle data

Key Principles for Use

- Scope filtering is required: Teams must review and filter the document to only applicable assets.
- Consistency is critical: Data must be applied uniformly across all models and disciplines. All disciplines must use structured information and the same defined parameters to ensure the information is captured, interpreted, and compared consistently.
- It is a live document: The DGS must be maintained and updated throughout Design.
- It drives downstream outcomes: This document is the backbone of asset data delivery to Facilities Maintenance and Operations (FMO).

Workflow of Information Requirements, Construction and Handover Phases



Procurement

1. Overview of Responsibilities:

The Owner (Appointing Party) is the organization requiring and receiving asset information. This party typical has the authority and responsibility for the long-term operation and management of the asset or asset portfolio. Key responsibilities include:

- Establishing information requirements for the project, i.e. defining Why, What and When specified information will be exchanged and validating that all required deliverables have been completed before acceptance. This includes developing / providing the BIM Requirements specification, comprised of the following:
  - OIR – Organizational Information Requirements
  - PIR – Project Information Requirements
    - AIR – Asset Information Requirements
    - EIR – Exchange Information Requirements
- Receiving information from the Delivery Team Lead (Lead Appointed Party).
- Working collaboratively with the Delivery Teams to assemble and ensure that the AIM – Asset Information Model is fit for purpose and required asset information is correctly specified, received, and maintained to support the whole asset lifecycle.

2. Procurement: Capital Planning

Changes that the Capital Planning team will need to be aware of include the following:

- New workflows to ensure that the BIM Requirements are included as part of the RFP process for all projects assigned to follow a digital workflow.
- Internal / external consultant, Information Manager, to support review of the draft BEP provided as part of the RFP response.
- Inclusion of the EIR (Exchange Information Requirements) will require update / alignment of existing handover documentation requirements to manage duplication.
- Consideration as to whether the existing paper process is still retained or needs to be removed from existing requirements.
- Ensure alignment of the EIR with the FMO team requirements on a project-by-project basis.
- Project budget planning, ensuring funds are allocated for:
  - Internal / external consultant to assume the role of Information manager, responsible for quality control processes audits / checks that are required to ensure that this data-driven-digital process brings value.
  - Potential additional costs from the Delivery Team, to meet the BIM Requirements.
  - Shift in the traditional payment schedule during the design phase.
  - Internal support and work effort for teams adapting to the new standard.

- RFP language, adjust deliverables to include the requirements for a draft BIM Execution Plan (BEP) with the proposal.
- Contracts: review of contract language and contract type to address potential issues related to:
  - Sharing and exchange of information
  - Shifting of responsibilities, timelines and deliverables
  - Noncompliance with requirements
  - Procurement teams can use the ICB 100 – 2014 BIM Contract Appendix, clearly identifying and completing all the sections and / or
- BIM Requirements Specification must be included in the RFP, noting that:

  "All parties responding to this RFP must comply with all actions, conditions and obligations established in the BIM Requirements Specification for Housing documentation attached in appendix ?? "

  - It is vital that the responding teams understand what the expectations are for the digital delivery.
- RFP Response Reviews ensure expertise is available to assess digital competency:
  - Review and provide feedback on the proponent teams BIM experience
  - Review of draft BEP provided along with the proponents understanding of the digital Requirements
  - Review proposed risk assessment strategy
  - Provide comment on implications of any exclusions included

3. Procurement: Project Management

- Participation of the project management team with the new process, including training on how and where to access the information, understanding of what to expect, how the process impacts the traditional workflows and deliverables.
- Consideration for where the inherent data being generated can support the project management of the project, with a view to reducing risk, i.e. virtual coordination, visualization of spaces, with stakeholders,
- Inclusion of the Appointing Party, Information manager in the compliance process for the project, including definition of the quality control process that is a requirement for end-to-end data governance that will support the achievement of defined goals and uses for the data.
- Process in place to manage potential non-compliance

Owner (Appointing Party) Checklist

Also known as: Client, Owner, Employer

PROCUREMENT PHASE

Invitation to Tender

- ☐ Engagement of the Information Manager
- ☐ Validate Organizational Information Requirements (OIR)
- ☐ Confirm Asset Information Requirements (AIR)
- ☐ Validate Project Information Requirements (PIR)
- ☐ Validate Exchange Information Requirements (EIR)
- ☐ Validate information requirements for specific project
- ☐ Define or validate if defined Data Need (LOIN) / Data Geometry Specification (DGS) requires adjustment
- ☐ Confirm information delivery milestones for the specific project
- ☐ Confirm Common Data Environment (CDE) requirements, responsibilities and access protocols
- ☐ Include openBIM data exchange requirements, Information Foundation Classes (IFC) versopm of applicable
- ☐ Include openBIM Model View Definition if applicable
- ☐ Include Information Delivery Specification (IDS) requirements for automated validation, if applicable

Tender Evaluation

- ☐ Review Pre-appointment BIM Execution Plans from prospective teams
- ☐ Assess BIM qualifications, competencies and experience of each party / team
- ☐ Evaluate proposed Information Delivery Plans (MIDP+TIDP +RAIC))
- ☐ Review proposed CDE solution and interoperability approach
- ☐ Assess capability and capacity to meet information requirements

INFORMATION PLANNING PHASE

Appointment

- ☐ Review and approve final BIM Execution Plan
- ☐ Confirm MIDP + TIDP +RACI matrix with all appointed parties
- ☐ Confirm information requirements with delivery team, agree and sign off on any amendments
- ☐ Review and accept risk mitigation measures
- ☐ Participate in BIM kickoff meeting
- ☐ Provide existing asset information, if relevant to delivery team

INFORMATION PRODUCTION PHASE

Review and Acceptance

- ☐ Review updated BIM Execution Plan at each submission
- ☐ Verify information completeness, accuracy and alignment with BEP at each submission
- ☐ Validate information compliance with BIM Requirements, or using IDS specification, at each submission
- ☐ Accept or reject entire information deliverables (partial acceptance is not recommended)
- ☐ Identify required amendments if information is rejected at each submission, check previous amendments have been rectified
- ☐ Provide feedback, document all decisions
- ☐ Validate draft asset registry at end of design phase
- ☐ Validate installed asset information collection is occurring and available for review and sign-off

PROJECT CLOSE OUT PHASE

Archiving and Handover

- ☐ Archive information, models, documents, etc. in the CDE following agreed procedures
- ☐ Confirm which containers (models, documents, drawings, etc.) are needed for the Asset Information Model (AIM)
- ☐ Define future access requirements
- ☐ Identify future re-use potential
- ☐ Define policies on data retention
- ☐ Information Manager to transfer required information from the PIM to AIM
- ☐ Retain remaining project information as read-only archive
- ☐ Capture lessons learned with delivery team, Design + Construction
- ☐ Record lessons in organizational knowledge store

OPERATIONS PHASE (advanced, for future implementation)

Asset Information Management

- ☐ Maintain AIM to reflect current asset state and condition
- ☐ Identify trigger events requiring new/updated information
- ☐ Determine information pathway for each trigger event
- ☐ Plan for foreseeable trigger events in advance
- ☐ Establish procedures for unforeseeable trigger events
- ☐ Carry out assigned surveys or maintenance work
- ☐ Update Asset Information Model (AIM) with new information
- ☐ Deliver survey/maintenance information for AIM incorporation
- ☐ Coordinate with specialists for sub-contracted work
- ☐ Ensure specialist information is provided for AIM updates

Delivery Lead (Lead Appointed Party) Compliance Checklist

Also known as: Prime Consultant, BIM Consultant, Architect, Contractor, Facility Manager

PROCUREMENT PHASE

Tender Response

- ☐ Coordinate tender response with all Appointed Parties
- ☐ Prepare Pre-BIM Execution Plan including BIM goals and uses
- ☐ Define information management strategy to meet EIR
- ☐ Propose standards, methods and procedures
- ☐ Develop high-level RACI matrix
- ☐ Define software stack and interoperability approach
- ☐ Establish quality control checks and training plans
- ☐ Create high-level model element table
- ☐ Compile BIM qualifications from each Appointed Party
- ☐ Develop Master Information Delivery Plan (MIDP)
- ☐ Establish Risk Register for information delivery
- ☐ Review capability and capacity of prospective delivery team

INFORMATION PLANNING PHASE

Appointment

- ☐ Confirm and expand BIM Execution Plan
- ☐ Incorporate Owner comments into BEP
- ☐ Establish detailed responsibility matrix (RACI)
- ☐ Define what information is to be produced
- ☐ Specify when information is to be exchanged and with whom
- ☐ Assign task teams responsible for each information container
- ☐ Confirm information requirements with all Appointed Parties
- ☐ Address and mitigate identified risks
- ☐ Chair BIM kickoff meeting
- ☐ Finalize documents for Owner review and approval

Mobilization

- ☐ Set up Common Data Environment(s)
- ☐ Configure CDE access permissions and workflows
- ☐ Establish naming conventions per standards
- ☐ Configure IFC import/export settings
- ☐ Set up IDS validation rules
- ☐ Enable BCF integration for issue management
- ☐ Establish data security protocols
- ☐ Deploy infrastructure for information exchange

INFORMATION PRODUCTION PHASE

Coordination and Review

- ☐ Coordinate information between Owner and delivery team
- ☐ Manage information flow across all Appointed Parties
- ☐ Ensure consistent application of information management processes
- ☐ Review shared information for coordination, completeness, accuracy
- ☐ Validate information against relevant requirements
- ☐ Return non-compliant information to Work In Progress (WIP) state for amendment
- ☐ Authorize compliant information to Published state
- ☐ Manage BCF coordination workflow for issue tracking
- ☐ Coordinate clash detection and resolution
- ☐ Validate deliverables against IDS before submission to Owner

PROJECT CLOSE OUT PHASE

Final Delivery

- ☐ Coordinate final model validation per IDS
- ☐ Prepare as-built IFC model for handover
- ☐ Compile project closeout deliverables
- ☐ Document lessons learned
- ☐ Update BEP templates based on project learnings
- ☐ Support Owner in archiving project information
- ☐ Participate in lessons learned capture with Owner

Delivery Team (Appointed Party) Compliance Checklist

Also known as: Architect, Contractor, Engineer, Trades, Service Operator

PROCUREMENT PHASE

Tender Response Support

- ☐ Assess current BIM and openBIM capabilities
- ☐ Develop Task Information Delivery Plan (TIDP)
- ☐ Align LOIN to national standards
- ☐ Configure IFC export mappings
- ☐ Establish model element matrices
- ☐ Provide BIM qualifications and competencies
- ☐ Document years of BIM experience and capabilities
- ☐ List relevant BIM project experience
- ☐ Provide certifications and BIM team size
- ☐ Obtain hardware/software to support BIM implementation

INFORMATION PLANNING PHASE

Appointment and Mobilization

- ☐ Review Owner-provided existing condition information
- ☐ Confirm information delivery responsibilities
- ☐ Prepare information management resources
- ☐ Define information quality standards
- ☐ Establish processes and protocols for information production
- ☐ Participate in BIM kickoff meeting
- ☐ Set up access to CDE
- ☐ Configure discipline-specific workflows

INFORMATION PRODUCTION PHASE

Information Creation

- ☐ Produce information in accordance with project requirements
- ☐ Generate information in CDE
- ☐ Maintain information within WIP until ready for sharing
- ☐ Retain responsibility for information within each container

Quality Control

- ☐ Perform internal quality checks before sharing
- ☐ Check against Task Information Delivery Plan
- ☐ Verify compliance with agreed standards, methods and procedures
- ☐ Validate IFC exports against IDS requirements
- ☐ Use BCF for issue tracking and resolution

Information Sharing

- ☐ Move compliant information from WIP to Shared state
- ☐ Respond to coordination issues identified by Delivery Lead
- ☐ Amend and resubmit information returned to WIP
- ☐ Deliver information containers per CDE workflow
- ☐ Coordinate information with other Appointed Parties as required

PROJECT CLOSE OUT PHASE

Final Delivery

- ☐ Complete final model delivery and QA
- ☐ Provide as-built model updates
- ☐ Contribute to lessons learned documentation
- ☐ Archive project content and libraries
- ☐ Share learnings across disciplines

Project Closeout

1. **Handover**

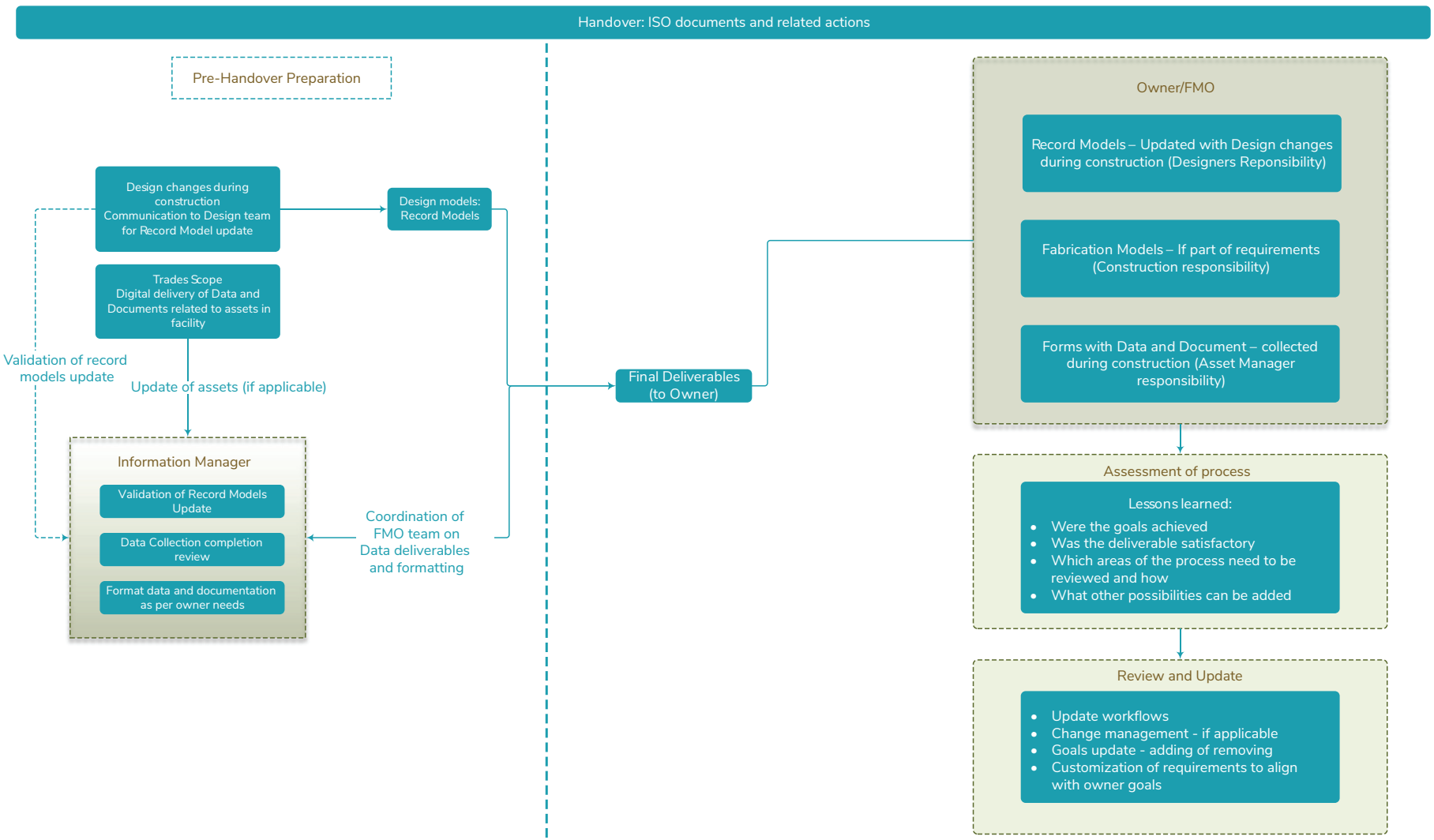
   As part of the handover, the owner must ensure that their responsibilities for review and document creation are taken care of, below are some of the common tasks that should be considered prior to handover and during the handover process:

   - Review by FMO team of the data and documentation being provided, in digital format, to support quality control during construction, and prior to the final handover.
   - Review timeline / schedule of the early project asset registry.
   - Development of transfer template for the AIM data and documentation at handover.
   - Development of process for managing the relationship between the project meta data and the associated digital documentation (PDF's).
     - Establishment of the timeline, to which the teams will be held accountable, for delivery of required information:
       - to support development of preventative maintenance plans, during construction
       - final handover package
     - Facilities Management teams to develop new processes for sign-off, approval and integration with existing systems.
     - Update of handover information during the lifecycle of the project.
     - Integration with owner CMMS, or other facility management platform.
   - Final consolidation of all required information from the Asset Information Model (AIM) into the Exchange Information Requirements (EIR) is the responsibility of the Appointing Party Information Manager.
     - designers, contractor and the information manager must all work collaboratively to complete their defined responsibilities, to enable the creation of all required documentation for handover as specified in the BIM Requirements.
     - These responsibilities include the following:
       - Record models update: Designers must ensure that the changes during construction are reflected in the design models in accordance with the specified Accuracy.
       - Trades Data and Documentation: Trades should have all the required parameters, data and documentation, approved and submitted.
       - Contractor/trades Fabrication Models: If part of the requirements, fabrication models must be submitted as part of the handover.
       - Contractor responsibility to review that the data submitted by trades is complete and accurate.
   - Information Manager is responsible for the following:
     - Validation of Record models: Ensure that the models submitted by the designers have been updated with the information communicated through change orders, etc., by the contractor during construction.
     - Ensure that the data and document collection is finalized and complete.
     - Format the data and documents per the Owner's AIM template.

2. Operational Phase

Owners will need to consider how to manage and update the handover information as changes occur over the life of the facility. New processes will need to be developed, aligned with the new CMMS solution, along with definition of what events will trigger an update, and how that update will be implemented. If the information is not kept current, then, over time, it will lose value.

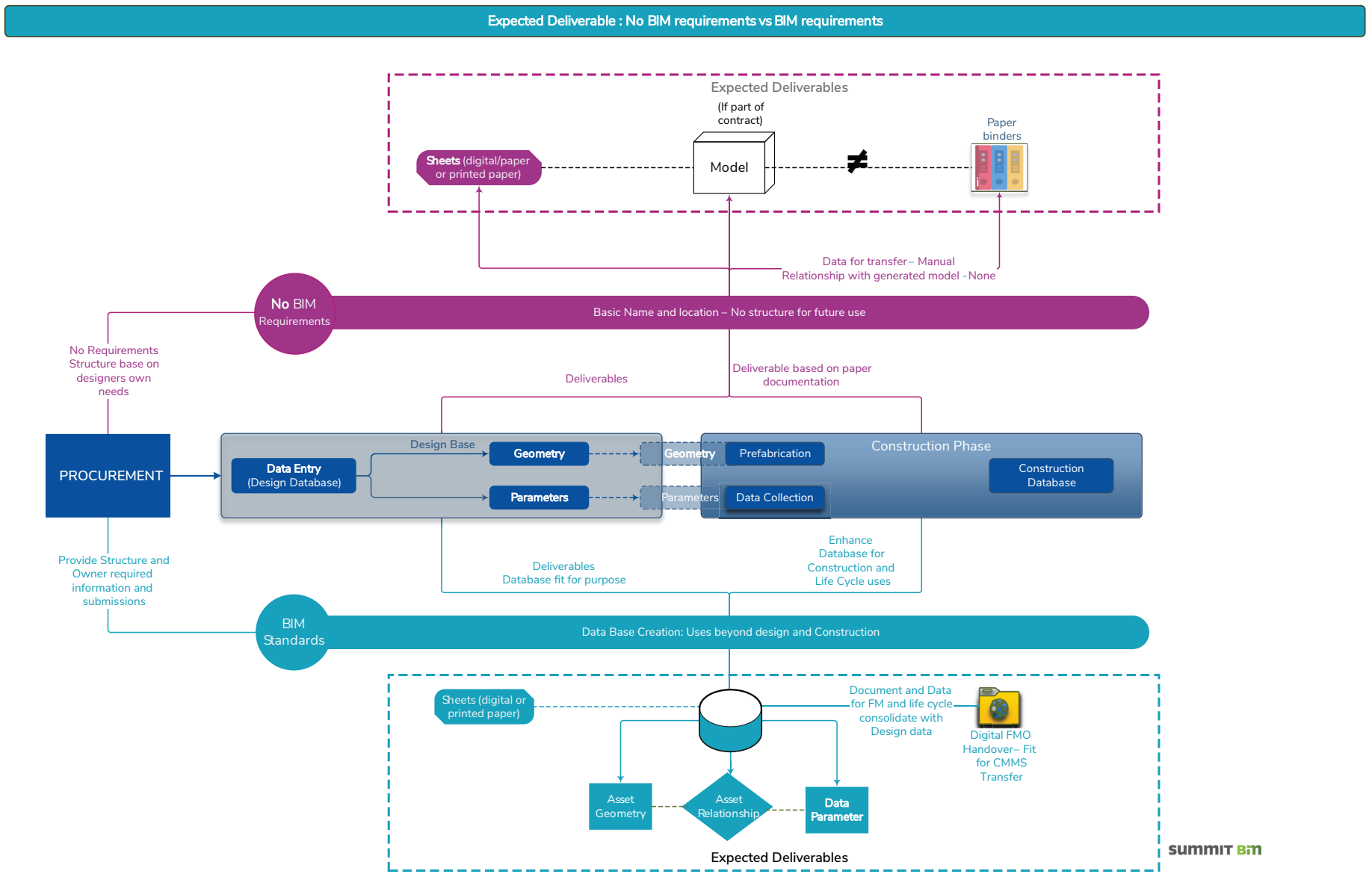
The digital handover will be comprised of several different components:



- Design Models:
  - Design models are developed using BIM authoring applications to represent the design intent of the project. They are used to produce project documentation and are progressively updated during construction to reflect approved design changes, ultimately becoming the Record Models. They contain design intent and coordinated project information, but do not represent installed asset information.
- Fabrication Models:
  - Trade models are developed to support detailed coordination, fabrication, installation, and assembly, including seismic restraints, hangers, and other trade-specific components where applicable. These models typically contain a higher level of graphical detail than design models and may include fabrication-specific information required for manufacturing and installation.
- PDF documents:
  - These can include design record drawing sets, as-built record drawings from construction, shop drawings, warranty certificates, manufacturers' operations manuals, design specifications etc..
- Structured Asset Registry:
  - A structured dataset containing the owner required information for installed asset instances and asset types, together with references to supporting documentation. The dataset is intended to support information exchange, validation, and transfer to downstream asset management systems.

Part 4: Case Studies

An undefined BIM process typically yields only 2D drawings. Using the approach outlined in this toolkit, projects can achieve a structured, requirement-driven approach that produces both drawings and a rich, consistent data set that supports design, construction and lifecycle asset management.



The ten projects described on the next two pages compare different aspects of BIM implementation which resulted in different datasets available at project completion.

By defining the information required at the beginning of the project, owners can benefit from a much richer dataset for the operational phase of a building.

Analysis of this data provides the following conclusions:

- Owner interest, commitment and involvement with the digital process leads to success.
- Owner interest in the BIM process is increasing as they start to recognize the benefits for themselves.
- Detailed specific requirements, included in RFP, leads to clarity and achievement of goals.
- Continuing misunderstanding around what BIM is; i.e. confusing BIM as an information management process with the software applications used to author, exchange, and manage project information.
- Recognition of the value of BIM from an Owner's perspective vs BIM simply supporting the work of design and construction firms.

This comparison is intended to help toolkit users understand how the way BIM is requested can influence project outcomes. The ten projects summarized on the following pages represents a range of facility types and procurement approaches, from projects with comprehensive BIM Requirements to projects where BIM was requested in general terms.

