Publish Date

MODEL PROTOCOL & QA Collaboration & Coordination

Company Name

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TABLE OF CONTENTS

[1. PIM Model Protocol 5](#_Toc168559484)

[1.1 Modelling Methods 5](#_Toc168559485)

[1.2 Project Origin 5](#_Toc168559486)

[1.3 Identification Convention 7](#_Toc168559487)

[1.4 Units and Measurements 11](#_Toc168559488)

[1.5 Dimensions 11](#_Toc168559489)

[1.6 Workset Requirement 11](#_Toc168559490)

[1.7 Revit Project Browser Arrangement 13](#_Toc168559491)

[1.8 Drawing Production 14](#_Toc168559492)

[1.9 Model Information container Startup Screen & Model Management 14](#_Toc168559493)

[2. Model Quality Control 16](#_Toc168559494)

[2.1 Overview 16](#_Toc168559495)

[2.2 Version Number Definition 16](#_Toc168559496)

[2.3 Model Validation Checklist 16](#_Toc168559497)

[2.4 Periodic Quality Control Checks 17](#_Toc168559498)

[2.5 Milestone deliverable Quality Control Checks 18](#_Toc168559499)

[2.6 Level of information need 19](#_Toc168559500)

[2.7 Data Utilization and Ownership 19](#_Toc168559501)

# PIM Model Protocol

## Modelling Methods

Every effort should be made to ensure model information takes account of construction practicality. Elements are to be modelled in line with how they are typically constructed, e.g. walls span from structural floor to structural floor, and curtain walling is assigned to the ground floor level spanning multiple floors (please note however there is no requirement for existing models to be altered to satisfy this requirement)

All design changes will be done in 3D and not as 2D patches on related drawings sheets. All model elements shall be created adhering to the boundaries of the project functional and spatial breakdown strategy where specified.

The design review and approval workflow of 2D information derived from the models will, in accordance with the Design Management Plan.

To support costing using the BIM model, information originators must adhere to the following:

* All building elements must be modelled as an instance of a 3D BIM object unless specifically agreed by the Cost Manager, BIM Leader, and Contractor Lead.
* BIM objects must be authored using the correct building category, or IFC mapping to allow accurate IFC type mapping during export workflows.
* BIM objects must be modelled inaccurate locations, with accurate dimensions in alignment with the design intent.
* All duplicate BIM objects and BIM model issues must be removed when shared on the CDE.
* Layered or composite BIM objects must contain material data attributes (defining the materials of the BIM objects) consistent with the design intent or must be indicated as a concept in the BIM object ‘name’ data attribute.
* Any additional non-geometric fields to be attached to BIM objects that are required for cost management must be agreed and defined in the post-appointment BEP.
* Spaces must contain accurate data regarding finishes, room function, name and intended occupancy where known.

## Project Origin

All model information will adopt the same coordinate system to ensure efficient collaborative working. All shared model information will.

* Use the agreed project origin point with the correct corresponding world coordinates.
* Be produced to the agreed height above datum.
* Have the agreed angle to True North orientation, ensuring a minimum of 6 decimal places used, i.e. in the format 19.663444 deg (Or if using DMS format 19deg 39min 49.3984sec).
* Ensure measurement units are in millimetres (any deviation should be advised before issue).

For the origin, datum height and angle to True North, all model information will be correct to 3 decimal places.

Table 1 - Project Origin

|  |  |
| --- | --- |
| Component | Value |
| Physical-world origin | Easting: Measurement (m)  Northing: Measurement (m) |
| Project level datum for Level 0 | Measurement (m) Above Ordinance Datum |
| Project North | Orientation (Degrees) Clockwise from true north |

Architect to provide an image with gridlines and coordinates to assist the rest of the consultants, these should include coordinated positions of 4 of the gridline intersections of the building grid in order to assist in site setting out activities.

When federating models, please use the Architect’s coordination model, and Revit users must import “Auto-By Shared Coordinates” option to avoid misalignment.

A blueprint of a building

Description automatically generated

## Identification Convention

### Files (information containers)

All model information project information containers will adopt a unified identification convention. This is based on the industry-standard BS EN ISO 19650-2:2018 and will guarantee clarity for collaborative working.

