

Annex

Level of Definition (LOD)

LoG and Lol Standards

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1. Introduction

The intent of these standards is to provide guidelines to ensure that all BIM (Building Information Models) models and its contents are prepared according to a standard and uniform data structure and geometrical definition. This document is intended to be a reference to be used by the AEC Supply chain involved in the Rail Baltica projects and any other that could be interested on adhering. It articulates the content and reliability of the BIM objects included in the BIM models at the different stages of the Rail Baltica's stages (Value Engineering, Master Design, Detailed Design, Construction and Operation & Maintenance) [for further details see Rail Baltica's BIM Manual, RBR-DOC-BIM-BMA-0001].

The definition of the Level of Definition allows the authors to understand and express the level of reliability their models show (or must be included in a BIM deliverable), making possible downstream users/actors to understand the use, the re-use and the limitations of the models they are being provided.

This document is subject to be updated throughout the life cycle of the Rail Baltica project, therefore, at the *kick-off meeting* before any Design/Construction/Operation stage, the latest version of this document must be confirmed, like any reference document of the BIM Manual ecosystem.

The BIM Manual has a Section called "Level of Definition" that defines the concepts described in this document. This documentation has the scope to provide further detail to what is defined in the BIM Manual, by specifying the Level of Definition (LOD), the Level of Geometric Detail (LoG) and the Level of Information (LoI) depending on the discipline of the object.

It is worth to note that this LOD document does not replace the BIM EIR/TS, but serve as a reference that may be modified or clarified in the mentioned documents. Besides, this document provides a means for defining the LOD in the BEP (BIM Execution Plan) that must be developed by the Supplier/Service Provider and agreed with RB Rail AS / National Implementing bodies (employer).

2. Level of Definition (LOD)

As defined in the BIM Manual, the Level of Definition (LOD) is a term used to manage the expectations and reliability of the extent to which an object category is modelled for a certain purpose, which is related to project stages, or even sub-stages if defined in that way in the BEP (for instance in a BIM Model Development Plan). This term is used to describe both the Level of Geometric detail (LoG) and the Level of Information (LoI).

$$\text{LOD} = \text{LoG} + \text{LoI}$$

It includes the level within the asset hierarchy, the geometric detail included (LoG), the accuracy of information required (LoI) and the attribute information expected for the different goals or at each delivery stage.

To be noted:

- The LOD (LoG & LoI) may differ in content depending on the contract, the discipline and the type of asset being described.
- The LOD itself does not define anything if not accompanied by the LoG and the LoI. The reference to LOD is commonly used by the AEC Industry to define the Level of Detail and/or Development, but Rail Baltica defines it as a duality of LoG and LoI.
- The LOD description uses a mathematical equation ($\text{LOD} = \text{LoG} + \text{LoI}$) but LOD has no numerical value.
[Example, being the LoG 300 and the LoI 200 $\Rightarrow \text{LOD} = \text{LoG} (300) + \text{LoI} (200) \neq 500$ nor 300 nor 200, simply LOD is defined as $\text{LOD} = \text{LoG} (300) + \text{LoI} (200)$]

3. Level of Geometric Detail (LoG)

The Level of Geometric detail (LoG) is the description of the quality of the graphical content of a container at a particular point during project delivery. It relates to how much detail is included within the model Space, System or Element.

The BIM Manual's "Level of Definition" Section defines the general approach to each LoG.

In case of discrepancy of what is included in a LoG, the BIM Forum LOD Specification (based on the AIA G202-2013 BIM Protocol) will prevail (<http://bimforum.org/lof/>).

Annex "BIM Objects LoG Matrix" [RBR-DAT-BIM-BMA-0007] shows the indicative LoG for each discipline and system for each project stage. These LoG shall be agreed separately in the BEP post-contract.

4. Level of Information (LoI)

The Level of Information (LoI) is the description of the quality of the non-graphical content of a container at a particular point during project delivery. It relates to the information that is included within the model's elements and that is contained in the elements' attributes. An example of this information could be (but not exclusive or limited to) performance specifications, location, tracking codes or asset management maintenance information.

The information that each element of the model shall contain is determined in the next documents:

- **RBR-DAT-BIM-BMA-0005_BIM_Objects_Attributes_Matrix**: Datasheet that includes the global attributes/parameters to be created and populated for each object by for the different LoI.

X:Mandatory O:Optional									
		attribute Description				LOI			
Group	Attribute	Data Type	Units	Description	Commentary	200	300	400	500
All attribute must be included in models									
Global attributes									
LoI									
	RBR-LoG	Integer		See Level of Definition Section	This attribute indicate the level of Reliability of the element from the LoG side.	X	X	X	X
	RBR-LoI	Integer		See Level of Definition Section	This attribute indicate the level of Reliability of the element from the LoI side.	X	X	X	X
Specifications									
	RBR-Spec Code	Integer		Specification code	Specifications codes, used to relate BIM objects to spec documents. Defined by Supply Chain during PIM.	-	O	X	X
	RBR-Spec Name	Text		Specification name		-	O	X	X
	RBR-Spec Division	Integer		specification division		-	O	X	X
	RBR-OCC	Text		Object Category Code		See codification tables	X	X	X
Quantities and Cost Estimation									
				Element Material designation according to the European Standard (EN, Eurocodes...) whenever there is an European standard.		-	X	X	X
	RBR-Material Designation	Text		Material description		-	X	X	X
	RBR-Material Description	Text		Name of the product		-	X	X	X
	RBR-Product Name	Text		Product description		-	X	X	X
	RBR-Product Description	Text		Uniclass 2015 Product table	As defined in UniClass 2015 tables.	-	X	X	X
	RBR-Pr Code	Text		For unique type identification	To distinguish different types with identical "Uniclass Pr codes"	-	X	X	X
	RBR-Type number	Integer		Measurement units	Indicates the measure units of the element	-	X	X	X
	RBR-Units	Text				-	O	O	O
	RBR-Unit Cost	Number				-	O	O	O
	RBR-Element Cost	Number				-	O	O	O