The comparison shows that stronger outcomes were achieved when BIM expectations were clearly defined, introduced early, and included as part of the RFP process. Clear and specific BIM Requirements gave project teams a shared basis for accountability, improved the consistency of the BIM process, and supported higher-quality final deliverables.

Examples of Projects using BIM

The ten projects described in the charts on the next two pages were compared for different aspects of BIM implementation. The projects are deliberately kept anonymous.

	Project Description	Clearly Defined BIM goals and uses	Defined Communication Protocols	Defined Data Exchange Formats	Defined Model Geometry	Defined Model element Data Requirements	Defined Asset Data Structure	Project Information Requirements (PIR)	Project Participants	Ownership	Design Requirements + BEP	Construction Requirements + BEP	Final Deliverables / Handover Requirements
Affordable Housing / Social Housing	1. Research project for social housing, testing BIM, prefabrication, wood and environmental aspects.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	2. Mixed use social housing above medical clinic [11 storey building with underground parking]	No	No	No	No	No	No	No	No	No	No	No	No
	3. Affordable rental housing [6 storey with single level of parking]	No	No	No	Yes	No	No	No	No	No	No	No	No
Commercial Multi-Residential	4. Multi residential tower on a retail podium with underground parking	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
University Multi-Residential	5. New Student Residences - 200 students, six-storey facility, one bed nano units and one bed units.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	6. New Student Residences - 400 students in single + double rooms with amenities spaces.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipal Infrastructure	7. New Fire Hall	No	No	No	No	No	No	Yes*	Yes*	Yes*	No	No	Yes*
Long Term Care Facilities	8. 200 bed, home-like environment with 32 adult day program and 49 Child Care facility.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	9. 5-storey, 200 beds designed as households, for 12 or 13 residents, including a 32 space adult day program.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Operating Theatre Upgrade	10. Upgrade + renovation of hospital operating rooms and associated infrastructure.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Yes* - developed after completion of the Design Phase

	Project Description	Overview of BIM expectations: Owner's Understanding of BIM Processes at the Issuance of the RFP	General Comments related to the BIM Requirements in the RFP.
Affordable Housing / Social Housing	1. Research project for social housing, testing BIM, prefabrication, wood and environmental aspects.	Ongoing learning through the research project. Owner interested in the digital output for FMO. Design team mixed experience with the technology. Owner provided digital compliance and support for the design team.	Fully developed set of BIM Requirements in place prior to issuance of RFP.
	2. Mixed use social housing above medical clinic [11 storey building with underground parking]	RFP expressed interested in the process but had no clear requirements.	"Utilize BIM in accordance with the IBC-101-2023" [This is a blank addendum to the contract to be filled out - no document was provided.] - BIM Model Manager required. "The Architect should possess the expertise to implement BIM methodologies, ensuring the creation and utilization of intelligent 3D models for design, construction + facility management"
	3. Affordable rental housing [6 storey with single level of parking]	RFP expressed interested in the process but had no clear requirements.	'300 Level of Detail for all except architectural Level 310'. 'The Corporation requires Level of Detail 300 or higher for design coordination, clash detection, detailed 3D modeling, construction documents (specifications + drawings), coordinated multiple disciplines, cost estimation and quantity take off."
Commercial Multi-Residential	4. Multi residential tower on a retail podium with underground parking	Ongoing learning through the project. Owner wanted digital output for FMO. Design team was familiar with the technology. Owner provided digital overview and compliance checks.	Fully developed set of BIM Requirements, introduced after the design team was selected and had completed Design Development models.
University Multi-Residential	5. New Student Residences - 200 students, six-storey facility, one bed nano units and one bed units.	Ongoing learning through the project. Owner wanted digital output for FMO. Design team was familiar with the technology. Owner provided digital overview and compliance checks.	Fully developed set of BIM Requirements in place prior to issuance of RFP.
	6. New Student Residences - 400 students in single + double rooms with amenities spaces.	Ongoing learning through the project. Owner wanted digital output for FMO. Design team was familiar with the technology. Owner initially provided digital overview and compliance.	Fully developed set of BIM Requirements in place prior to issuance of RFP.
Municipal	7. New Fire Hall	No BIM requirement, however the design team was using the technology. Owner interested in the digital output for FMO and employed a digital consultant.	Design consultants advised they were using BIM. Client wanted a digital handover towards the end of design, working with an inconsistent data set to generate a digital handover.
Long Term Care Facilities	8. 200 bed, home-like environment with 32 adult day program and 49 Child Care facility.	Owner experienced with the digital (BIM) process and provided detailed BIM Requirements and digital compliance overview. Teams required to be familiar with the technology and process.	Fully developed set of BIM Requirements in place prior to issuance of RFP.
	9. 5-storey, 200 beds designed as households, for 12 or 13 residents, including a 32 space adult day program.	Owner experienced with the digital (BIM) process and provided detailed BIM Requirements and digital compliance overview. Teams required to be familiar with the technology and process.	Fully developed set of BIM Requirements in place prior to issuance of RFP.
Operating Theatre Upgrade	10. Upgrade + renovation of hospital operating rooms and associated infrastructure.	Owner experienced with the digital (BIM) process and provided detailed BIM Requirements and digital compliance overview. Teams required to be familiar with the technology and process.	Fully developed set of BIM Requirements in place prior to issuance of RFP.

References

Resource Name	Description	URL
building SMART Canada	As a federally incorporated not-for-profit organization, the Canadian chapter of buildingSMART International (bSI) acts as the national headquarters for Canadian building information management (BIM), digital project and asset lifecycle delivery standards, and best practices development. bSC exists to support the implementation of BIM in ways to help enable industry partners and members to successfully achieve their objectives and ultimately, improve Canadian communities we build.	https://buildingsmartcanada.ca/
building SMART International	buildingSMART is a global community of chapters, members, partners and sponsors led by the parent body, buildingSMART International. The buildingSMART community is committed to creating and developing open digital ways of working for built asset environment. buildingSMART standards help asset owners and the entire supply chain work more efficiently and collaboratively through the entire project and asset lifecycle. buildingSMART is an open, neutral and international not-for-profit organisation.	https://buildingsmart.org/
Canadian Practice Manual for BIM	Documenting bSC's initiatives to support the broad adoption of BIM, this manual provides a general background on the uses and benefits of BIM and provides guides on how to implement BIM within organizations and across collaborative projects. This manual has three volumes which can be purchased individually or as a complete set.	https://buildingsmart.gilmoreglobal.com/en/product/adecc971-8e98-4d0a-bbde-f185d2bc1940
IBC 100-2014 Contract Appendix	The Institute of BIM in Canada (IBC) Contract Appendix is a fillable document that was created to help industry professionals become more familiar with the overlap between disciplines and information which occurs with the use of BIM. The appendix provides standard form contracts with information regarding industry best practices, alignment with BIM ISO 19650, and how to advance the industry's use of BIM.	https://buildingsmart.gilmoreglobal.com/en/category/97d4a59a-0573-4ec5-b029-c6ea56f06d85
ISO 19650 - 2 Canadian Annex	The Canadian Annex provides guidance for understanding the Canadian version of the ISO 19650 standard. The annex suggests the use of language-independent coding and discusses the current state of field codification in Canada. By using the annex, industry professionals will benefit from storing, retrieving, and exchanging information through the use of a common data environment that assigns values based on agreed-upon codification standards.	https://buildingsmartcanada.ca/wp-content/uploads/2023/02/ISO-19650-2-Canadian-National-Annex_V1.0.pdf

Resource Name	Description	URL
ISO 19650-1:2018	Part 1: Concepts and principles Establishes the foundational concepts and principles for information management at a stage of maturity described as building information management according to the ISO 19650 series. This part provides the conceptual basis upon which the other parts of the standard are built.	https://www.iso.org/standard/68078.html
CAN/CGSB/CSA-ISO 19650-1:24	Canadian source for Part 1: Concepts and principles (Adopted ISO 19650-1:2018, first edition, 2018-12)	https://www.csagroup.org/store/product/CAN-CGSB-CSA-ISO_19650-1%3A24/
ISO 19650-2:2018	Part 2: Delivery phase of the assets Specifies the requirements for information management during the delivery phase of assets, defining the management process and information exchanges that occur when using BIM for project delivery.	https://ww.iso.org/standard/68080.html
CAN/CGSB/CSA-ISO 19650-2:24	Canadian source for Part 2: Delivery phase of the assets (Adopted ISO 19650-2:2018, first edition, 2018-12)	https://www.csagroup.org/store/product/CAN-CGSB-CSA-ISO_19650-2%3A24/
ISO 19650-3:2020	Part 3: Operational phase of the assets Specifies requirements for information management during the operational phase of assets, addressing the management process and information exchanges required to support asset operation and maintenance using BIM.	https://www.iso.org/standard/75109.html
CAN/CGSB/CSA-ISO 19650-3:24	Canadian source for Part 3: Operational phase of the assets (Adopted ISO 19650-3:2020, first edition, 2020-07)	https://www.csagroup.org/store/product/CAN-CGSB-CSA-ISO_19650-3%3A24/
ISO 19650-4:2022	Part 4: Information exchange Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling	https://www.iso.org/standard/78246.html
CAN/CGSB/CSA-ISO 19650-4:24	Canadian source for Part 4: Information exchange (Adopted ISO 19650-4:2022, first edition, 2022-08)	https://www.csagroup.org/store/product/CAN-CGSB-CSA-ISO_19650-4%3A24/
ISO 19650-5:2020	Part 5: Security-minded approach to information management Addresses the steps required to create and cultivate an appropriate and proportionate security mindset and culture across organizations with access to sensitive information, including requirements for monitoring and auditing compliance.	https://www.iso.org/standard/74206.html
CAN/CGSB/CSA-ISO 19650-5:24	Canadian source for Part 5: Security-minded approach to information management (Adopted ISO 19650-5:2020, first edition, 2020-06	https://www.csagroup.org/store/product/CAN-CGSB-CSA-ISO_19650-5%3A24/

Resource Name	Description	URL
ISO 19650-6:2025	Part 6: Health and safety information Specifies concepts and principles for classifying, sharing, and delivering health and safety information collaboratively, supporting the economic, environmental, and social benefits of effective safety management.	https://www.iso.org/standard/82705.html
ISO 7817-1:2024	Part 1: Concepts and principles Building information modelling — Level of information need	https://www.iso.org/standard/82914.html
buildingSMART Technical Standards	This is the official website maintained by buildingSMART International to publish buildingSMART building information modelling [BIM] standards, technologies, supporting information and documentation.	https://technical.buildingsmart.org/
NRC Digital Construction Platform Roadmap Full Report	The NRC will develop a Digital Construction Platform (DCP) which aims to digitalize processes and offer services to Canadian built asset industry stakeholders by providing standardized frameworks to facilitate desired outcomes and identify essential services and resources to support them. The full report includes a high-level overview of current work in digital ecosystems for the built asset industry, as well as machine-readable building codes, automated code compliance checking, and e-permitting.	https://flipbooks.buildingsmartcanada.ca/d0f2fe952c.html
bSC Certification	Accelerated global adoption of BIM faces challenges in terminology, competence, and consistency. buildingSMART Canada supports these standards and offers a Professional Certification program as a BIM competency benchmark. This program benefits professionals, employers, and client organizations in the built asset industry, promoting transparency and consistency. The Professional Certification Program by bSC supports openBIM® training standardization, promotes international standards and best practices, and raises awareness about buildingSMART and its solutions.	https://buildingsmartcanada.ca/certification/
Level of Development (LOD) Specification	The LOD Specification is an industry-recognized reference that defines the content, reliability, and intent of Building Information Models at key stages of project delivery. The 2025 release supports clearer communication, improved coordination, and consistent expectations across design, construction, and operations. The 2025 Level of Development (LOD) Specification is published by BIMForum.	https://bimforum.org/resource/lod-level-of-development-lod-specification/

Resource Name	Description	URL
openBIM Implementations for a Canadian Roadmap	This comprehensive research project investigates the transformative journey of the Canadian architecture, engineering, construction, owner, operator, and municipality (AECOOM) sectors as they adopt Building Information Management (BIM) and openBIM standards to digitalize the planning, design, construction, and management of built assets.	https://heyzine.com/flip-book/ca89bf13b2.html
BIM maturity at scale: enabling digital transformation across the Canadian construction industry	A comprehensive strategy to advance digital transformation across the Canadian Construction Industry (CCI) by scaling Building Information Modelling (BIM) maturity assessment and improvement efforts nationwide.	https://nrc-publications.canada.ca/eng/view/object/?id=339e60b0-9c65-44f1-a733-568f17c2f2c9

APPENDIX - Sample BIM Requirements Specification

Sample BIM Requirements Specifications for Housing Projects in Canada

Aligned with ISO 19650

1. Version control

Version	Date	Author	Notes
V1			
V2			
V3			

2. Introduction

a. Purpose of the document

This document defines specific BIM Requirements for housing projects in Canada. Its purpose is to establish a clear, simple, and consistent framework for:

- Coordinated design and construction
- Support for prefabrication strategies
- Lifecycle data and document handover
- Cost-effective and scalable BIM implementation

This guideline prioritizes information quality over model complexity.

b. Information Management Framework

These BIM Requirements, follow the ISO 19650 information management framework, adapted to the Canadian housing context.

Key principles:

- Information is produced for a defined purpose
- Only the minimum necessary geometry and data are required
- Information must be structured, consistent, and reusable
- BIM is a process, not a modeling exercise

c. Definitions

A list of acronyms and a glossary with the definitions of the main BIM terms mentioned in the BIM Requirements Specifications can be found in Appendix A: Acronyms and Appendix B: Glossary.

The following colour scheme is utilized in the BIM Specification to help identify work effort required during the design phase, the construction phase and by Project completion.

DESIGN	CONSTRUCTION	PROJECT COMPLETION

For a comprehensive graph about how to use this standard please refer to Appendix S: Standards: How to use.

3. Organization Information Requirements (OIR)

(ISO 19650: Organizational Information Requirements)

The Owner's Organization Information Requirements define why information is needed at an organizational level, beyond the needs of a single project.

These requirements apply to all housing projects delivered under this guideline.

The Owner requires structured digital information to support the delivery, coordination, and long-term management of housing projects across its portfolio.

a. Organizational Objectives

The organization requires BIM and digital information to:

- Enable repeatable, cost-effective housing delivery through standardization
- Support prefabrication and modular construction as a key strategy for affordable and sustainable housing
- Reduce project risk through early virtual coordination
- Establish a consistent baseline of asset information across projects
- Improve decision-making by enabling comparison and reuse of information between housing developments

b. Information Principles

Across all housing projects, the organization requires that information:

- It is produced only where it serves a defined purpose
- It is proportional to the scale and complexity of the project
- Uses consistent classification and data structure
- Prioritizes information reliability over model detail
- Supports reuse at a portfolio level, not just individual projects

c. Relationship to Project Requirements

Project BIM Goals and Project Information Requirements (PIR) are derived from these Organizational Information Requirements.

Each project shall interpret and apply these requirements in a manner that is practical, scalable, and aligned with the project's delivery strategy.

d. BIM Goals and Uses

(ISO 19650: Organizational Information Requirements → Project Information Requirements)

These Requirements have been prepared to describe to the Delivery Teams, the goals and uses that the Owner has for the underlying inherent data generated through the use of BIM-enabled software. It is the responsibility of the Delivery Teams to define, within the BIM Execution Plan (BEP), along with the AIR (DGS), the responsible parties, strategies, workflows, processes, and protocols they intend to utilize to achieve the stated goals and uses.

The Owner (Appointing party) requires BIM to support the following goals:

- Enable **virtual coordination** to reduce clashes, RFIs/change orders, and rework during construction using a CDE (Common Data Environment) and issue tracking software.
- Support **prefabrication** and modular construction to:

    - Reduce construction cost
    - Improve schedule certainty
    - Support sustainable and repeatable housing delivery
- Capture **reliable and structured data** for operations and future projects
- Establish a **repeatable information baseline** for similar housing developments

To support these goals, the Owner has defined specific requirements relative to Tracked Assets and Rooms, that must be met by specific project submittals. The Asset Information requirements are defined in the **Appendix G: AIR Asset Information Requirements referred in this document as Data and Geometry Specification (DGS) + Data Collection Specification (DCS).**

> *Note 1: To facilitate these goals, it is required that excluding details, single line diagrams, and schematics, all other drawings views, and schedules must be derived from the model*

4. Project Information Requirements

The PIR establishes the requirements that must be achieved for the Owner (Appointing Party). It defines what, and when, critical required information must be available within the model data set, by each participant team / firm from design to handover. The participating team / firm must define within the BIM Execution Plan (BEP) how these requirements will be met.

> *Note 2: The PIR is a holistic document that covers the information requirements from design to handover, each discipline is required to comply with the sections relevant to their*

The PIR Document Set is comprised of two (2) interrelated documents as noted below:

- **BIM Requirements Specification** – this document sets technical requirements and workflows that support the generation of design models that can be used as containers for data and document collection during construction and as record models during the operation of the facilities. It includes, in Appendix E: BIM Execution Plan (BEP) Design and Appendix F: BIM Project Execution Plan (BEP) Construction, topics that must be addressed in the BEP for both Design and Construction Delivery Teams. The BEP is a living document required to capture project information, modeling strategies, workflows, and any requests for amendments or exclusions to the PIR.
- **Asset Information Requirements:** DGS/DCS– An Excel file, (provided as a PDF in Appendix G: AIR Asset Information Requirements, referred to in this document as Data and Geometry Specification (DGS) + Data Collection Specification (DCS) details in different tabs the following:
    - Notes Tab: Terms and definitions along with guidance on how to use the excel file.
    - AIR: Data and Geometry Specification (DGS) and the Data Collection Specification (DCS) Tab, defining the scopes for both Design and Construction Delivery Teams as follows:

- Design Phase: AIR, Data and Geometry Specification (DGS) – Provides a master list of asset types that FMO is interested in, 'tracked assets', that must be generated by the Design Delivery Team if they are part of the design. Each asset type has a classification, acronym, and a minimum geometric level along with a list of attributes/properties that must be included in the design model to facilitate the Owner (Appointing Party)'s compliance checks, design analysis and facilities management functions.

Please refer to Appendix T: AIR-DGS How to use**.**

Note 1: All parameters relative to the design containers (models) of the project must be present in the models associated to their respective assets, even if those parameters are not specified in the AIR (DGS/DCS). The reason is to retain design data. Some examples may be manufacturer, model, capacity, size, mounting, etc.

- Construction Phase: AIR (DCS) identifies what information must be collected against different asset types (based on Asset Description in Column 'C' of DGS), 'tracked assets', during construction and later transferred to an FMO/CMMS/CAFM/IWMS solution. The AIR (DGS/DCS) will be provided during the RFP process to support definition of requirements for document upload.

Please refer to Appendix U: Standards: AIR_DCS How to use**.**

Note 4: Designers are not expected to update or override the design container's (model) data with the installed data during construction. The expectation is to retain the design information in the database. Example: if a designer assigned a manufacturer to a piece of mechanical equipment, that information must be present in the container (model) associated to the asset, this is the design data specified by the designer and is not related to the AIR (DCS) parameter 'manufacturer' that will be provided by the trades during construction. The actual installed manufacturer will not override the design data manufacturer.

Note 2: It is the responsibility of the Design Delivery Team to review the AIR (DGS) portion of the spreadsheet and identify assets that will be included in their design and assign a responsible party to the scope and indicate any variations they would like to submit for approval. All other assets can be marked as N/A and filtered out.

The Design Delivery Team must maintain the AIR (DGS/DCS) throughout the design phase of the project and include it with all required submissions.

The above-mentioned spreadsheets (Appendix G: AIR Asset Information Requirements, referred to in this document as Data and Geometry Specification (DGS) + Data Collection Specification (DCS)) are combined into a single Excel file to facilitate management. The editable version of this file will be shared with the Team after project award.

The Data and Geometry Specification and Data Collection Specification are identified on the same table, utilizing the specified colours.

a. BIM Project Participant Roles

Appendix I: BIM Scope of Work contains a summary of BIM scopes of work and deliverables by the Team along with the project phase in which they occur.

Team (Appointed Parties)

This document uses the term Team (Appointed Party) to refer to work effort required, relative to BIM processes, during Design and during Construction, irrespective of the contract type being used.

For the purposes of ISO 19650, the Team is comprised of one or more Appointed Parties, including any Lead Appointed Party and associated Task Teams, as applicable.

- **Design Delivery Team (Appointed Party / Lead Appointed Party – Design Phase)**

  Work effort required in relation to Design as defined in the Project Agreement, Contracts, Construction Management Agreement, Design Build Agreement, etc., as applicable.

  The Design Delivery Team (Appointed Party / Lead Appointed Party) is responsible for the overall development and delivery of the Design Building Information Models, including the Record Model at handover and all processes and deliverables as defined in this document as Design Delivery Team scope.

- **The Construction Delivery Team (Appointed Party / Lead Appointed Party – Construction Phase)**

  Work effort required in relation to Construction as defined in the Project Agreement, Construction Management Agreement, Design Build Agreement, etc., as applicable.

  For the purposes of this document, this role is defined as the Construction Delivery Team (Appointed Party). The Construction Manager / Design-Builder, as applicable, acting as the Lead Appointed Party, shall determine which trade contractors, firms, or individuals form part of the Construction Delivery Team (Task Teams) and shall be responsible for ensuring their compliance with these Requirements.

Participation

For the purposes of the Owner's (Appointing Party) BIM and information management process, all participants involved in Design and Construction are required to conform to the Project Information Requirements (PIR) set out in this document.

> *Note 3: This includes all specialist consultants whose scope of work involves any tracked asset identified in the AIR (Asset Information Requirements), which in this document is referred to as the Data and Geometry Specification (DGS).*

It is the responsibility of the Design Delivery Team and the Construction Delivery Team project participants to define within the BIM Project Execution Plan (BEP) the responsible parties, strategies, workflows, processes, and protocols they intend to utilize to address specific issues and achieve the stated goals.

During Construction the BEP continues to be a living document that will be used by all parties and where the responsibility for the evolution and development of the digital process will

> *Note 4: Any proposed amendments to these Requirements must be recorded in the BEP for approval and sign-off.*
>
> *Amendments that impact the quality of the underlying data or compromises the achievement of the Owner (Appointing Party)'s stated goals will not be accepted.*

ts

The Owner (Appointing Party)

This document uses the term The Owner (Appointing Party) to define and encompass all Owner stakeholder groups acting on behalf of the Appointing Party, who are responsible for establishing, managing, and accepting information in accordance with ISO 19650.

- Issue the BIM Information Requirements, including the Project Information Requirements (PIR) and Asset Information Requirements (AIR: Data and Geometry Specification (DGS/DCS), to enable the achievement of the established BIM and information management objectives.
- Approve the BEP, including any requested exemptions.
- Review and approve the BIM Project Execution Plan (BEP), including the review and formal approval of any requested exemptions or deviations from the defined Information Requirements.
- Review, comment on, and accept submitted information deliverables, including design information models, asset information, and associated data uploads, in accordance with the defined acceptance criteria.
- Approve and sign off the Asset Registry, confirming completeness, accuracy, and alignment with the defined Asset Information Requirements.
- Sign off on construction data and documents uploaded by trades.
- Approve and sign off construction-phase asset data and documentation submitted by trade contractors, confirming compliance with the Information Requirements prior to handover.

The Owner's (Appointing Party) Information Manager

As it is specified in ISO 19650, it is recommended that The Owner (Appointing Party) shall retain an Information Manager to undertake QA/QC Reviews, to ensure compliance with these requirements and check that the data generated can support the proposed goals and uses and mitigate the defined risks.

The Information Manager will be responsible for providing/establishing the external database environment, or alternate approved solution, for the collection and collation of required data and documents for Facilities Management (FM).

