351in Model Use Templates Guide v1.0

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*This document must be read in conjunction with **211in Model Uses List** and the **Post 40. Information Taxonomy**. For a more detailed understanding, please also read Paper A12 covering the overall LITE framework which can be downloaded **from here**.*

I. Introduction

A **Model Use** is defined as "the intended or expected Project Deliverables from generating, collaborating-on and linking Models to external databases". Model Uses (MU)s are one branch of the **Information Use Taxonomy** which also includes **Document Uses** and **Data Uses**.

A **Model Use Template** (MUT)[1] *extends* the Model Use definition by explaining the activities and resources needed to deliver it. The aim of an MUT is to satisfy three complementary **objectives**:

- **Educate** individuals and organisations about the benefits, requirements, and functioning of each Model Use;
- **Assess** individuals or organisations' ability to deliver a Model Use[2]; and
- **Assist** individuals/organisations to deliver a Model Use.

Education is the *primary* objective of Model Use Templates. Both online and offline materials are optimised to satisfy this objective.

II. MUT Overview

A Model Use Template collates all relevant information pertaining to a specific Model Use in a structured manner. MUTs collate many **MU Properties**[3] under five categories (**Figure 1**):

1. **Basic Properties:** an identification and brief description of a Model Use;
2. **Advanced Properties:** a description of the resources and methods supporting a Model Use;
3. **Activity Flows**: an explanation of the activities needed to execute a Model Use;
4. **References**: the materials referred to when developing the Model Use Template; and
5. **Project Admin**: the information needed to manage the delivery of the Model Use Template.

MU Properties are displayed online through (a) texts, images, and videos; (b) team consoles, or (c) embedded within Activity Flow Diagrams[4]. MU Properties are listed in **Table 1** with sample **Fields/Lists**.

[1] Model Use Templates are developed under **MicroProject F2** within **Project F: Integrated Information** (refer to the project's webpage).
[2] Diagrams and lists are offered in formats that can be easily adapted to suit different organisational and project requirements. For example, the **Draw.io diagrams** (diagrams.net) can be duplicated upon access, modified, and saved locally as needed.
[3] MU Properties will be reviewed and extended during the development of additional MUTs and their respective application in practice.
[4] The online module for exploring/searching MU Properties is still under development. MUTs are currently available as extensions to Model Use entries (terms) within the **BIM Dictionary**. Some properties cannot be displayed/searched until development is completed.