Figure 1: Global attributes

- **AD4** (Asset Data Dictionary Definition Document) **for each Asset**: Attributes related to some chosen assets that will be operated and maintained and will need further information beyond the one included in the **RBR-"DAT-BIM-BMA-0005_BIM_Objects_Attributes_Matrix"** as Global attributes. These attributes will be identified for the chosen attributes in specific Operation Documents, such as TMP (Technical Maintenance Plan) or others. For an easier use and identification, these attributes will be included in the spreadsheet **"DAT-BIM-BMA-0005_BIM_Objects_Attributes_Matrix"** in specific tabs called **"AD4_asset-name"**.

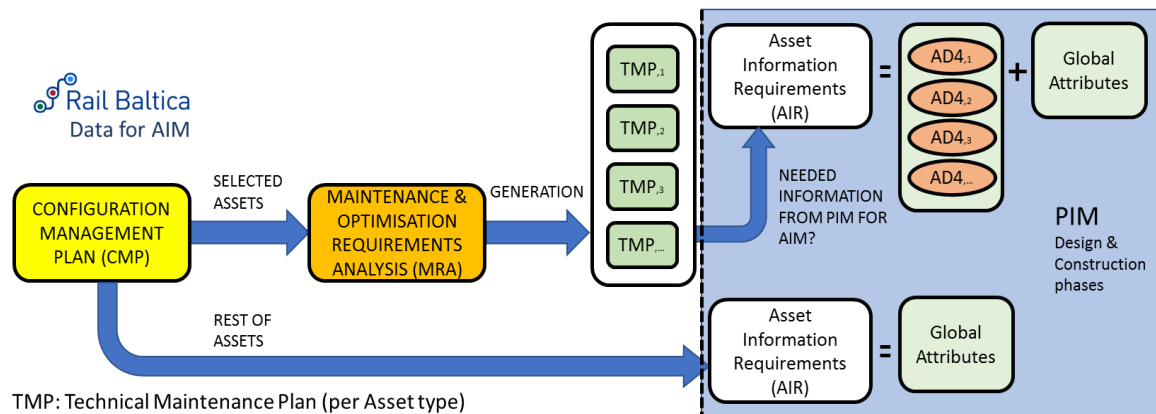



Figure 2: Global attributes + AD4 (type specific for Asset Management)

Element Type	Code	Image	Description
Rail	4		Rail

☒Mandatory ☐Optional

Type	Group	Attribute	Data Type	Units	Description	attribute Description	Commentary	200	300	400	500
All attribute must be included in models											
Type-Specific attributes											
Type	Group	Attribute									
Rail	Rail										
	Rail Side	String			The side of rail is locate based on the normal direction of traffic, e.g. left hand rail or right hand			-	x	x	x
	Rail Section Type	String			What is the rail type by standard coding	CEN60, CEN56...		-	x	x	x
	Rail Grade of Steel	String			Rail hardness by grading	R260, R250, HPRail...		-	x	x	x
	Rail Geometry	String			Describes the manufactured geometry of the rail	Straight, Pre-curved...		-	x	x	x
	Weight per metre	Decimal	kg/m		Weight per metre of rail			-	x	x	x

Figure 3: AD4 (type specific for Asset Management) – Rail asset example

5. Level of Reliability

The Level of Reliability of a particular object for the Geometrical and the Information sides will be defined in the “RBR-LoG” and “RBR-LoI” objects’ parameters respectively. (See “RBR-DAT-BIM-BMA-0005_BIM_Objects_Attributes_Matrix” datasheet)

The Level of Reliability is referred to the maximum level you can rely upon the objects included in a model for a particular LoG and LoI, therefore in the event an object is overdetailed or overmodelled, the reliability will be limited to the LoG and LoI defined in the objects parameters defined previously. (see table below)

		X:Mandatory O:Optional							
		attribute Description				LOI			
Group	Attribute	Data Type	Units	Description	Commentary	200	300	400	500
All attribute must be included in models									
Global attributes									
LOO									
	RBR-LoG	Integer		See Level of Definition Section	This attribute indicate the level of Reliability of the element from the LoG side.	X	X	X	X
	RBR-LoI	Integer		See Level of Definition Section	This attribute indicate the level of Reliability of the element from the LoI side.	X	X	X	X

Figure 4: RBR-LoG & RBR-LoI global attributes, used for Reliability notation

The Level of Suitability concept is not equivalent to the Level of Reliability one, for further explanations see “Levels of Reliability and Suitability” chapter in the “Level of Definition” section of the BIM Manual.

For further details see BIM Manual’s “Level of Definition” section.

6. Annexes

6.1. BIM Objects Attributes Matrix (RBR-DAT-BIM-BMA-0005)

This spreadsheet includes the global and the asset-specific datasheets. It is related to the Lol.

6.2. BIM Objects LoG Matrix (RBR-DAT-BIM-BMA-0007)

This annex describe the LoG for each particular discipline and model type.