The external database environment must ensure transparency for the Owner (Appointing Party) and any member of the project team who requires access.

Other responsibilities include the following:

- Recommending approval of proposed amendments or exclusions to these BIM Requirements.
- Provide advice and recommendations to the Design Delivery Team and Construction Delivery Team.

- Audit the BEP to ensure strategies and workflows defined in the document are aligned with the Project Information Requirements (PIR) and being adhered to within the model dataset.
- Audit the design model data to ensure compliance on modeling strategies and placement of data to confirm that the Project Information Requirements (PIR) are being met.
- Review BIM process and protocols to ensure agreed processes are being followed.
- Generate the design model Asset Registry.
- Support the work effort of other project consultants and all parties approved by the Owner (Appointing Party), in accessing the cloud based external data base used for Data and Document Collection.
- Prepare, host, and monitor the cloud-based environment for asset information upload.
- Generate progress reports on the data and document upload progress.
- Compile the data for transfer to Computer Maintenance Management System (CMMS).

Ownership

The ownership and responsibility for each individual digital model resides with the party that generated it. Only the responsible Design / Trade Delivery Team shall enter information into their model. However, the Owner (Appointing Party) must be granted unlimited license, and use of, all models generated during the project for the lifecycle of the facility.

Models are to be shared with all parties as required by the Owner (Appointing Party), and as agreed and defined in the BEP, however the Owner (Appointing Party) reserves the right to request additional model submissions.

Models must be uploaded to a common data environment (CDE) on a regular basis, to be agreed and defined in the BEP. The CDE to share the models during design and construction is different than the cloud external data base used for Data and Document Collection.

Note 5: All PDF/DWF drawings, which will constitute the legal documents, must be derived from the model's dataset. See Note 6 for allowed exceptions.

5. Project Information Requirements for the Design Phase

The relevant ISO 19650 Sections are as follows:

- ISO 19650: 5.4 APPOINTMENT PROCESS, 5.6 COLLABORATIVE INFORMATION PRODUCTION.
- ISO 19650: BEP DESIGN, RESPONSIBILITY MATRIX, TIDP (Task Information Delivery Plan), RACI (Responsible, Authoring, Contributing, Informed).

a. General Information

The Team (Appointing Party) should consider and record in the BEP their strategy for managing the following:

- **Risk Mitigation**

The relevant ISO sections are as follows:

- Risk Assessment (ISO 19650 5.3.6 Risk Register) – Identify hazards and risk factors that have the potential to cause harm within the process.

The Design Delivery Team must generate a Risk Assessment matrix, to identify and manage issues and risks that they feel might impact their ability to meet the requirements of the BIM Requirements as detailed within this document. See Appendix Q: Risk Assessment Matrix Example for a guideline to generate the Risk Assessment Matrix.

- **File Sharing Platform (CDE: Common Data Environment)**

  An accessible file sharing platform, for common access to all BIM Models should be established by the Design Delivery Team, who should update the BIM Models on this platform on a regular basis, as agreed and noted in the BEP. Versioning of models is required and must also be detailed in the BEP.

  The Design Delivery Team is to include in the BEP the workflows they propose to follow.

- **Software Versioning**

  Versioning of software shall be managed by the Design Delivery Teams throughout the project lifecycle. The version number of any software to be used including collaboration software must be announced at the start of the project and must be maintained throughout the project to close-out, unless the team agrees to upgrade to a newer version. The versioning of the software must be identified in the BEP.

- **Geo-Reference, Level, Grids and Units**

  The design consultants must establish a strategy for management of the following:

  - Spatial coordinates, which must accurately geo-reference in all models.
  - Levels and Grids to be used consistently across the entire team, including fabrication models.

b. Pre-appointment deliverables

ISO 19650 requests the teams to provide the following documents with their tender response (before the appointment of the teams) to make sure the teams are understanding the goals and standards outlined in this document.

- Bim Execution Plan (BEP), see Appendix R: Pre-Appointment BIM Execution Plan.
- Risk Assessment for the strategies proposed, see Appendix Q: Risk Assessment Matrix Example.

> *Note 9: The first submission of the Design BEP is to be provided with the RFP response. All the strategies outlined in Appendix R: Pre-Appointment BIM Execution Plan must be resolved and a pre-appointment BEP must be submitted with the RFP response.*

A BIM-enabled project inherently requires a collaborative approach from all participants.

The Design BIM Execution Plan (Design BEP) is a document developed by the Design Delivery Team (Appointed Party) and coordinated by the Lead Appointed Party, to document the agreed approach to information delivery for the Design Phase.

The Design BEP records how the Design Delivery Team will meet the Information Requirements, including clarification of:

- Who is responsible for producing specific information,
- What information will be produced,
- In which information containers (models/documents),
- And at which project milestones.

The Design BEP documents the agreed model practices, information management strategies, processes, and protocols to be followed, and shall clearly identify any approved exclusions, deviations, or areas of non-compliance with these BIM Information Requirements.

Appendix E: BIM Execution Plan (BEP) Design identifies the minimum topics and issues that must be addressed within the BEP (Design Phase), where applicable to the project.

In addition, the Design BEP provides clarity to parties outside the Design Delivery Team regarding how the Design Phase information has been structured, coordinated, and delivered, including the strategies adopted to manage collaborative working across multiple disciplines and information containers.

The Design BEP is a living document and shall be maintained and kept current throughout the Design Phase. An updated version of the Design BEP shall be submitted with each Design milestone submission. Changes to the BEP shall be clearly identified, and a change log table shall be included to record approved revisions.

Irrespective of the contract type, the Design Phase BEP shall be made available to the Construction Delivery Team (Appointed Party – Construction Phase) to support continuity of information delivery. The BEP may also be used by the Owner (Appointing Party) to understand the structure, intent, and limitations of the delivered information at handover; however, ongoing asset information management requirements post-handover shall be governed by the Asset Information Requirements (AIR).

An updated Design BEP shall be included, along with all Design Phase information containers (models) and the applicable AIR Asset Information Requirements, referred to in this document as Data and Geometry Specification (DGS), as part of each audit or review submission.

As noted in Note 9, the first version of the Design BEP (Pre-Appointment BEP) shall be submitted as part of the RFP (Request for Proposal) response.

Note 10: The BIM Design kick-off meeting should include a representative from the Owner (Appointing Party), The Owner's Information Manager (BIM Consultant), and the appropriate BIM and leadership representation from the Design Delivery Team, including Architectural, Envelope, Mechanical, Electrical, Plumbing, and Structural.

c. Modeling and Data Requirements

One of the main risks targeted by this process is to reduce overall project risk along with the data loss, delay, quality of handover documentation, ensuring sufficient space for maintenance and replacement of tracked assets.

As such QA/QC Reviews will target data and document collection focusing on; whether the models are sufficiently robust to support and identify tracked assets for collection and collation of additional information against all assets that are tracked by the Owner (Appointing Party).

These are tracked assets that will be transferred into their Computer Maintenance Management Software (CMMS) / other software systems.

The design models shall be created to include all geometry, physical characteristics, design, and design intent product data needed to describe the required scope of the project.

> *Note 6: All drawings, and schedules, excluding exceptions noted below, required for assessment, review, bidding, and construction must be derived directly from the model's dataset. Details, schematics and single line diagrams are excluded from the above requirement.*
>
> *The Design Delivery Team must ensure that all model elements, required to define the design intent and are present on the drawing views, have a descriptive Model Object Name and Type to support downstream goals and uses.*
>
> *See also Note 1 and Note 4.*

Appendix D: Modeling and Data Requirements establishes the modeling and data requirements against which models and documents will be audited. For ease of use, the model and document requirements are broken into the following groupings:

- **Document Deliverables:** Updated BEP, AIR (DGS/DCS), risk assessment matrix, and virtual coordination matrix as applicable.
- **Model Consistency**: Alignment between the BIM requirements and the BEP, BEP readability/clarity; alignment with models; phasing consistency; cleanup; duplications/placeholder objects.
- **Model Coordination**: Modeling precision; clearances; virtual coordination.
- **Asset Extraction**: Modeled objects; geometry level; scope clarification; asset granularity.
- **Asset Location**: Model alignment; room bounding; existing rooms; associated room; level; room type and multiple repetitive rooms / floors.
- **Asset Classification**: OmniClass (2012) classification consistent category; descriptive names; system names.
- **Data Clarity**: Built-in parameters; object relationship; views and schedule data usage.

d. ISO 19650 AIR Asset Information Requirements (DGS/DCS)

Appendix G: AIR Asset Information Requirements, referred to in this document as Data and Geometry Specification (DGS) and Data Collection Specification (DCS), supports the implementation of the Asset Information Requirements (AIR) as defined in accordance with ISO 19650.

The AIR (DGS/DCS) identifies assets that are required to be represented within the project information for the purposes of design coordination and asset information delivery. A subset of these assets, defined as Tracked Assets, are of critical importance for Facilities Management (FM) and are identified to support the structured collection of asset-related data and documents during the Construction Phase.

Tracked Assets serve as information containers for asset data and documentation to be collected and managed within the designated data environment during the Construction Phase of the project.

> *Note 7: The definition of tracked assets does not exclude all other assets required for the design of the project, and all design intent data must be associated to them. See Note 1 and Note .*

Each Appointed Party, and their respective Task Teams, shall be responsible for validating and ensuring that all required data fields, as defined in the AIR (DGS and DCS), are populated with complete, accurate, and appropriate information for each Tracked Asset prior to IFC (Issued for Construction) or equivalent milestone submission. Refer to *Note 2*.

e. Level of Information Need

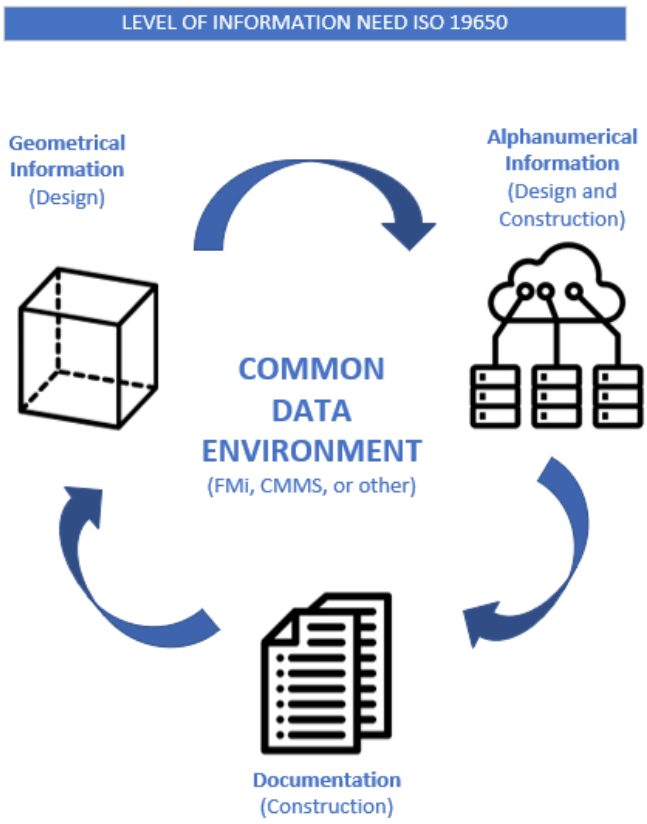
In alignment with the ISO 19650 information management framework, a more efficient and effective approach is to define information requirements based on the intended information purpose, rather than default levels of model detail.

The Level of Information Need establishes:

- which aspects of the geometric information must be accurate (e.g. quantity, size, location, elevation, orientation, or appearance),
- what information is required to be derived from that geometry,
- which downstream information purposes rely on that information,
- and when, at which project milestone, the information is required.

In addition to geometric information, the Level of Information Need defines the alphanumeric (non-graphical) information required to support the intended information purpose. This may include system identifiers, asset identifiers, type identifiers, classification references, performance properties, manufacturer information, and other information attributes specified through the Asset Information Requirements (AIR). The timing at which this information must be available within the project information model shall also be clearly defined to support downstream information uses.

Within the ISO 19650 framework, both graphical and alphanumeric information are treated as integral components of information delivery and shall be defined, delivered, and validated in accordance with the applicable BIM Information Requirements. Refer to the diagram below for illustration.



Geometric Information

The AIR (DGS) defines the minimum geometric information required at specified stages of the Design Phase for each Tracked Asset type, where inclusion of the asset is required to support the defined information purposes.

Tracked Assets shall be represented within the design information models in a manner appropriate to the required geometric information.

Representation shall be achieved using authoring objects appropriate to the authoring platform and shall be correctly classified in accordance with the project's classification system.

All assets required to convey design intent, whether identified as Tracked Assets or not, shall be represented within the design information using appropriate 3D or 2D model-based representations. The use of isolated 2D symbols or lines as the sole form of representation, without association to an information container or object, is not acceptable.

The following table, provided for general guidance, outlines the expected Geometry Levels at each stage of the Design Phase.

For the purposes of this document, Level of Development (LOD) terminology is retained exclusively to describe the geometric level of resolution as per BIM Forum.

Alphanumeric (non-graphical) information requirements are defined separately and are not governed by LOD, in alignment with the ISO 19650 Level of Information Need concept.

Link to BIM Forum LOD definition:

https://bimforum.org/resource/lod-level-of-development-lod-specification/

Note 13: For FMO purposes, it is not needed to model elements to a fabrication level of geometry in the design models.

Alphanumerical information: Required Data Parameters

The required alphanumeric information associated with Tracked Assets is defined within the AIR (DGS), including the project phase or milestone by which the information is required to be available within the project information set.

In alignment with the ISO 19650 information management framework, the defined alphanumeric information forms part of the Level of Information Need and supports the Asset Information Requirements (AIR). The information delivered during the Design Phase is intended to support downstream processes, including asset data aggregation and integration with the Owner's (Appointing Party) CMMS and other asset management systems.

To ensure consistency, reliability, and successful extraction of information for downstream use, critical data attributes shall be provided using standardized parameter definitions appropriate to the selected authoring platform as identified in the AIR (DGS).

It is of critical importance that the Design Delivery Team (Appointed Party) adheres to the parameter definitions specified in the AIR (DGS) to enable consistent data delivery across all information containers and to support the successful extraction of asset information for operational use.

Any proposed deviation from the specified parameter definitions shall:

- be applied consistently across all relevant information containers,
- be submitted for review and approval by the Owner (Appointing Party)
- and be clearly documented within the BIM Execution Plan (BEP).

Required Data Parameters:

Asset Classification System (OmniClass Name and Number)
Tags (Asset Identification and Presentation)
System (Asset System Association)
Room Requirements (Spatial Containers)
Object naming convention (Type and Instance Identification)

Asset Classification System (OmniClass Name and Number)

To support consistent information management and quality control (QA/QC), the Owner (Appointing Party) has selected OmniClass 2012 as the asset classification system for the organization, structuring, and retrieval of asset information for all Tracked Assets.

The use of both the OmniClass classification title and number is required and shall be verified against the defined Asset Description to ensure correct alignment between assets and their associated information requirements.

Within the AIR (DGS), each Asset Description is mapped to a corresponding OmniClass classification number and title. This classification shall be applied by the Design Delivery Team (Appointed Party) to identify Tracked Assets within the project information models and

associated information containers, in accordance with the defined Asset Information Requirements (AIR).

The Design Delivery Team shall document within the BIM Execution Plan (BEP) the method by which asset classification information will be assigned to model elements or information objects, including the proposed quality control procedures to verify accuracy and consistency.

The use of software tools or extensions to support the assignment of OmniClass classification is permitted; however, the selected approach shall be applied consistently across all project information models and disciplines, irrespective of authoring platform.

Note 14: All Design disciplines must include these two attributes/properties for all required tracked assets.

Tags (Asset Identification and Presentation)

To support consistent identification, coordination, and downstream use of asset information, Tracked Assets shall be identified and presented using the defined asset identification attributes.

For each Tracked Asset, the Type Identifier and Instance Identifier shall be derived from the designated data attributes as defined within the AIR (DGS).

The Appendix G: AIR Asset Information Requirements referred to in this document as Data and Geometry Specification (DGS) + Data Collection Specification (DCS) identifies:

- assets that require type-level identification (Type Identifier), and
- assets that require instance-level identification (Instance Identifier),

for each project milestone.

Asset identification attributes shall be used consistently when:

- generating graphical annotations (e.g. tags placed on drawings or sheets), and
- generating parametric schedules, lists, or other information outputs.

Where assets are collected and managed at an instance level, a single, consistent attribute shall be used as the unique identifier for that asset instance.

Example – Asset Collected by Instance (illustrative):

Asset Description: Variable Air Volume Box
Asset Type: Variable Air Volume Box – Supply Air
Capacity: 450 CFM
Asset Type Identifier: VAV
Asset Instance Identifier: VAV-01
OmniClass Classification Number: 23-33 41 17 13
OmniClass Classification Name: Variable Air Volume Terminal Units
System Name: Supply Air
System Abbreviation: SA1
Parent Asset: AHU-01

In this example, the asset instance is identified using the Instance Identifier.

The Instance Identifier is formed by combining the Type Identifier with a unique numeric suffix, providing a unique and persistent identifier for the asset instance.

The Type Identifier shall use the approved acronyms defined in Column M ('Acronyms') of the AIR (DGS/DCS).

Note 15: Free-text annotations or text-only notes shall not be used as a substitute for structured asset identification attributes.

In addition:

- *All asset identification presented graphically shall use the approved acronyms defined in Column M ('Acronyms') of the AIR (DGS).*
- *Where graphical tags or schedules are generated using concatenated data attributes, the selected attributes and concatenation logic shall be:*
  - *applied consistently across all disciplines and information containers, and*
  - *clearly documented within the BIM Execution Plan (BEP).*

The use of platform-specific tagging tools (e.g. annotation families in a BIM authoring tool) is permitted.

System (Asset System Association)

All Tracked Mechanical, Electrical, and Plumbing (MEP) assets shall be associated with a defined system to support coordination, asset information management, and downstream operational use.

System association shall be recorded using the designated system identification attributes within the project information models or associated information containers (e.g. system name, system code, or system abbreviation, as applicable to the authoring platform).

The Design Delivery Team (Appointed Party) shall document within the BIM Execution Plan (BEP):

- the proposed system naming convention,
- associated system acronyms or codes, and
- the method by which system information will be assigned and maintained across the project information models.

The defined system naming structure and associated attributes shall be submitted for review and approval by the Owner (Appointing Party) prior to implementation and shall be applied consistently across all disciplines and information containers, irrespective of authoring software (e.g. system parameters within a BIM authoring tool such as ~~Revit~~).

All Mechanical Electrical Plumbing (MEP) tracked assets must be associated with a defined system and the Design Delivery Team must record in the BEP the system naming structure, and acronyms for approval.

Room Requirements (Spatial Containers)

Enclosed spaces (Rooms) shall be defined and maintained by the Design Delivery Team (Appointed Party) as spatial containers to support the identification, coordination, and management of asset-related information.

Each room shall include the required room identification attributes, including suite type and suite number, as defined within the AIR (DGS).

Rooms shall be spatially defined to extend from the finished floor level to the underside of the floor or structure above, in order to ensure that Tracked Assets located within ceiling voids or interstitial spaces are correctly associated with the appropriate spatial container.
In addition, rooms shall be defined to include shafts, service spaces, and other enclosed areas that contain Tracked Assets.

Spatial containers shall also be defined for areas outside the primary building envelope where Tracked Assets are located, including but not limited to:

- rooftop equipment and plant,
- assets located on external walls,
- site and landscape assets (e.g. parking ticket machines, electric vehicle charging stations, benches, bicycle racks, emergency call points).

The Owner (Appointing Party) will collect room and space information for operational and asset management purposes. The following room-level information attributes are required, where applicable:

- Room Name
- Room Number
- OmniClass Room Number and Description
- Owner (Appointing Party) Room Number
- Floor Drain Required (Yes/No)

The method used to define rooms or spatial containers shall be appropriate to the selected authoring platform (e.g. room objects within a BIM authoring tool such as Revit), provided that the required spatial boundaries and information attributes are delivered consistently across all information containers.

Object naming convention (Type and Instance Identification)

To support consistent identification, coordination, and downstream use of information, object naming conventions shall be applied to all modeled or represented assets in accordance with the defined information requirements.

Object type names and instance names, where applicable, shall follow a consistent hierarchical naming structure, to support clear identification and classification of objects across all information containers.

The agreed naming structure shall be applied consistently across all disciplines and project stages and shall be documented within the BIM Execution Plan (BEP).

The method used to assign object type and instance names shall be appropriate to the selected authoring platform (e.g. Family Name and Type Name within a BIM authoring tool such as Revit), provided that the underlying naming logic and structure remain consistent.

Custom Owner Defined Parameters (Based on Owner's goals)

Asset Hierarchies (Parent/Child Relationships)
Underlying Object Data
Finishes
Fire Rating
Hardware Group
Sound Rating
Tender Package

Asset Hierarchies (Parent/Child Relationships)

It is critical for The Owner (Appointing Party) to be able to build the asset hierarchies, parent/child relationships from the underlying model dataset, as such the Design Delivery Team, specifically the mechanical and electrical consultants are required to record in the BEP their strategy for providing this information. Column Z ('Parent-Child Relationship'), in the AIR (DGS) notes those tracked assets that must have this information provided.

Note 16: Assets that need the parent-child relationship parameter have been identified in Column Z ('Parent-Child Relationship') of the AIR (DGS/DCS) document. However, it is the responsibility of the Design Delivery Team to provide the parent information for any asset that is part of the systems identified by the Owner (Appointing Party), even if it is not listed in the AIR (DGS).

Tracked assets that are inherently sub-components within another asset do not require this parent-child relationship, i.e., the sub-components of an AHU box / skid do not need to be modeled. However, if a tracked asset is outside of the AHU box / skid then it must be modeled and the parent child relationship as describe above provided.

The parent of an asset is to be captured by the Design Delivery Team in two different shared parameters:

- Parent Asset Description
- Parent Mark

For each asset that belongs to any of the systems identified by The Owner (Appointing Party) those two shared parameters should be populated with the parent information of that asset (one level up).

Underlying Object Data

Although not explicitly itemized within these standards, it is expected that all information required to generate the Design Phase drawing set, including the necessary geometric and alphanumeric information to convey design intent, shall be contained within the project information models and associated information containers.

See *Note 1*, *Note 1*, *Note 4*, *Note 5*, *Note 6*, and *Note 7*.

Other Custom Owner optional parameters:

- Finishes
- Fire Rating
- Hardware Group
- Sound Rating
- Tender Package

f. Virtual Coordination

Virtual Coordination is a key information management process used to support risk mitigation throughout the project lifecycle.

During the Design Phase, the Design Delivery Team (Appointed Party) shall develop and coordinate the project information models to support virtual coordination activities across the entire facility, in accordance with the defined Information Requirements.

The geometric information defined in Appendix G: AIR Asset Information Requirements referred to in this document as Data and Geometry Specification (DGS) + Data Collection Specification (DCS), together with the Level of Information Need, applies specifically to Tracked Assets. The Design Delivery Team shall ensure that Tracked Assets are represented with the required geometric reliability and are accurately positioned within the project information models to support the defined coordination and downstream information purposes.

The Design Delivery Team must document in the BEP how they propose to conduct virtual coordination throughout the design phase, using Appendix L: Virtual Coordination Workflow (Design) as a reference. The following items must be addressed:

- **Coordination Software**: Which virtual coordination software will be used. This software must have the ability to automate the clash review process based on customizable settings using the model geometry and underlying component information. It must also have the ability to uniquely track issues, assign responsibility, save views of issues and maintain a record of the eventual resolution of coordination issues.
- **Schedule**: What is the proposed frequency of reviews / meetings.
- **Digital Building Review**: How visual checks will be done to resolve potential constructability or design issues not highlighted by either a soft or hard clash.
- **Clash Coordination**: How hard and soft clash checks will be undertaken and who will be responsible for creating the federated model, running clash tests, reviewing, and grouping the results, assigning responsibility, and managing resolution.
    - **Hard clashes**: physical conflicts between two objects.
    - **Soft clashes**: objects impinging on required clearances for code, maintenance, or replacement. Clearances for maintenance must include the required access column to reach overhead tracked assets / equipment requiring maintenance.
    - **Colour coding**: Which colours will be used to distinguish model elements / systems / disciplines.
    - **Sequence strategy**: which disciplines, objects, systems, assets, etc. will take precedence over others.

