LEVEL OF DEFINTION GUIDANCE NOTE

NHSScotland

Abstract

A short guide to Level of Definition, what it is and a frame of reference

Contents

1 Introduction

Information requirements are intended to provide enough information to answer a Plain Language Question (PLQ) required at a particular work stage. PLQs are in essence the questions that an NHS Board needs answering at a project approval gateway in order to approve that the project progresses to the next stage.

Think of a PLQ as a broad information requirement against which a supplier will respond with data taken from models and other sources. Any more information and waste is incurred, any less and the question cannot be effectively answered.

1.1 How much information?

Once you have established the PLQs it is then necessary to consider what information is needed from the supply chain in order to adequately answer it. How much information must be driven by the amount of information needed to answer each PLQ. More information will be produced as the design is developed, but the level of detail required may vary based on whether a separate design team or a contractor is responsible for detailed design.

At RIBA Stage 1 Preparation & Brief and SCIM Stage Initial Agreement (IA), the NHS Board will need to answer certain questions before proceeding to the next stage. An example of a PLQ may be 'What are the expected benefits of the proposal? Information to answer this question may involve the development of a Benefits Register, outlining the key expected benefits associated with the proposal, together with the agreed identification, evaluation and prioritisation methodologies for the next stage.

As the project progresses, NHS boards will require further information about the project in order to make informed decision. An example of a PLQ at the Handover and Closeout stage and SCIM Project Monitoring & Evaluation (PMS) may be 'Does the completed facility meet the brief?' Information to answer this may involve 3D models, test & commissioning attribute information, performance simulations, room / other schedules, functionality assessments, life cycle carbon assessments and life cycle cost assessments.

1.2 Level of Definition

In the same way that BIM can mean different things to different people, so to can the acronym, around LOD. For example the American Institute of Architects refer to LOD as 'Level of Development' within their specification publication. This is generally a single LOD code used to help define the content of any part of a BIM project.

In the UK, LOD is defined as 'Level of Definition'. Essentially it is the collective term for levels of detail (LOD), which describes geometry, and levels of information (LOI), the specification for non-geometric information or data. A benefit of using an agreed Level of Definition is that Design information is produced to a consistent level of detail that is no less or no greater than is required at the stage of a project.

Clear communication of the information requirement is very important but clients are not all expected to be able to define precisely what data they require from suppliers. A BIM Level 2 workflow is efficient, cumulative and informative. As a project progresses, the level of information will gradually increase (or, in some cases, decrease). Clearly defined data and information requirements will make sure that NHSScotland procure and receive verified data and information to the right level of definition.

1.3 Graphical and Non-graphical Information

The Level of Definition concept moves away from the idea of having a single code applied to a model at a certain stage. It is only when we combine both Graphical and non-graphical information do we get a clear picture. For example, while geometrical or graphical data can communicate the width of the brickwork leaf and the height of the wall, it is the written word that takes us to a deeper level of understanding. Information such as the bricks density, strength and source are not modelled graphical.

Figure xx illustrates an example of some graphical and non-graphical considerations for a typical masonry construction detail.

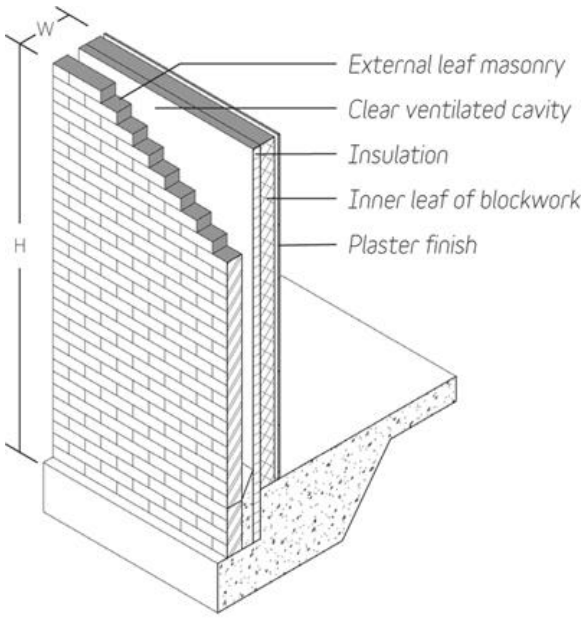
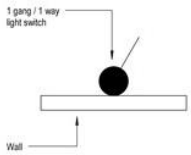
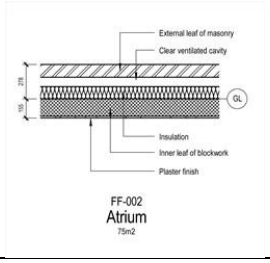
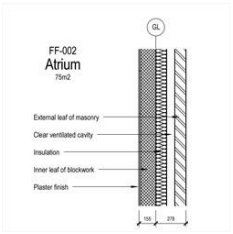
Graphical Information	**Non Graphical Information**
	**Performance** *– Accuracy tolerances (for structural performance)* *– Design submittals requirements (applicable where there is a contractor-designed component)* *– Working life* *– Fire performance* *– Structural performance – impact, M&E services, vehicular* *– Heat loss (U value)* **Execution** *– Workmanship during adverse weather* *– Cleanliness* *– Reference and sample panel requirements (to monitor workmanship, materials quality)* *– Specific product installation requirements (e.g. installing cavity wall insulation, installing lintels, block bonding new walls to existing, laying frogged bricks in mortar)* **Product properties** *– Thermal conductivity* *– Freeze/Thaw resistance* *– Recycled content* *– Dimensional tolerances for masonry units* *– Compressive strength*

