METROLINX

Metrolinx Asset Information Requirements (BIM)

MX-ALM-GDC-002

Revision 00
June 2025

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Metrolinx,

an Agency of the Government of Ontario

Preface

This is the first edition of the Metrolinx Asset Information Requirements (BIM). This AIR document provides guidance on Metrolinx Asset Information Requirements, directions and necessary details that will help Consultants and Contractors to produce and deliver the Asset Information per Metrolinx minimum required standards.

This standard is directed at Metrolinx Project Delivery Teams (PDT), Consultants and Designers.

This document was developed by the Metrolinx's Asset Lifecycle Management, Asset Management and Maintenance Division.

The Metrolinx Asset Information Requirements (BIM) is available for external users to download via the Metrolinx public download site at: www.metrolinx.com/en/metrolinx-technical-standards

Suggestions for revisions or improvements can be sent to Engineering and Asset Management - Asset Lifecycle Management, Attention: Senior Manager of Asset Lifecycle Management. The Senior Manager of Asset Lifecycle Management ultimately authorizes the changes. A description of the proposed change shall be included along with information on the background of the application and any other useful rationale or justification. Proposals for revisions or improvements shall also include your name, company affiliation (if applicable), e-mail address, and phone number.

June 2025

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Acronyms and Abbreviations

Abbreviations used in this document are defined below:

Table 1: Abbreviations

Abbreviation	Definition
AIR	Asset Information Requirements
BEP	BIM Execution Plan
BIM	Building Information Modelling
CDE	Common Data Environment
EIR	Exchange Information Requirements
GIS	Geographic Information Systems
MIDP	Master Information Delivery Plan
O&M	Operations and Maintenance

Note to Drafter:

This document is a baseline for the Metrolinx Programs and Projects Asset Information Requirements and details the minimum requirements. It may be amended at the project level to suit specific contracts where appropriate.

Items that are not covered by this AIR that should be included in contractual documentation:

- *Risk and Liability; and*
- *Data ownership and cybersecurity.*

1. Executive Summary

1.1 Key Principles

1) Unless defined or as otherwise provided herein, words and phrases used in this document shall have the same meaning and shall be defined and interpreted per the Definitions and interpretation of the Project Agreement and Output Specifications.

    a. The AIR details the requirements and information needed to manage the asset per the Metrolinx minimum required standards.

    b. To deliver the mandatory level of Asset Information, the Metrolinx, Consultant/Contractor and other Stakeholders shall collaborate and exchange information.

    c. Consultant/Contractor shall submit a proposed list of maintainable assets for approval by the Metrolinx in compliance with MX Asset Information and Data Dictionaries.

    d. Asset information for all Metrolinx Wide Programs/Projects must adhere to the same standards. Consistency and accuracy in defining, capturing and maintaining asset data and information ensures it can be easily retrieved and utilized for decision-making and reporting across the Metrolinx Wide Programs/Projects.

    e. These standards apply to all Metrolinx-owned assets within all Programs and Projects, regardless of the commercial arrangement for design, build, operate, or asset maintenance.

    f. The Level of Information Need requirements at each Works Submittal is made up from the Level of Geometrical Detail (LoD), as defined in the EIR and the Level of Information (LOI) as specified in this AIR.

    g. The asset class data dictionaries will define the data requirements of each maintainable asset, i.e. the Level of Information Need.

1.2 Approach

1) In principle, the AIR will define the following information:

    a. Metrolinx overall asset information intentions;

    b. The quality, quantity and granularity of asset information required;

    c. The hierarchical structure of asset information required;

d. The approach to asset information delivery, coordination, and validation; and

e. The responsibilities associated with asset information delivery and the recipients of this information.

2. Introduction

2.1 Purpose

1) The purpose of this document is to communicate the asset information requirements set by the Metrolinx to support the effective management and maintenance of assets related to the Programs and Projects across the project lifecycle. The overall approach being adopted is based on good practice approaches to acquiring asset information. This approach will ensure that data is provided in a timely, efficient and effective manner, to meet quality requirements and with suitable monitoring of the overall process.

2) This document is not intended to give instructions as to how or who is responsible for the collection, provision and management of data, but it is to be used to achieve the delivery of consistent classification and attribution of asset data.

3) Consultant/Contractor preparing information during the design and construction phases of the Programs and Projects shall familiarize themselves thoroughly with this AIR document and associated documentation listed in Section 2.2.