- **Issue Tracking strategy**: How issues will be tracked, prioritized, assigned, and shared across the Team and with the Owner (Appointing Party). Virtual coordination reports should include a unique identifier of the issue, date, location, level, disciplines involved, graphical representation of the issue, status field, severity/risk, assignment of responsibility and timeline for resolution.

Note 17: The Design Delivery Team must provide a copy of the issue tracking document / virtual coordination report with each required project submission.

g. QA/QC Reviews

The Owner (Appointing Party)'s Information Manager will conduct QA/QC reviews focused on ensuring compliance with these BIM Requirements as described in Appendix J: QA/QC Review Workflow. The QA/QC Compliance review will be considering the entire project dataset. Model and data requirements will be reviewed for each design model using the BEP as reference for strategies, processes, workflows and any agreed exclusions. A report will be generated and shared with the Owner (Appointing Party) and the Design Delivery Team, indicating the modeling, data and workflow issues that must be addressed prior to the next review.

When included as a use by the Owner (Appointing Party), clearances must be modeled and included in the Virtual Coordination workflow, even if the assets are not marked as tracked in the AIR (DGS/DCS).

Note 18: The QA/QC Review, conducted by the Owner (Appointing Party)'s Information Manager are focused on issues and requirements defined in this document.

Virtual coordination issues that are observed during the QA/QC Review will be reported as part of the audit.

Note 19: QA/QC Reviews will align with project milestone submissions.

QA/QC Review Submission Requirements

The following are to be provided for each compliance submission as defined in table below Design BIM Deliverables.

- Updated BEP and AIR (DGS).
- All design authoring software models.
- PDF set of the printed submission drawing sheets.
- Virtual Coordination report, for all CD submissions.

h. Record Model Update

It is of critical importance to the Owner (Appointing Party) that the design models provided at substantial completion be a suitable geometric representation, as agreed and recorded on the Accuracy Table, Appendix H: Level of Accuracy Table inclusive of the design rationale, and all

sheet views, including the single line diagrams, schematics, schedules, and drawings of what has been constructed.

To achieve this, the Design Delivery Team must record in the BEP the process they propose to use to capture, within the design models, the geometry and design rationale changes that have occurred during construction. Appendix P: Record Model Update has a recommended workflow and should be used as a reference. The proposed process should define the timeline, milestone checks for update, along with the accuracy that is to be applied to the design rationale, systems, and assets etc. See Note .

The Design Delivery Team must liaise with the Construction Delivery Team, whose responsibility is to ensure that changes are communicated to them. This update must occur during and not after construction. The Information Manager will be checking to ensure that this process is occurring.

Note 20: Fabrication models are not acceptable as an alternative to updated Design Models for the Record Model.

Appendix H: Level of Accuracy Table contains a recommended Accuracy Table for model updates. The team is expected to review and provide, if deemed necessary an updated version of this table for approval and sign-off by the Owner (Appointing Party).

i. Design Phase BIM Deliverables

The following table sets out the expected BIM deliverables during the design phase of the project. The suggested location and method for the transfer of this information is to be included in the BEP. It is recommended that a common data environment is used.

BIM deliverables	Design Delivery Team	The Owner's Information Manager	Owner (Appointing Party)
Deliverables: QA/QC Review			
Updated BEP and AIR (DGS including any additional assets not identified)	x		
Source design models – All disciplines	x		
Source software files – Civil, landscape, specialist sub-consultants	x		
Consolidated PDF sheets – By discipline, including civil, landscape and specialty consultants	x		
Virtual coordination report – For all CD submissions	x		
QA/QC Review report		x	
Reviewed BEP		x	
Deliverables: End of Design Phase			
Updated BEP and AIR (DGS)	x		
Sheet sets (all disciplines)	x		
Source Design models – All disciplines	x		

BIM deliverables	Design Delivery Team	The Owner's Information Manager	Owner (Appointing Party)
Source software files – Civil, landscape, specialist sub-consultants, single line diagrams	x		
Design specifications (.pdf)	x		
Access to Data Collection Environment		x	
Asset Registries		x	
Asset Registry sign off			x

6. Project Information Requirements for the Construction Phase

a. BIM Execution Plan (Construction BEP)

The Construction Delivery Team must continue to develop and maintain the BIM Execution Plan (BEP) started during the Design Phase of the project. The Construction Delivery Team should plan to have an updated and complete version of the draft Construction BEP prior to the Construction Phase BIM Kick-off Meeting.

Appendix F: BIM Project Execution Plan (BEP) Construction contains an outline of the issues that must be addressed in the BEP. The main requirements are related to specific workflows and strategies regarding Virtual Coordination, Design Model Update and Change Management.

Note 21: An updated version of the Construction BEP must be provided when changes occur, and the Team must maintain a log in the PEP to record agreed changes. The Owner (Appointing Party)'s BIM Information Manager/Consultant will provide assistance, review and flag issues.

b. Level of information need for Construction

AIR: Documentation Information (DCS)

Appendix G: AIR Asset Information Requirements referred to in this document as Data and Geometry Specification (DGS) + Data Collection Specification (DCS) defines the data and documents required to be collected, during the construction phase of the project, relative to each tacked asset, that is part of the project.

Note 22: The data and document collection parameters will be created and managed in an external database, by the Owner (Appointing Party)'s BIM Information Manager/Consultant. These parameters will not be included in the design model. Trades will upload the required information to this platform. See Note .

The DCS contains the following information:

- Master list of tracked assets organized by groups of like assets.
- Data / documents required to be provided relative to each different type of assets. Please note this is a master list which will be refined to assets that are part of the design. Information is to be collected during construction aligned with specific events, such as approval of shop drawings, would be the trigger for the upload of the shop drawings, manufacturer, type, and model.
- Number of parameters required for data collection for each type of asset.

c. Asset Registry

The Owner's (Appointing Party) Information Manager will generate a preliminary project specific Asset Registry based on the Design Delivery Team's models around the issuance of the 100% CD submission. This will be refined and updated based on the Issued For Construction submission models. This document will list all tracked assets that are part of the project against which additional data and documents must be collected during construction.

The Team must be available to provide clarifications to the Owner (Appointing Party)'s BIM Information Manager/Consultant, to ensure the Asset Registry is accurate and includes all tracked assets that are part of the construction scope. The Owner (Appointing Party) will be responsible for final confirmation of the Tracked Asset list.

d. Data / Document Collection Environment

Unless otherwise noted, it is the responsibility of the Owner (Appointing Party) and their BIM Information Manager/Consultant to provide, for the duration of the project, a Data Collection Environment (external database). This environment will be an external database that supports the association of the required data and documents to the instance of the design model tracked assets.

See Note .

The Construction Delivery Team is required to work with the Information Manager to assign responsibility for all tracked assets to the specific responsible trade / party. The Construction Delivery Team is responsible for ensuring that the responsible assigned party complies with and uploads all the required data and documents, according to the specified timeline, to the data collection environment.

The Information Manager will be responsible for:

- Extracting information from the design models and generating the Asset Registry.
- Managing the External Database and providing the interface.
- Working with the Construction Delivery Team to undertake a QC review for alignment between the asset registry and trade scope.

- Working in collaboration with the Construction Delivery Team, the Information Manager will assign responsibility, in the external database, to the agreed applicable trade, in accordance with their defined scopes.
- Generating accounts so that project participants can access and review information.
- Providing raining and support to the appointed responsible party to facilitate the collection of the information.
- Providing periodic upload progress reports.
- Transferring uploaded information, at substantial completion, to the Owner (Appointing Party) for their final upload into their CMMS solution.
- Providing a structured digital report that presents data and documents collected in a structured, integrated, and easy to navigate format.

The Construction Delivery Team will:

- Work with the Information Manager team to define trade scope and responsibility.
- Provide contact information within four (4) weeks of each trade contract award (Company, Name, Email, Scope of work).
- Provide and upload both metadata (text, dates) and documents to the Data Collection Environment.
- Flag any design data inconsistency that impairs the upload progress.
- Advise of any tracked assets within a trade's scope which are not included in the Asset Registry.
- Undertake a QA/QC process on uploaded information to ensure that the data required for FMO is accurate, associated to the correct element, and reflecting the installed asset information. This process must be documented in the BEP.

The Owner (Appointing Party) will:

- Undertake QA/QC reviews of the uploaded data and documents using the digital report provided by the Information Manager or the Data Collection Environment.

e. Data / Document Upload

The Owner (Appointing Party)'s BIM Information Manager/Consultant will organize the external database so that each party responsible for providing and uploading information will only see the assets that they are required to provide information against. Appendix K: Data Collection Workflow defines the data collection workflow.

Trades will be required to participate in the data and document upload, providing the required information as noted in the Data Collection Specification (DCS). Requirements are specific to the different asset types. Shop drawing approval is the trigger for the trades to begin uploading information that is now fixed, e.g., shop drawings, manufacturer, model, type, vendor, etc.

The requirement, unless agreed otherwise and recorded in the BEP, is as follows:

- The Construction Delivery Team will provide to the Owner (Appointing Party) / the Owner (Appointing Party)'s BIM Information Manager and keep up to date the submittal schedule for anticipated shop drawing approval.

- All required information defined in the DCS, which becomes fixed on approval of shop drawings, will be uploaded within 2 weeks of approval.
- Manufacturers' instruction manuals, maintenance schedules etc., will be uploaded to the external database as soon as they become available, to support development of critical preventative maintenance programs.
- Each PDF file provided will be specific to the asset type and no PDF file will be uploaded containing multiple asset types. For example, Pumps shop drawings: should be by type, and not include all types of pumps on the project.
- All uploaded PDF's, including stamped approved shop drawings provided by trades, will be submitted as software-generated PDF's. No scanned documents will be accepted.
- The triggers for data collection upload are set in the DCS document.

f. Exchange Data Transfer (AIM: Asset Information Model)

All required data and documents must have been uploaded and reviewed prior to substantial completion. Collected information will be transferred to the Owner (Appointing Party), by the Owner (Appointing Party)'s Information Manager, at handover. The Owner (Appointing Party) will import information into their CMMS solution.

The Owner (Appointing Party) must specify how they intend to receive the AIM deliverables: ie: BCF, IDS, IFC, source software, PDF, csv, excel, etc.

g. Prefabrication

Independent of contract type, once the contractor is involved and part of the project, the Construction Delivery Team will participate actively in the BIM process, reviewing the design for constructability issues, maximizing the efficiency of the construction schedule, and evaluating opportunities for prefabrication.

Design models will be shared with the Construction Delivery Team and shall be used to support generation of a federated model for enhanced virtual coordination with sub-trade fabrication models, construction sequencing/optimization and other activities.

h. Fabrication Models

The generation of fabrication models is encouraged for all major components. It is however, strongly recommended for Envelope, Structural and Mechanical, (HVAC, Plumbing, Fire Suppression, and other significant systems), to mitigate risk and support prefabrication and virtual coordination. Of critical importance is to ensure that clearances for maintenance access, replacement and code clearances are maintained.

i. Virtual Coordination (during Construction)

The expectation is that the design phase models will be used, in conjunction with fabrication models, to mitigate risk and maximize efficiency. The fabrication models, when created by the

trades must be linked into a federated model in which virtual coordination and clash detection processes will occur in order to mitigate risks and maximize efficiency.

Once in the construction phase of the project, the fabrication models must be used for virtual coordination, and the trades must ensure that the virtual coordination process continues and that all clashes are resolved in a specific area in the model before construction is set to commence in that same specific area of the building.

A recommended workflow for virtual coordination can be found in Appendix M: Virtual Coordination Workflow (Construction). The Construction Delivery Team must document in the BEP the process, participants, fabrication software and coordination software that they propose to use to manage this process. The following information should be considered:

- **Digital review**: Resolution of any remaining design phase issues.
- **Clash coordination**: Hard and soft clash check. Hard clashes are physical conflicts between two objects. Soft clashes are objects impinging on required clearances for code, maintenance, or replacement needs. Clearances for maintenance must be included the required access column to reach overhead equipment.
- **Fabrication Models**: List of trades providing fabrication models and the systems being represented. Coordination of fabrication level models, which should include hangers, seismic restraints, supports, accessories, etc. that have not been modeled during the design phase.
- **Software**: Software must have the ability to automate the clash review process based on customizable settings using the model geometry and underlying component information. It must also uniquely track issues, assign responsibility, save views of issues, and maintain a record of the eventual resolution of coordination issues.
- **Schedule**: Frequency of reviews / meetings.
- **Issue Tracking Strategy**: How issues will be tracked, prioritized, assigned, and shared across the Team and with the Owner (Appointing Party). Virtual coordination reports should include a unique identifier of the issue, date, location, level, disciplines involved, graphical representation of the issue, status field, severity/risk, assignment of responsibility and timeline for resolution.
- **Change Management**: Method for capturing changes that require feedback and updates in the Design Models, tracking and reporting any changes to tracked asset, location, orientation, or access requirements for maintenance.

j. Record Model Update

Of critical importance to the Owner (Appointing Party) is that the design models provided at substantial completion are a suitable representation of the actual built facility. To that end, the Construction Delivery Team is required to provide in the BEP their timeline and workflow for providing the Design Delivery Team with the information they require to update their models, in accordance with Appendix H: Level of Accuracy Table, to reflect changes. This includes schematics, single line diagrams and panel schedules to reflect the equipment controlled.

The BEP should also record the accuracy of the information being relayed to the Design Delivery Team relative to different systems / assets, rooms, underground services, etc. The following changes should be considered:

- Orientation of the assets
- Count / number (added / removed elements).
- Location (level, room, x, y,).
- Elevation (z)

See Note 22 related to changes to tracked assets within the design models.

Appendix H: Level of Accuracy Table contains a recommended Accuracy Table establishing suggested accuracy requirements for model updates. The team is expected to review and provide any requested changes for sign off.

Appendix P: Record Model Update: has a recommended workflow for Record Model update. It assumes that the Construction Delivery Team will define focus areas in the building (e.g., a level, a room, a zone) before starting the development of fabrication models or starting construction.

k. BIM Progress Review

The Owner (Appointing Party)'s BIM Information Manager/Consultant will perform periodic upload progress reports, and checks to ensure that the required processes, as defined by the Construction Delivery Team in the BEP, meets the outcomes defined in the Project information Requirements.

The Construction Delivery Team and the Owner (Appointing Party) will define in the BEP the frequency and schedule for the QA/QC Reviews. Issues flagged by trades in the Data Collection Environment will be reviewed and may trigger changes in the asset registry or requests for design model updates.

Following each review, a data and document upload progress report will be generated by the Owner (Appointing Party)'s BIM Information Manager/Consultant and shared with the Construction Delivery Team. This report will summarize main pending issues and give details about the upload performance of each trade.

l. Substantial Completion BIM Deliverables

The following requirements are specific to BIM deliverables and are to be available at substantial completion of the facility.

BIM deliverables	Design Delivery Team	Construction Delivery Team	Trades	Information Manager	The Owner (Appointing Party)
SUBSTANTIAL COMPLETION					
Completed Project BEP (Design and Construction)	x	x			
Record Design Models (.rvt) updated to the version agreed in the BEP	x				

BIM deliverables	Design Delivery Team	Construction Delivery Team	Trades	Information Manager	The Owner (Appointing Party)
2D CAD (non-Revit, i.e. civil, landscape, single line diagrams, existing facilities and agreed exceptions	x				
Final consolidated Record drawings set (.pdf)	x				
Design specifications (.pdf)	x				
Federated fabrication models (if generated)		x	x		
Project information extracted from the external database, as a consolidated digital building				x	
Structured digital report that presents data and documents collected in a structured, integrated, and easy to navigate format				x	
Tracked asset information and associated data and documents, exported in a format to be agreed, for import into the Owner (Appointing Party)'s CMMS				x	
Lessons learned report				x	
Data transfer templates for CMMS					x
Data/document collection sign off					x

m. Closeout

The relevant ISO 19650 section is as follows:

- ISO 19650 5.8 PROJECT CLOSEOUT

The concept is described in ISO 19650 as an approach to support a smooth transition into the operational phase of a project. This is characterized by a strategic plan and gradual handover which occurs throughout the project's life, from inception to completion and beyond, into the lifecycle of the building.

The concept has been adapted to align with the North American market and aligns with the structured workflows defined within this document, where information is collected iteratively, from early design onwards through construction to enable the development of preventative maintenance plans, support commissioning efforts, support QA/QC processes, provide clarity around maintenance requirements and enable the data transfer into CMMS. The process aligns with the traditional roles, responsibilities, and work effort. See Appendix O: Soft Landing Approach.

Appendix A: Acronyms

Acronym	Description
3D	Three Dimensions (x,y,z)
2D	Two Dimensions (x,y)
AHU	Air Handling Units
BEP	BIM Execution Plan
BIM	Building Information Management / Modeling
CAD	Computer Aided Design
CAFM	Computer-Aided Facility Management
CD	Construction Document (project phase)
CDE	Common Data Environment
CMMS	Computerized Maintenance Management System
AIR (DCS)	Data Collection Specification (Construction)
DD	Design Development
AIR (DGS)	Data and Geometry Specification (Design)
DWF	Design Web Format (file format)
FM	Facilities Management
FMO	Facility Maintenance and Operations
HA	Health Authority
HVAC	Heating Ventilation and Air Conditioning
IFC	Issued for Construction (project phase)
IWMS	Integrated Workplace Management System
MEP	Mechanical, electrical and plumbing
NIC	Not In Contract
OIR	Organization Information Requirements
PDF	Portable Document Format (file format)
PIR	Project Information Requirements
QA/QC	Quality Assurance / Quality Control
RFP	Request for Proposals
SD	Schematic Design
SOR	Statement Of Requirements

Appendix B: Glossary

Term	Definition
Accuracy Level Table	Sets out the degree of accuracy required between the 'Record Model' and the actual as constructed condition for different assets, assemblies and building components. The Team is expected to review and provide and updated version of this table.
Asset Registry	A list of every asset present in a project's design models which will have data and documents collected against it. The DCS will specify the parameters required relative to each asset type.
QA/QC Review	The project's Information Manager will be responsible of evaluating compliance of the Design Delivery Team models with the established BIM Requirements. While full compliance is not expected early in a project, the Information Managerwill issue a report periodically to assist the Project Team in prioritizing compliance to ensure the Authority receives the full benefit of a BIM process. Submissions must work towards full compliance by their 95% CD milestone.
BIM Execution Plan (BEP)	The BIM Execution Plan (BEP) is an editable "living document" which is to be maintained and updated throughout the project's life by the BIM lead by project phase. It is meant to capture project information, modeling and workflow strategies that are specific to a given project. The updated document must be included in all submissions.
Building Information Management/ Modeling (BIM)	ISO 19650 defines BIM as a framework for managing information throughout the lifecycle of a built asset. BIM is a process for creating and managing information on a construction project throughout its whole life cycle. As part of this process, a coordinated digital description of every aspect of the built asset is developed, using a set of appropriate technology. It is likely that this digital description includes a combination of information-rich 3D models and associated structured data such as product, execution, and handover information. (NBS UK).
Consolidated Digital Building	Augmented database that ties all required data and documents generated and collected during the project to the relevant 'Record Model' objects. Also includes new stakeholder custom views along with any 'Federated Models' used during the project.
Construction Model	A BIM authoring model developed and managed by the Construction Delivery Team to support internal project activities such as virtual coordination, constructability reviews, and sequencing optimization.
AIR: Data and Geometry Specification (DGS)	The AIR (DGS portion) is a spreadsheet which includes a master list of all assets that must be modeled, if they are part of the design, along with the data parameters that the Design Delivery Team must include during the Design Phase. Each asset type is associated with an OmniClass 2012 Title and Number to be used in the Design Models to identify FMO assets.
AIR: Data Collection Specification (DCS)	The Data Collection Specification (DCS) provides a master list of Model Elements (element types) that are tracked by the FMO Team. It is meant to be provided at the RFP stage to the Construction Phase Team for the purpose of communicating expectations, of the types of data and document requirements associated with

Term	Definition
	element types, if they are part of the project. The Information Manager will normally produce an Asset Registry once an IFC or IFT submission is generated for the purpose of facilitating Data collection. The Information Manager may generate a preliminary Asset Registry earlier than IFC to allow Trades to have a better idea of what data collection requirements will be for a specific project. Data collection will occur using the Data Collection Environment provided by the Information Manager.
Data Collection Environment	The Data Collection Environment is the platform to be used during the Construction Phase to link files and information to the database extract from the design models. The Data Collection Environment is an intermediate step to aid in the collection of installed asset information extracted and transferred to the facilities maintenance and operations (FMO) Computerized Maintenance Management System (CMMS) or other software systems.
Design Models	Individual design models created and maintained by members of the Design Delivery Team to develop the design intent and produce project documentation. These models are progressively updated throughout construction to incorporate approved design changes and ultimately become the Record Models.
Fabrication Model	A fabrication model is a geometrically rich and detailed 3D model generated by a trade to enable prefabrication and enhanced Virtual coordination prior to construction. For example, while a 'design model' for HVAC ductwork will include duct sizes at various elevations, the 'fabrication model' will additionally include necessary weld gaps, hangers, additional valves relating to design specifications, controls and other design tolerances necessary for building, assembling and operating the final product. Fabrication models will be used by the Construction Delivery Team, for virtual coordination during construction, not for association of data for FMO purposes.
Federated Model	A consolidated model that is comprised of multiple models from various sources whose identity or integrity cannot be modified. Normally, a federated model is used to bring together 'design model', 'site/civil model' and 'fabrication models' into a single environment for the purpose of virtual coordination during Design and Construction phases.
Geometrical Information	A table that communicates the required geometric level of a model element as defined in this document.
LOD Level of Information Need	The Level of Information Need is used to define the data and geometry requirements of an asset based on the purpose, the goal and uses, identifying what aspect of the geometry needs to be accurate, what is the required information to be derived from that geometry, quantity, size, location, elevation, orientation, or appearance. What downstream uses are going to rely on this geometry and when during the process it will be required. In addition, what are the data attributes and documents required to be associated to that geometry.
Model Element	A 3D virtual representation of an object. May be at varying geometric levels.
Project Completion	It refers to the issuance of project completion certificate.