Figure 1-1 Graphical and Non-graphical considerations

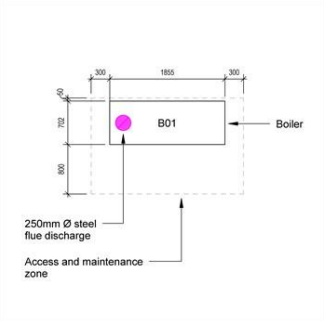
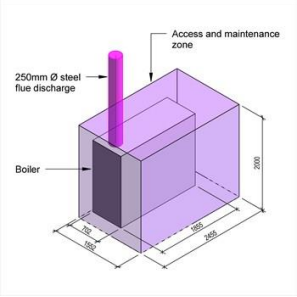
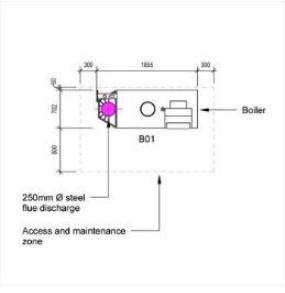
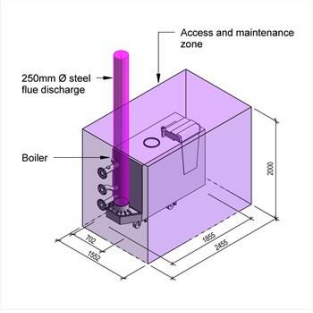
Within any NHSScotland project, the specific information requirements will vary. These will also vary depending on the form of procurement chosen. The information requirements at different stages on a commercial building and a highway will differ not only due to differences in procurement but also due to the requirements of planning, feasibility and long term asset management. The process defined in PAS 1192-2 should remain the same regardless of these.

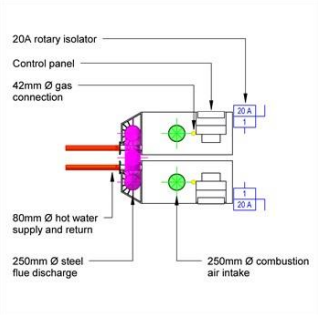
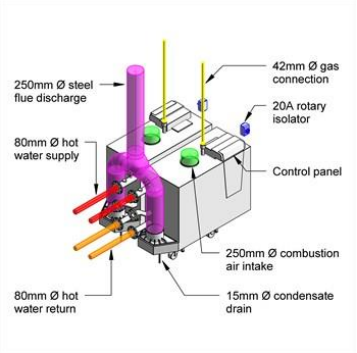
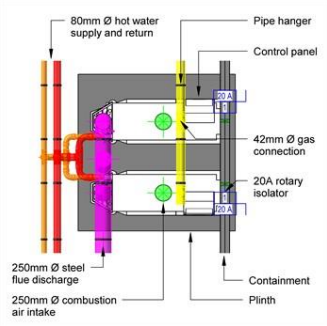
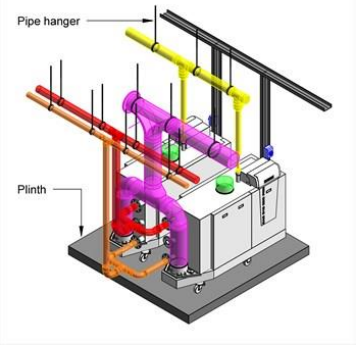
Having the ability to use LOD and LOI together provides for greater flexibility and allows for different procurement routes. It is also important to understand that LOD and LOI codes are not mutually exclusive to a project stage and may be higher or lower than the project stage number. For example at stage 2 Concept design stage client may ask for an LOD 2 (just enough to show spatial coordination, and door swing) and LOI 3 in order to understand Fire or security performance

