Appendix VI – LOD-I Requirements, Creation and Extraction

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1. Introduction

This Appendix describes Level of Information (LOD-I) for BIM models and BIM objects. Section 2 lists out and describes LOD-I across the WDs. Section 3 describes how to create attribute fields in different sample authoring software. Section 4 outlines different types of BIM attributes, and Section 5 describes principles of BIM attribute mapping and extraction. Validation tools with relevant user guidelines to perform initial assessments on the BIM data quality are also available for access at the login Government BIM Data Repository (website link: page of the https://gbdr.landsd.ccgo.hksarg/).

2. LOD-I Across the WDs

Table App VI-1 describes general LOD-I requirements of LOD 100 to 500. The groupings of attributes have been developed based on principles set out in CIC BIM Standards - General. Further descriptions of the attribute table are as follows:

2.1. WDs' Attributes Requirements

Asset owner could define additional information needs. In accordance with paragraph 17 of the Technical Circular (Works) No. 2/2021, WDs should review and collaborate with maintenance agencies of the built assets regarding asset information requirements (AIR). Asset owners who have not defined their information needs should refer to the table below as the basis. Asset owners who have already defined their own required attribute(s) should ensure the pre-defined attributes could cover relevant LOD-I.

2.2. The Groups of Attributes in the LOD-I Requirements

The list of attributes is formulated based on common approaches as discussed with WDs. Table App VI-1 contains the following groups of attributes:

- a) Project Information is used to facilitate geolocation and data conversion via the Conversion Engine.
- b) General Properties are used to enable information grouping and identification.
- c) Design Properties are used to facilitate design review, drawing generation and quantity take-off.
- d) Classification Properties are used to facilitate asset classification. Departmental classification(s) in addition to or instead of OmniClass could be defined by WDs.
- e) Manufacturer's Equipment Properties, Condition Properties and Verification Properties are used to facilitate asset information management.

2.3. Mandatory and Required Attributes

"M" indicates mandatory information to facilitate metadata extraction and geolocation for Conversion Engine. "R" indicates required information to the WDs. To facilitate information exchange, Table App VI-1 shows the minimum required LOD-I and should be inputted into BIM models as far as practicable. Exemptions to exclude required information to WDs should be sought from **maintenance agencies**, and the records on the decisions should be kept and documented in BEP.

2.4. BIM Authoring Software

Attributes that are built-in to BIM authoring software should be utilised as far as practicable. In the last two columns of Table App VI-1, Revit and Civil 3D are used as examples for the attributes' creation methods. If software other than these two software is adopted, the methods for creating attributes should be properly documented in the BEP.

2.5. Samples of Attributes Files

To facilitate WDs' adoption of the LOD-I across the WDs, a project-specific shared parameter text file for Autodesk Revit (refer to Figure App VI-1) and a .dwg file including for Autodesk Civil 3D with those attributes will be sent by CD-ROM with the final hard copy of the Guidelines.