Term	Definition
Record Model Update	Refers to any and all issues during the construction phase with respect to deviations from Issued For Construction Design documents, i.e. via an RFI, SI, CO, Field Notice/Directive, other documented process or verbal clarification, whether or not associated with cost, which must be updated within the Record Model.
Record Model	Final updated 'design models', including updates to reflect the agreed as constructed condition.
Site Model	A 3D civil engineering model containing underground services. This model is to be aggregated into a 'federated model' to ensure virtual coordination with incoming services has occurred.
Substantial Completion	In the context of RAIC, substantial completion refers to a point in a construction project where the majority of the work is completed, allowing the project to be ready for its intended use. This milestone is typically defined by the contract between the owner and the contractor, and is often marked by a certificate of substantial completion issued by the architect or project owner.
Shop Drawings (Approved)	Shop drawings in electronic PDF, software-generated document (not scanned) with necessary approval stamps, dates, and equipment selection clearly identified. Document should be uploaded by element type and must be text searchable. No password or printing restrictions should be applied.
Tracked Asset	A model element which will be maintained for the lifecycle of the project. Additional data and documents will be collected as defined in the Data Collection Specification (DCS) during construction. Model elements must be placed in the models (as a component family) if the asset is part of the design, and the location must be updated in the Record Model.
Viewer/External Database	The Viewer/External Database is the environment/software used to distribute information for the purpose of access and review during design and construction of a project. The Viewer/External Database may also be the Data Collection Environment.
Virtual Coordination (BIM Coordination / Clash Detection)	Refers to the BIM workflows associated with the following three processes, Digital Building Review, Hard Clash and Soft Clash, used to capture issues, and assign responsibility for resolution prior to and during construction. 1. Digital Building Review: A virtual coordination process used in design to explore the design by walking through the Federated Model in a virtual environment to track and note issues. Normally involves the colour coding of different building systems and captures design issues that are not necessarily physical conflicts (for example, a column directly in front of a window). 2. Hard clashes: clashes that occur due to the physical conflict of two objects not being able to occupy the same space. Emphasis will be placed in areas of high congestion of ductwork, piping, or equipment. 3. Soft clashes: additional clashes set up to account for known clearance requirements that could limit or inhibit the adequate construction, maintenance servicing, operation, or replacement of equipment.

Term	Definition
Virtual Coordination Report	A report to be generated by the Team for the purpose of documenting and demonstrating that virtual coordination is occurring, and that issues are being assigned and resolved.

Appendix C: System Acronyms

Naming Convention	Acronym
Building Automation System	BAS
Carbon Monoxide Alarm Systems	COALRM
Chilled Water	CHW
Code Blue System	CODEB
Condensate	COND
Conditional Power	C
Controlled Pressure Environment	CPE
Delayed Vital	D
Domestic Cold Water	DCW
Domestic Hot Water	DHW
Domestic Hot Water Return	DHWR
Dust Extraction System	DUST
Fire Protection	FP
Fire Alarm System	FAS
Heating Hot Water	HHW
High Voltage	HV
Lab Air	LAIR
Medical Air	MAIR
Medical Gas	MGAS
Medical Vacuum	MVAC
Nurse Call System	NC
Public Address System	PA
Reverse Osmosis System	RO
Standby Power	SB
Steam	STM
Vital	V

Appendix D: Modeling and Data Requirements

DESIGN PHASE: Modeling and Data Requirements			
	Title/Topic		**Description**
0	**Required Deliverables for each BIM Compliance Audit**		
	1	Models	All design models, including any CAD or Civil 3D files in their native format
	2	Documents	Current version of the BEP, AIR (DGS/DCS), risk assessment matrix, virtual coordination log / report.
1	**Model Consistency**		
	1	BEP Reliability	Workflows and definitions approved in the BEP must be reflected in the models. Attention must be given to model breakdown strategy, project file names, phasing strategy, worksets strategy and parent / child relationships.
	2	Phasing Consistency	Phasing strategy proposed in the BEP must be followed, and consistency is expected, i.e., no 'Comments' parameter reading 'existing' and phase set to 'New Construction'.
	3	Cleanup	CD and Issued for Construction submission models should not contain abandoned designs, testing models, empty worksets, personal views, 'design options. All families not part of the project should be purged.
	4	Duplications/ Placeholder Objects	To ensure clarity and that only the intended element is used, all duplicate/placeholder objects must be tagged as such (e.g. 'PLC' acronym inside 'Mark'). Provide a clear strategy in the BEP for managing duplication, identifying which model is the host and which the placeholder. The party responsible for generating, and the model in which, tracked assets are located should be clear and align with the AIR (DGS). For example, if there are several Architectural models, what assets are located in which model? If there are duplicates which model is the host and which the placeholder? Which model has valid rooms? etc. All placeholder objects must be removed from the data set by 95% CD submission.
2	**Model Coordination**		
	1	Modeling Precision	To support effective virtual coordination, the expectation is that elements will be model to represent their correct size and location in space, including slopes and insulations if applicable. The Team should record in the BEP any elements that will not meet this fundamental requirement. To support energy analysis, consistent materials are expected to be used in all assemblies that compose the building envelope. Use of the out of the box "Basic Ceiling" is not allowed. The use of this element with no thickness, is a known and documented issue that causes problems downstream.

DESIGN PHASE: Modeling and Data Requirements			
	Title/Topic		**Description**
	2	Clearances	A strategy to ensure proper clearances must be described by the Team in the BEP (e.g., represent required clearance zones using dedicated model objects or equivalent methods supported by the BIM authoring application). The modelling approach shall enable the required clearances to be reviewed during virtual coordination.
	3	Virtual Coordination	Virtual coordination, as defined in this document, is expected to occur throughout Design. The expectation is that by the end of the design phase the models will be fully coordinated. Strategies for managing clearances for non modeled systems/objects must be recorded in the BEP.
3	**Assets Extraction**		
	1	Modeled Objects	All elements identified in the AIR (DGS) are tracked assets that must be modeled if part of the project. Any exception must be documented in the BEP for review/approval.
	2	Geometry (LOD: Geometrical Level of Resolution)	It is a fundamental requirement that objects shown/tagged in sheets are modeled (not lines, filled regions or symbols). All tracked assets must have the 'Geometrical Information' LOD) defined in the AIR (DGS) from Columns to P and Q. Image files representing drawings is prohibited. 2D representation can only be used for elements that do not impact virtual coordination and are not tracked assets. However, these elements must be modeled as families.
	3	Scope Clarification	The strategy for identifying assets as existing or future elements, or those that are not included in the contract (NIC) or purchased by the client and installed by others, must be consistently used across all models, and recorded in the BEP. If using sequential tendering, all tracked assets must contain their tender package association in a parameter.
	4	In-place Families	In-place families cannot be used for tracked assets.
	5	Asset Granularity	In some cases, assets can be split up unnecessarily in multiple instances or several assets can be combined into one object (e.g., skids). The breakdown of tracked assets into component parts should be in alignment with the AIR (DGS). Exceptions must be recorded in the BEP.
4	**Assets Location**		
	1	Model Alignment	All federated models, including IFC files and laser scan data, shall be aligned using the project's established coordinate reference system and model origin to ensure accurate project georeferencing. Grids and levels must be consistently named and located across all models.
	2	Room Bounding	Architectural rooms will be used to categorize tracked assets in the models. To achieve adequate quantification of components inside a room, room objects must use level offsets from the structural floor elevation in the associated level to the underside of the next structural floor/slab/deck above.

DESIGN PHASE: Modeling and Data Requirements			
	Title/Topic		**Description**
			Ceilings, floors, and wall finishes must not be “Room Bounding’.
	3	Existing Rooms	For areas where tracked assets are being added or modified in existing areas, those rooms must be modeled using separation lines, if necessary, to ensure objects can be properly assigned to the correct room.
	4	Associated Room	Each tracked asset must be associated to one specific room, as such all spaces with tracked assets must have a placed room object, e.g., shafts. There should be no unplaced, redundant, or overlapping rooms present in any model. Exterior and roof ‘rooms’ must be modeled using room separation lines and placed with the correct height, to capture elements outside the building envelope. Exterior/Roof rooms must be identified with a prefix.
	5	Associated Level	Tracked assets must be associated to the correct level, i.e., the level they are immediately above. Items below the lowest level, i.e., sumps, should be modeled at the correct location so they can be captured. Special care must be taken when copying elements inside a model. Modeling across multiple levels must be avoided.
	6	Multiple Repetitive Rooms	All tracked assets and associated systems must be modeled in all rooms on all levels. Each floor plate must be modeled in its entirety. When using typical levels a strategy for achieving this must be recorded in the PEP. Each room must have a parameter that identifies the Room Type it belongs to. A strategy to provide this information must be described in the BEP if applicable.
5	**Assets Classification**		
	1	OmniClass Classification	OmniClass 2012 Table 23: must be used to identify all modeled tracked assets. OmniClass numbers for each asset type are defined in the AIR (DGS).
	2	Room Classification	Room types must be defined using OmniClass Table 13 classification system, as defined in the Room Data Requirements tab in the AIR (DGS/DCS) spreadsheet.
	3	Consistent Category	Tracked assets shall be modeled using the appropriate built-in object types or object classes provided by the BIM authoring application. Generic object categories or miscellaneous object types shall not be used to represent tracked assets. Any approved exceptions shall be documented in the BIM Execution Plan (BEP).
	4	Descriptive Names	The use of ‘standard’, ‘default’, ‘company initials’ prefix, or the use of numbers alone is prohibited. ‘Family Name’ and ‘Type Name’ must follow a consistent theme of naming general to specific as these will be used to identify objects during the construction phase.

DESIGN PHASE: Modeling and Data Requirements			
	Title/Topic		**Description**
	5	System Naming	The Team must use the 'prefix' in **Appendix C** to identify systems within the model dataset. The AIR (DGS) defines which asset types require system information.
6	**Data Clarity**		
	1	Built-in Parameters	Built-in parameters must be used when present unless an approved process is recorded in the PEP. Using these parameters ensures that the data is where it is expected to be and that it can be consistently used. Custom or shared parameters should only be used if a 'Built-in' parameter is not available. Built-in parameters should not be duplicated.
	2	Object tag and relationships	Asset Identifier and Type Identifier, or equivalent information attributes supported by the BIM authoring application, shall be used to identify tracked assets as defined in the AIR (DGS). The proposed strategy to capture parent/child relationships of MEP equipment must be consistent across the Design Delivery Team and recorded in the BEP.
	3	Views and Schedules Data Usage	2D text notes will not be accepted to tag tracked assets. Any notes or descriptions shown in documentation must be reflected in the modeled object parameters. All project views and schedules must be generated directly from the model and its underlying data. Exceptions to this rule are limited to schematic diagrams, wiring diagrams, point to point diagrams, riser diagrams, details and 2D CAD details when approved
	4	Non-modeled tracked assets	Tracked asset that will not be modeled, i.e., building controls, must be included as a custom parameter on all tacked assets, where applicable.
END OF DESIGN PHASE: Modeling and Data Requirements			

Appendix E: BIM Execution Plan (BEP) Design

The following table sets out issues that need to be considered and addressed within the Design Phase BEP.

DESIGN PHASE: BEP			
	Title/Topic		**Description**
BEP Overview			Brief description of project type including any additional information not provided elsewhere in this document along with the digital goals and uses.
1	**Project Information**		
			ID, name, description, address, contract type, BIM Specification version, standard units, number, and name of buildings
2	**Site and Building Information**		
			Site location / key plan, orientation, ID, name, project type (new/existing/renovation), target occupancy date
3	**Schedules and Frequencies**		
	1	Project Timeline	Project schedule, list of submittals with proposed dates, list of Tender packages with milestone submission dates
	2	BIM Activities	BIM kick-off meeting date, frequency of BIM meetings, virtual coordination sessions and cost estimate submissions
	3	BIM Uses and Strategies	Agreed goals and uses, along with proposed strategies to achieve them
	4	BIM Exchanges	Method and frequency of model exchanges
4	**Team Definition**		
			BIM related participants with role, organization, name, email, phone, time zone
5	**Software**		
	1	Platforms and versions	Design authoring, design analysis (structural, lighting, power, energy, cost), issue tracking, specifications, virtual coordination, collaboration, communications, file/document exchange and management.
6	**Standards**		
	1	Naming structure	Disciplines, models, links, levels, worksets
7	**Model Information**		
	1	Model Files	Discipline/content, name, authoring company
	2	Model Hierarchy	Identify reference models using placeholder assets and models with rooms and tracked assets.
	3	External Links (.dwg, .ifc)	Discipline/content, name, authoring company
	4	Levels	Consistent level naming, project elevation, site elevation, across all models

DESIGN PHASE: BEP			
	Title/Topic		**Description**
	5	Coordinates	Consistent coordinates across all models, i.e., either shared coordinates or survey location.
	6	Grids	Consistent grid name and location across all models
	7	Phases	Name should be descriptive, i.e., Phase 1; Phase 2 rather than 'new' or 'extg'.
	8	Worksets	Descriptive name must be used, default visibility (on/off)
Strategies and Workflows			
1	**Modeling Strategies**		
	1	Model Breakdown	Required for larger projects to keep model size manageable. The BEP should include an outline of what will be modeled in each file.
	2	Model Alignment	Define project origin, coordinate system and true north orientation to be consistent across all models.
	3	Phasing Strategy	Required to be consistent across all models.
	4	Clearances	Define how required clearances will be modeled and managed
	5	Finishes	Define strategy for management of finishes.
2	**Workflow Issues Strategies**		
	1	Multiple Models	Process for managing multiple models within a discipline
	2	Non-Revit Models	Describe the process to coordinate across different software types
	3	Software version update	Describe strategy to be used to update all models
	4	Object duplication	Strategy for managing duplication across all models (e.g., openings, housekeeping pads, plumbing fixtures, lighting fixtures, stairs, ceilings etc.). Strategy to include identifying which model is the host and which the placeholder.
	5	Parent Child Relationship	Strategy for managing this requirement amongst tracked assets.
	6	Naming	The naming strategy must be descriptive and applied to both Family and Type for all model objects.
	7	Room Association	Strategy for developing the relationship between rooms and their unit type + number
3	**Virtual Coordination Strategies**		
	1	Clash Detection	Proposed process to find issues (hard and soft clashes)
	2	Issue Tracking	Proposed process for assigning, and resolving issues
	3	Risk Mitigation	Describe the process for mitigating the risk for running virtual coordination with systems that have not been modeled, i.e., sprinkler system, pneumatic tube.

4	**Data Quality Strategies**		
	1	OmniClass 2012	Describe process to populate OmniClass (Table 23) number for tracked assets and OmniClass (Table 13) number for rooms along with the QC process to be used to check for accuracy.
	2	Systems	Describe process to be used to ensure that all mechanical and electrical assets are associated with consistent systems.
	3	Asset and Type Identifiers	Define the QA/QC process to ensure consistent use across all models
	4	Relationships	Strategy to ensure accuracy of parent/child and equipment power source relationships between tracked assets within the same model and across models (e.g., pump/system)
	5	Shared Parameters	Provide list of all shared parameters in the project and the categories to which they apply.
	6	Record Model	Strategy to ensure the design models remain in alignment with the built condition and the accuracy table.
5	**Project Specific Amendments and Exclusions**		
			Provide list of, and reasons for, any requested exemptions to the BIM Specifications. All requested exemptions require approval.
END OF DESIGN PHASE: BEP			

Appendix F: BIM Project Execution Plan (BEP) Construction

The following tables sets out issues that need to be considered and addressed within the Construction Phase BEP.

CONSTRUCTION PHASE: PEP			
	Title/Topic		**Description**
1	**Team Definition**		
			BIM related participants with role, organization, name, email, phone, time zone
2	**Trade Information**		
			List of trades responsible for data and document upload and their scope of work
3	**Virtual Coordination**		
	1	Design Model Sign off	Process for sign off on use of design models (if required)
	2	Fabrication Models	List fabrication models (if generated)
	3	Software	Types and versions
	4	Timeline	Coordination session schedule, required participants
	5	Strategy + Workflows	Sharing strategy, resolution process, feedback, management of process for maintenance of service access and replacement paths
4	**Design Model Update**		
	1	Update Strategy	Define strategy, workflows, and frequency for model updates
	2	Model Accuracy	Define strategy for defining and managing the accuracy of the design models to the built facility and the accuracy table
5	**Data and Document Upload**		
			Define strategy for managing participation and checking quality of the data and documents uploaded
6	**Project Schedule**		
			Provide updated project schedule, including substantial completion timelines
END OF CONSTRUCTION PHASE: BEP			

Appendix G: AIR Asset Information Requirements

referred to in this document as Data and Geometry Specification (DGS) + Data Collection Specification (DCS)

The following table sets out the expected input from both the Design and Construction Delivery Teams into the DGS and DCS spreadsheet respectively.

Refer to the notes tab in the AIR (DGS/DCS) document.

Asset Information Requirementt (AIR)

Uniformat II Owner Define - For Reference Only					BIM Uses (Based on Owner goals)				Asset Identification		Minimum OmniClass Classification	Design Models Database Requirements (Revit or similar)														Construction Requirements (Construction Phase)								
					FMO		PM					Geometry Requirement			Data Parameters (required, to be finalized by indicated milestone)					Custom Owner Defined Parameters (Based on owner goals)					Submission @ Shop Drawings Approval						Submission Prior to: Substantial Completion		
Asset Category	Asset Group CODE	Asset Group Name	LEVEL 3 CODE	LEVEL 3 NAME	Access for maintenance, replacement (Use of data and location included)	Asset Registry generation (" Y" indicates location / counts only)	Virtual coordination	Visualization (understanding design and compliance)	Asset	Acronyms (Suggested acronyms, if authority do not have a	OmniClass Classification	Geometry Level of Development	Model Clearance Required (for access, replacement or code requirement)	Delivery Milestone	Asset type label (e.g Type Mark in Revit)	Asset Label (e.g Mark in Revit)	OmniClass Classification Name (refer to column N for required data)	OmniClass Classification Number (refer to column N for required data)	System Information (Name, Classification, Abreviation,etc.)	Fire Rating	Hardware Group	Parent - Child Relationship	Sound Rating	Tender Packge Name/Number (if applicable)	Shop Drawings (Aproved)	Manufacturer	Model	Serial No.	Vendor / Supplier	Housing Authority Asset Number	Installation Date /Substantial Completion Date	Manufacturers Instruction Manuals	Warranty End Date
Architectural																																	
B	B10	SUPERSTRUCTURE	B1020	Roof Construction	Y	Y	Y	Y	Roof	ROOF	23-13 39 00 (Roof Coverings, Claddings, Linings)	LOD 300	N	50/60%	DD	50/60%	50/60%	50/60%		50%	90%	50%	IFC	Y	Y			Y	Y	Y		Y
	B20	EXTERIOR VERTICAL ENCLOSURES	B2010	Exterior Walls	Y	Y	Y	Y	Walls (Exterior)	W	23-13 33 15 (Wall Exteriors)													Y				Y		Y		Y
				Exterior Walls	Y	Y	Y	Y	Walls (Structural)	W	23-13 35 21 (Structural Walls)													Y				Y		Y		Y
		EXTERIOR VERTICAL ENCLOSURES	B2030	Storefronts Exterior	Y	Y	Y	Y	Automatic Door	ADR	23-17 11 00 (Doors)		Y											Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y	Y	Exterior Door	ED	23-17 11 00 (Doors)													Y				Y		Y		Y
					Y	Y	Y	Y	Overhead Door	OHDR	23-17 11 00 (Doors)		N											Y	Y	Y	Y	Y	Y	Y	Y	Y
C	C10	Interior Construction	C1030	Interior Doors	Y	Y	Y	Y	Interior Door	D	23-17 11 00 (Doors)		Y											Y				Y		Y		Y
					Y	Y	Y	Y	Fire Doors	FDR	23-17 11 31 (Fire Doors)													Y				Y	Y	Y		Y
G	G30	Liquid and Gas site utilities	G3030	Storm Drainage Utilities	Y	Y			Roof Drain	RD	23-13 41 39 (Roof Drains)	LOD 200	N											Y	Y			Y		Y		Y
E	E20	FURNISHINGS	E2010.	Fixed Furnishings	Y	Y			Custom General Casework	C	23-21 19 13 (Custom General Casework)	LOD 300												Y	Y			Y	Y	Y		Y
Audio/Visual/Electronic Security																																	
B	B20	EXTERIOR VERTICAL ENCLOSURES	B2050	Exterior Doors and Grilles	Y	Y			Automatic Door Controls and Operators	ADC	23-17 19 11 31 (Automatic Door Controls and Operators)	LOD 200												Y	Y	Y		Y	Y	Y	Y	Y
D	D60	COMMUNICATIONS	D6020	Voice Communications	Y	Y			Sound Devices	S	23-37 17 11 (Sound Devices)	LOD 300	N	50/60%	DD	50/60%	50/60%	50/60%	90%				IFC	Y	Y	Y		Y	Y	Y	Y	Y
			D6030	Audio-Video Communication	Y	Y			Audio Equipment	AU	23-37 15 29 (Audio Equipment)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Audio Visual Recorders	AV	23-37 15 21 (Audio Visual Recorders)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Video Recording Equipment	VER	23-37 15 27 (Video Recording Equipment)													Y	Y	Y		Y	Y	Y	Y	Y
			D6060	Distributed Communications and Monitoring	Y	Y			Intercom Equipment	IE	23-37 23 17 (Intercom Equipment)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Public Address Equipment	PA	23-37 17 15 (Public Address Equipment)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Public Address System	PA	23-37 17 15 (Public Address Equipment)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Building Clock Controls	CK	23-27 15 11 (Building Clock Controls)	LOD 200												Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Building Management System Controller (BMS/BAS)	BMS/BAS	23-27 13 13 13 (Building Automated Systems)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Building Monitoring Control Panels	BMCP	23-27 13 13 15 (Building Monitoring Control Panels)	LOD 300												Y	Y	Y		Y	Y	Y	Y	Y
	D70	Electronic Safety and Security	D7010	Access Control and Intrusion Detection	Y	Y			Security Door Answering Controls	SECD	23-29 13 17 (Security Door Answering Controls)	LOD 200												Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Security Personnel Access Keypads	K	23-29 13 21 (Security Personnel Access Keypads)	LOD 300	N											Y	Y	Y		Y	Y	Y	Y	Y
			D7030	Electronic Surveillance	Y	Y		Y	Camera	C	23-37 15 11 (Cameras)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y			Camera Recorders	CREC	23-37 15 13 (Camera Recorders)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y		Y	Closed Circuit Television (CCTV)	CCTV	23-29 11 11 (Closed Circuit Television Equipment)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y			Door Request-to-Exit Switch	DREX	23-17 19 11 29 17 (Door Request to Exit Switches)	LOD 200	N											Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Electrified Lockset	LSET	23-29 13 19 (Electronic Key Equipment)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Intrusion Detection Devices	IDD	23-29 11 23 (Intrusion Detection Devices)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Personnel Card Reader	CR	23-29 13 13 (Personnel Card Readers)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Security Camera Monitoring System Panels	CAMP	23-29 11 11 21 (Security Camera Monitoring System Panels)	LOD 300												Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Security Video Imaging System Equipment	S	23-29 11 13 (Security Video Imaging System Equipment)													Y	Y	Y		Y	Y	Y	Y	Y
			D7050	Detection and Alarm	Y	Y			Presence Detection Registration	PDR	23-29 11 25 (Presence Detection Registration)													Y	Y	Y		Y	Y	Y	Y	Y
			D7090	Electronic Safety and Security Supplementary Components	Y	Y			Personnel Biometric Readers	PBR	23-29 13 11 (Personnel Biometric Readers)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Personnel Counting Equipment	PCE	23-29 13 15 (Personnel Counting Equipment)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Security Sensors	SECS	23-29 11 21 (Security Sensors)	LOD 200												Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Signal Devices	SD	23-37 17 13 (Signal Devices)													Y	Y	Y		Y	Y	Y	Y	Y
*	D80	INTEGRATED AUTOMATION	D8010	Integrated Automation Facility Controls	Y	Y			Elevator Monitoring and Controls	ELEVC	23-27 15 15 (Elevator Monitoring and Controls)		N											Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Building Automation and Control	BAC	23-27 15 00 (Building Automation and Control)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Building Control Systems	BCS	23-27 13 13 (Building Control Systems)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Building Door Controls	BDC	23-27 15 13 (Building Door Controls)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Energy Management Control System (EMCS)	EMCS	23-27 15 17 (Energy Monitoring and Controls)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Building Automation System	BAS	23-27 15 00 (Building Automation and Control)													Y	Y	Y		Y	Y	Y	Y	Y
E	E10	EQUIPMENT	E1010	Vehicle and Pedestrian Equipment	Y	Y			License Plate Reader Camera (LPR)	LPR	23-39 11 15 19 (Traffic Cameras)													Y	Y	Y		Y	Y	Y	Y	Y
			E1040	Institutional Equipment	Y	Y			Digital Music Players	DMP	23-37 15 15 (Digital Music Players)													Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Computer Video Conferencing Equipment	CVCR	23-37 13 27 (Computer Video Conferencing Equipment)	LOD 300												Y	Y	Y		Y	Y	Y	Y	Y
					Y	Y			Projection Equipment	PJE	23-37 15 17 (Projection Equipment)													Y	Y	Y		Y		Y	Y	Y
*			E1090	Other Equipment	Y	Y			Access Control Turnstiles	AT	23-29 13 23 (Access Control Turnstiles)	LOD 200												Y	Y	Y		Y	Y	Y	Y	Y
Circulation/Escape/Protection																																	

summit BIM

Asset Information Requirementt (AIR)