The amount of graphical information needed for each object at each stage will also differ depending upon what it is. For example a light switch may only ever require symbolic information showing its location, while other items may require more geometry and volumetric information to help resolve spatial requirements and clashes. The image below shows a ceiling light switch and an external wall internal leaf system, both LOD 3. Note that while the wall would show section, and plan details while the light switch is only communicated as a symbol.

Banding code	Banding code
	 

Use of the LOD and LOI helps to ensure that the right amount of information is supplied at specific stages of a project, to help NHSScotland make better informed. The table below illustrates the Level of Detail concept for a Boiler together with a short description of the intended purpose of the information.

Level of Detail Principles		
Typical for Stage	Example: Boiler	
2: Concept Design Outline Business Case (OBC) To provide a visual representation of proposals at a Concept stage and support general spatial coordination. General descriptions would be expected to communicate principles of materiality, scope, colour and context.		
3: Developed Design Full Business Case (FBC) To provide a visual representation of proposals, confirming brief for technical Design stage supporting full spatial coordination. Can form a brief for a specialist sub-contractor or fabricator to progress with their technical design, fabrication and installation.		

Level of Detail Principles		
4: Technical Design Full Business Case (FBC) To provide a visual representation of proposals at a Technical Design stage supporting full spatial coordination. Graphical representation of system, dimensionally accurate indicating primary performance characteristics.		
5: Construction Construction & Commissioning To be updated during the construction process to reflect the final design, and to provide a future reference to sit alongside the O&M Manuals. Typical / Installation details separately produced linked to model element and adjacent constructions.		

The table below illustrates the Level of Information concept for a Boiler. Note how the information builds up from a simple description outlining design intent through to key properties that will be used during the operation and maintenance phases.

Level of Information Principles		
Banding code	Description	Example
2: What is typical for concept stage?	A simple description outlining design intent.	• To heat to staff room
3. What is typical as the design develops?	The specified overall performance of the deliverable.	• To heat to staff room (First floor 101) for 20 people.
4. What is typical in technical design?	The prescribed generic products that that meet the desired overall performance requirements.	• Mounting: Floor mounted • Fuel: Biogas • Electrical supply type – Single phase
5. What is typical in the construction phase?	The prescribed manufacturer products that that meet the generic product specification	• Manufacturer name • Standard - Boilers with heat input not exceeding 70 kW – To BS EN 677
6. What is typical for operation and maintenance?	The key properties to be transferred into an asset database	• BarCode: RFID Code • Expected life: 10 years • O&M Manual: Hyperlink • Warranty start date: 2016-06-28T23:59:59

2 What do I need to do?

2.1 Step 1: Define your PLQs

The first step is to define your PLQs that need to be answered. These are a key part of the information requirements process ensuring data is only produced when needed and ensures that digital data has clear purpose and aligned with organisational needs such as decision making.

You should develop a matrix with your plan of Work Stages across the x-axis and identify the plain language questions to help support the decision making process for each stage. You should also identify key decisions and Whether there are any security requirements around the information

2.2 Step 2: Define appropriate Level of Definition

Once you have defined your PLQs to help support the decision making processes, you should now consider the information that is required and the appropriate Level of definition.