Figure App	5 VI-1	Shared	Parameter	File	for Revit
0 1					

Revam	p Model C	ommon Attributes.txt
1	# This	is a Revit shared parameter file.
2	# Do no	t edit manually.
3	*META	VERSION MINVERSION
4	META	2 1
5	*GROUP	ID NAME
6	GROUP	1 Classification Properties
7	GROUP	2 General Properties
8	GROUP	3 Design Properties
9	GROUP	4 Manufacturer's Equipment Properties
10	GROUP	5 Condition Properties
11	GROUP	6 Verification Properties
12	*PARAM	GUID NAME DATATYPE DATACATEGORY GROUP VISIBLE DESCRIPTION USERHODIFIABLE
13	PARAM	ba3c3418-a4ba-460d-bb47-f25ba4d56a8e Equipment Capacity TEXT 4 1 1
14	PARAM	f184fa44-50fe-4e0d-be15-f9e776181cd2 Contract Number of the Equipment TEXT 4 1 1
15	PARAM	87dabc67-a110-4bca-982b-548150a66ed8 Verification TEXT 6 1 1
16	PARAM	24d8fb6d-3f01-4a8c-b254-f55a95dda970 Material Grade TEXT 3 1 1
17	PARAM	71f6107b-59c8-486f-8b2d-82f6c1aea810 CAT Code TEXT 2 1 1
18	PARAM	de760a88-d846-4697-a9d2-b04bd0f58115 Manufacturer Name TEXT 4 1 1
19	PARAM	7b262c88-0db1-4a8d-9b70-f8730a0a33ec Design Capacity TEXT 3 1 1
20	PARAM	2be8dc88-6137-48ab-8a7e-564259dd95c4 Model Number TEXT 4 1 1
21	PARAM	56848590-dd58-45b4-8561-4d90e97168bc Departmental Unique ID TEXT 2 1 1
22	PARAM	8979349f-9719-4416-9204-af0f333e75d1 Certified Completion Date TEXT 5 1 1
23	PARAM	2a3681ac-2d41-47e6-922e-3282c823b9dd Handover Date TEXT 5 1 1
24	PARAM	c92b6fc2-f76c-4065-908f-adf5f22eb83e Asset ID TEXT 4 1 1
25	PARAM	cac282cd-9403-4c82-aeb4-a88757c778b7 OmniClassTitle TEXT 1 1 1
26	PARAM	d06feedf-d592-495f-8db5-b0aafea86e98 LOD-G TEXT 1 1 1
27	PARAM	e3f4d6e5-b221-42b4-ad34-49282662d045 Brand Name TEXT 4 1 1
28	PARAM	56cb03ea-0752-490e-812b-19bfb0c50a5e OmniClassVersion TEXT 1 1 1
29	PARAM	676bb5f6-a71b-4a20-bf4e-5e8c143862a9 OmniClassCode TEXT 1 1 1
30	PARAM	de1780f8-89a1-4175-a779-00e83675ad1a Location TEXT 2 1 1
31	PARAM	28e1f8f9-479b-4de7-8a8f-53525653f350 LOD-I TEXT 1 1 1

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No. Grouping Attribute Name		Description	LOD-I					Proposed Input Format	Creation Method for Sample Authoring Software		
				100	200	300	400	500	Input Format	Revit	Civil 3D
1	Project Information	Organisation Name	Client name (per agreement/ contract)	М	М	М	М	М	Alphanumeric	Use default attribute in	Use Custom Property in
		Project Issue Date	Project Commencement date	М	M	М	М	М	MMM YYYY	Information Dialog Poy	Properties Dialog Poy
									(eg. 100 2014)	Dialog Box	Dialog Box
		Project Address	The street address of the project	М	М	М	М	М	Alphanumeric	Refer to Section 3.1	Refer to Section 3.2
		Project Name	The project name as shown on the drawing sheet's title block	М	М	М	М	М	Alphanumeric		
		Project Number	The project number as shown on the drawing sheet's title block	М	М	М	М	М	Alphanumeric		
2	General Properties	CAT Code	Departmental category	R	R	R	R	R	Alphanumeric	Shared Parameter	Property Set
			(see Remark 1)								Refer to
		Locations	Location (e.g. district code for outdoor object)		R	R	R	R	Alphanumeric	Refer to Section 3.3	Section 3.4
		Departmental Unique ID	The unique ID for departmental information management		R	R	R	R	Alphanumeric		

Table App VI-1 LOD-I Across the WDs

No.	Grouping Attribute Name Description			LOD-I				Proposed Input Format	Creation Method for Sample Authoring Software		
				100	200	300	400	500		Revit	Civil 3D
3	Design Properties	Material	Singular material or all materials		R	R	R	R	Alphanumeric	Family parameter	Property Set
Material Grade Design Capacity			assembly							Refer to Section 3.7	Refer to Section 3.4
		Material Grade	Material grade (e.g. concrete grade, steel		R	R	R	R	Alphanumeric	Shared Parameter	
		grade)							Refer to Section 3.3		
		Design Capacity	Design capacity		R	R	R	R	Alphanumeric		
		Number	Room Number				R	R	Alphanumeric	Use default attributes	N/A
		Name	Room Name				R	R	Alphanumeric	"Room"	
										Refer to Section 3.8	
4	Classification Properties	OmniClassCode	OmniClass code			R	R	R	Alphanumeric	Classification	Classification
	(see Remark 2)									Section 3.5	Section 3.6
		OmniClassTitle	OmniClass title			R	R	R	Alphanumeric		
		OmniClassVersion	OmniClass version			R	R	R	Alphanumeric		