Uniformat II Owner Define - For Reference Only					BIM Uses (Based on Owner goals)				Asset Identification		Minimum OmniClass Classification	Design Models Database Requirements (Revit or similar)													Construction Requirements (Construction Phase)								
					FMO		PM					Geometry Requirement			Data Parameters (required, to be finalized by indicated milestone)					Custom Owner Defined Parameters (Based on owner goals)					Submission @ Shop Drawings Approval						Submission Prior to: Substantial Completion		
Asset Category	Asset Group CODE	Asset Group Name	LEVEL 3 CODE	LEVEL 3 NAME	Access for maintenance, replacement (Use of data and location included)	Asset Registry generation (* indicates location / counts only)	Virtual coordination	Visualization (understanding design and compliance)	Asset	Acronyms (Suggested acronyms, if authority do not have a	OmniClass Classification	Geometry Level of Development	Model Clearance Required (for access, replacement or code requirement)	Delivery Milestone	Asset type label (e.g Type Mark in Revit)	Asset Label (e.g Mark in Revit)	OmniClass Classification Name (refer to column N for required data)	OmniClass Classification Number (refer to column N for required data)	System Information (Name, Classification, Abreviation,etc.)	Fire Rating	Hardware Group	Parent - Child Relationship	Sound Rating	Tender Packge Name/Number (if applicable)	Shop Drawings (Aproved)	Manufacturer	Model	Serial No.	Vendor / Supplier	Housing Authority Asset Number	Installation Date /Substantial Completion Date	Manufacturers Instruction Manuals	Warranty End Date
D	D10	CONVEYING	D1010	Vertical Conveying Systems	Y	Y	Y		Dumbwaiter	DW	23-23 17 11 (Dumbwaiters)	LOD 300	Y	50/60%	DD	50/60%	50/60%	50/60%					IFC	Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y	Y	Elevator	ELEV	23-23 11 11 (Elevators)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y	Y	Escalator	ESC	23-23 11 13 (Escalators)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y			Scissor Lift	SL	23-23 13 11 (Lifts)													Y	Y	Y	Y	Y	Y	Y		Y
Electrical																																
D	D50	ELECTRICAL	D5010	Facility Power Generation	Y	Y			Automatic Transfer Switch	ATS	23-35 37 11 (Automatic Transfer Switches)	LOD 200		50/60%	DD	50/60%	50/60%	50/60%	90%				IFC	Y	Y	Y		Y		Y		Y
					Y	Y			Bypass Automatic Transfer Switch	BATS	23-35 41 00 (Electrical Isolation Equipment)	LOD 300	N											Y	Y	Y		Y		Y		Y
					Y	Y			Battery Charger	BATCHRG	23-35 21 00 (Battery Chargers)													Y	Y	Y		Y		Y	Y	Y
					Y	Y			Disconnect Switch	DS	23-35 37 19 (Disconnect Switches)													Y	Y	Y		Y		Y		Y
					Y	Y			Fused Disconnect Switch	FDS	23-35 37 19 (Disconnect Switches)													Y	Y	Y		Y		Y		Y
					Y	Y			Fused Safety Switch	FSS	23-35 37 19 (Disconnect Switches)	LOD 200												Y	Y	Y		Y		Y		Y
					Y	Y	Y	Y	Generator	GEN	23-35 11 00 (Electrical Generators)	LOD 300	Y											Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Generator Batteries	GENBAT	23-35 19 00 (Batteries)													Y	Y	Y		Y		Y		Y
					Y	Y			Manual Transfer Switch	MTS	23-35 37 13 (Manual Transfer Switches)	LOD 200	N											Y	Y	Y		Y		Y		Y
					Y	Y			Safety Switch	SSW	23-35 37 19 (Disconnect Switches)		N											Y	Y	Y		Y		Y		Y
					Y	Y			Transfer Switch	TSW	23-35 37 13 (Manual Transfer Switches)	LOD 300	Y											Y	Y	Y		Y		Y		Y
					Y	Y			Uniterruptible Power System	UPS	23-35 23 21 (Uninterrupted Power Supply (UPS) Units)													Y	Y	Y		Y		Y	Y	Y
			D5020	Electrical Service and Distribution	Y	Y	Y		Current Transformer	CT	23-35 13 13 11 (Current Instrument Transformers)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Distribution Panel	DP	23-35 31 13 (Distribution Panel Boards)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y			Ground Fault Circuit Interrupter	GFI	23-35 29 23 (Ground Fault Circuit Interrupters)	LOD 200	N											Y	Y	Y		Y		Y		Y
					Y	Y			Heat Trace	HT	23-33 15 15 17 (Cable Heat Trace)	LOD 300												Y	Y	Y		Y		Y		Y
					Y	Y	Y		Main Distribution Panel	MDP	23-35 31 13 (Distribution Panel Boards)		Y											Y	Y	Y	Y	Y	Y	Y		Y
					Y	Y	Y		Motor Control Centre	MCC	23-35 31 23 (Motor Control Centers)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Panel Board	P	23-35 31 17 (Electrical Panel Boards)													Y	Y	Y	Y	Y	Y	Y		Y
					Y	Y	Y		Power Distribution Center	PDC	23-35 31 27 (Power Distribution Units)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Substation	SUB	23-39 23 00 (Electrical Utility Equipment)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Switch Board	SWBD	23-35 31 29 (Switchboards)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Switchgear	SWG	23-35 31 31 (Switchgear)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Transformer	T	23-35 13 00 (Transformers)													Y	Y	Y	Y	Y	Y	Y	Y	Y
			D5040	Lighting	Y	Y			Lighting Control Panel	LCP	23-27 15 21 11 (Building Lighting Control Panel)													Y	Y	Y		Y	Y	Y		Y
					Y	Y		Y	Emergency Lighting	EML	23-35 47 13 (Emergency Lighting)		N											Y	Y	Y		Y		Y	Y	Y
					Y	Y		Y	Exit Light	EXL	23-35 47 15 (Exit Illuminated Signs)													Y	Y	Y		Y		Y		Y
Fire Protection																																
D	D40	FIRE PROTECTION	D4010	Fire Suppression	Y	Y	Y		Fire Protection Water Pump	FPWP	23-27 17 00 (Pumps)	LOD 300	Y	50/60%	DD	50/60%	50/60%	50/60%	90%		90%		IFC	Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Jockey Pump	JP	23-27 17 00 (Pumps)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Dry Pipe Sprinkler System	DPSS	23-29 33 00 (Fire Suppression System Components)													Y	Y	Y		Y		Y		Y
					Y	Y	Y		Fire Department Connection	FDC	23-29 25 15 19 13 (Fire Fighting Pumper Connections)		N											Y	Y	Y		Y		Y		Y
					Y	Y	Y		Fire Hose Cabinet	FHC	23-29 25 15 15 (Cabinets for Fire Hoses)		Y											Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Fire Protection Backflow Preventor	FPBFP	23-27 31 11 (Backflow Preventors)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Fire Protection Dry -Air Compressor	FPDAC	23-27 21 00 (Compressors)													Y	Y	Y		Y		Y		Y
					Y	Y	Y		Fire Pump Automatic Transfer Switch	FPATS	23-35 37 11 (Automatic Transfer Switches)		N											Y	Y	Y		Y		Y		Y
					Y	Y	Y		Fire Pump Switch Gear	FPSW	23-35 31 31 (Switchgear)		Y											Y	Y	Y		Y		Y		Y
					Y	Y	Y		Fire Sprinkler System	FSRP	23-29 33 00 (Fire Suppression System Components)													Y	Y	Y		Y		Y		Y
					Y	Y	Y		Fire Suppression	FSUPP	23-29 33 00 (Fire Suppression System Components)													Y	Y	Y		Y		Y		Y
					Y	Y	Y		Fire Switches	FASW	23-29 29 15 (Fire Switches)													Y	Y	Y		Y		Y		Y
					Y	Y	Y		Fire System Damper	FDAMP	23-33 29 23 (Fire Dampers)													Y	Y	Y		Y		Y		Y
					Y	Y	Y		Fixed Dry Chemical Extinguishing System	FDCES	23-29 33 13 19 (Dry Chemical Fire Suppression Equipment)													Y	Y	Y		Y		Y		Y
					Y	Y	Y		Fixed Wet Chemical Extingushing System	FWCES	23-29 33 13 17 (Wet Chemical Fire Suppression Equipment)													Y	Y	Y		Y		Y		Y
					Y	Y	Y		Foam Water Sprinkler System	FWSS	23-29 33 00 (Fire Suppression System Components)		N											Y	Y	Y		Y		Y		Y
					Y	Y	Y		Heat Detectors	HD	23-27 11 19 11 (Heat Detectors)													Y	Y	Y		Y		Y		Y
					Y	Y	Y		Jockey Pump Controllers	JPC	23-29 31 35 (Jockey Pump Controllers)	LOD 200												Y	Y	Y		Y		Y		Y
					Y	Y	Y		Kitchen Hood Fire Suppression	KHFS	23-33 31 17 (Exhaust Hood Fire Suppression System)	LOD 300												Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Kitchen Suppression System	KSS	23-33 31 17 (Exhaust Hood Fire Suppression System)													Y	Y	Y		Y		Y		Y
					Y	Y	Y		Standpipe	STP	23-29 25 15 19 11 (Fire Fighting Standpipes)													Y	Y	Y		Y		Y		Y
					Y	Y	Y		Wet Pipe Sprinkler System	WPSS	23-29 33 00 (Fire Suppression System Components)													Y	Y	Y		Y		Y		Y
			D4030	Fire Protection Specialties	Y	Y	Y		Fire Extinguisher	FEXT	23-29 25 19 (Fire Extinguishers)													Y	Y	Y		Y		Y		Y
Mechanical: HVAC and Plumbing																																
					Y	Y	Y		Compression Tank	CTK	23-27 29 19 (Tanks)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Flash Tank	FT	23-27 29 19 (Tanks)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Acid Netralization Tank	ANT	23-27 29 19 (Tanks)													Y	Y	Y	Y	Y	Y	Y	Y	Y

nt

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Asset Information Requirementt (AIR)

Uniformat II Owner Define - For Reference Only					BIM Uses (Based on Owner goals)				Asset Identification		Minimum OmniClass Classification	Design Models Database Requirements (Revit or similar)															Construction Requirements (Construction Phase)								
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	D20	PLUMBING	D2010	Domestic Water Distribution	Y	Y	Y		Chilled Water Heat Exchanger	CHWHEX	23-27 23 00 (Heat Exchangers)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Heat Exchanger	HEX	23-27 23 00 (Heat Exchangers)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Pressure Relief Valve	PRV	23-27 31 49 11 (Pressure Relief Valves)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Safety Valve	SV	23-27 31 53 (Safety Valves)													Y	Y	Y		Y		Y		Y
					Y	Y	Y		Backflow Preventer	BFP	23-27 31 11 (Backflow Preventors)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Domestic Hot Water Expansion Tank	DHWEXT	23-31 29 13 (Hot Water Tank Heaters)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Domestic Hot Water Tank	DHWT	23-31 29 13 (Hot Water Tank Heaters)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Domestic Water Pressure Reducing Valve	DWPRV	23-27 31 47 (Pressure Regulating Valves)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Elevator Sump Pump	ESP	23-27 17 35 11 (Submersible Sewage Ejectors)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Gas Fired Domestic Hot Water Heater	GFDWH	23-31 29 11 13 (Gas Instantaneous Hot Water Heaters)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Hot Water Heater	HWH	23-31 29 11 (Instantaneous Hot Water Heaters)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Hot Water Unit Heater	HUH	23-31 29 11 (Instantaneous Hot Water Heaters)													Y	Y	Y	Y	Y	Y	Y	Y	Y
			D2020	Sanitary Drainage	Y	Y	Y		Pump Station	PSTN	23-39 31 11 11 (Packaged Pumping Stations)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Sediment Interceptor	SEDINT	23-39 37 15 (Sediment Removal Equipment)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Grease Interceptor	GI	23-27 37 11 (Grease Traps)													Y	Y	Y	Y	Y	Y	Y	Y	Y
			D2030	Building Support Plumbing Systems	Y	Y	Y		Gas Detector	GD	23-39 35 11 17 (Gas Storage, Weighing, and Leak Detection Equipment)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Sand Filter	SDF	23-27 55 11 (Liquid Filters)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Sanitary Sump Pump	SSP	23-27 17 35 11 (Submersible Sewage Ejectors)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Storm Sump Pump	STSP	23-27 17 35 11 (Submersible Sewage Ejectors)													Y	Y	Y	Y	Y	Y	Y	Y	Y
			D2050	General Service Compressed-Air	Y	Y	Y		Air Compressor	AC	23-27 21 00 (Compressors)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Valve	V	23-27 31 00 (Valves)													Y	Y	Y		Y		Y		Y
			D3010	Facility Fuel Systems	Y	Y	Y		Hydraulic Oil Pump	HOP	23-27 17 00 (Pumps)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Fuel Oil Pump	FOP	23-27 17 00 (Pumps)													Y	Y	Y	Y	Y	Y	Y	Y	Y
m					Y	Y	Y		Chemical Feed Tank	CFT	23-27 29 19 (Tanks)													Y	Y	Y	Y	Y	Y	Y	Y	Y
			D3020	Heating Systems	Y	Y	Y		Air Handling Unit	AHU	23-33 25 00 (Air Handling Units)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Air Separator	AS	23-27 55 35 (Liquid Separators)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Boiler	BLR	23-33 11 00 (Commercial Boilers)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Air Filter	AF	23-27 57 27 (Air Filters)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		De-Aerator	DA	23-27 55 35 (Liquid Separators)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Electric Duct Heater	EDH	23-33 15 17 11 (Fuel Fired HVAC Duct Heaters)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Electric Unit Heater	EUH	23-33 15 00 (HVAC Heating Units)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Force Flow Heater	FF	23-33 15 27 (Forced Air Electric HVAC Heaters)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Furnace	FURN	23-33 13 00 (Furnaces)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Radiant Heat Panel	RHP	23-33 15 17 13 (Fuel Fired HVAC Radiant Heaters)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Radiant Heating System	RHS	23-33 15 17 13 (Fuel Fired HVAC Radiant Heaters)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Supply Air Intake	SAI	23-33 49 27 (Ventilators)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Terminal Heating Unit	THU	23-33 15 00 (HVAC Heating Units)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Solar Panel	SOLP	23-19 25 11 19 15 (Solar Panels)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Unit Heater	UH	23-33 15 00 (HVAC Heating Units)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Steam Filter	STFLTR	23-27 55 11 (Liquid Filters)													Y	Y	Y	Y	Y	Y	Y	Y	Y
			D3030	Cooling Systems	Y	Y	Y		Chilled Water Pump	CHWP	23-27 17 00 (Pumps)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Chiller Condensor Pump	CCP	23-27 17 00 (Pumps)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Heat Pump	HP	23-27 17 00 (Pumps)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Secondary Chilled Water Pump	CHWSP	23-27 17 00 (Pumps)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Other Pump types	P	23-27 17 00 (Pumps)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Air Conditioning Condensing Unit	CU	23-33 37 00 (Refrigerant Condensing Units)	LOD 300	Y											Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Air Conditioning Unit	ACU	23-33 39 00 (Air Conditioning Equipment)													Y	Y	Y	Y	Y	Y	Y	Y	Y
*					Y	Y	Y		Air Curtain	ACUR	23-33 31 11 (Air Curtains)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Chemical Feed Equipment	CFE	23-39 35 00 (Water and Wastewater Chemical Feed Equipment)													Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Chiller	CH	23-33 21 00 (Chillers)													Y	Y	Y	Y	Y	Y	Y	Y	Y
*					Y	Y	Y		Coil	C	23-33 35 00 (HVAC Coils)													Y	Y	Y	Y	Y	Y	Y	Y	Y

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D	D30	HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)	D3030	Cooling Systems	Y	Y	Y		Computer Room A/C Unit	CRAC	23-33 39 11 11 (Room Air Conditioners)			50/60%	DD	50/60%	50/60%	50/60%	90%			90%		IFC	Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Condensing Coil	CONDC	23-33 43 00 (HVAC Condensing Units)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Condensing Fan Unit	CONDF	23-33 43 00 (HVAC Condensing Units)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Condensing Unit	CU	23-33 43 00 (HVAC Condensing Units)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		HVAC Cooler	COOL	23-33 45 00 (HVAC Coolers)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Cooling Coil	CC	23-33 35 00 (HVAC Coils)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Cooling Tower	CT	23-33 23 00 (Cooling Towers)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Dehumidifier	DHUM	23-33 27 13 (Dehumidifiers)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Fan Coil Unit	FCU	23-33 33 11 (Fan Coil Units)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Steam Heating Coil	SHC	23-33 35 00 (HVAC Coils)														Y	Y	Y	Y	Y	Y	Y	Y	Y
			D3050	Facility HVAC Distribution Systems	Y	Y	Y		Condensate Receiver	CONDR	23-27 29 19 (Tanks)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Condensate Tank	CONDT	23-27 29 19 (Tanks)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Condensate Tankless	CONTS	23-27 29 19 (Tanks)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Expansion Tank	EXT	23-27 29 19 (Tanks)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Air Dryer	AD	23-33 47 00 (Air Dryers)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Economizer	ECON	23-27 23 11 (Heat Exchanger Economizers)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Ehxaust Volume Control Box	EVCB	23-33 41 17 13 (Variable Air Volume Terminal Units)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Exhaust Fan	EF	23-33 31 19 (Fans)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Fan	F	23-33 31 19 (Fans)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Humidifier	HUM	23-33 27 15 (Air Humidifiers)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Manual Dampers	DAMP	23-33 29 19 13 (Manual Dampers)														Y	Y	Y		Y	Y	Y		Y
					Y	Y	Y		Mixing Box	MB	23-33 41 15 (HVAC Mixing Boxes)														Y	Y	Y		Y	Y	Y		Y
					Y	Y	Y		Motorized Dampers	DAMP	23-33 29 19 11 (Automatically Control Dampers)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Pressurization Fan	PF	23-33 31 19 (Fans)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Condensate Pump	CONDP	23-27 17 00 (Pumps)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Domestic Hot Water Recirculation Pump	DHWRP	23-27 17 00 (Pumps)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Heating Hot Water Pump	HHWP	23-27 17 00 (Pumps)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Hot Water Pump	HWP	23-27 17 00 (Pumps)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Hot Water Recirculation Pump	HWRP	23-27 17 00 (Pumps)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Variable Frequency Drive	VFD	23-35 17 15 (Variable Frequency Drives)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Variable Speed Drive	VSD	23-35 17 00 (Variable Speed Drives)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Variable Air Volume Box	VAV	23-33 41 17 13 (Variable Air Volume Terminal Units)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Steam Domestic Water Heater	SDWH	23-27 25 15 (Liquid Steam Heaters)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Steam Trap	ST	23-27 37 15 (Steam Traps)														Y	Y	Y	Y	Y	Y	Y	Y	Y
			D3060	Ventilation	Y	Y	Y		Fume Hood Exhaust Fan	FHEF	23-33 31 19 (Fans)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Heat Recovery Unit	ERV	23-33 55 00 (Energy HVAC Recovery Equipment)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y			HVAC Temperature Controllers	HVACTC	23-27 11 11 15 (Temperature Controllers)	LOD 200	N												Y	Y	Y		Y		Y		Y
					Y	Y			HVAC Temperature Detectors	HVACTD	23-27 11 11 17 (Temperature Detectors)	LOD 300	Y												Y	Y	Y		Y		Y		Y
					Y	Y	Y		Kitchen Exhaust Fan	KEF	23-33 31 19 (Fans)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Return Fan	RF	23-33 31 19 (Fans)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Stairwell Pressurization Fan	SPF	23-33 31 19 (Fans)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Supply Fan	SF	23-33 31 19 (Fans)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Toilet Exhaust Fan	TEF	23-33 31 19 (Fans)														Y	Y	Y	Y	Y	Y	Y	Y	Y
			D7010	Access Control and Intrusion Detection	Y	Y	Y		Fire Alarm Magnetic Door Holder	FAMAG	23-17 19 11 31 15 (Electromagnetic Door Holders)														Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Alarm Panel	AP	23-29 31 13 (Fire Alarm Control Panels)														Y	Y	Y		Y		Y		Y

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	D70	ELECTRONIC SAFETY AND SECURITY	D7050	Detection and Alarm	Y	Y	Y		Carbon Monoxide Alarm Systems	COALRM	23-27 11 17 17 (Other Gas Concentration Measuring Instruments)	LOD 200	N													Y	Y	Y		Y		Y		Y
					Y	Y			CO2	CO2SEN	23-27 11 17 13 (Carbon Dioxide (CO^2) Concentration Measuring Instruments)														Y	Y	Y		Y		Y		Y
					Y	Y			NO2 Sensor	NO2SEN	23-27 11 17 17 (Other Gas Concentration Measuring Instruments)														Y	Y	Y		Y		Y		Y
					Y	Y	Y		Duct Smoke Detector	DSD	23-29 29 13 11 (Smoke Detectors)	LOD 300	Y													Y	Y	Y		Y		Y		Y
					Y	Y		Y	Fire Alarm Annunciator	FAAN	23-29 31 11 (Fire Alarm Annunicator Panels)		N													Y	Y	Y		Y		Y		Y
					Y	Y			Fire Alarm Flow Switch	FAFS	23-29 29 15 (Fire Switches)															Y	Y	Y		Y		Y		Y
					Y	Y			Fire Alarm System	FAS	23-29 33 00 (Fire Suppression System Components)															Y	Y	Y		Y		Y		Y
					Y	Y	Y		Fire Alarm Control Panels	FAPNL	23-29 31 13 (Fire Alarm Control Panels)		Y													Y	Y	Y		Y		Y		Y
					Y	Y	Y		Dishwasher	DISH	23-21 21 19 (Commercial Dishwasher Equipment)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Freezer	FRZ	23-21 21 27 (Commercial Refrigerators And Freezers)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Fume Hood	FH	23-25 69 11 15(Laboratory Fume hoods)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Kitchen Appliance	APP	23-21 21 00 (Food Service Equipment and Furnishings)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Laundry Dryer	LDRY	23-21 23 51 (Residential Laundry Dryers)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Laundry Washer	LWASH	23-21 41 00 (Commercial Laundry Equipment)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Oven	OVEN	23-25 69 13 27 (Laboratory Ovens)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Reach In Cooler	RIC	23-21 21 27 13 25 (Commercial Upright Reach In Freezers)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Refrigerator	FRDG	23-21 21 27 (Commercial Refrigerators And Freezers)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Waste Compactor	WSTC	23-39 45 15 17 11 (Waste Compactors and Destructors)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Waste Dumper	WSTD	23-21 39 00 (Commercial Washing and Waste Disposal Equipment)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Duct Silencer	DSIL	23-33 49 21 17 (Ductwork Sound Attenuators)															Y	Y	Y		Y		Y		Y
					Y	Y	Y		Irrigation Sprinkler System	ISS	23-11 27 15 11 (Irrigation Sprinklers)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Fire Protection Water Storage Tank	FPWT	23-27 29 19 (Tanks)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Combination Fire And Domestic Water Tank	CWT	23-27 29 19 (Tanks)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Domestic Water Bladder Tank	DWBT	23-27 29 19 (Tanks)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Domestic Water Storage Tank	DWT	23-27 29 19 (Tanks)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Storage Tank	STO	23-27 29 19 (Tanks)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Water Storage Tank	WSTO	23-27 29 19 (Tanks)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Fire Hydrant	HYD	23-29 25 13 (Fire Hydrants)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Water Filter	WF	23-27 55 11 11 (Water Filters)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Water Meter	WM	23-27 11 15 17 (Flow Detector)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Water Treatment Package Unit	WTPU	Water Treatment Package Unit															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Hydraulic Oil Tank	HOT	23-27 29 19 (Tanks)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Fuel Oil Tank	FOT	23-27 29 19 (Tanks)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Air Tank	AT	23-27 29 19 (Tanks)															Y	Y	Y	Y	Y	Y	Y	Y	Y
					Y	Y	Y		Air Receiver	AR	23-27 29 15 (Specialized Tanks)															Y	Y	Y	Y	Y	Y	Y	Y	Y
E	E10	EQUIPMENT	E1030	Commercial Equipment																															
			E1090	Other Equipment																															
* F	F10	SPECIAL CONSTRUCTION	F1030	Special Function Construction																															
	G20	SITE IMPROVEMENTS	G2080	Landscaping																															
G	G30	LIQUID AND GAS SITE UTILITIES	G3010	Water Utilities																															
			G3060	Site Fuel Distribution																															
							Y	Y	Rooms			Geometry			Unit Type	Room Name	Room Number	Area (associated to the room/space)		House Authority Room Number	Security	Sound Rating												
												Placement required			DD	DD	DD	DD		90%	90%	90%												
							Y		Air terminals	Not required	Not required	LOD 300	Y																						
							Y	Y	Building Envelope				N/A																						
							Y	Y	Cable trays and accessories				Y																						
							Y	Y	Caseworks				N/A																						
							Y		Conduits and accessories				Y																						
							Y		Ducts and accessories				N/A																						
							Y	Y	Funiture																										
							Y		Pipes and accessories				Y																						
							Y		Structural building assets																										
							Y	Y	Walls (not included in the list above)																										