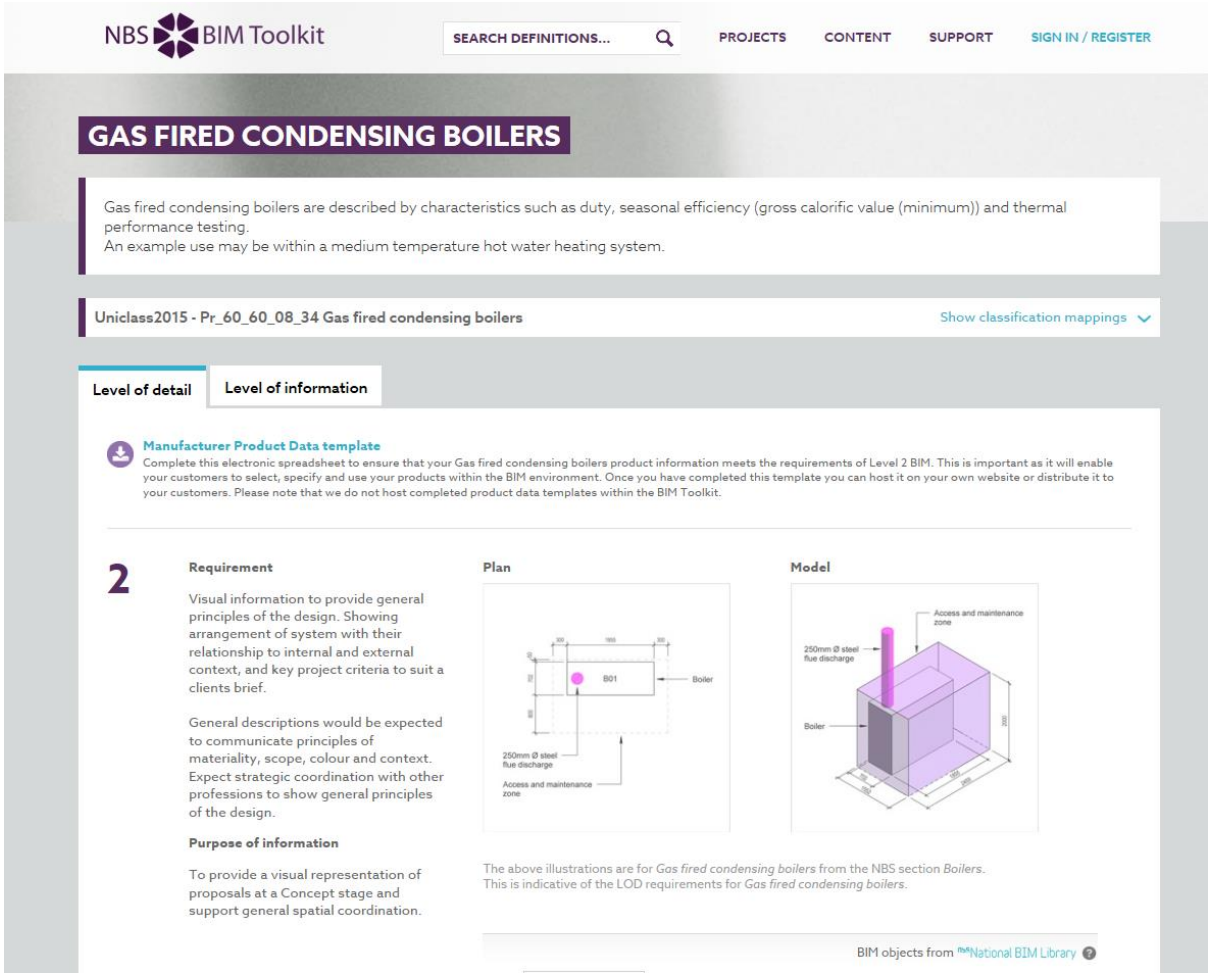
Supporting tools such as the free to use NBS BIM Toolkit are useful as it provides a reference definitions library for over 5,700 construction definitions for level of detail. The definitions are arranged by Uniclass 2015 classifications which are split into tables to help group similar items together. The tables are hierarchal support the clarification of big to small, such as from a Hospital campus, road network, to a floor tile or kerb unit. (This is discussed in more detail in the guides).

The defintions are also arranged by discipline:

- Architecture (E.g. Ceilings, doorstets, Partitions, tile roofs etc)
- Civil (Rail tracks, Tunnel linings etc)
- Landscape (Fencing, drainage, paving, planting etc)
- Services (Air conditioing, Gas supply, heating, ventilation etc)

While particular project requirements may need a higher or lower LOD or LOI than the corresponding project stage, a good starting part is to use the default of Stage 2= LOD 2/LOI 2 etc

These can be obtained from the NBS BIM Toolkit website https://toolkit.thenbs.com



2.3 Step 3: Documenting Information Requirements - MPDT

Now that you have defined your PLQs, and considered the appropriate LOD/LOI, you will now need to document this by assigning an LOD/LOI code against each building component or system, at each stage of the project within the 'Model Production Delivery Table' or MPDT for short . The value in this is that everyone knows what to expect

The MPDT can be found within Appendix C of the NHSScotland Employers Information Requirements document. As well as documented Level of definition for each system or element against project stages you will also need to consider the following:

- Information type, e.g. model, document
- File Format, e.g. PDF, COBie
- Responsibility, e.g. role responsible for creating and managing this information

The figure below is an extract from the MPDT. It provides details of each element together with the LOD/LOI requirements and who is responsible for delivering them for each project stage.