All model file names should remain constant throughout the project and contain no revision number or timestamp. This is to avoid complications when updating federated models. The identification convention should refer to the BEP section **Error! Reference source not found.** **Error! Reference source not found.**

Amendments to this identification structure may be permitted following approval. The required format and list of codes can be found in Lead appointed Party Model, Drawing and Document Identification Protocol, which is included within the Project Quality Management Plan

### Objects

Model objects are to be named in accordance with BS8541-1:2012 using clear, descriptive object identification for all object and family types prefixed by function or company reference. A list of object and family type codes are to be provided by each model contributor.

* All MEP Component shall be connected and linked into corresponding Pipe/Duct Systems, and where existed electrical circuitry is required to be set up in the Revit model.
* All system type shall be set in the Duct System and Pipe System accordingly and to be recommended as below.

#### {SYSTEM CODE}\_{SUBSYSTEM CODE}

Table 2 - Objects code

|  |  |  |  |
| --- | --- | --- | --- |
| System | Code | Sub-system | Code |
| Fire Services | FS | Fire services supply / incoming water supply system | FSS |
| Fire Services | FS | Automatic sprinkler system | SPR |
| Fire Services | FS | Fire hydrant and hose reel system | FHR |
| Fire Services | FS | Manual and automatic fire detection and alarm system | FDA |
| Fire Services | FS | Pre-action sprinkler system | PAS |
| Fire Services | FS | Gaseous extinguishing system | GAS |
| Fire Services | FS | Aspirating smoke detection system | ASD |
| Fire Services | FS | Portable hand-operated appliances | PHA |
| Fire Services | FS | Electrical and control system | ELC |
| Plumbing | PL | Cleansing water system | CLW |
| Plumbing | PL | Coldwater system | NCWP |
| Plumbing | PL | A potable cold-water system | PCW |
| Plumbing | PL | Flushing water system | FLW |
| Plumbing | PL | A potable hot water system | PHW |
| Plumbing | PL | Hot water system | HWP |
| Plumbing | PL | The incoming water supply system | IWS |
| Plumbing | PL | Kitchen cold water system | KCW |
| Plumbing | PL | Kitchen hot water system | KHW |
| Plumbing | PL | Kitchen hydrovent system | KHV |
| Drainage | DR | Rainwater disposal system | RWD |
| Drainage | DR | Soil, waste, and ventilation system | SWP |
| Drainage | DR | Siphonic drainage system | SID |
| Drainage | DR | Vent Pipe | VNP |
| Mechanical Ventilation and Air-conditioning | AC | Chilled water system | CHW |
| Mechanical Ventilation and Air-conditioning | AC | Condensate drainage system | CDP |
| Mechanical Ventilation and Air-conditioning | AC | Refrigerant system | RFP |
| Mechanical Ventilation and Air-conditioning | AC | Water treatment chemical system | WTC |
| Mechanical Ventilation and Air-conditioning | AC | Condensing water system | CND |
| Mechanical Ventilation and Air-conditioning | AC | Make-up water system | MUW |
| Mechanical Ventilation and Air-conditioning | AC | Cooling water system | COW |
| Mechanical Ventilation and Air-conditioning | AC | The primary air duct system | PAD |
| Mechanical Ventilation and Air-conditioning | AC | Supply air duct system | SAD |
| Mechanical Ventilation and Air-conditioning | AC | Return air duct system | RAD |
| Mechanical Ventilation and Air-conditioning | AC | Exhaust air duct system | EAD |
| Mechanical Ventilation and Air-conditioning | AC | The fresh air duct system | FAD |
| Mechanical Ventilation and Air-conditioning | AC | Transfer air duct system | TAD |
| Mechanical Ventilation and Air-conditioning | AC | Staircase Pressurisation system | SPD |
| Mechanical Ventilation and Air-conditioning | AC | Smoke extraction system | SED |
| Mechanical Ventilation and Air-conditioning | AC | The make-up air duct system | MAD |
| Mechanical Ventilation and Air-conditioning | AC | Kitchen exhaust system | KED |
| Mechanical Ventilation and Air-conditioning | AC | Temporary air-conditioning system | TAC |
| Mechanical Ventilation and Air-conditioning | AC | The electrical power supply system | EPS |
| Mechanical Ventilation and Air-conditioning | AC | Building management system | BMS |
| Electrical | EE | Incoming main | ICM |
| Electrical | EE | Mains and sub mains | MSM |
| Electrical | EE | Lighting and small power system | SPS |
| Electrical | EE | Lightning | LIG |
| Electrical | EE | Earthing and bonding | EAB |
| Electrical | EE | Normal | N |
| Electrical | EE | Emergency | E |
| Electrical | EE | Uninterruptible Power Supply | UPS |
| Electrical | EE | IT | IT |
| Electrical | EE | COM | COM |
| Electrical | EE | ELV | ELV |
| Electrical | EE | Fire Service System | FS |
| Electrical | EE | FB | FB |
| Electrical | EE | Security | SEC |
| Electrical | EE | PA | PA |