Asset for Geometry use only (Goals: Virtual Coordination)

N/A

Asset Information Requirementt (AIR)

Uniformat II Owner Define - For Reference Only					BIM Uses (Based on Owner goals)				Asset Identification		Minimum OmniClass Classification	Design Models Database Requirements (Revit or similar)														Construction Requirements (Construction Phase)								
					FMO		PM					Geometry Requirement			Data Parameters (required, to be finalized by indicated milestone)					Custom Owner Defined Parameters (Based on owner goals)					Submission @ Shop Drawings Approval						Submission Prior to: Substantial Completion		
Asset Category	Asset Group CODE	Asset Group Name	LEVEL 3 CODE	LEVEL 3 NAME	Access for maintenance, replacement (Use of data and location included)	Asset Registry generation (" " indicates location / counts only)	Virtual coordination	Visualization (understanding design and compliance)	Asset	Acronyms (Suggested acronyms, if authority do not have a	OmniClass Classification	Geometry Level of Development	Model Clearance Required (for access, replacement or code requiement)	Delivery Milestone	Asset type label (e.g Type Mark in Revit)	Asset Label (e.g Mark in Revit)	OmniClass Classification Name (refer to column N for required data)	OmniClass Classification Number (refer to column N for required data)	System Information (Name, Classification, Abreviation,etc.)	Fire Rating	Hardware Group	Parent - Child Relationship	Sound Rating	Tender Packge Name/Number (if applicable)	Shop Drawings (Aproved)	Manufacturer	Model	Serial No.	Vendor / Supplier	Housing Authority Asset Number	Installation Date /Substantial Completion Date	Manufacturers Instruction Manuals	Warranty End Date
							Y		Other (Assets not included on this table but that may be part of the project)																								

Appendix H: Level of Accuracy Table

The goal of the accuracy table is to ensure that the Record Model handed over to the Authority at the end of construction is a suitable representation of the built facility. Of specific importance are all tracked assets, as defined generally in the DCS and specifically in the project asset registry. The Construction Delivery Team is responsible for managing, recording, and providing all required information to allow the update of construction changes in the design models by the design consultants.

MAXIMUM DEVIATION ALLOWED						
	Asset Group	**Examples**	**Location (X + Y)**	**Elevation Accuracy (Z)**	**Slope**	**Count (number of assets)**
1	Tracked assets as defined by the DCS	Mech: Valves, Pumps, AHU, Equipment clearances Elec: Panels, Transformers, Lighting	100mm	100mm		Exact
2	All systems associated with the required tracked assets	Elec: Conduits when grouped, Cable trays	100mm	100mm		
3	Model elements directly associated with a tracked asset	Mech: Grilles, Louvers, Vents, Dampers, Access Panels, Drains	100mm	100mm		Exact
		Elec: Fire Alarms, Receptacles, Switches, Sensors	300mm	300mm		
4	Non tracked assets - room bounding model elements	Arch: Walls, Roofs, Floors, Windows, Doors, Ceilings,	100mm	100mm	+/- 5%	Exact
		Strt: Floors, Columns, Beams, Walls	100mm	100mm	+/- 5%	Exact
5	Non tracked asset - general model elements	House Keeping Pads, Cable trays, Washroom fixtures	WCT*	WCT*		Exact
6	Fixed furnishing/equipment	Casework, Fire hose cabinets, Fire extinguishers, Kitchen cabinets, Bathroom vanities	100mm	100mm		Exact
7	Underground services	Drains, Catch basins, Incoming services - gas, water	50mm	50mm	+/- 5%	Exact

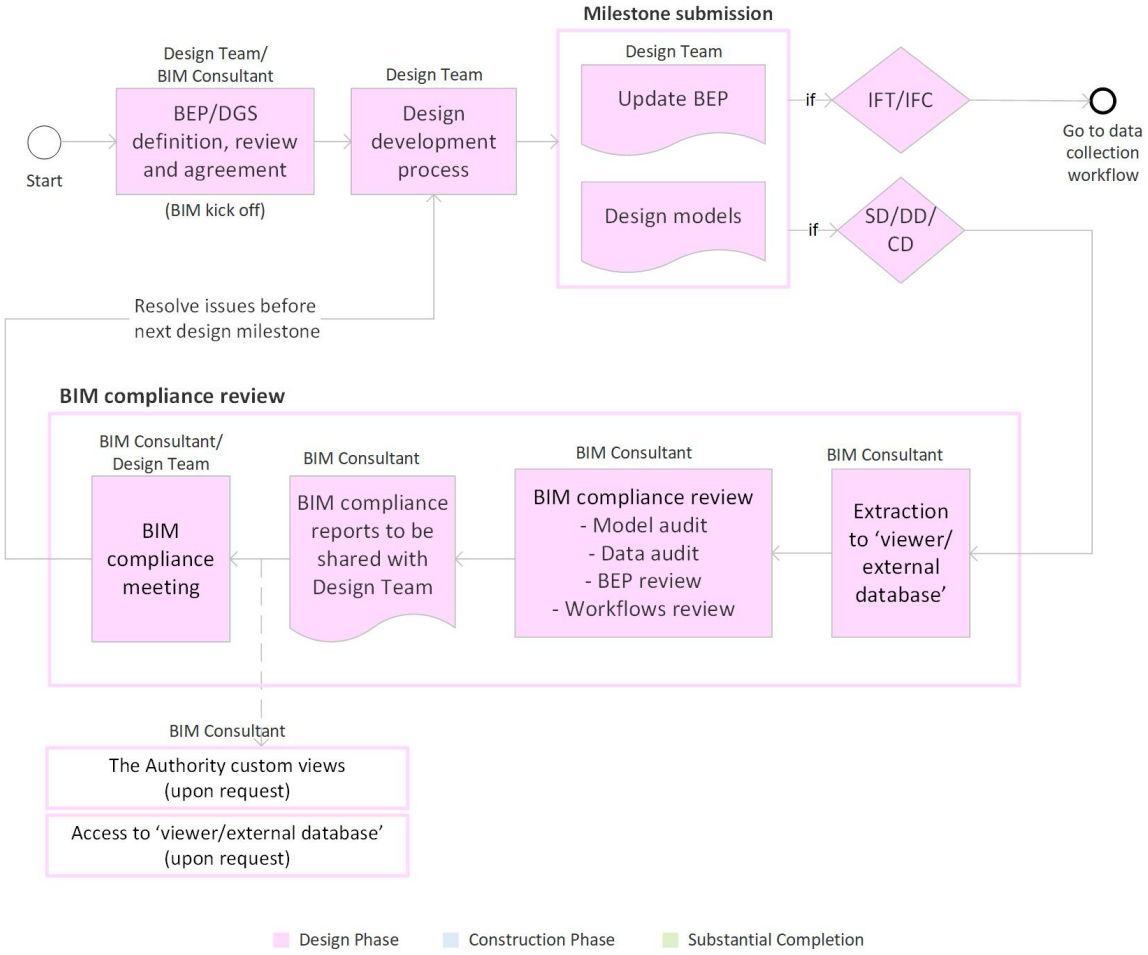
Appendix I: BIM Scope of Work

Task	Team			The Owner's (Appointing Party) Team	
	Design Delivery Team	Construction Delivery Team	Trades	Information Manager	The Owner (Appointing Party)
DESIGN					
Generate and update Design BEP	x				
Create design models based on AIR (DGS) LOD	x				
Add AIR (DGS) data in model elements	x				
Manage design process	x				
Share design models with team	x				
QA/QC of design data required for FMO	x			x	x
Perform virtual coordination	x				
Find, track, and solve clash coordination issues	x				
Perform BIM requirements compliance review				x	
Monitor compliance of workflows defined in the BEP				x	
Extract data from design models for Viewer/External Database				x	
Generate asset registry				x	
Provide clarifications regarding modeled elements and scope	x				x
CONSTRUCTION					
Generate and update construction BEP		x			
Perform construction analysis		x			
Generate fabrication models			x		
Perform virtual coordination with construction federated models		x			
Resolve coordination issues generated by fabrication models	x	x	x		
Redline mark ups sharing for record model update		x			
Update design models to reflect construction changes	x				
Share updated design models with team	x				
Extract updated design models in case of critical changes in tracked assets				x	
Review agreed processes and protocols defined in the BEP				x	
Provide the Data Collection Environment and training				x	
Setup and management of Data Collection Environment				x	
Trades scope assignment		x		x	
Generate data/document upload progress report				x	

SUBSTANTIAL COMPLETION					
Provide building documentation of installed tracked assets		x	x		
Generate structured digital data collection reports				x	
Validate data/documents provided by trades		x			x
Provide consolidated digital building handover				x	
Provide data transfer templates to CMMS system					x
Transfer data to CMMS system				x	x

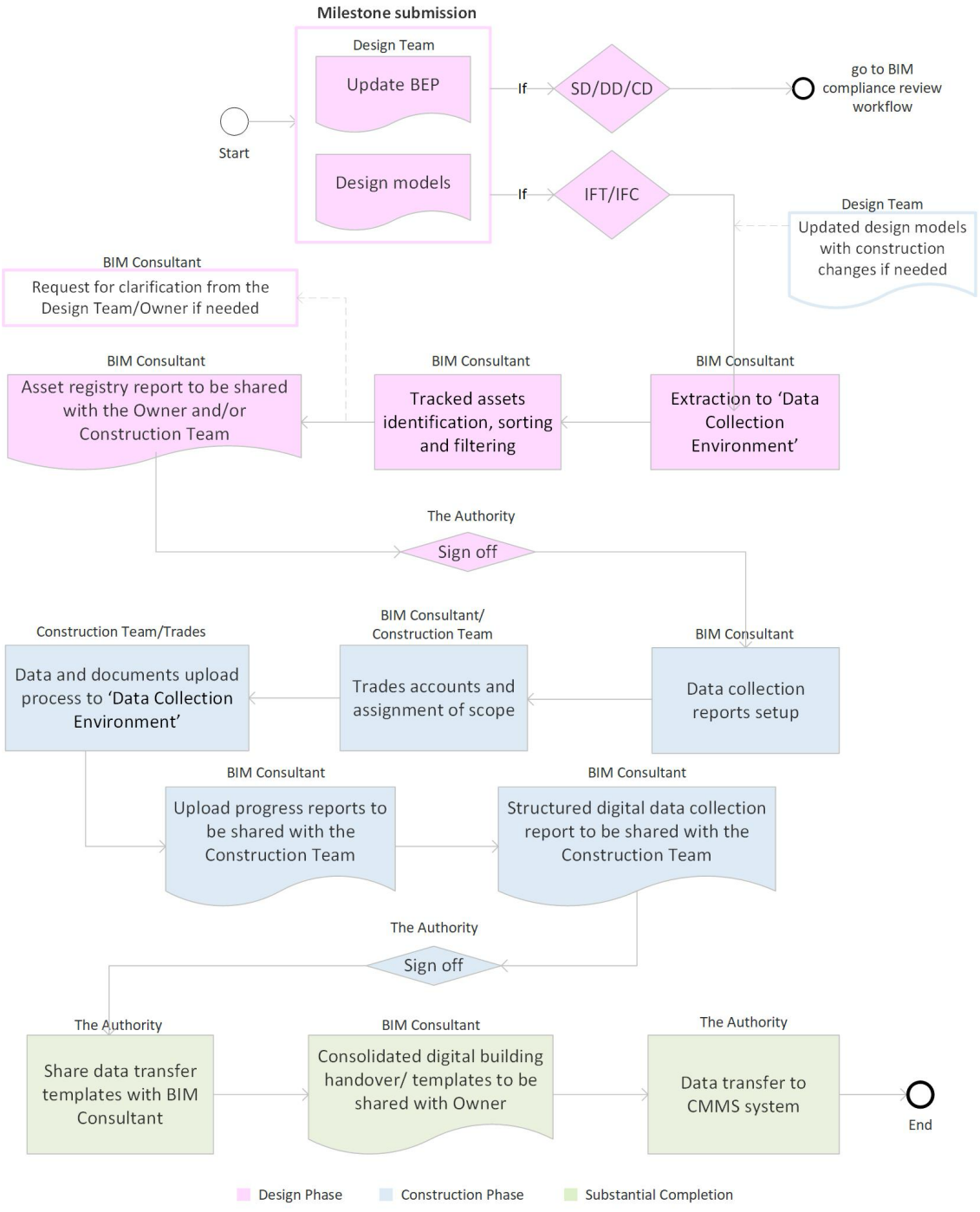
Appendix J: QA/QC Review Workflow

ISO 19650-2 5.6 Collaborative information production & 5.7 Information Model Delivery (Validation + Verification)



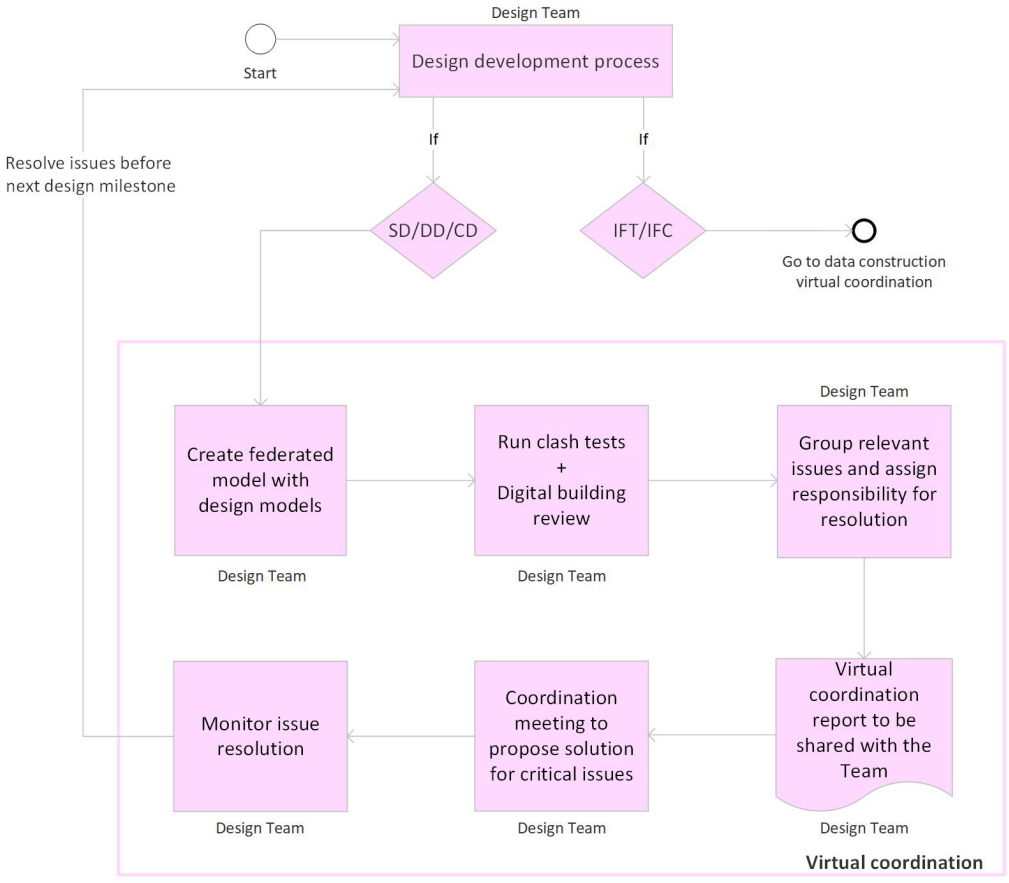
Appendix K: Data Collection Workflow

ISO 19650-2 5.7 Information Model Delivery (Validation + Verification)

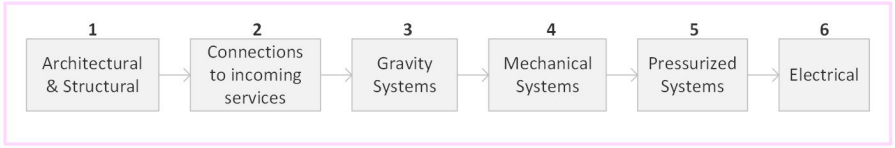


Appendix L: Virtual Coordination Workflow (Design)

ISO 19650-2 5.4 Appointment Process & 5.6 Collaborative Information Production



Recommended hierarchy of clashes

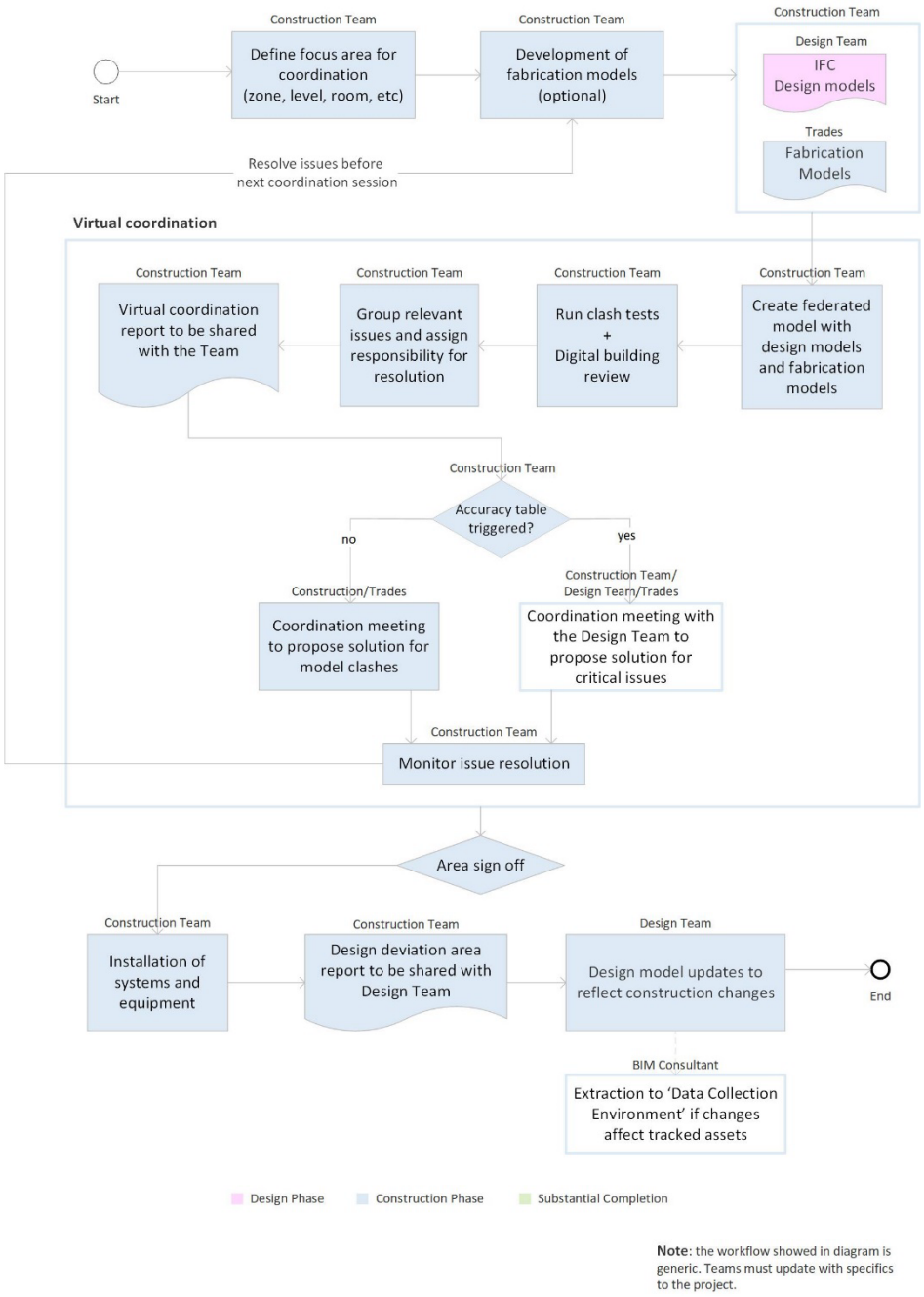


Design Phase Construction Phase Substantial Completion

Note: the workflow showed in diagram is generic. Teams must update with specifics, such as design collaboration with trades if applicable.

Appendix M: Virtual Coordination Workflow (Construction)

ISO 19650-2 5.4 Appointment Process & 5.6 Collaborative Information Production



Note: the workflow showed in diagram is generic. Teams must update with specifics to the project.