4) The AIR is a contractual document. It forms a part of the contractual agreements to which all Project Team members shall adhere for this project, including consultant(s), specialist(s), contractors(s) and supplier(s) of any tier.

5) The AIR shall be read in conjunction with all the corresponding documents listed in Section 2.2 and with all the applicable standards listed in Section 2.3. Project Team members shall ensure that the most current revision of the documents is being used.

6) The expected benefits delivered by these asset information requirements are:

    a. Concept design: clear expectations of information deliverables, holding stakeholders contractually accountable to deliver structured data that can be reused across the Project and the lifecycle of the asset;

    b. Detailed design and construction phase: clear definition and deliverable of the Level of Information Need at each stage/milestone of the Project, delivering a progressive development of information, physical tagging and development of asset lists; and

    c. During handover and the operations and maintenance phase: clear requirements delivering more reliable and accessible information to enable effective management and decision-making.

2.2 Key Documents

1) This document covers general asset information requirements; additional Asset Class Data Dictionaries will cover asset class-specific information requirements.

2) Consultant/Contractor shall comply with this AIR and the associated documents shown in Table 2.

Table 2: Associated Documentation

Document Reference	Title	Scope
MX-ALM-STD-004	Metrolinx CADD/ BIM Standards Manual	Metrolinx Wide
MX-ALM-GDC-003	Metrolinx Exchange Information Requirements (BIM)	Metrolinx Wide
MX-ALM-STD-001 MX-ALM-DIC-001 MX-ALM-DIC-002 MX-ALM-DIC-003 MX-ALM-DIC-004 MX-ALM-DIC-005 MX-ALM-DIC-006	Metrolinx Asset Information Standard MX Asset Information and Data Dictionaries: Civil Signals Tracks Station Facilities Bus Facilities Rail Facilities	Metrolinx Wide
CKH-DMC-GDE-007	CPG ISO19650 Compliant Numbering Guide	Metrolinx Wide
MX-ALM-GDC-001	Metrolinx Level of Information Need Guide (BIM)	Metrolinx Wide

3) The Asset Information and Data Dictionaries are designed to be 'living' documents updated as the Asset Classes matures. As further understanding of the asset breakdown evolves during the project phases, in compliance with BS EN 50126-1:2017, the Data Dictionaries will be updated and expanded to include new asset types and their required attributes as they become known.

    a. The Metrolinx shall issue updated Asset Information and Data Dictionaries as the project progresses.

    b. Consultant/Contractor shall use the latest version of the Asset Information and Data Dictionaries at the time of their appointment. Changes made after appointments may be applied after discussion with the Metrolinx.

2.3 Industry Standards

1) Consultant/Contractor shall comply with the industry standards listed in Table 3, which are relevant to this AIR:

Table 3: Industry Standards

Standard	Description	Requirements
CEN - EN 13306	Maintenance – Maintenance Terminology	Guidance
BS EN 50126-1:2017	Railway Applications – The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS)	Compulsory
ISO 55000	Asset Management – Overview, principles and terminology	Guidance
ISO 55001	Asset Management – Management Systems – Requirements	Guidance
ISO 55002	Asset Management – Management Systems – Guidelines for the application of ISO 55001	Guidance
BS EN ISO 19650-1	Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling Part 1 – Concepts and Principles	Guidance
BS EN ISO 19650-2	Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling Part 2 – Delivery phase of the assets	Guidance
BS EN ISO 19650-3	Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) -Information management using building information	Guidance

	modelling - Part 3: Operational phase of the assets	
BS EN ISO 19650-5	Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) -Information management using building information modelling – Part 5: Security-minded approach to information management	Guidance
BS 1192-4: 2014	Collaborative production of information Part 4: Fulfilling employer's information exchange requirements using COBie – Code of Practice	Compulsory
PAS 1192-6: 2018	Specification for collaborative sharing and use of structured health and safety information using BIM	Guidance
UniClass 2015	Uniclass Tables	Compulsory
ASTM E1557	Standard Classification for Building Elements and Related Sitework – UNIFORMAT II	Compulsory

2.4 Scope

1) The requirements set out in this AIR apply to Metrolinx Wide Programs and Projects.

2) The term asset information is used as a generic term that includes but is not limited to:

    a. Asset documents and data:

        i. Asset inventory;

        ii. Classification of assets;

        iii. Attributes of assets;

        iv. Location and spatial information of assets;

        v. Relationships between assets;

vi. Design and As-Built models (Project Information Model (PIM) and Asset Information Model (AIM));

vii. Documents, drawings and records of assets and systems, including test certificates; and

viii. Photographs.

b. Operation & maintenance information (for O&M contracts only):

i. Preventative maintenance tracking;

ii. Asset condition and performance tracking;

iii. Asset cost tracking;

iv. Maintenance and warranty data on assets; and

v. Condition, cost, and performance data on assets.