No. Grouping		Attribute Name Description		LOD-I					Proposed	Creation Method for Sample Authoring Software		
					200	300	400	500	input Format	Revit	Civil 3D	
5	Manufacturer's Equipment Properties	Brand Name Manufacturer Name Model Number of element / equipment Equipment Capacity Asset ID Contract Number of the Equipment	Brand name Manufacturer name Model number Equipment capacity Asset ID The equipment's contract number				R R R R R R	R R R R R R	Alphanumeric Alphanumeric Alphanumeric Alphanumeric Alphanumeric	Shared Parameter Refer to Section 3.3	Property Set Refer to Section 3.4	
6	Condition Properties	Certified Completion Date Handover Date	Certified completion date Handover date				R R	R R	MMM YYYY (eg. Nov 2014) MMM YYYY (eg. Nov 2014)	Shared Parameter Refer to Section 3.3	Property Set Refer to Section 3.4	

No.	Grouping Attribute Name Description			LOD-I				Proposed Input Format	Creation Method for Sample Authoring Software		
				100	200	300	400	500	input i ormat	Revit	Civil 3D
7	Verification Property	Verification	Verification method (input A for "field verified by visual inspection" and B for "field verified by a measured survey")					R	Text (e.g. A or B)	Shared Parameter Refer to Section 3.3	Property Set Refer to Section 3.4

Remarks:

- 1. Category (in the form of the shared parameter "CAT Code" under "General Properties") could facilitate grouping and data filtering. In addition, "category" may refer to:
 - a) The use of appropriate category or object types when creating BIM objects to minimize data loss (especially LOD-G) during open format exchange.
 - b) BIM Object naming's abbreviation code fields 1 & 2 to facilitate BIM object library management and consistency of information container ID naming.
- 2. Department-specified classification(s) in addition to or instead of OmniClass could be defined by WDs.

3. Creation of Attributes for Required Information

3.1. Creation of Project Information Attributes in Revit

In Revit, default attributes can be utilised for inputting Project Information under **Manage** tab \rightarrow **Settings** panel $\rightarrow \textcircled{M}$ **Project Information**. The figure below illustrates the Revit Parameters used for Project Information.

|--|

roject in	formation		
Family:	System Family: Project Information	~	
Type:		~	
Instance P	Parameters - Control selected or to-be-created i	nstance	
	Parameter	Value	
Identity	Data		
Organiza	ation Name <		 Attributes for Organization
Organiza	ation Description		Name
Building	Name		
Author			
Energy	Analysis		
Energy S	Settings	Edit	Attributos for Project Issue
Route A	nalysis		- Attributes for Project issue
Route A	nalysis Settings	Edit	Date Project commencement
Other			Date
Project I	ssue Date <		
Project S	Status		 Attributes for Project Address
Client N	ame		
Project A	Address 🗧		 Attributes for Project Name
Project I	Name		Attributes for Project Number
Project I	Number		Autorite for Hojeet Humber

3.2. Creation of Project Information Attributes in Civil 3D

In Civil 3D, Project Information attributes can be created by using **Custom Property** in **Drawing Properties** dialog box.

Figure App	VI-3 I	Project	Information	Attributes	in	Civil 3D
i iguie ripp	1121	Indjeet	mormation	1 minoures	111	CIVIL JD

General Summary Sta	atistics Custom		
Custom properties:			
Name	Value	<u>A</u> dd	
Organization Name		2.1.2	
Project Issue Date		Delete	Custom propertie
Project Address	•		for project
Project Name			information
Project Number			Constant from the books of the books

To create the Custom Property, first input "**DWGPROPS**" in the command line to show the **Drawing Properties** dialog box, then follow the steps as illustrated in the figure below to add the Project Information attributes.