The above system list is subject to change for project need. Any extra sub-system not listed above shall be added if necessary. The above list of abbreviation is subject to final confirmation by the Lead Appointed party.

Duct and Pipe System name shall be named with sufficient detailed for clarification on the system capacity and system number and serving location if applicable.

All Pipe, Pipe Insulation, Duct and Duct Insulation Type shall specify as per their Materials with standard specification or Brands. The corresponding sizing of each material pipe and duct shall be setup accordingly as well.

#### {MATERIAL NAME}\_{(MATERIAL ABBREVIATION)}\_{AUTHOR}\_{STANDARD/BRAND}\_{SIZING}

\*Applicable for Pipe Type, Duct Type, Cable Tray Type, Conduit Type etc.

For MEP component, except Pipe, Pipe Insulation, Duct and Duct Insulation, all the family identification and type identification shall be specified with Size, Equipment Type, and description wherever applicable as dependent only family creation. (To be further updated.)

### Project View

View identifier shall be consistent across all references to that view. Renaming of views shall be carried out with care as any changes will be automatically reflected across all documentation. The View Naming could be concluded as follows.

#### {LEVEL\_CONTENT}

Examples:

Table 3 - Project View

|  |  |
| --- | --- |
| Identifier | Description |
| ZZ | Multiple levels/locations |
| XX | No level/location applicable |
| 00\_Plan | Level 0/Ground floor plan |
| 01\_Plan | Level 1/First floor plan |
| M1\_CeilingPlan | Mezzanine above level 1 reflected ceiling plan |
| B1\_DetailPlanElevator1 | Basement level 1 detail plan at elevator1 |
| ZZ\_AA | Section A-A along gridline xx |
| ZZ\_NorthSouthSection | North-South full building section |
| XX\_EdgeSection | Typical edge section showing slab, beam, and wall |
| ZZ\_SouthElevation | Building South Elevation |

For a more accessible and more straightforward naming convention, all fields are optional. To maintain compliance, any variations should be clearly stated in the Project BIM Execution Plan.

### Family / Type Identification

Element Naming consists of 2 levels related to family’s parameters that are Family Name and Type Name.

#### {FAMILY NAME: TYPE NAME}

Example:

Table 4 - Family Type

|  |  |
| --- | --- |
| Identifier | Description |
| Basic Wall: W1\_Fullbrick\_200mm | 200mm thick brick wall specified as W1 |
| Compound Ceiling:C1\_Concrete Paint | The ceiling in concrete paint specified as C1 |
| Rectangular Footing:F1\_800x1000mm | Footing specified as F1 |
| Sliding\_Aluminium:W1\_1.30x2.05 | Aluminium window specified as W1 |

**Family Name** is a parameter name describing materials and function of the element which shall be named as a followed concept.

#### {FUNCTION\_MATERIAL (Optional)\_DESCRIPTION (if necessary)}

Graphical user interface, application

Description automatically generated

**Type Name** is a parameter name describing specific details such as dimension which shall be named as a followed concept.

#### {TYPE MARK\_DESCRIPTION\_DIMENSION}

Graphical user interface, application

Description automatically generated

**Type Mark** is one of the parameters in Revit that is attached to the element ‘Type.’ In this case, Type Mark is used to indicating design specification according to a particular project. Family Name and Type Name might vary upon family disciplines (AR, ST, MEP). However, the concept of identification remains the same.

### Rooms / Areas

Room/area identification shall be in accordance with the Lead Designers model.