2.5 Asset Information Systems

1) Metrolinx Asset Information Systems are the suite of systems used to manage asset information throughout their life cycle.

2) Metrolinx Asset Information Systems include:

a. Enterprise Asset Register and Maintenance Management System (EMMS);

b. Electronic Document and Records Management System (EDRMS);

c. Enterprise Geographical Information System (EGIS); and

d. Data Lake Platform.

3) The Asset Information Systems are highly integrated. They enable business users to view asset details, their condition, location, work history and all associated documents in a single source of truth. All data within or that feeds the Asset Information Systems is owned by Metrolinx.

4) Metrolinx will use a data lake platform as part of its business-wide strategy to improve data governance across the organization. Asset information related to the Program/Project is expected to be integrated into the data lake to provide long-term data analysis and business insights.

5) All Metrolinx asset data shall be captured and maintained in Metrolinx systems.

6) Consultant/Contractor shall conduct testing to ensure asset data's successful migration into Metrolinx systems. This testing shall be carried out at the same time as the first Works Submittal.

2.6 The Digital Information Model

1) Figure 1 below, describes the relationship between the key Digital Information Model Principles. Refer to ISO 19650 for a definition of the terms.

2) In line with ISO 19650, Consultant/Contractor shall provide the BEP, MIDP, PIM, and AIM as a response to the AIR and EIR issued by the Metrolinx.