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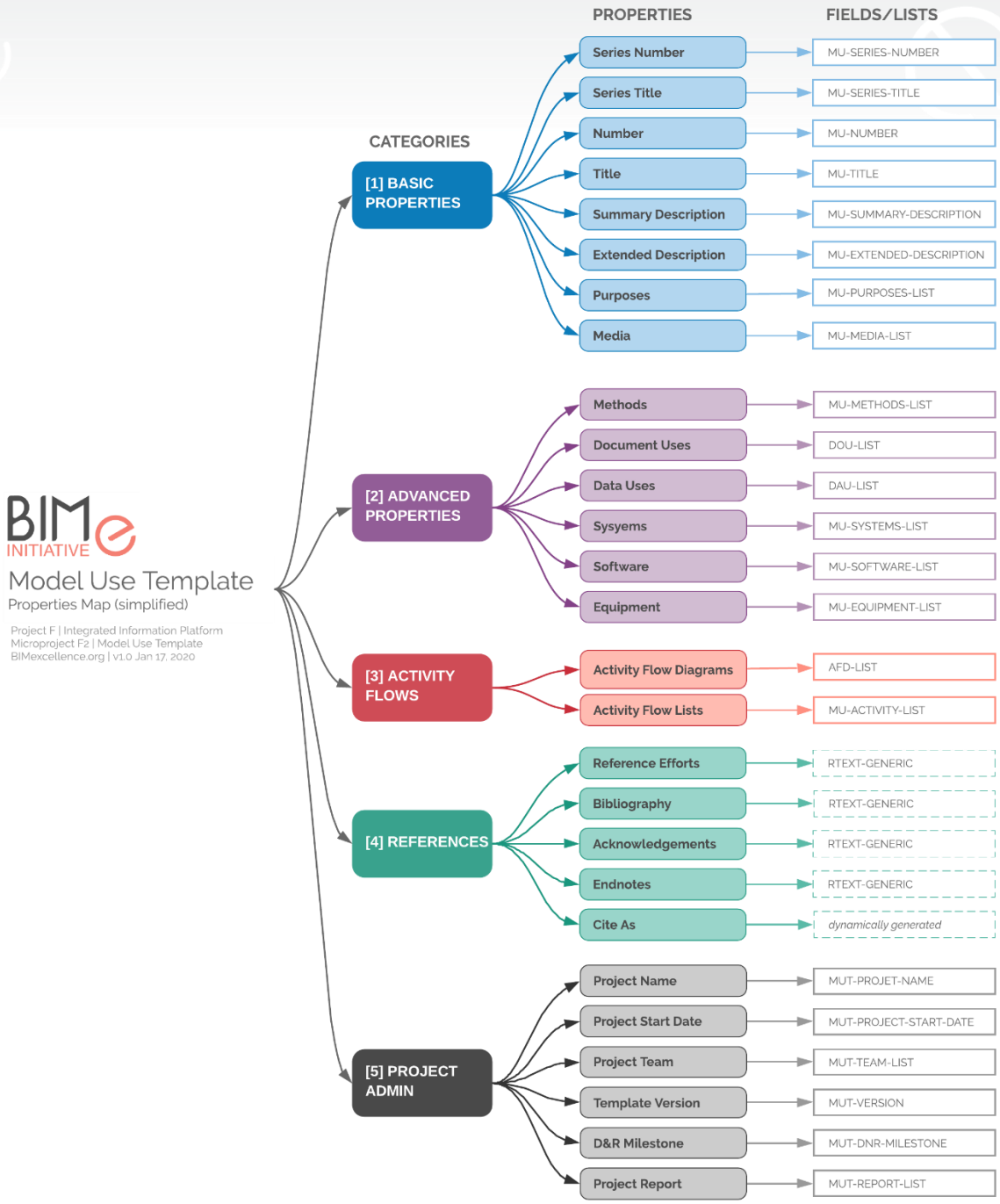

Figure 1. Model Use Template – Simplified Properties Map v1.0

Table 1. Model Use Template – Extended Properties

CATEGORIES	PROPERTIES	DESCRIPTIONS	EXAMPLES	DISPLAY	LISTS
[1] BASIC PROPERTIES	**Series Number**	**Domain Model Uses** are organised in seven series (2000-8000)	4000	Info Panel (not publicly shown)	MU-SERIES-NUMBER
	Series Title	See above	Simulating and Quantifying	Info Panel (not publicly shown)	MU-SERIES-TITLE
	Number	Model Use Title and Number are derived from the 211in Model Uses List	4040	Info Panel (not publicly shown)	MU-NUMBER
	Title	See above	Clash Detection	Term Block	MU-TITLE
	Summary Description	Default BIM Dictionary entry (< 50 words)	See multiple examples online	Text Block (plain)	MU-SUMMARY-DESCRIPTION
	Extended Description	Explanations beyond the Summary Description (~250 words)	See example online	Text Block (rich)	MU-EXTENDED-DESCRIPTION
	Purposes	List of Defined Purposes leading to the selection of Model Use(s) to execute	"Checking accuracy of [[Building]] information, eliminating interferences between [[Building System]]s and/or [[Component]]s"	List Block *(currently text with bullet points)*	MU-PURPOSES-LIST
	Media	A video explanation developed by the BIMe Initiative, the Project Team or – if neither are available - by vetted 3rd parties		Video Item *(currently text with embedded video)*	MU-MEDIA-LIST
[2] ADVANCED PROPERTIES	**Methods**	Methods and recommended practices to be followed when delivering the Model Use	LoX Matrix; Zone Diagrams; Modelling/Tolerances Guidelines	List Block (not publicly shown)	MU-METHODS-LIST
	Document Uses	The Documents inputted and/or outputted as part of delivering the Model Use	Clash Detection Report	List Block (not publicly shown)	DOU-LIST
	Data Uses	The Data sets or scripts inputted and/or outputted as part of delivering the Model Use	Clash Detection Script	List Block (not shown)	DAU-LIST
	Systems	The Systems included within Models enabling the execution of the Model Use	Refer to Asset Hierarchy	List Block (not publicly shown)	MU-SYSTEMS-LIST
	Software	The software, middleware, and plugins that enable the delivery of the Model Use or to make its delivery more efficient	Navisworks BIMcollab ZOOM Bexel Manager	List Block *(currently an embedded table)*	MU-SOFTWARE-LIST
	Equipment	The equipment, hardware, and tools that enable the delivery of the Model Use or to make its delivery more efficient	Computers Smart Board	List Block (not publicly shown)	MU-EQUIPMENT-LIST