Custom properties:			
Name Organization Name Project Issue Date	Value	Add <	2) Click Add button
Custom property na Project Address	roperty me:	×	 3) Input the Custon property name
	ОК	Cancel	4) Click OK button

Figure App VI-4 Adding Custom Property Name in Civil 3D

- 3.3. Creation of Shared Parameters in Revit
- 3.3.1. In Revit, Shared Parameters are identified by unique GUIDs to facilitate attribute consistency across BIM files. Shared Parameters could be applied to BIM object and BIM model.
- 3.3.2. Adding Shared Parameters to Revit Family Files (BIM objects in .rfa format)
 - a) Create a new family or open an existing one.
 - b) Click Create tab > Properties panel > $\stackrel{\texttt{Properties}}{=}$ (Family Types).
 - c) In the Family Types dialog, under the Parameters group box, click Add.
 - d) In the Parameter Properties dialog, select Shared Parameter.
 - e) Click **Select** and choose the appropriate shared parameter from the appropriate parameter group. If desired, click **Edit**; this will return to the **Edit Shared Parameters** dialog which allows opening a different shared parameter file or adding new parameters (refer to the steps in Section 3.3.4).
 - f) Choose whether to store the parameter by instance or type.
 - g) Click **OK**. The parameter name appears in the **Family Types** dialog.
 - h) Optionally, enter a value for the shared parameter or create a formula to calculate its value.
- 3.3.3. Adding Shared Parameters to Revit Project Files (BIM models in .rvt format)
 - a) Create a new project or open an existing one.
 - b) Click Manage tab > Settings panel > III (Project Parameters).

- c) In the **Project Parameters** dialog, click Add.
- d) In the **Parameter Properties** dialog, select **Shared parameter**.
- e) Click **Select** and choose the appropriate shared parameter from the appropriate parameter group. If desired, click Edit; this will return to the **Edit Shared Parameters** dialog which allows opening a different shared parameter file or adding new parameters (refer to the steps in Section 3.3.4).
- f) Choose whether to store the parameter by instance or type.
- g) Select the categories to add the shared parameter on the right-hand side.
- h) Click **OK**. The parameter will appear in the elements.
- i) Optionally, enter a value for the shared parameter or create a formula to calculate its value.
- 3.3.4. Adding new Shared Parameters in Edit Shared Parameters Dialog
 - a) Click **Create**.
 - b) In the **Create Shared Parameter File** dialog, enter a file name, and save the dialog to a desired location.
 - c) In the **Groups** box, click **New** and enter a name for the parameter group.
 - d) From the **Parameter Group** drop-down menu, select a group.
 - e) In the **Parameters Group** box, click New.
 - f) In the **Parameter Properties** dialog, enter a name, discipline, and type for the parameter.
 - g) Optionally, under **Tooltip Description**, click **Edit Tooltip**. In the **Edit Tooltip** dialog, enter the tooltip text, up to 250 characters.

- 3.4. Creation of Property Set in Civil 3D
- 3.4.1. In Civil 3D, **Property Sets** could be used for user-defined attributes for BIM model elements. Below is an example of user-define attribute for pipe using **Property Sets**.

Figure App VI-5 An Example of User-define Attribute for Pipe Using Property Sets

			[+][Top][2D Wireframe]
	Pipe	- 📽 🔶 📲	
ecto	DOCUMENTATION	-	<u> </u>
d so	Hyperlink	-	
4	Notes		
	Reference documents	= (0)	
User-defined	PROPERTY SETS	· · · · ·	
attributes for	PipeData	· · · · · · · · · · · · · · · · · · ·	
pipes using ខ្ល	BeddingType	В	
Property Sets	UpStreamManholeType	El	
			\sim
5			
- Ing			5 D C

- 3.4.2. **Property Sets** could be defined in **Style Manager**. The following are key steps for setting up **Property Sets** for user-defined attributes for Civil 3D BIM object.
 - a) Input command "STYLEMANAGER" in the command line to open the Style Manager which is shown as below Figure:

Figure App VI-6 Step a of Setting up Property Sets for Civil 3D BIM Object



b) Under Style Manager, right click Property Set Definitions under Documentation Objects, then click New.



c) Input the Name and Description of the Property Set in General tab.

Figure App VI-8 Step c of Setting up Property Sets for Civil 3D BIM Object



d) Under **Applies To** tab, select the types of object (e.g. Pipe) to be applied in the **Property Set**.