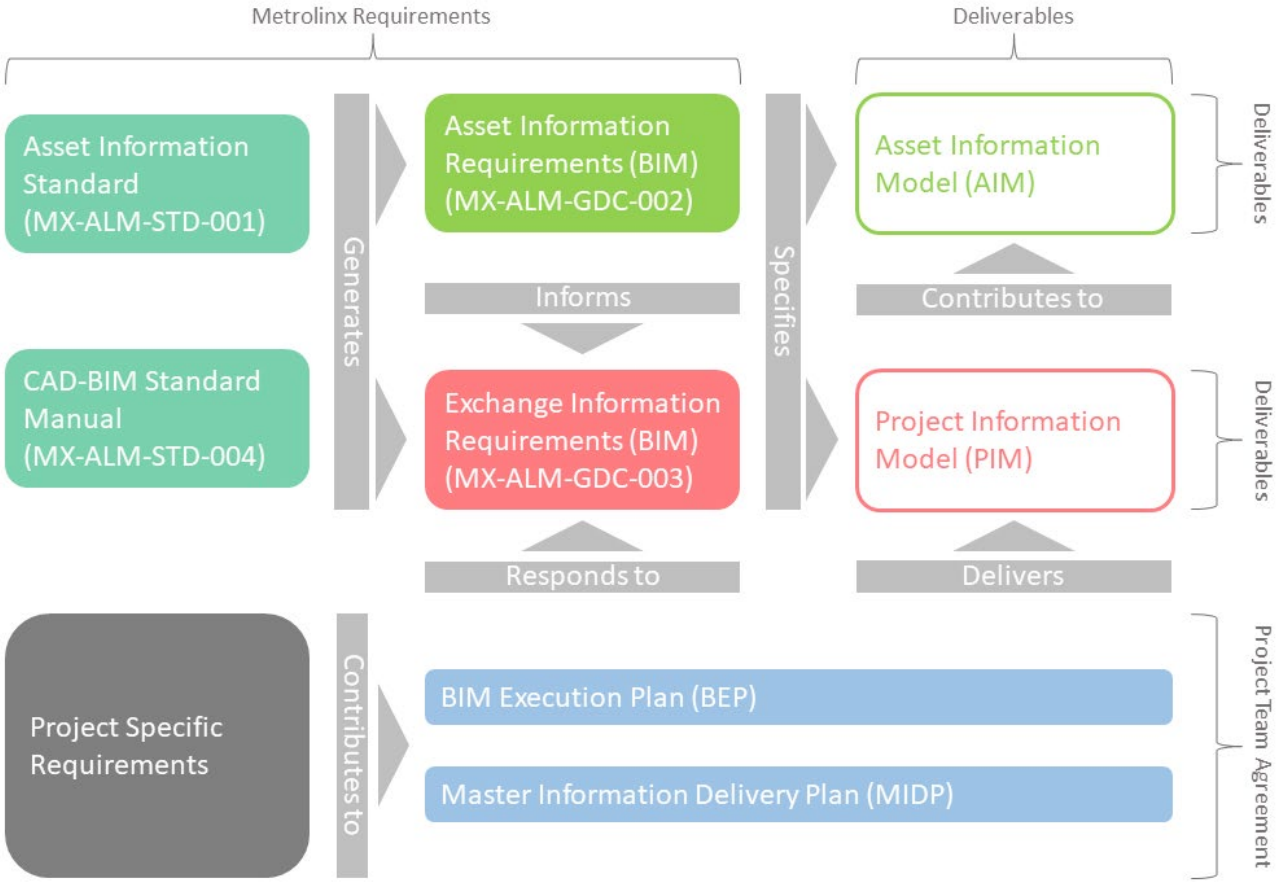

Figure 1: Digital Information Model Principles

2.7 Asset Information Governance

1) The responsibilities of the Metrolinx shall include the following:

    a. Provide access to a CDE that will facilitate the sharing of information, including Asset Information, between all parties;

    b. Provide access to Asset Information Systems where appropriate for the delivery of asset information;

    c. Validate and assure asset information provided by Consultant/Contractor; and

    d. Ensure Asset Class Data Dictionaries have the latest list of minimum information requirements.

2) The responsibilities of the Consultant/Contractor shall include the following:

    a. maximize the use of the BIM model to support the production, management and sharing of Asset Information throughout the Project Term;

    b. detail within the BIM Execution Plan (BEP):

        i. how Consultant/Contractor will create, manage and deliver Asset Information per this AIR;

        ii. how the BIM models will be used to manage the Asset Information and define the extent to which information will be embedded in the models, attached to modelled objects or stored in other systems; and

        iii. how Consultant/Contractor will align with ISO 19650 and ISO 55000 series.

    c. Define the list of maintainable assets in the form of an asset register;

    d. Tag and classify all Asset Information with a common language and structure;

    e. Utilize their own CDE systems to manage their own information production;

    f. Assure asset information in asset information systems is complete, accurate, current and in compliance with this AIR; and

    g. Hand over all Asset Information for review to Metrolinx per the Review Procedure per Project Agreement.

3) During the Operational Term:

    a. Consultant/Contractor shall share with the Metrolinx the latest Asset Information on a weekly basis as specified in the Output Specifications; and

    b. Consultant/Contractor shall use its Maintenance Management System and Asset Information System per the Output Specifications to manage the Asset Information prior to delivery into the Metrolinx systems.

3. Asset Information

3.1 Introduction

1) Delivering a complete, detailed set of Asset Information at project handover to support the operations, maintenance and assurance of the Program/Project is one of the Metrolinx key objectives. This section provides guidance on how to deliver against this requirement.

2) The purpose of this section is to present how asset data shall be developed and held within an asset register. It defines the primary assets and their attribute data, and complements the requirements in the Metrolinx Asset Information Standard (MX-ALM-STD-001).

3) The Metrolinx Program and its respective projects may require other information on assets. This AIR document is only to be used to specify data required for operating and maintaining assets.

4) There are eight asset classes that fall within the Metrolinx Wide Program/Project:

    a. Civil Structure Systems;
        i. Bridge System
        ii. Drainage System
        iii. Signal Structure
        iv. Tunnels
        v. Noise Barriers
        vi. Retaining Wall
    b. Electrification;
    c. Fleet;
    d. Signals;
    e. Facilities and Stations;
    f. Track;
    g. Drainage; and
    h. I&IT.

5) This AIR describes the general Asset Information Requirements only. Additional Asset class-specific requirements will be provided in class-specific Asset Data Dictionaries.

3.2 Definition of an Asset

1) Metrolinx defines an asset to be:

    a. A physical or tangible item that has potential or actual value to Metrolinx (excluding intellectual property, human resources, and financial instruments), including IT systems and software.

2) Also, one or more of the following are true:

    a. Asset requires a maintenance plan approved for its care;

    b. Asset requires tracking for reliability and performance benchmarking; and

    c. Asset requires tracking by regulation or legislation, or legal/contractual or licensing requirements.

3) An asset record shall be created and maintained in Metrolinx Asset Information Systems if it is owned, operated, or maintained by Metrolinx.

4) An Asset shall be defined at the line replaceable unit (LRU) or at a level deemed acceptable by the Metrolinx.