CATEGORIES	PROPERTIES	DESCRIPTIONS	EXAMPLES	DISPLAY	LISTS
[3] ACTIVITY FLOWS	Activity Flow Diagrams	The sequence of activities to follow when executing a Model Use	Refer to section below	Diagram Unit *(currently embedded diagram)*	ACTIVITY-FLOW-DIAGRAM-LIST
	Activity Flow Lists	All activities[5] within Activity Flow Diagrams (at varying Granularity Levels)	See example online	List Block *(currently bullet points)*	MU-ACTIVITY-LIST[6]
[4] REFERENCES	Reference Efforts	Similar BIM/Model Uses/IDMs by others (Process Maps, Interaction Maps, and Exchange Requirements)	buildingSMART Int PennState Uni / Yonsei Uni Massport / Wuppertal Uni	Text Block (not publicly shown)	RTEXT-GENERIC
	Bibliography	The main research papers, standards, guides, and protocols reviewed during the development of the Model Use Template	See example online	Text Block	RTEXT-GENERIC
	Acknowledgements	Authors, contributors and sponsors of each Model Use Template	See example online	Text Block	RTEXT-GENERIC
	Endnotes	Additional information and BIMei Resources of relevance to each Model Use Template	See example online	Text Block	RTEXT-GENERIC
	Cite As	A recommended format to use when citing the Model Use Template	See example online	Citation Block *(DOI not shown)*	*Dynamically generated*
[5] PROJECT ADMIN	Project Name	The name/title assigned by BIMei or provided by collaborating partners	"Project 4040"	*(included in Endnotes or project's website)*	MUT-PROJECT-NAMES-LIST
	Project Start Date	The date a team was formally assigned to a Model Use Template project	"Clash Detection – Model Use Template development project"	*(included in Endnotes or project's website)*	MUT-PROJECT-START-DATE
	Project Team	The names and roles (if applicable) of volunteers and contributors	See example online (included in the Acknowledgement Section)	List Block *(currently bullet points)*	MUT-TEAM-LIST
	Template Version	The current Formal version (not the *last updated* version) - refer to D&R Path	V1.0 November 20, 2019	Version Dropdown	MUT-VERSION
	D&R Milestone	The current Development and Release milestone – refer to D&R Path	D2 | Published as Draft	Info Panel (not publicly shown)	MUT-DNR-MILESTONE
	Project Report	The document summarising the research/ validation efforts by the Project Team	Example will be available when MUT reaches D&R milestone F2	Attachment Panel (not publicly shown)	MUT-REPORT-LIST

[5] Activities, Abilities, and Outcomes are considered three uses of the same 'Statement' (e.g. "identify Clash Detection Rules to apply within a Clash Detection Cycle").
[6] Activity Lists include activities, sub-activities, tasks, sub-tasks, and steps (no further subdivision allowed) that need to be executed when delivering a Model Use.

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III. Focus on Activity Flow Diagrams

Activity Flow Diagrams clarify the sequence of activities to follow when executing a Model Use. Activities within Activity Flow Diagrams are derived from the Activities List and presented in a sequential – or in parallel patterns when necessary - to aid understanding.

To reduce complexity, modular Activity Flow Diagrams are used to describe and explain information exchanges across an Asset's lifecycle. This modularity is necessary to prevent repeating the *same activity sequences* across *different Model Uses* and to allow users to focus on the activity flows of most relevance to them.