## Units and Measurements

All units of measurement are to be in metric and are to comply with the following project standards:

Table 5 - Units and Measurements

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Measurement | Unit | Symbol | Decimal Places | Example |
| Length | Millimetres | mm | 0 | 123mm |
| Area | Square Metres | m² | 3 | 0.123m² |
| Volume | Cubic Metres | m³ | 3 | 0.123m³ |
| Mass | Kilogrammes | kg | 3 | 0.123kg |
| Rotation | Degrees | xº | 6 | 0.123456º |

## Dimensions

Similar to Text Styles, Arial or Arial Narrow shall be used for dimension styles. It is recommended to adhere to dimension styles included in the model template. Where additional dimension styles are required, BIM coordinator shall discuss and agree with the Project BIM Manager.

Recommended Dimension Style identification Convention



* {Purpose} - Optional, Exclusive purpose of this text style.
* {Type Face} - Font used (Arial or Arial Narrow).
* {Graphics} ‐ Description of font style.

Table 6 - Dimension Style Name Examples

|  |
| --- |
| Dimension Style Name Examples |
| SheetAnnotation‐Arial‐5mm‐Transparent |
| QA\_Arial‐Red‐3mm |

## Workset Requirement

A workset is a collection of elements in work shared Revit project. Purpose of worksets is to enable multiple users to work on the same project and facilitate collaboration by subdividing building elements in a project.

Organisation of worksets is essential for updating, maintenance and review of models. It should be organised in a way that users working simultaneously are not interfered by each other by frequent request and grant of permission to edit elements and facilitates modelling and coordination of within scope by closing worksets outside the scope.

All Lead Appointed Party Name - Company Name BIM projects in Revit platform shall be work-sharing enabled with worksets suitably created for the project needs.

Worksets shall be created in Just‐in‐Time fashion as per project needs, following the Workset Identification Convention.

Table 7 - Workset Identification Convention

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| {Package/Appointment No.} | \_ | {Discipline} | \_ | {DESCRIPTION} |
| x\_datum | \_ | Grid/Level/ etc | | |
| x\_link\_ | \_ | {MODEL FILE NAME} | | |

* {Package} ‐ MC/ NSC00x.
* {Discipline} - AR/ ST/ FS/ AC etc.
* {Description} ‐ Description of Scope.

Table 8 - Workset Identification Examples

|  |  |
| --- | --- |
| Name | Description |
| X\_datum\_Grid | Grids in the Architecture model |
| X\_datum\_Level | Levels in Architecture model |
| X\_datum\_ReferencePlane | Reference Planes in Architecture model |
| MC\_AR\_Core Wall | Default workset for all architectural scope |
| NSC001\_AC\_Air Side xxxx | Architectural elements in ‘scope A’ |
| x\_link\_’Project Code’\_AR\_XX\_Tower\_SD.rvt | Tower architectural model |

General rules in workset creation

* No default worksets created by Revit should remain unchanged, i.e. Shared Levels and Grids and Workset1. These should be renamed to AR\_Level, AR\_Grid and AR\_Overall respectively.
* {{Description}} used in workset identification should describe the scope of works logically contained in the workset. This will help users to understand the structure of the project when they return to the project after an extended period and facilitate model review and sign‐off. Avoid adding any worksets for single user’s purpose, such as “John’s Workset.”
* All levels and grids in the model shall be appropriately assigned to worksets.
* In the case where two or more disciplines coexist in the same model, they should be assigned to different worksets.
* All linked model instances must be assigned to its link workset.

## Revit Project Browser Arrangement

Table 9 - View Group

|  |  |
| --- | --- |
| View Group | View Sub-group |
| 00 General | Drawing Reference |
| BIM Audit |
| 01 Drawing | Shop - “Contractor Name” |
| CSD - “Contractor Name” |
| CBWD - “Contractor Name” |
| ISD - “Contractor Name” |
| BIM360 - 3D Views |
| etc |
| 02 Works Package | “Works Package Number” - “Contractor Name” |
| etc |
| 03 5D Payment | “IP Number” - “Works Package Number“- “Works Contractor” - “(VO)/NA” |
| etc |
| 04 Coordination | “Company” - “Location” - Purpose |
|  |
| 05 WIP | “Company” - “Staff Name” |
|  |

#View Group and View Subgroup are project parameter.