3.3 Attributes

1) Asset attributes are characteristics and values of items held against each asset to support whole-life intelligent decision-making. There is a set of core attribute data, which shall be collected for all assets, and asset class-specific attribute data, detailed in the separate Asset Class Data Dictionaries. As the works progress through the project delivery stages, the requirements for individual attributes may change. BIM Object (Asset) specific attribute list can be found in MX Level of Information Need Guide – MX-ALM-GDC-001, which must be referenced with Asset Specific Data Dictionary.

2) Consultant/Contractor shall define in their BIM Execution Plan (BEP) how they will provide the attribute data at each project stage.

3.4 Core Attributes

1) The core attribute information to be assigned to all assets are listed in Table 4. Refer to the Asset Data and Information Standard for further detail.

Table 4: Core Asset Information Requirement Attributes

Attribute	Format	Definition
Classification Code	Code	Uniformat for Facilities, Uniclass for Guideway and Right of Way assets.
Asset Description	Text	Descriptive term to identify asset
Contract Number	Alphanumeric	Contract number asset is related to
Asset ID	Alphanumeric	Unique asset ID
Asset status	Text	Indicates whether the asset is, for example, 'In Service' or 'Not In Service'
Operational Status	Text	Indicates whether the asset is, for example, 'Installed' or 'Decommissioned'
Manufacturer Name	Text	Manufacturer of the asset (refer to section (b))
Model Name/ Number	Alphanumeric	Model name or number of the asset
Part Number	Alphanumeric	Part Number of the asset (if applicable)
Serial Number	Number	Serial number of the asset
Commission Date	Date	Date asset was commissioned or put into service
Originator Company	Text	Name of company creating asset record
Expected Life Service	Number	Anticipated life of the asset in years
Replacement Value	Number	Cost of replacing the asset
Date of purchase	Date	Date the asset was purchased
Date of install	Date	Date the asset was installed
Warranty Provider	Text	Details of the warranty provider
Date of warranty expiry	Date	Date warranty expires
Condition Rating	Text	Condition rating of an asset as per five-point scale
Hierarchy level	Text	Hierarchy level of the asset (system, subsystem, asset system, asset subsystem)
Security Level	List	Security level of the asset per ISO 19650-5

Geometry	URL	Link to core model component
Coordinate Latitude	Number	Latitude of the asset location
Coordinate Longitude	Number	Longitude of the asset location
Location	Alphanumeric	Location hierarchy code of the asset (refer to Section (c))

2) A standardized list of Manufacturer Names shall be utilized – Consultant/Contractor shall provide a list of Manufacturers to the Metrolinx for approval.

3) Location information shall be provided in the form of a Location Hierarchy code. Consultant/Contractor shall propose Location Hierarchy codes for approval by the Metrolinx in case of a Brand-New Location. For a location that already exists on Metrolinx Network, Consultant/Contractor must refer to the Data Dictionary for the Location Codes.

3.5 Asset Class-Specific Attributes

1) Refer to the Asset Class Data Dictionaries for custom attribute information requirements.

4. Information Production Methods and Procedures

The methods and procedures in this section aim to drive consistency across the asset information process across Metrolinx Wide Programs/ Projects. All asset information shall be built around the five requirements:

a. Clear;

b. Accurate;

c. Up-to-date;

d. Accessible; and

e. Unambiguous.

4.1 Asset Information Delivery Process

1) Asset Information shall be developed iteratively during the design and construction of the project. Data drops for Asset Information deliverables will follow the V-cycle representation per BS EN 50126.

2) As stated in ISO 19650:

   a. Consultant/Contractor shall communicate the information deliverables required at each corresponding project stage via the MIDP

   b. Responsibilities for the delivery of information shall be further agreed via the project BEP, identifying authoring parties.

4.2 Data Format

1) The Metrolinx intends to use open shareable asset information. Consultant/Contractor must submit asset information in an open, non-proprietary data format.

2) Asset information shall be submitted in COBie format. COBie (Construction Operations Building Information Exchange) is a schema for transferring construction operational maintenance information. The most common representation of COBie is a non-proprietary, multi-page and color-coded spreadsheet. The COBie spreadsheet format includes information about a built asset's spatial locations, equipment and components. Data transferred in this format must conform to BS1192-4.

3) Other structured formats may be proposed to the Metrolinx via the BEP.

4) Consultant/Contractor shall detail how they will validate data prior to submittal to the Metrolinx per the AIR.