Drainage.dwg General Apples To Definition Documentation Objects A2D Section/Elevation Styles ab Property Data Formats Property Set Definitions Property Set Definitions Property Set Definitions AEC Polygon Styles List Definitions Ask Block Definitions Maker Block Definitions Material Definitions Material Definitions Profiles Profiles Select All Clear All Clear All				
Apples To: © Objects Property Data Formats Property Set Definitions PipeData AEC Polygon Styles E Classification Definitions E Layer Key Styles E List Definitions Material Definitions Material Definitions Multi-View Block Definitions Multi-View Block Definitions Multi-View Block Definitions Mass Element Styles Multi-View Block Definitions Multi-View Block Definitions Multi-View Block Definitions Parcel Face Label Parcel Segment Label Propile and Structure Table Property Label Property Label	Drainage.dwg Drainage.dwg	General Applies To Definition		
Material Definitions Material Definitions Multi-View Block Definitions Parcel Boundary Parcel Segment Label Parcel	20 Section/Elevation Styles Iab Property Data Formats Property Set Definitions PipeData Multi-Purpose Objects AEC Polygon Styles E Classification Definitions E User Key Styles B E List Definitions Mask Block Definitions	Apples To: Objects Styles and Definitions Pipe Multi-View Block Reference Network Network Part Base Network Part Connector Network Part Connector Network State	Classifications: None avail	
Select All Clear All	- In Mass Element Styles → Material Definitions - In Multi-View Block Definitions - D Profiles			Select object
Select All Clear All Clear All		Pipe and Structure Table Pipe Label Pipe Label Pipe Network Section <		Property Set
		Select All Clear All	Clear All	
< >		<	>	

Figure App VI-9 Step d of Setting up Property Sets for Civil 3D BIM Object

e) In **Definition** tab, click the properties as required to be added to the **Property Set**.

Figure App VI-10 Step e of Setting up Property Sets for Civil 3D BIM Object



f) Edit the Name, Description, Type, Source, Default value, etc. for the properties.

Drainage.dwg								
Documentation Objects A 2D Section/Elevation Styles	General Apples to Demitton	Description	Tune	Same	Default	Units	Farmet	Control 1
+ lab Property Data Formats	The section Trans	Description	Test	Source	Default	Units	Format	Examp
Property Set Definitions	Te UnStreamManholeTune	BeddingType	Auto Incremen	t - Character	B		Standard	B E1
ALL Polygon Styles Classification Definitions Classification Definitions Layer Key Styles List Definitions Mark Reach Definitions			Real Text True/False					
Mask block Definitions	Edit Na	me, Description	Type, Sou the Prope	irce, Defa rty.	ault val	ue, etc	. for	

Figure App VI-11 Step f of Setting up Property Sets for Civil 3D BIM Object

- 3.4.3. The steps for applying **Property Set** to Civil 3D BIM objects are as follows:
 - a) Select the model element, input **PROPERTIES** command in the command line, then click **Extend Data** in the **PROPERTIES** palettes.

Figure App VI-12 Step a of Applying Property Sets to Civil 3D BIM Object



b) Click Add Property Sets icon in the bottom left of the PROPERTIES palettes. In the Add Property Sets dialog, click to select the pre-defined Property Set "PipeData", then click the OK button.

Figure App VI-13 Step b of Applying Property Sets to Civil 3D BIM Object



c) The "**PipeData**" of **Property Set** is now added to BIM object shown as below Figure.





3.5. Creation of Classification in Revit

This section describes the methods of adding classification information in Revit. Classification information could be department-specified classification(s), additional classification (e.g. OmniClass), or both. If department-specified classification(s) are used, classification information could be created as Shared Parameters (refer to Section 3.3 for details). If OmniClass classification is used, there are three creation methods as described in sections below.

3.5.1. This section describes a sample creation method for classification information especially for OmniClass, as this method is not limited by OmniClass and Revit's updates. Considering OmniClass version would be updated from time to time, to ensure consistency, if OmniClass is the project-specific or stakeholder-specified classification system, OmniClass information should be inputted as Shared Parameters. Refer to the figure below for an example and Section 3.3. for details.