2.4 Step 4: Receiving and reviewing information

The MPDT is now developed following contract award by the PSCP (Main Contractor). This enables all parties to contribute and feed into the overall Project Information Model and final Asset Information Model.

NHS Boards and suppliers will need to agree what data and other deliverables are required to answer the PLQs. These are documented in the post-appointment BEP using Task Information Delivery Plans (TIDP).

You will need to determine how information is to be received and reviewed as part of your decision making process. Information required to respond to the PLQs will be developed by the project team, using the CDE to exchange information within the team.

EMPLOYERS INFORMATION REQUIREMENTS - Appendix C MPDT

NHS SCOTLAND

MODEL PRODUCTION & DELIVERY TABLE			RIBA Plan of Work 2013 Stage			0 Strategic Definition			1 Preparation & Brief			2 Concept Design			3 Developed Design			4 Technical Design			5 Construction			6 Handover & Close out			7 Operations & End Use			Information Exchange
Project Ref XXX		NHSS Board XXX	Programme Ref XXX			xx/xx/201x - xx/xx/201x			xx/xx/201x - xx/xx/201x			xx/xx/201x - xx/xx/201x			xx/xx/201x - xx/xx/201x			xx/xx/201x - xx/xx/201x			xx/xx/201x - xx/xx/201x			xx/xx/201x - xx/xx/201x						
NRM1 (BCIS Elemental) Note: below list to be developed to reflect project design			Uniclass 2015	Uniclass 2015	Asset Tag and/ or COBie data (referenced from Appendix C)	MEA (model element author)	NBS		MEA	NBS		MEA	NBS		MEA	NBS		MEA	NBS		MEA	NBS		MEA	NBS		MEA	NBS		COMMENTS
							LOD	LOI		LOD	LOI		LOD	LOI		LOD	LOI		LOD	LOI		LOD	LOI		LOD	LOI		LOD	LOI	
Elemental	------	Work Package	[Ss V1.9]	[Pr V1.9]																										
1	SUBSTRUCTURE	.																												
1.1	Substructure	.																												
	1.1.1	Standard Foundations	.	.	yes/ no								2	2		3	3		4	4		5	5		5	6				[PICKLIST SELECT]
	1.1.2	Specialist Foundations	.	.	yes/ no								2	2		3	3		4	4		5	5		5	6				
	1.1.3	Lowest Floor Construction	.	.	yes/ no								2	2		3	3		4	4		5	5		5	6				
	1.1.3.3	Lift pits & services channels	.	.	yes/ no								2	2		3	3		4	4		5	5		5	6				
	1.1.3.7,8,9	Below ground drainage inc internal gullies, outlets & access manholes	.	.	yes/ no								2	2		3	3		4	4		5	5		5	6				
	1.1.4	Basement Excavation	.	.	yes/ no								2	2		3	3		4	4		5	5		5	6				
	1.1.5	Retaining Walls	.	.	yes/ no								2	2		3	3		4	4		5	5		5	6				
2	SUPERSTRUCTURE	.																												
2.1	Frame	.																												
	2.1.1	Steel frame	.	.	yes/ no								2	2		3	3		4	4		5	5		5	6				
	2.1.2	Space frame/decks	.	.	yes/ no								2	2		3	3		4	4		5	5		5	6				
	2.1.3	Concrete casing to steel frame	.	.	yes/ no								2	2		3	3		4	4		5	5		5	6				
	2.1.4	Concrete frame	.	.	yes/ no								2	2		3	3		4	4		5	5		5	6				
	2.1.5	Timber frame	.	.	yes/ no								2	2		3	3		4	4		5	5		5	6				
	2.1.6	Specialist Frame	.	.	yes/ no								2	2		3	3		4	4		5	5		5	6				
2.2	Upper Floors	.																												