4.3 Asset Information Deliverables

1) All asset information and supporting documentation shall be submitted into the Metrolinx CDE for review (per the Review Procedure stated in the PA).

2) All project handover documentation shall be captured in a structured digital format, named in line with the file naming guidance document. The format of the digital handover documentation shall be logically developed by Consultant/Contractor, facilitating a link between:

    a. Asset Information;

    b. Operations and Maintenance documentation;

    c. IFC model components; and

    d. Drawings.

3) Master Information Delivery Plan (MIDP) shall be compiled by Consultant/Contractor for each asset class, itemizing all digital document deliverables and uploaded to the Metrolinx CDE. This shall be updated periodically as assets are installed on-site. The schedule shall contain an itemized list of document deliverables named to the specified project naming convention, including the document description.

4) An MIDP template shall be provided to Consultant/Contractor by the Metrolinx.

4.4 As-built Records

1) Consultant/Contractor shall deliver as-built BIM models, drawings, red-lined drawings and supporting information to the Metrolinx CDE per the timelines specified in the Output Specifications.

2) Consultant/Contractor shall define how they will meet the as-built requirements in the BEP.

3) As-Built Model Delivery

    a. Consultant/Contractor shall update the BIM models to capture as-built information and include any revisions made to the final design during construction and installation as documented and formalized by the Engineer of Record through, among others, requests for information, design revisions, Construction Document Submittals, and shop drawings.

b. Consultant/Contractor shall define in the BEP the process to validate the BIM model against the recorded as-built information and deliver the information to the Metrolinx CDE. Where the BIM model is beyond the design tolerances, Consultant/Contractor shall update the BIM model and any associated output information, such as drawings.

c. Consultant/Contractor shall verify the physical asset against the Output Specifications, and the AIM shall accurately mirror the physical asset delivered to the defined LOI requirement in this AIR.

4) Consultant/Contractor shall ensure that as-built information, when submitted to the Metrolinx:

a. is updated to capture as-built information and include any revisions made to the final design during construction and installation, as documented and formalized by the Engineer of Record through, among others, requests for information, design revisions, Construction Document Submittals, and shop drawings;

b. adheres to the process for model validation developed by Consultant/Contractor and is per accuracy requirements as outlined in the BEP. This may include but not be limited to the use of laser scans and red-lined as-built information;

c. includes any deviation from the design, such as additions, omissions and out-of-tolerance conditions; non-conformance Reports, requests for information, as identified through the inspection and testing plan, field verification and as-built survey process;

d. represents the constructed and installed asset represented in a geometrical, geospatial and non-geometrical form that meets all the Metrolinx relevant assurance and performance requirements, including design, construction, performance, testing, interoperability, and security;

e. includes quality control Records in line with the requirements of Quality Management;

f. is submitted to the Metrolinx through a federated as-built information model in a fully geospatial context surrounding supporting information per the Metrolinx CADD/BIM Standards Manual (MX-ALM-STD-004) and the as-built surveys and Record Drawings GCS standards of the Output Specifications; and

g. has a defined process for managing changes and updates to the as-built information model and communicates how these are communicated to all relevant parties, including but not limited to the Metrolinx, Subcontractors, Suppliers and third parties.

5) Recording As-Built conditions

   a. Consultant/Contractor shall define within the BEP how Consultant/Contractor will record the as-built conditions. This process shall include data quality control and validation.

4.5 File Validation

1) Consultant/Contractor shall submit asset information for a Quality Assurance (QA) check by the Metrolinx. Once this has been passed, Metrolinx will review the content shown in Figure 2 and align with the Review Procedure.