Table 10 - Schedule Group

|  |  |
| --- | --- |
| Schedule Group | Schedule Sub-group |
| 00 General | Project Datum - Grids, Levels, etc |
| Project View List, Project Sheet List |
| Project Room List |
| Project Model Groups |
| Project RVT Links |
| Mass |
| Parts |
| Assemblies |
| 01 Drawing | Works Packages Number - Works Contractor - Drawing Package Number & Description |
|  |
| 02 BQ/SOR | Works Package Number - Works Contractor |
|  |
| 03 WIP |  |

Table 11 - Sheet Group

|  |  |
| --- | --- |
| Sheet Group | Sheet Sub-group |
| 01-General |  |
| 02- Works Package | Works Package Code - Contractor Name - Drawings Set Name |

## Drawing Production

All layout views and schedules shall be generated from the Revit model. While it is preferred to be created within Revit, schematic diagrams and typical details may be generated in AutoCAD and linked or imported in Revit Sheets.

### Xref Views

All disciplines shall prepare a set of deliverable views and sheets in Revit including Floor Plan, Reflective Ceiling Plan, Section and Elevation in the respective discipline BIM model ready for another discipline to overlay with ‘Linked View’ option in Visibility/Graphics Override setting.

### Drawing List

All drawing lists shall be generated and updated automatically from Revit sheets included in the Revit project as part of the deliverables to eliminate discrepancies and human errors.

## Model Information container Startup Screen & Model Management

Model management is required upon issuing of information containers (files) to the rest of the design team. All model information containers which are issued to the project team will require a start-up screen. This must contain:

* Project name.
* Date of issue.
* Fundamental model changes from earlier information container issue.

All drawings produced for this project shall utilize the **ISO 5457** compliant drawing sheet provided.

All deliverables shall include the following **ISO 7200** compliant title block.

Graphical user interface, text

Description automatically generated

Figure 1 - Drawing Title block

All model information containers which are issued to the project team will require a model clean-up to reduce the file size and to purge unnecessary items. This includes:

* All items related to the purpose of the issue should be ‘bound in’ to the model Information container (this may apply for example where a single discipline has smaller linked models that are relevant to the purpose of issue, e.g. bathroom pods).
* All items not specifically related to the purpose of the issue should be deleted.
* All drawing sheets must be deleted.
* All views deleted.
* All linked DWGs shall be deleted.
* 'Purge' and 'audit' the information container to remove any unused objects and model corruption issues.

# Model Quality Control

## Overview

All BIM coordinators and project contributors are responsible for maintaining the quality and integrity of respective discipline models as specified in agreed BIM Standard and project-specific BEP. All project contributors must read and understand these Information containers before start working on the model. To ensure model quality and relevant information is adequate for the intended BIM objectives and BIM uses, the following workflow of quality control should be implemented.

## Version Number Definition

Rev P01.01: This is the first release of the information container. All other releases will be P01.02, P01.03 etc. Rev.0.1: The first iteration of the document. For each minor change to the information container, use the decimal revision numbers to indicate the status of the current update process (0.2,0.3,1.1, 2.1 etc.).

Revisions starting with 0 (e.g. 0.1, 0.2) are draft issues for comment. Information containers with a 0 revision number have not formally been issued.

## Model Validation Checklist

The checklist consists of the following checks to assure quality within models and information, to eliminate errors and achieve desired project outcomes.

Table 12 - Model Validation Checklist

|  |  |
| --- | --- |
| Check | Definition |
| Project Coordination Check | Ensure the correct location of the building across all models of all disciplines. |
| Model Element Check | Ensure that those model elements are correct according to the standard. |
| Model Integrity Check | Ensure the correct location and reference of the model elements. |
| Interference Check | Detect problems in the model where two building components are clashing |
| Link File check | Ensure that all links will be valid and easy for further use |
| Excess Information Check | Ensure that there is no unnecessary information in the model. |
| File Location Check | Ensure that all the files in the Central Workspace are valid and incorrect location. |