Figure App VI-15 An Example of Adding OmniClass Information as Shared Parameter in Revit

Edit Shared Parameters		×
Shared parameter file: C:\Users\liuye\Downloads\NBS_BIMObje	Browse	Create
Parameter group:		
BOS_General	~	
Parameters:		D
NBSChorusProjectId NBSChorusSpecificationId NBSChorusSuffix NBSChorusTitle NBSDescription NBSNote NBSOfficeMasterTag NBSReference NBSTypeID OmniClassCode OmniClassCode OmniClassVersion ProductInformation		Parameters New Properties Move Delete Groups New
Revision Uniclass2015Code Uniclass2015Title Uniclass2015Version Version	~	Rename Delete
ОК	Cancel	Help

- 3.5.2. Revit has an add-in program named as "Classification Manager" for classification management. Refer to the below link for the details of the add-in program. <u>https://knowledge.autodesk.com/support/revit-products/getting-started/caas/simplecontent/content/classification-manager-for-revit-quick-start.html?st=classification%20manager</u>
- 3.5.3. Revit provides pre-set parameters "OmniClass Number" and "OmniClass Title" under Identity Data for Revit families. These parameters correspond to OmniClass "Table 23 – Products" in Revit Family. Classification number could be defined by editing the Revit family's properties. Refer to the figure below for an example.

Figure App VI-16 An Example of Pre-set Parameters "OmniClass Number" and "OmniClass Title" under Identity Data in Revit Family

Properties	×
R	
Family: Pipe Accessories	✓ 🚰 Edit Type
Constraints	*
Host	
Dimensions	*
Round Connector Dimension	Use Diameter
Mechanical	*
Part Type	Valve - Breaks Into
Identity Data	*
OmniClass Number	23.27.31.17
OmniClass Title	
Other	*
Work Plane-Based	
Always vertical	
Cut with Voids When Loaded	

If OmniClass 2012 standards is assigned to be used and the OmniClass numbers supplied in Revit are incorrect, please refer to below link and update the OmniClass Taxonomy File accordingly.

https://knowledge.autodesk.com/support/revitproducts/troubleshooting/caas/CloudHelp/cloudhelp/2020/ENU/Revit-Troubleshooting/files/GUID-BA0B2713-ADA0-4E51-A7CD-85D85511F3EDhtm.html

- 3.6. Creation of Classification in Civil 3D
- 3.6.1. In Civil 3D, there are no pre-set parameters function for OmniClass. Classification **Definitions** could be used for setup OmniClass information for the Civil 3D BIM objects under **Style Manager**. The key steps are as follows:
 - a) Input command "STYLEMANAGER" in the command line to open the Style Manager. Classification Definitions could be found under Style Manager.

Figure App VI-17 Step a of Setting up OmniClass information under Style Manager for Civil 3D BIM Objects



b) In Style Manager, right click Classification Definitions under Multi-Purpose Objects, then click New to create new classifications.

Figure App VI-18 Step b of Setting up OmniClass information under Style Manager for Civil 3D BIM Objects

000000000000000000000000000000000000000		
	5 Style	1) Right cli Classificati Definitions
Classification Definitions → Layer Key Styles → E List Definitions → Mask Block Definitions → Mass Element Styles → Material Definitions → Multi-View Block Defir → Profiles	New Synchronize with Project Standards Update Standards from Drawing Version Styles Copy Paste	2) Click Ne
	Purge	Apph
	Send	

c) On General tab, enter the Name and input the Description.

Figure App VI-19 Step c of Setting up OmniClass information under Style Manager for Civil 3D BIM Objects



d) On Applies To tab, select the BIM object with the OmniClass information.





- e) On **Classification** tab, click **Add** to enter classification items which are **Item** and **Description** ("Item" is equivalent to OmniClass classification number while "Description" is equivalent to OmniClass classification title). Click the **OK** button when classification information is entered.
 - Figure App VI-21 Step e of Setting up OmniClass information under Style Manager for Civil 3D BIM Objects



- 3.6.2. Apply OmniClass classification number to Civil 3D BIM objects
 - a) Select the BIM object, in the **Extended Data** tab of **PROPERTIES** Palettes, click "Unspecified".

Figure App VI-22 Step a of Applying OmniClass Classification Number to Civil 3D BIM Objects



b) In the **Select Classification** dialog, select the pre-defined classification information, then click **OK**.