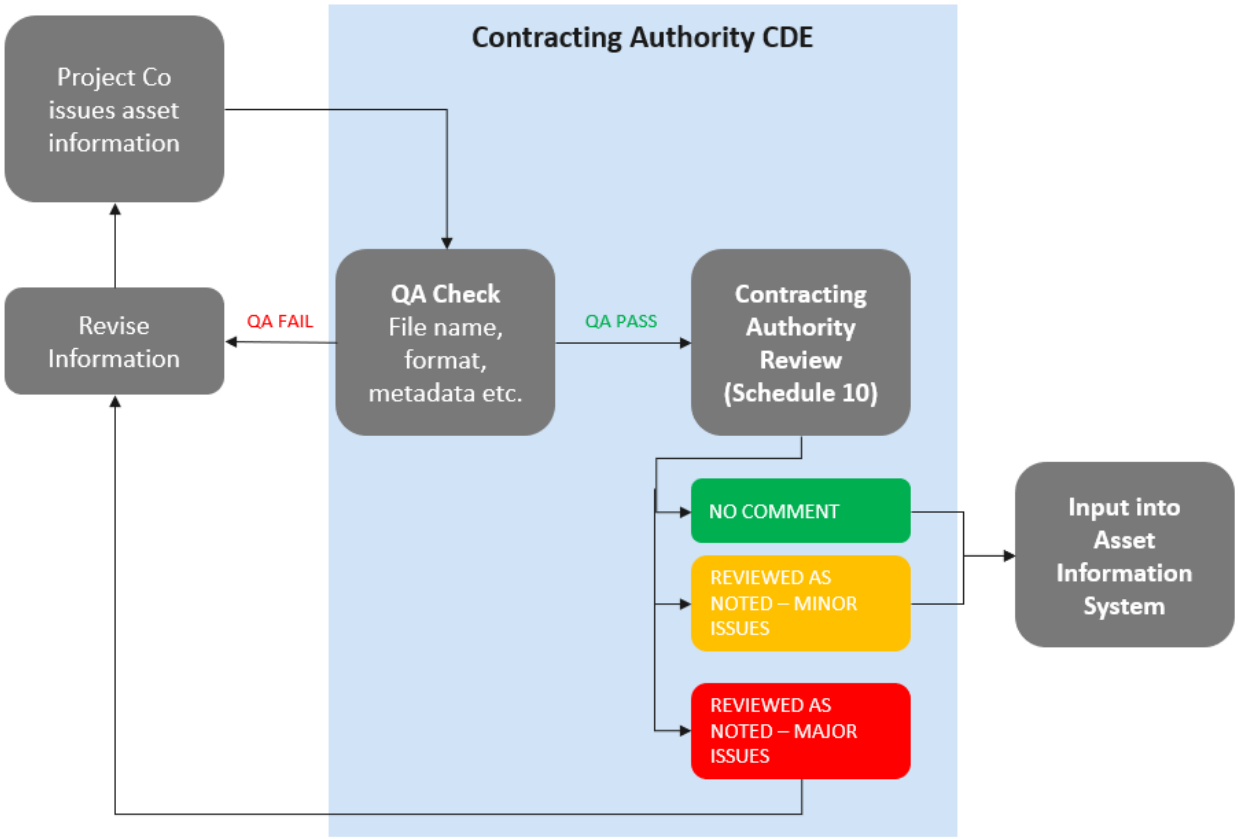

Figure 2: File Validation Process

5. Information Management

5.1 Asset Classification

1) Consultant/Contractor shall use the following classification systems for all BIM information:

    a. Uniformat for Facilities; and

    b. Uniclass for Guideway and right-of-way assets.

2) Consultant/Contractor shall define its approach to managing and applying the classification system within the BIM Execution Plan.

3) Examples are included within the Asset Class Data Dictionaries.

5.2 Asset Hierarchy

1) Compliance with the Metrolinx Asset Hierarchy is critical to ensure that Asset Information across Metrolinx wide Program/Projects asset classes are defined, captured and consistently maintained. The purpose of the Asset Hierarchy is to record assets into logical and functional groupings and sub-groupings.

2) The Functional Asset Hierarchy defines the functional parent-child relationship from Systems to Assets. The Functional Asset Hierarchy is used to help identify similar assets, to help segregate ownership and accountability for assets, and to roll up the cost of work orders performed against assets. All Metrolinx Assets shall be incorporated into the Functional Asset Hierarchy (no orphan asset records). The asset hierarchy with a Uniclass Classification example for Bridges is shown in Figure 3.

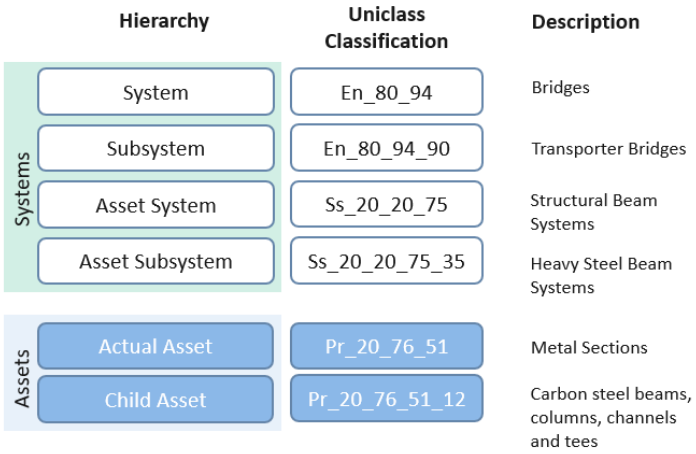

Figure 3: Functional Asset Hierarchy Illustration using Uniclass Classification

3) Further examples are provided within each Asset Class Data Dictionary

5.3 Asset Identification

1) Assets are to be assigned a unique asset identification.