Activity Flow Diagrams are organised into levels - all represented through a stylized *Business Process Model and Notation* (BPMN) language. *Higher levels* are more abstract to cover the whole Information Lifecycle of an Asset, while *lower levels* are 'detailed-enough' to cover MU specific information exchanges and technical requirements[7]. There are five **Activity Flow Levels** [1-5]:

1. **Activity Flow Level 1** represents the high-level *Information Actions* (sets of activities) across an asset's information lifecycle – refer to the LITE framework[8]. At this level, there are *eight* sequential actions – corresponding to the framework's eight **Information Milestones** - from the *start* to the *end* of a single **Information Cycle** (**Figure 2Error! Reference source not found.**):

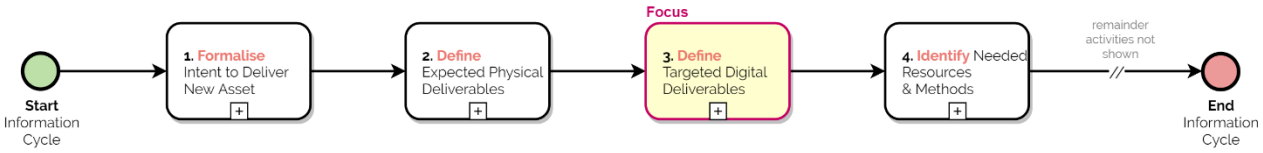

Figure 2. Activity Flow Diagram Level 1 | **Information Cycle** (no parent) Granularity Level 1, Version 0.1 [**AFD.1001.V0.1**]

The Activity Flows clarifies the need to [1] *formalize* the intent to deliver new assets; [2] the specifications of the physical assets to be delivered; [3] the digital artefacts (models, documents, and data sets) necessary to deliver the physical assets, and [4] the resources and methods that – without which – no digital or physical assets can be delivered.

[7] Activity Flows cross-reference each other using hyperlinks. Cross references are used within the same, higher, or lower Activity Flow Levels. Wherever possible, Activity Flows are presented in a linear fashion with minimal loops, gates, and branches.
[8] Activity Flow Level one is based on the **Lifecycle Information Transformation and Exchange** (LITE) framework (published Feb 2020).

2. **Activity Flow Level 2** expands upon the eight parent actions in Level 1. For example, branching from **Information Milestone 3** (refer back to **Figure 2**), the user can be guided to *selecting* the **Information Uses** (Model Uses, Document Uses, and Data Uses - **Figure 3**) needed to deliver the physical assets as specified in the preceding **Information Milestone 2**[9]:

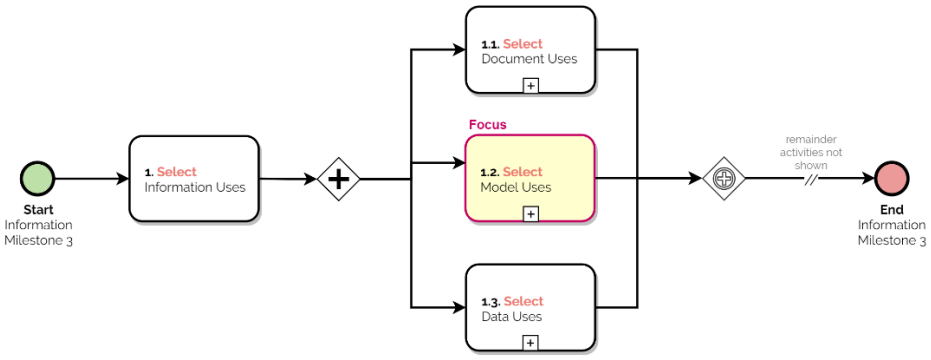

Figure 3. Activity Flow Diagram Level 2 | **Define Targeted Digital Deliverables** (parent: Information Milestone 3 of Level 1 Activity Flow Diagram - Information Cycle) Granularity Level 2, Version 0.1 [**AFD.2001.V0.1**]

After selecting the Model Uses (and building the **Model Use Stack**[10]), the user can then be guided to prepare the models according to these uses.

3. **Activity Flow Level 3** clarifies the preparatory activities needed after selecting a single Model Use or a Model Use Stack (**Figure 4**).