Figure App VI-23 Step b of Applying OmniClass Classification Number to Civil 3D BIM Objects

×	Pipe		- 🖬 🔶	-45	
*	CLASSIFICATION			sign	
	OmniClass	*Unspecified*		õ	
	DOCUMENTATION			-	
	Hyperlink	-			$\widehat{}$
	Notes				
	Reference documents	— (0)		lay	
PERNES	C Select Classific "Unspecified" Ormiclass - 23-11212 - 23-11212 - 23-1212 - 23-12 - 33-12 - 33-12	ation 11 - Pavement Drainage 21 21 11 - Culverts -11 21 21 11 11 - Pipe Culverts		bject Class Excanded Data Dis	 1)Click to select the classification.
PRO	11 IR	OK Cancel	Нер		2)Click OK

c) After the selection, the OmniClass classification number is shown as below Figure.

Figure App VI-24 Step c of Applying OmniClass Classification Number to Civil 3D BIM Objects



- 3.7. Creation of Material Attribute in Revit
- 3.7.1. In Revit, Family parameters for loadable families can be added as material attributes in the **Family Editor**. Key steps for adding a material attribute are described as follows:

Figure App VI-25 Adding Material Attributes to Family Parameters for Loadable Families

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Modify	an Blend Revolve Sweep Sweet Void Model Com Blend Forms	1) In the Family Editor, Click Create tab > Properties panel > Family Types
Family Types		×
Search varameters		2) In the Family Types Dialog, Click New
Parameter	Value	Formula
Construction		
Wall Cosure	By host =	
Construction Type		
Dimensions	Parameter Properties	׾
Height	Parameter Turne	Difference in the Descention of the local
Width	Construction Type	3)In the Parameter Properties dialog,
Rough Width	Pamiy parameter	select Family parameter
Rough Height	(Cannot appear in schedules or tags)	
Analyt cal Properties Analyt c Construction Define Thermal Properties by Visual light Transmittance Solar heat Gain Coefficient	Shared parameter (Can be shared by multiple projects and families, expor appear in schedules and tags) Select	4) Input "Material " as the parameter
Therm I Resistance (R) Heat T ansfer Coefficient (U)	Parameter Data Name:	name
IFC Parameters	Material Type	
Operation		E) Calcut either Instance on Tune
Other	Usopine:	5) select either instance of type
Default Sill Height	Common 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
Identity Data	Type of parameter:	
Keynote	Material	6) Select "Material" as the type of parameter
Model	Group parameter under: report it in	a formula or as a
Manuficturer	Materials and Finishes	7) Select "Material and Finishes" as the Group
Type Comments Type Image URL	Tooltip description: <no a="" custo<="" description.="" edit="" parameter="" td="" this="" to="" tooltip="" write=""><td>n tooltp. Custom</td></no>	n tooltp. Custom
	Edit Tooltp	
How do I manage family types?	How do I create family parameters?	7) Click OK
Contrast, Cline proc. Decel 2 March	OK *	/) CIICK UK.

3.7.2. For Revit system families (e.g. basic ceilings, ramps), material should be set using the built-in "Material" parameter in the **Type Properties** dialog under **Materials and Finishes**. Refer to the figure below for details.

Figure App VI-26 Adding Built-in Material Attributes to System Families

pe Properti	ies			×
Family:	System Family: Bas	ic Ceiling 🗸 🗸	Load	
Type:	Ceiling 1	~	Duplicate	
			Rename	
i ype Param	Parameter	Value	=	
Materials	and Finishes		\$	
Material	and rankin s	<by category=""></by>		Default family parameter for Materia
Analytical	Properties		*	
Heat Tran	sfer Coefficient (U)	a second second second		
Thermal R	Resistance (R)			
Thermal N	Mass			
Absorptan	nce	0.700000		
Roughnes	s	3		
Identity D	Data		\$	
Type Imag	ge			
Keynote				
Model				
Manufact	urer		- 11 - 11	
Type Com	nments			
URL				
Descriptio	n			
Assembly	Description			
Assembly	Code			
	k			~

3.7.3. For compound structures, which are system families composed of parallel layers (e.g. walls, floors, compound ceilings and roofs), material should be set using the built-in "Material" parameter for each compound structure layer in the **Type Properties** dialog under **Materials and Finishes**.