Appendix N: Modeling Environment – Data Requirements

ISO 19650 AIR Asset Information Requirements

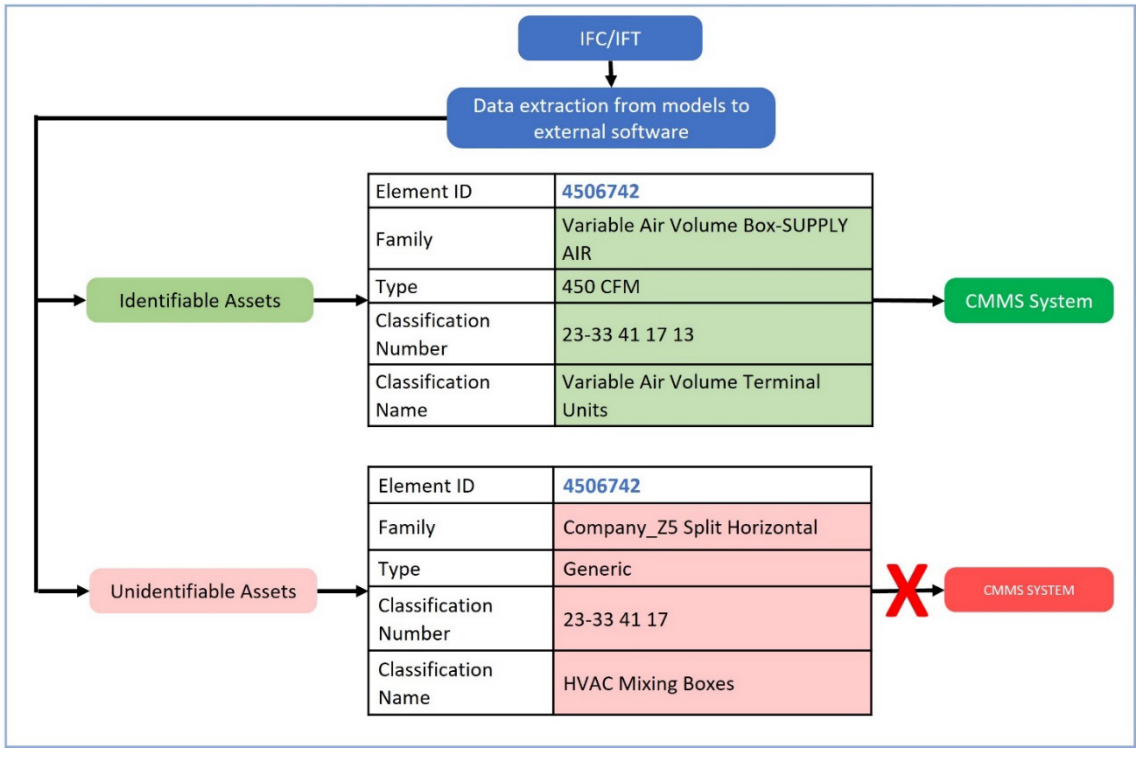
Data Quality

Model elements with good data	
Element ID	4506742
Family	Variable Air Volume Box-SUPPLY AIR
Type	450 CFM
Type Mark**	VAV
Mark *	VAV-01
Classification Number	23-33 41 17 13
Classification Name	Variable Air Volume Terminal Units
System Name	Supply Air
System Abbr.	SA1
Parent	AHU-01

Model elements with bad data	
Element ID	4506742
Family	Company_Z5 Split Horizontal
Type	Generic
Type Mark	VT01
Mark	192
Classification Number	23-33 41 17
Classification Name	HVAC Mixing Boxes
System Name	Undefined
System Abbr.	-
Parent	-

*Mark, (or another parameter) must be used as means of establishing connection between tagging on Drawing View/Schedules/Schematics and the FMO dataset.
*If the tagging nomenclature is not provided by the owner, the proposed schema must be consistent and recorded in the PEP.
**Where applicable use of Type Mark alone is permissible, e.g., Floor Drains (FD-01).

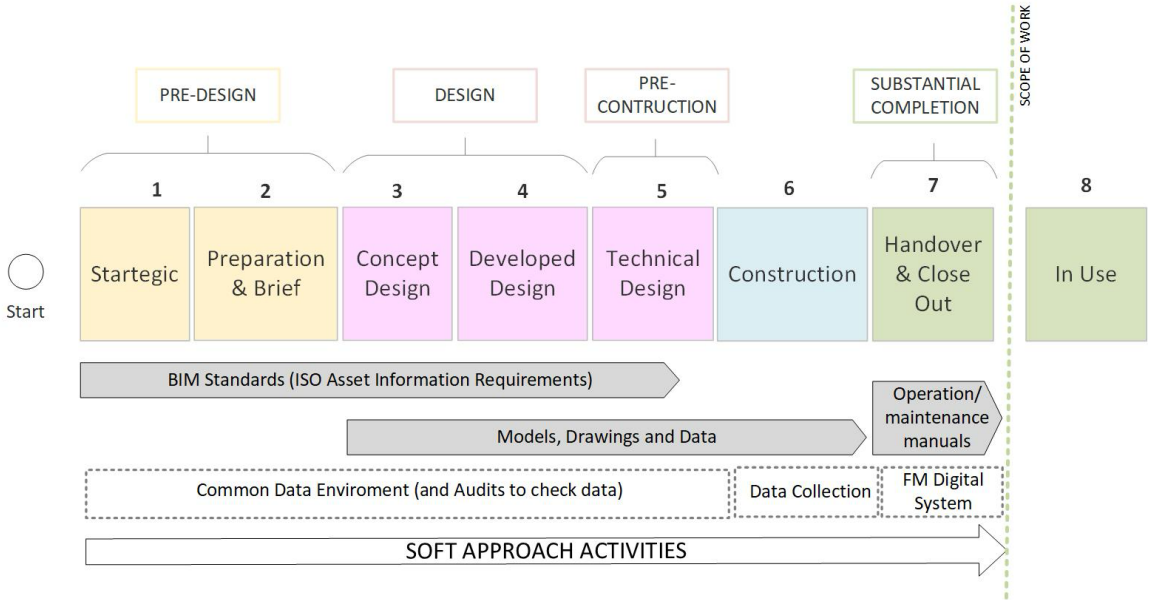
Asset Identification



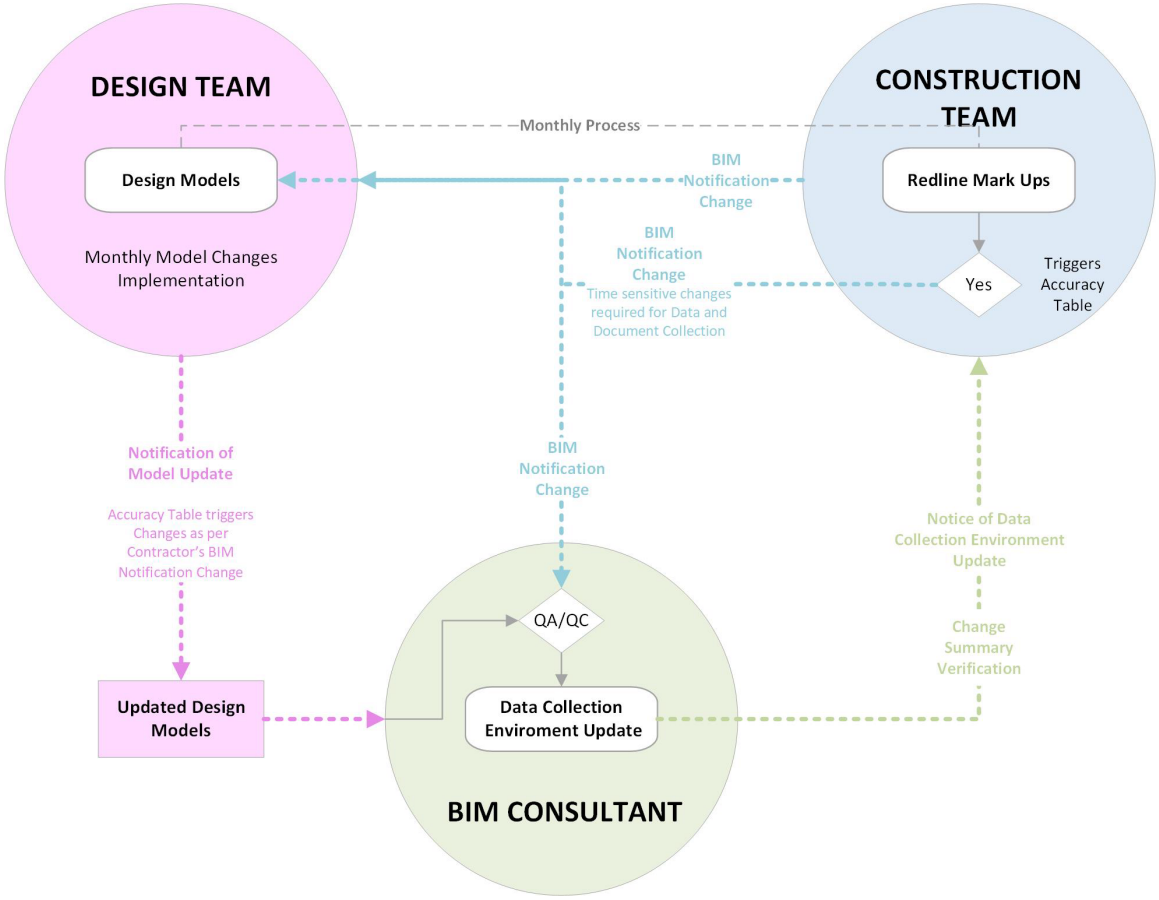
Appendix O: Soft Landing Approach

ISO 19650-2 5.1 Assessment & Need & 5.6 Collaborative Information Production & 5.7 Information Delivery Model & 5.8 Project Closeout.

(ISO 19650 Soft Landing)



Appendix P: Record Model Update



Appendix Q: Risk Assessment Matrix Example

ITEM	DESCRIPTION	IMPACT	MITIGATION STRATEGY AND WORKFLOWS How are the risks identified going to be managed and mitigated?			
			Strategy	**Workflows**	**Tools**	**Reporting**
Clearances	If clearances are not accurately modeled, there's a risk of interference between components. In designs that require maintenance or servicing, inadequate clearances can make it difficult to access and replace components, leading to increased downtime and maintenance costs.	High	Explain the strategy proposed to mitigate risk	Provide a workflow for that strategy	Describe if tools are being used to automate the process	How often are quality checks happening
Parent Child Relationship	Ensuring consistent and accurate parent-child relationships can be challenging, especially in large projects with multiple disciplines and contributors. If the relationships are not properly maintained, it can lead to discrepancies in the model, which may affect design accuracy and coordination.	High				

ITEM	DESCRIPTION	IMPACT	MITIGATION STRATEGY AND WORKFLOWS How are the risks identified going to be managed and mitigated?			
			Strategy	Workflows	Tools	Reporting
Clash Detection	-Late Discovery: If clash detection is performed too late in the design or construction process, it can result in costly design changes or delays to resolve conflicts, especially if they are identified after construction has started. -Human Oversight: Relying solely on automated clash detection tools without human oversight can result in missed issues that may not be detectable by the software but are evident to experienced professionals.	High				
OmniClass 2012	Misapplication of Codes: Inaccurate application of OmniClass codes to BIM elements can lead to confusion and misinterpretation of the model's information. If codes are assigned incorrectly or inconsistently, it can undermine the usefulness of the classification system. If the OmniClass codes in the model	High				

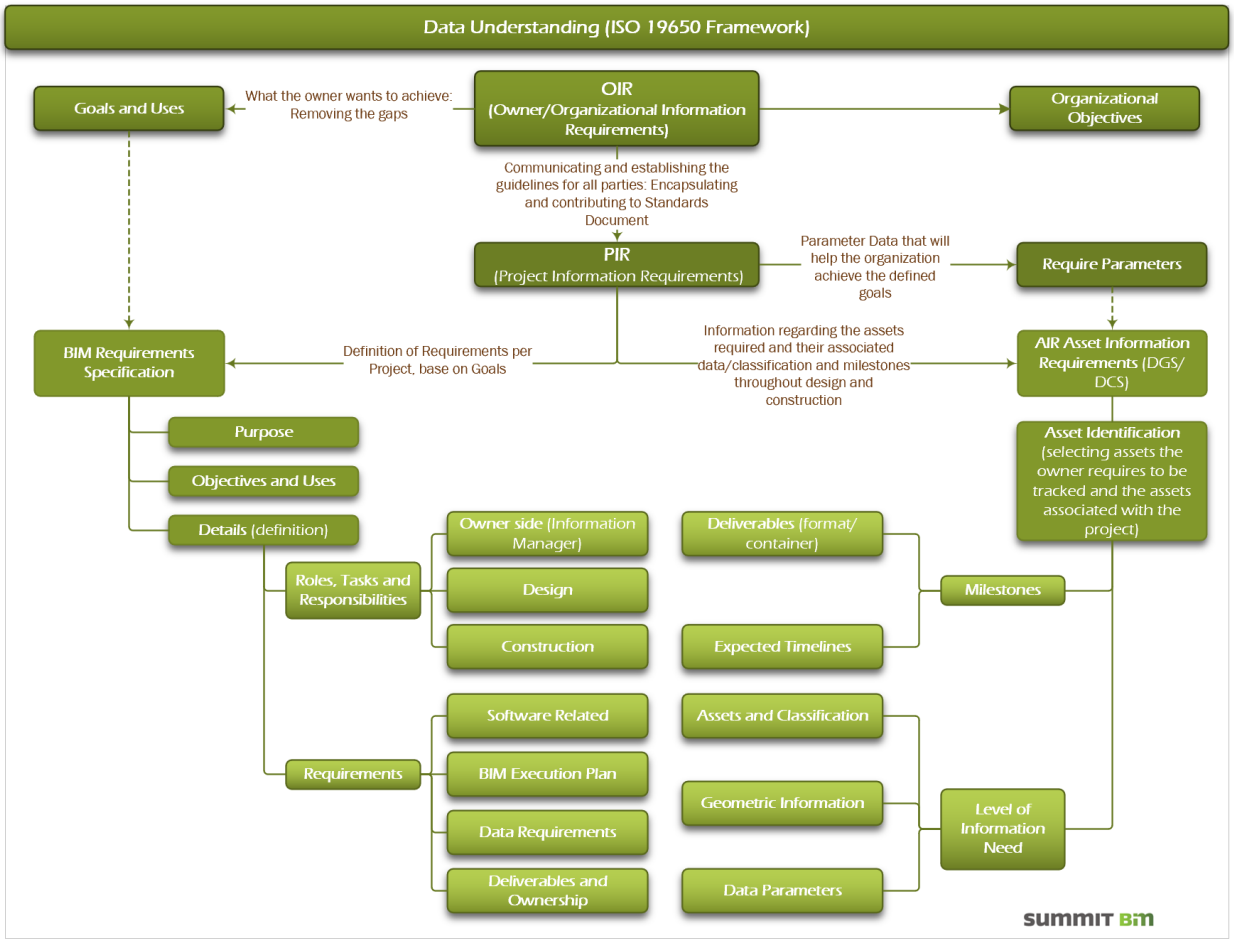
ITEM	DESCRIPTION	IMPACT	MITIGATION STRATEGY AND WORKFLOWS How are the risks identified going to be managed and mitigated?			
			Strategy	Workflows	Tools	Reporting
	don't align with the codes used in the project documentation, it can lead to confusion and discrepancies.					
Shared Parameters	-Data Validation: The absence of data validation checks can result in inconsistent or incorrect data being included in the BIM model. -Misuse of Parameters: Inexperienced users might misuse or incorrectly assign shared parameters to elements. This can result in inaccurate data being included in the BIM model, leading to design errors or misunderstandings.	High				
Finishes	If the finishes captured in the BIM model do not accurately reflect the actual materials and colors intended for the project, it can lead to misunderstandings among project stakeholders and result in discrepancies between the model and the final construction.	Medium				

ITEM	DESCRIPTION	IMPACT	MITIGATION STRATEGY AND WORKFLOWS How are the risks identified going to be managed and mitigated?			
			Strategy	Workflows	Tools	Reporting
Data Integrity	If data integrity is compromised due to human error or technical issues, it can lead to errors in the final construction or negatively impact project schedules.	High				

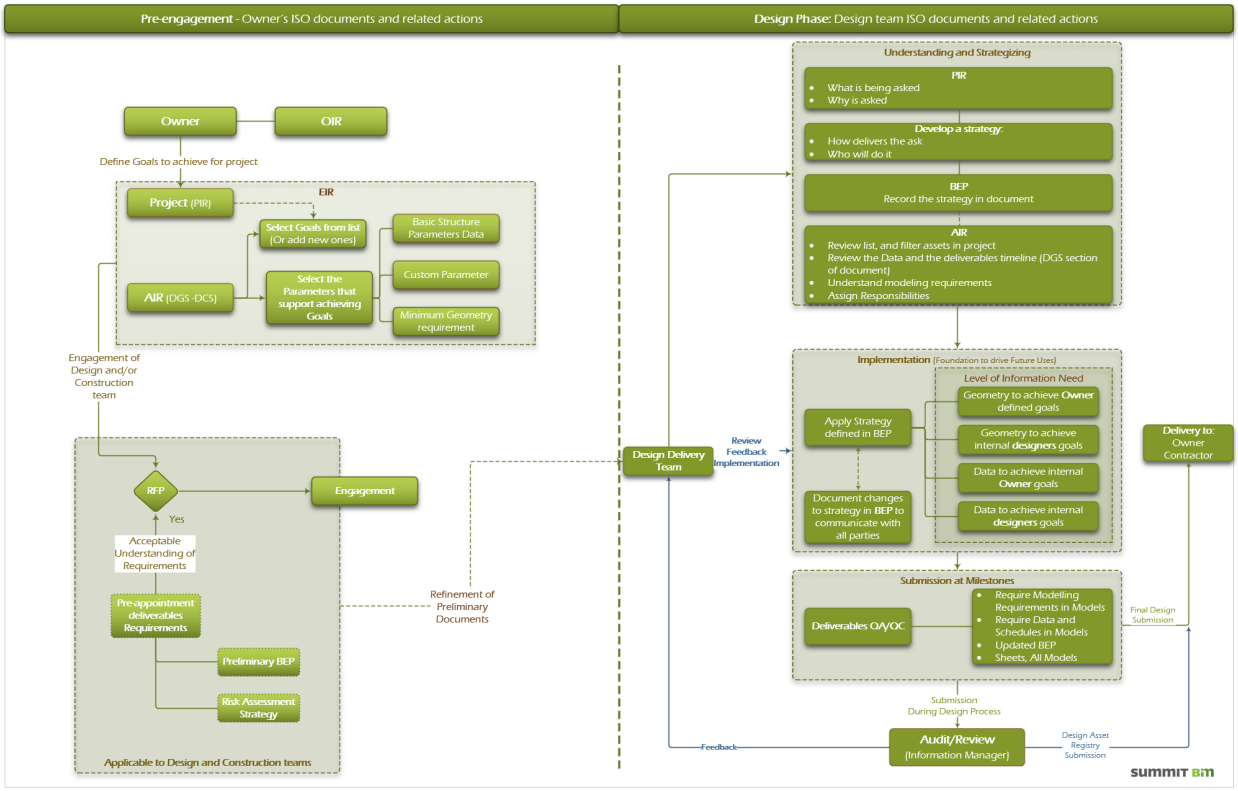
Appendix R: Pre-Appointment BIM Execution Plan

STRATEGIES TO BE OUTLINED IN THE PRE-APPOINTMENT BEP			
	Title/Topic		**Description**
Strategies and Workflows			
1	**Modeling Strategies**		
	1	**Clearances**	Define how required clearances will be modeled and managed
	2	**Finishes**	Define strategy for management of finishes.
2	**Workflow Issues Strategies**		
	1	**Object duplication**	Strategy for managing duplication across all models (e.g., openings, housekeeping pads, plumbing fixtures, lighting fixtures, stairs, ceilings etc.). Strategy to include identifying which model is the host and which the placeholder.
	2	**Parent Child Relationship**	Strategy for managing this requirement amongst tracked assets and naming.
	3	**Naming**	The naming strategy must be descriptive and applied to both Family and Type for all model objects.
	4	**Room Placement**	QA/QC strategy for Room requirements paramenters.
3	**Virtual Coordination Strategies**		
	1	**Clash Detection**	Proposed process to find issues (hard and soft clashes)
	2	**Issue Tracking**	Proposed process for assigning, and resolving issues
	3	**Risk Mitigation**	Describe the process for mitigating the risk for running virtual coordination with systems that have not been modeled, i.e., sprinkler system, pneumatic tube.
4	**Data Quality Strategies**		
	1	**OmniClass 2012**	Describe process to populate OmniClass (Table 23) number for tracked assets and OmniClass (Table 13) number for rooms along with the QC process to be used to check for accuracy.
	2	**Systems**	Describe process to be used to ensure that all mechanical and electrical assets are associated with consistent systems.
	3	**Asset and Type Identifiers**	Define the QA/QC process to ensure consistent use across all models
	4	**Relationships**	Strategy to ensure accuracy of parent/child and equipment power source relationships between tracked assets within the same model and across models (e.g., pump/system)
	5	**Shared Parameters**	Provide list of all shared parameters in the project and the categories to which they apply.

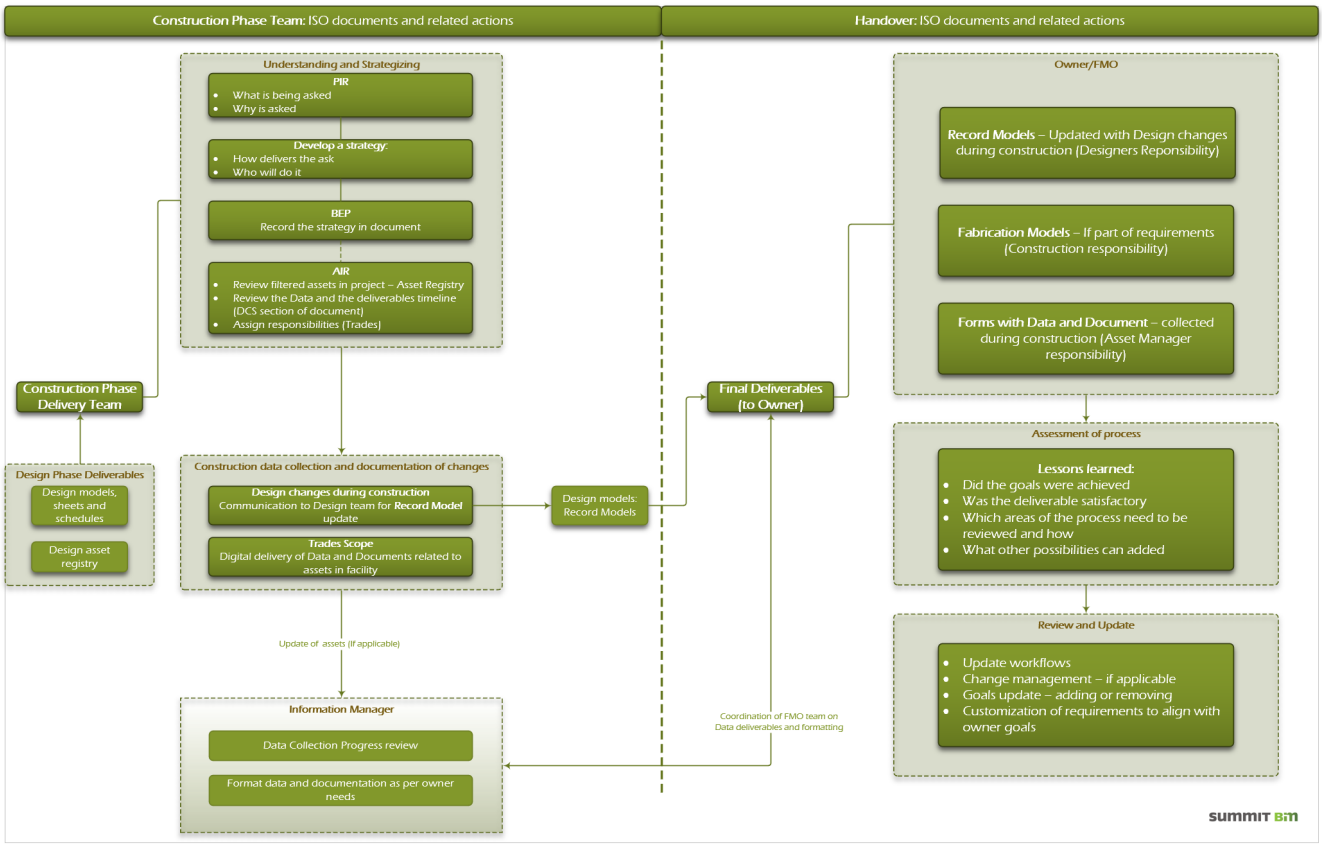
Appendix S: Standards: How to use



Appendix T: AIR-DGS How to use



Appendix U: Standards: AIR_DCS How to use



Appendix V: Standards: Process-Standards-No Standards