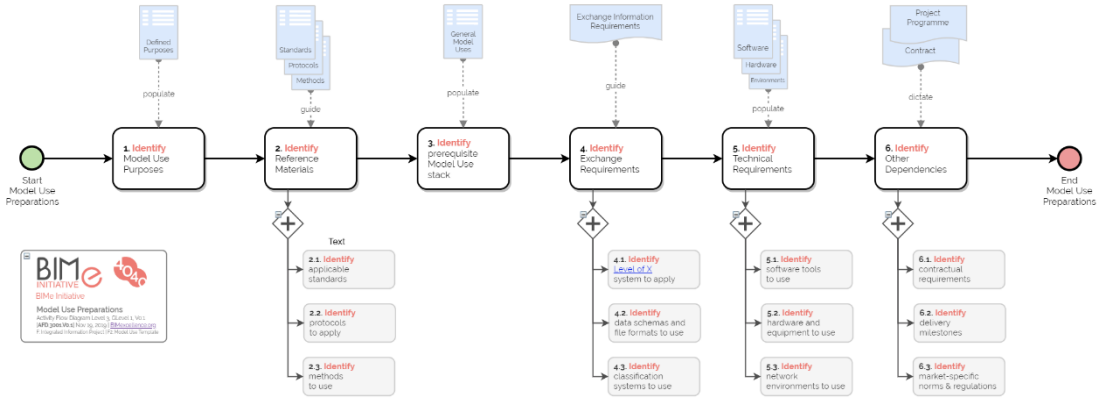

Figure 4. Activity Flow Diagram Level 3 | **Model Use Preparations** (parent Select Model Uses of Level 2 Define Digital Deliverables) Granularity Level 1, Version 0.1 [AFD.3001.V0.1]

[9] The diagram branching from Information Milestone 2 is not included in this document.
[10] Multiple Model Uses can be targeted at once. This resembles a stack of overlapping requirements that may be satisfied through a single Federated or Integrated Model.

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4. **Activity Flow Level 4** clarifies the activities needed to execute any Information Use – the example used here is for a Model Use - **4040 Clash Detection** (**Figure 5**). The Activity Flow Diagram may include loops to account for design and/or delivery iterations as needed (refer to **Information Loops** within the LITE framework):

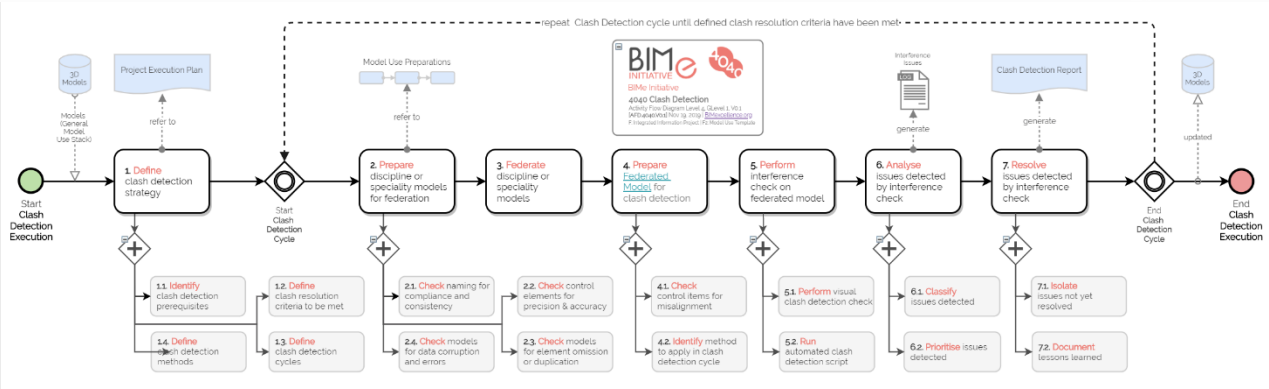

Figure 5. Activity Flow Diagram Level 4 | **4040 Clash Detection** (parent: Level 3 Model Use Preparations) Granularity Level 1, Version 0.1 [AFD.4040.V0.1]

5. **Activity Level 5** connects information exchange requirements (defined for human actors) with data exchange requirements for machine actors (computers). At this level, a information is expressed as a Model View based on a standardised/formal or ad-hoc/informal Model View Definitions (MVD)s[11]. Level 5 Activity Flows are outside the scope of this Guide[12].