Figure App VI-27 Adding Built-in Material Attributes to Compound Structure System Families

Edit Assembly							×
	Family: Type: Total thickness: Resistance (R): Thermal Mass: Layers	Basic Wall Exterior - Brick o 350.0 9.4859 (m ² ·K)/V 13.41 kJ/K EXT	n Mtl. Stud Sa /	mple Heig	ht: 6096.0		
	Function	Material	Thickness	Wraps	Structural	^	
	1 Finish 1741	Rick Com	10.0		Material		
	2 Thermal/Air I	Air	76.0				
	3 Membrane La	Air Infiltrati	0.0	N	-		
the the the the the the the the the	4 Substrate [2]	Plywood, S	19.0	E I			Default family parameters for
	5 Core Boundar	Layers Above	0.0				Materials
	6 Structure [1]	Metal Stud	152.0		2		
	7 Core Boundar	Layers Below	0.0	Sec. 8			
	8 Membrane La	Vapour Ret	0.0				
	19 IFinish 2 [5]	Gvosum W	13.0 ptop stne	N I			
	Insert	Delete	Ut		Down		
	Defa it Wranning						
	At Inserts:		At Ends:				
	Do not wrap		~ None			~	
	Modify Vertical Stru	cture (Section Pr	eview only)				
· · · · · · · · · · · · · · · · · · ·	Modify	Merg	e Regions		Sweeps		
, c	Assign Layers	Spl	Region		Revisals		
		ОК	c	ancel	Help	,	
Qb View: Floor Plan: Modify tys ∨	Preview >>						a.

3.8. Filling in Default Attributes under Room in Revit

> In Revit, Room objects already contain Name and Number as default parameters. The location of these attribute on "Properties" tab are described as follows:



Figure App VI- 28 Filling in Default Attributes under Room in Revit

4. Types of BIM Model Attribute

Prior to the publication of the Guidelines, some WDs have already defined and implemented asset owner-specific attributes. A mapping approach is utilised to consolidate the information whilst allowing WDs who needs to keep their pre-defined attributes. Four different types of LOD-I attributes exist, with different degrees of the alignment. This section explains their definitions and harmonisation approaches.

4.1. Common Attributes

Common attributes are those with the same attribute names and GUID with those listed in Table App VI-1 of this appendix. This kind of attribute name are aligned, and the information could be stored with the same nature for ease query.

4.2. Common Attributes with Alternative Attribute Names

The common attributes with alternative attribute names are those who contain the same information as one of the common attributes with an alternative name as predefined by the WDs. Mapping is required to associate the WDs' attribute names with the common attribute. With mapping defined, naming of the attributes from different WDs but with the same nature could be mapped and stored for ease query.

For example, if multiple attributes meaning "Asset Code" exist with names such as DSD.Com.Asset Code, EMSD.Common.Asset Code, which could all be mapped into the same column in the tabular format. Refer to figure below for an example.

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272 442	411 22-23 23 00		Pipe Fittings		0	0		-1								
273 442	413 22-23 23 00		Pipe Fittings		0	0		-1								
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270 442	419 02090800	Piping & Fittings	Pipe Fittings		0		VICTAULIC FIREL	oc -1			VICTAULIC	style 009N ,	005, 07 23.0	0.30.11.14	Pipework Fittin	gs
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Figure App VI-29 Sample Tabular Format for Storing Attributes

4.3. General Attributes

The general attributes are those commonly adopted across more than one WD but without aligned attribute names. Similar to Section 4.2, review is required to group those attributes with similar nature, prior to map these attribute names into the same column of the tabular format.

4.4. Remaining Attributes

Remaining attributes are the attributes that not classified as the common attributes and general attributes. Those attributes are discipline-oriented and not necessary to be aligned. Thus, the remaining attributes list could be stored without alterations to maintain the completeness of the information.

5. Mapping and Extraction of Attributes from BIM Models

5.1. Extraction Method Overview

After attribute mapping, extraction of attributes from BIM models could be conducted through authoring software's built-in functions, scripts or plug-ins. The sections below describe principles of attribute extraction from Revit and Civil 3D.

5.2. Extraction of Attributes from Revit

The attributes in Revit can be exported to an external dataset in tabular format. The software default attributes and user defined attributes could be identified and extracted to tabular format. For example, Dynamo for Revit may be used to view and extract element parameters.

5.3. Extraction of Attributes from Civil 3D

For Autodesk Civil 3D, since COBie spreadsheet cannot be exported directly from Civil 3D currently, **Property Set** should be defined in Civil 3D in order to extract the attributes in IFC format. Refer to Section 3.4 for details on **Property Set**.