Introduction

As buildings become increasingly digitized, the need for structured, interoperable asset identifiers has become critical. Historically, data fragmentation and siloed information systems have plagued the architecture, engineering, construction, and operations (AECO) sectors. Asset data—such as equipment IDs—are often redefined at each project phase: assigned ad hoc in design models, relabeled by contractors during construction, and inconsistently re-entered or lost entirely at handover.

This long-standing misalignment has made it difficult to achieve lifecycle continuity. BIM authoring tools like Revit store equipment tags in free-text fields without standard validation, while downstream platforms—such as CMMS, BMS, and digital twins—require persistent, structured, machine-readable identifiers. The lack of a unified token format introduces costly reconciliation processes, duplicated effort, and missed opportunities for automation and analytics.

This paper documents a step-by-step evaluation process that led to the selection of a globally unique identifier (GUID) schema for an example rooftop unit (RTU) in a Building Information Modeling (BIM) environment. The objective was to define a universal token convention that could be authored once in Revit and then transported seamlessly through open data exchanges including COBie, IFC, and RDF-based semantic models like Brick and Haystack—all while remaining compliant with ISO 81346 and aligned to ASHRAE Standard 233P: Semantic Interoperability Metadata for Building Systems.

ISO 81346 plays a pivotal role in resolving data fragmentation by offering a hierarchical, structured designation system that aligns functional, locational, and product identifiers across lifecycle phases. Its integration into this workflow strengthens governance, supports semantic clarity, and offers consistency from design through operations.

Problem Statement

How can we create a single, reusable equipment ID (tag) in Revit/BIM that:

- (a) satisfies ISO naming conventions,
- (b) is transportable to COBie, IFC, and semantic models, and
- (c) meets the URI/IRI requirements of Brick, Haystack, and ASHRAE 233P?

Option Exploration

1. ISO 81346 Reference Designation System (RDS)

Structure: ISO 81346 uses a consistent way of naming and structuring equipment based on three parts: function, product, and location. Prefixes like =, +, and - show whether something is a location, function, or product.
Example: -BLDG01-ROOF_A =HVAC +RTU0001

Pros:

- Recognized international standard: Widely adopted in Europe and gaining traction in global digital engineering.
- Hierarchical and human-readable: Shows where equipment is and what it does.
- Supported across domains: Works in both BIM software and operational systems like CMMS.

Cons:

- Special characters limit URI use.
- Steep learning curve for untrained users.

Outcome: ISO 81346 was used as a structural reference for naming logic, but the final token avoids special characters to ensure URI compatibility.

2. Haystack ID Conventions

Structure: Project Haystack uses flexible URN/URL-style identifiers.
Example: urn:blm:BLDG01:ROOF_A:RTU0001

Pros:

- Widely used in analytics and automation platforms.
- Compatible with modern APIs and QR codes.
- Machine-readable and intuitive.

Cons:

- No enforced structure can lead to inconsistency.

Outcome: Adopted as the canonical URI format for semantic integration.

3. Brick Schema IRI Requirements

Structure: Web-style IRI required for each asset.
Example: https://id.domain.com/BLDG01/RTU0001

Pros:

- Optimized for machine reasoning and semantic graphs.
- Works well with RDF and SPARQL.

Cons:

- Requires domain infrastructure.
- Higher implementation effort for smaller organizations.

Outcome: Used as a complementary transport form for cloud-based semantic applications.

4. COBie and IFC Field Mapping

Challenge: Inconsistent identifiers across Revit, COBie, and IFC can lead to data reconciliation issues.

Solution: Store the canonical token in Revit's AssetTag and copy it exactly into COBie Name, IFC AssetIdentifier, and all downstream exports.

Token Example: BLDG01_ROOF_A_RTU0001

- Used consistently in Revit, COBie, IFC, Brick, Haystack, and QR codes.

ISO 81346 Integration Strategy

Purpose

ISO 81346 provides the structural and classification framework necessary to extend identifier consistency and governance across the building lifecycle. It informs token design and enables classification clarity in BIM, CMMS, and digital twin systems.

Key Questions Explored

1. **Should class codes (e.g., Q, KH, KF) appear in endpoint tags?**
    - **Conclusion:** Use in structured metadata, not in endpoint names.
2. **Should ISO 81346 guide only token structure or broader lifecycle use?**

- **Conclusion:** Use as both a structural reference and governance framework across BIM and operations.

Pros and Cons of Broader Adoption

Pros: Cross-domain hierarchy, lifecycle traceability, semantic alignment
Cons: Requires training, enforcement, and tool customization

Final Recommendation

Apply ISO 81346 as a lifecycle governance framework with clear separation between:

- URI-safe token naming
- Class code metadata mapping

Rationale for Final Selection

The token BLDG01_ROOF_A_RTU0001 was selected because it:

- Aligns with ISO 81346 structure (Building + Location + Type + Sequence)
- Is URI-safe and machine-readable
- Integrates into COBie, IFC, Brick, and Haystack
- Complies with ASHRAE 233P IRI requirements

Summary

The integration of smart systems and lifecycle BIM processes hinges on stable, cross-domain asset identifiers. ISO 81346 provides a unified logic to resolve long-standing data fragmentation and inconsistent classification. Through comparative evaluation, a canonical token structure has been validated that bridges Revit authoring, COBie handover, IFC models, and semantic standards such as Brick, Haystack, and ASHRAE Standard 233P.

This approach establishes a path to lifecycle interoperability grounded in globally accepted standards. Future work will focus on extending this model across more asset types and embedding ISO 81346 into BIM Execution Plans (BEPs) and Asset Information Requirements (AIRs).

Disclaimer

This document is presented as a proof-of-concept exploration and is intended to illustrate the potential for harmonizing equipment identifier strategies across BIM, COBie, IFC, and semantic modeling environments using open standards. The methods and examples described herein are illustrative and may require adaptation to meet specific project conditions, software configurations, or organizational requirements. The Building Lifecycle Management Initiative (BLMI) makes no representations or warranties, express or implied, as to the completeness, accuracy, or suitability of the content for any particular purpose and assumes no liability for errors, omissions, or consequences arising from the use of this material.