[11] A Model View Definition is a specification which identifies the properties and specifies the exchange requirements of Model Views. A 'standardised' Model view Definition (MVD) can be a subset of an established schema (e.g. Industry Foundation Classes), typically intended for software developers (not end users) to implement into their Software Tools (e.g. the IFC4 Design Transfer View by buildingSMART International). For more information, please refer to **ISO 29481-1:2016 Building information models - Information delivery manual - Part 1: Methodology and Format**. https://www.iso.org/standard/60553.html

[12] There are many international efforts focusing on mapping information/data exchanges at **Activity Flow Level 5** using similar BPMN-inspired diagrams. The BIMe Initiative **seeks to collaborate** with community initiatives, research institutions, and software companies that have developed compatible, open-access materials. If you represent such an organisation that is willing to align efforts, share knowledge, and exchange lessons learned, please contact us.

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IV. MUT Development Principles

To achieve uniformity when developing Model Use Templates for a variety of Model Uses, MUT development teams are asked to follow three **MUT Development Principles** to ensure:

1. **Quality** of the information represented by MUTs:
   1.1. All information needs to be vetted for accuracy
   1.2. All images need to be vetted for clarity
2. **Consistency** of terms, concepts, and relations used across MUTs:
   2.1. All terms need to be derived from the international BIM Dictionary
   2.2. All template titles and numbers need to be derived from the 211in Model Uses List
   2.3. All concepts, attributes, relations, and knowledge sets need to be derived from the 291in Conceptual BIM Ontology
3. **Modularity** of information represented by MUTs:
   3.1. All inputs and outputs need to be derived from BIMei normalised lists (e.g. Software Tools List) to be used across MUTs. These lists are will be developed and maintained independently[13]
   3.2. All activities needed to execute a Model Use must be presented as a single Activity Flow Diagram at Level 4. As some activities may apply across multiple MUs and thus need to be represented at Level 3, MUT teams must closely coordinate their efforts with other Project F teams.

V. MUT Development and Release path

The Development and Release (D&R) path of a Model Use Template follows a similar path to other BIMe Initiative resources. It includes ten milestones, organised under four sections/categories:

Development (D)

- D1 | *Initial Development* by the BIMei community or by collaborating researchers.
- D2 | *Review* by the BIMei Community, check for quality, consistency and modularity.
- D3 | *Publish as Draft* - e.g. 4040 Clash Detection - Draft 190125.

Formalization (F) - English

- F1 | *Evaluate* in different environments, improve if applicable, and update draft template.
- F2 | *Publish as Formal* (with a version number)[14] – e.g. 4040 Clash Detection v1.

Localisation (L) - LOTE

- L1 | *Localise* in a new language or for a new market,
- L2 | *Check Localisation* by the BIMei Community for quality.
- L3 | *Publish as Localised* – e.g. 4040.pt Detecção de Interferências v1.

Review (R)

- UR | Under Review (if a formal review is needed with major changes expected).
- RX | Removed (if the publication is considered redundant but the code used to reference it need to be maintained).

[13] As an example, the **Software Tools List** is currently being developed as part of **MicroProject F3 >Technological Resources**.
[14] The incremental MUT-Version number may not be shown publicly. As Model Use Templates continually change (InfoBlocks are updated independently), the *formal* MUT version number will be assigned to the static PDF document downloaded by the user.

VI. Acknowledgements

This document and the examples provided were developed over an 18-months period as a collaborative effort between: Ms. Fernanda Machado, *Technical Sales Specialist at Autodesk*, **Brazil**; Ms. Paula Mota, *BIM Director at SIPPRO*, **Brazil**; Dr. Lorena Moreira, *Federal University of Bahia*, **Brazil**; Prof. Regina Ruschel, *School of Civil Engineering & Architecture*, *University of Campinas* **Brazil**; Dr. Erik Poirier of *Le Groupe BIM du Québec*, **Canada**; and Dr. Bilal Succar of *ChangeAgents AEC*, **Australia**.

VII. More information

New international teams will be tasked with delivering additional Model Use Templates for the remaining Model Uses. For more information about these efforts and/or participate in Microproject F2, please refer to the **Model Use Templates Development Strategy** (released June 2020) or Contact Us.

This document will be continuously updated. For the latest version, please refer to the BIMe Initiative resources page. To cite this document version, please consider using the following:

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VIII. License to use

IX. Change Log

VERSION	DATE	DESCRIPTION
0.1	Dec 17, 2019	Initial draft
0.6	Jan 17, 2020	Mature draft released to the BIMei Community and Sponsors
1.0	Mar 11, 2020	First online release – Minor Improvements - DOI assigned

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