Table 13 - Example of Model Validation Checklist

|  |  |
| --- | --- |
| Model Check | ✓ ✘ |
| 1. Project Coordination Check |  |
| 1.1 Model has Acquired Coordination from GRID.rvt | See File Coordination Check tracking |
| 1.2 All Grid and Level are Copied-Monitored from GRID.rvt |
| 1.3 Survey Point and Project Base Point are in the correct position (Refer to BEP XX.XX Project Coordinate) |
| 1.4 Project Base Point is located on the correct gridline (X, X) and has been clipped |
| 1.4 For the project with links file: All files are drawn at the correct level. |
| 2. Lead Appointed Party Standards BEP and Model Element Check |  |
| 2.1 File naming is correct according to the standard (Refer to BEP XX.XX Identification Convention) | ✘ |
| 2.2 Family Name and Type Name are correct according to the BIM standard | ✘ |
| 2.3 Family's Type Mark is correct according to project specification | ✓ |
| 2.4 Use family from the appropriate category (Refer to BEP XX.XX Family Management) | ✓ |
| 2.5 Model have required elements and information in the elements as specified in Model Ownership | See Model Ownership Checklist |
| 2.6 MEP ONLY: Ducts and Pipes are in the correct System Classification and System Type | ✓ |

## Periodic Quality Control Checks

Apart from the weekly model coordination effort that focuses on spatial coordination and clash resolution, the Appointment BIM Manager should review all disciplines project models and ensure compliance with BEP and BIM Standard. Periodic, i.e. weekly, or bi-weekly model review and comments should be forwarded to each BIM coordinators for their follow up.

Table 14 - Periodic Model Check Items (Weekly/Bi-weekly)

|  |  |
| --- | --- |
| Model size | Check if the model size is kept within the agreed limit. Typically, it is recommended to keep the size of a single model to be within 300MB. If it is more significant than the agreed size limit, the project team should consider further segregation of the model. |
| Worksets | Check if model elements are assigned to correct worksets. |
| Purge Unused | Check if there are unnecessary families loaded on to the project model. |
| Model Warnings | Go through model warnings and identify errors that should be resolved. |
| Model Audit | Last auspicious model audit time. The model audit should be carried out weekly at a minimum. |
| Model  Alignment | Check if the model is assigned with correct coordinates, project north, project basepoint and internal origin. All project models within the same project should be linked with correct alignment without manual adjustment of the linked model after linking. |
| Identification  Convention | Check if identification convention of model elements (sheets, views, families, etc.) |
| Graphic Standard | Check compliance of graphic standards (line weight, object style, annotation elements, etc.) |

## Milestone deliverable Quality Control Checks

In addition to weekly quality control checks, milestone deliverable quality control checks should be conducted for sign‐off. At a minimum, the following items should be checked before the milestone deliverables can be signed off.

Table 15 - Milestone Model Check Items

|  |  |
| --- | --- |
| Level of information need | Check if the level of model maturity progression elements is adequate as specified in BEP. |
| Drawing List | Check if drawing list is complete and consistent with sheets both in project models and PDF sheets. |
| Consistency with other deliverables | Check if the contents of other milestone deliverables are consistent with project models. (PDF sheets, Design review models, etc.) |

## Level of information need

The part 1 & 2 of BS EN ISO 19650:2018 set of standards introduced a new term ‘Level of information need’ which is designed to replace the terms used in PAS1192 such as Level of model definition/level of detail (LOD) and level of information (LOI). Since the PAS1192-2:2013 has been withdrawn[[1]](#footnote-2) and the new BS EN ISO 19650-2:2018 does not define the Maturity Model Progression requirements, such that the trade contractor should propose the suitable model maturity throughout different project stage and should submit to the BIM lead Consultant for review and approve. The BIM Lead Consultant shall have the final right to determine the Level of Information need in any circumstance.

The Maturity Model Progression shall comply with NBS Toolkit definitions Level of Detail and Level of Information stated in dPoW.

The NBS Toolkit can be accessed by the following: <https://toolkit.thenbs.com/definitions>.

## Data Utilization and Ownership

Appointing Party Name needs to own, reuse, and adequately manage building data throughout the facility lifecycle. Appointing Party Name and Lead Appointed Party Name place significant importance on the accurate creation, management, and stewardship of building information during the design and documentation process. The design process shall allow refinements during and after the construction process, with the goal being delivery of project data in support of the owner, and utilization in facility management. The Appointing Party, i.e. Appointing Party Name shall have ownership of all information Containers, i.e. CAD files, BIM Models, and Facility data developed for the Project, Appointing Party name may make use of this data following any deliverable.

1. PAS1192-22013 Figure 20 – Level of Definition [↑](#footnote-ref-2)