2) The full asset identification may be up to 30 characters in length, made up of alphanumeric characters and hyphens.

3) Consultant/Contractor shall submit an asset naming strategy for approval by the Metrolinx.

5.4 Asset Tagging

1) This section explains the general approach to applying physical Asset Tag labels. Specific requirements for each asset class are provided within the Asset Class Data Dictionaries.

2) Assets in the field shall be identified by a physical tag where required by the Asset Class Team to identify and locate assets in the field.

3) Asset labels allow clear identification of assets with sufficient information so that assets can be uniquely identified in systems which support asset management activities.

4) Final labelling locations should be determined using common sense from the perspective of the future asset maintainer, considering the line of sight and peripheral vision. Asset tag labels should be safely accessible so that code reading apparatus may be used to capture the asset information.

5) Labels in the public areas have further restrictions:

    a. Labels should be as small as reasonably practicable to avoid being unsightly while ensuring that safety-critical equipment is labelled visibly.

    b. Labels used in back-of-house areas can be larger to facilitate ease of understanding and recognition.

    c. Labels should be located in an unobtrusive area, yet still accessible for the barcode reading equipment.

    d. Labels should not impact the aesthetics of the area.

    e. Alternative labelling methods, such as laser engraved labels on stainless steel or metallic-coloured multi-layer acrylic sheets, may be considered as there are observed instances where members of the public have picked at and peeled off adhesive labels.

f. Public-facing areas include but are not limited to platforms, elevators, tunnels, parking areas and station concourses.

6) Assets shall have up to two forms of machine-readable asset identification:

   a. QR codes that will be engraved or etched on the Asset Identification Label at the time when the label is being created; and

   b. RFID tags, where specified in the relevant Asset Class Data Dictionary document.

7) Consultant/Contractor shall submit the proposed asset tagging strategy for approval, including, as a minimum: the tag's location, type, material, and dimensions. Both QR codes and RFID tags shall contain, as a minimum, the asset identification code.

8) Consultant/Contractor may propose an alternative asset tagging solution to the Metrolinx for approval.

9) The following physical properties shall be complied with for the Asset Tags:

   a. The appropriate tag material shall be chosen depending on the asset's environment. Examples include:

      i. **Foiled Aluminium Asset Labels**: Made from 100% anodized aluminum, the labels are suitable for all textures of surfaces. Tags have a matte surface that reduces glare and enhances fast barcode scan rates. Suitable for laptops and certain types of machinery.

      ii. **Premium Polyester Asset Labels**: Can be safely used on fixtures, furniture, equipment, and even computers. The Tamper-Evident Polyester Asset Labels or the Destructible Vinyl Asset Labels are preferred for theft-resistant options.

      iii. **Metalphoto Aluminum Asset Tags**: are the most durable tags, built to withstand impact, abrasion, UV light, heat, and chemicals. Suitable for machinery placed in harsh environments.

   b. Asset Tag Dimensions - common asset label dimensions in the field are 0.75" x 1.5" -however, an Asset Class Team may propose an alternative dimension to better fit their purpose.

   c. Storage – Optimal conditions for storing labels is at 22 °C with relative humidity at 50%.

   d. Surface preparation – the surface to which the label will be applied should be dry and clean with no dust, oil, grease or rust.

10) Where RFID Tags are specified within the Asset Class Data Dictionaries, they shall comply with the following requirements:

    a. RFID Tags shall be UHF tags that comply with ISO 18000-6C;

    b. RFID Tags shall be passive Tags;

    c. RFID Tags shall be Write Once Read Many times (WORM) Tags;

    d. The RFID Tags shall be encoded with the MX Asset ID, e.g. XXXX-XXX-00001 and shall be consistent with the information encoded in the optical barcode;

    e. RFID Tags shall be suitable for the intended application (e.g. embedded in concrete) and provide a read range of at least 2m;

    f. RFID Tags shall be encapsulated and protected to IP68, a minimum temperature range of -200C to +500C, vibration resistant to BS EN 60068-2 and chemical resistant.